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Boulder Laboratories

BIBLIOGRAPHY ON IONOSPHERIC PROPAGATION OF RADIO WAVES (1923 - 1960)

BY
WILHELM NUPEN

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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NATIONAL BUREAU OF STANDARDS

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October 1960

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BIBLIOGRAPHY ON IONOSPHERIC PROPAGATION OF RADIO WAVES (1923-1960)

INTRODUCTION

This bibliography comprises a non-exhaustive compilation of over 1400 references to the world's literature on the ionosphere with special emphasis on its effect on reflection, refraction or propagation of electromagnetic waves. The frequencies involved are usually in the low frequency or long wave bands in contrast to those(UHF, VHF and SHF) involved in tropospheric propagation investigations although the pulsed technique at vertical or slant incidence makes use of a wide range of frequencies.

Several distinct fields of ionospheric propagation have been purposely omitted in order to keep the volume of material down to manageable proportions. There are:

Meteor or meteor trail propagation
Radio reflection from auroras
Radioastronomy

These, and related aspects, will be the subjects for a smaller supplementary volume; and the accumulated literature on Tropospheric Propagation for still another volume, also of somewhat smaller dimensions.

Although material from every country, where ionospheric investigations are being carried on, is included herein, the user will no doubt be aware that more material from U.S. and Japanese, and correspondingly less material from French, German and Russian sources, has been included than would be the case if a more exhaustive coverage were possible. Eventually, the literature of these countries (and of the U.S.A.), which has been overlooked in this bibliography, will be included in one or other supplement to this volume.

Every effort has been made to avoid errors in citations and although scores of errors have been discovered in proof and corrected, many others have no doubt gone undetected. If anyone should find a serious error, such as in the spelling of an author's name, or in the date of publication, we should be pleased to have such called to our attention. Similarly, notice of any serious omissions should be communicated, with or without an abstract, so that supplements will be as exhaustive as possible.

The material is arranged alphabetically by the first author's name, and chronologically under each author. An author index is provided for the purpose of identifying works of added (i. e., second or third) authors where teams have cooperated in writing an article. A subject and place outline, and subject index are also provided in order to give the reader an idea of the scope of the subject material involved. Obviously, with such a large total number of items on a fairly narrow range of subject matter, there will be too large a number of references on some subjects no matter how noble an effort is made to subdivide the material under each heading.

We wish to express great appreciation for the work performed by Mr. Otto Taborsky in preparing the systematic geographical outline which follows the subject outline, and to Mrs. Dorothy Gropp for checking the accuracy of serial citations, and to Mrs. Doris Nickey for the months of work she has performed in typing and correcting copy for this voluminous work.

Finally, we wish to express our appreciation to the National Bureau of Standards Boulder Laboratories for support of this compilation, and especially to Mr. Bradford R. Bean, of that Laboratory, for his patient guidance in helping to determine the general scope and arrangement of material herein, and for many of the entries submitted by his laboratory; and to the Air Force Cambridge Research Center, under whose sponsorship much of the original work which went into the

product was performed. These items are identified by the initials of the abstractors as indicated below.

Considerable use was made of the excellent bibliographies prepared in 1947 and 1955 by L. A. Manning (items A-799 and 803), in checking and searching for missing references. Any of the abstracts taken from this source are indicated by the initials L. A. M.

Malcolm Rigby, editor
Meteorological and Geoastrophysical Abstracts
Box 1736, Washington 13, D. C.

Note:

Abstractors/Ionospheric Propagation Bibliography

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Others:

L.A.M. = L. A. Manning
Physics Abstracts
Science Abstracts of China, Earth Sciences
Institute of Radio Engineers, Proceedings

Library Symbols:

DBS...... U.S. National Bureau of Standards, Washington, D. C.
DGS..... U.S. Geological Survey, Washington, D. C.
DLC...... Library of Congress, Washington, D.C.
DWB...... U.S. Weather Bureau, Suitland, Maryland
DN-HO.... U.S. Navy Hydrographic Office, Suitland, Maryland

SUBJECT OUTLINE

I. GENERAL WORKS

1. Textbooks, monographs, manuals. A-164, 177, 188, 189, 190, 299, 300, 356, 378, 385, 479, 489, 503, 542, 628, 655, 658, 693, 742, 756, 764, 773, 820, 907, 946, 948, 952, 1009, 1013, 1018, 1026, 1157, 1218, 1235, 1250, 1252, 1359, 1360

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4. Ph. D. Theses. A-659, 685

   M. S. Theses. A-302

5. Maps and nomograms. A-164, 204, 277, 330, 360, 455, 669, 823, 876, 901, 919, 933, 948, 1080, 1234, 1322

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7. History. A-24, 26, 175, 252, 429, 487, 488, 590, 596, 676, 724, 736, 917, 958, 1161, 1231, 1276, 1293

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III. FORMULAS

X. METHODS AND TECHNIQUES OF OBSERVATION

GEOGRAPHICAL OUTLINE

C. OCEANS, SEAS AND ISLANDS

BIBLIOGRAPHY ON IONOSPHERIC PROPAGATION

A-1 Abbot, Charles G. (Smithsonian Inst.), Periodicities in ionospheric data. Smithsonian Miscellaneous Collections, 35 (10), May 28, 1958. 5 p. fig., 3 tables. DWB (M10.35 A126pe).

A-2 Abbott, W. N., Quelques interessantes variations du souffle de fond observees sur les frequences de 17.6 Mc/s. (Some interesting variations of static noise at frequencies of 17.6 Mc/s.) Journal of Atmospheric and Terrestrial Physics, 11(1):72-74, 1957. fig., ref. English summary p. 72. DWB--Observations of static on 17.6 Mc/s at St. Omer at 2 hr intervals (1 hr before, 1 and 3 hrs after sunset) show a slight decrease (0.6 dB) after sunset in winter and spring. This disappears in July to Sept. when the presence of the center of the Galaxy counterbalances loss of reception cone. It is attributed to descent of F layer. On 5 Mc the effect is opposite. --C.E.P.B.

A-3 Abel, W. G. and Edwards, L. C., Source of long-distance backscatter. Institute of Radio Engineers, Proceedings, 39(12):1528-1541, 1951. --Study of scattering of electromagnetic radiation which occurs when it encounters irregularities along path of propagation; conflicting opinion in ionospheric physics as to whether backscatter has origin in E region of ionosphere or at surface of earth; method of determining source of long distance backscatter; results obtained using this method at frequencies of 9, 12, 16 and 22 Mc. --E.I.S.

A-4 Abel, William, Use of long-distance backscatter to determine skip distance and maximum usable frequency. International Scientific Radio Union-Institute of Radio Engineers, Joint Meeting held Washington, D.C., April 1951, Measurements of delay time in the 5- to 30-mc band between the leading edge of the backscatter pattern and the response of a beacon transponder has shown that delay time to the leading edge of the backscatter is a measure of the skip distance. Since the frequency on which backscatter is obtained is the maximum usable frequency (muf) for the skip distance of this frequency, the muf for other distances can be obtained by conventional methods. Backscatter can be obtained using peak-power outputs as low as 200 - 300 w. Methods are being developed to permit instantaneous determination of skip distance using ordinary transmitters and receivers together with suitable display equipment.

A-5 Aden, Arthur L., de Bettencourt, J. T. and Waterman, A. T., Jr., Note on ionospheric radio wave polarization. Journal of Geophysical Research, 55(1):53-56, March 1950. --In magneto-ionic theory, certain misleading or incorrect statements regarding polarization of ionospheric radio waves have appeared; notion that ordinary and extraordinary elipses should have mutually perpendicular major axes is not, in general, correct, being applicable only in case in which collisional friction of electrons is neglected. --E. I. S.

A-6 Agranovich, V. M. and Rukhadze, A. A., (On the propagation of electromagnetic waves in a medium with appreciable spatial dispersion.) Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, 35(4):982-984, 1958. In Russian. Transl. into English in Soviet Physics JETP, N. Y., 35(i. e. 8) No. 4:685-686. 5 refs., 12 eqs.

A-7 Agy, Vaughn, Bibliography of Arctic ionospheric research in the United States and Alaska since 1949. U. S. National Bureau of Standards, NBS Report, No. 5561, March 7, 1958. 11 p. refs. Reproduced from typescript. DWB--The available unclassified material on Arctic ionospheric propagation of 1-30 Mc/s radio waves, including magnetic and auroral activities, is listed as follows: a) Papers in the literature, 23 items; b) Reports by private organizations, 50 items; c) Report of work by U. S. Government agencies, 15 items. Informative notes on the respective research programs and contracts listed are included. --W. N.

A-8 Agy, Vaughn, Motion of the storm-D regions. Nature, London, 173(4401):445-446, March 6, 1954. 3 figs., 3 refs. DWB--Variation of black-out due to excessive absorption is shown by charts of average probability, its amplitude, and time of maximum. No indication of a 48 hr rotation was found. --C. E. P. B.

A-9 Agy, Vaughn (Natl. Bu. of Standards, Boulder, Colo.), Results of ionospheric drift measurements in the United States. (In: Polar Atmosphere Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionosphere Section. N. Y. Pergamon Press, 1958. p. 23-25. 2 figs.) DWB Also issued in: Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, Pt. 2, 1957, pub. 1958. p. 23-25. 2 figs. DLC--The Bureau of Standards suspended its work on drift measurements for about 2 years but with the help of similar reports from Ottawa, Canada and Cambridge, Eng., a summary has been made for the polar plot of daytime E-region winds covering the years July 1950-June 1953. The result shows that the wind vector blows away from the origin of the charts; that during the winter there is a pronounced clockwise rotation in the phase of the wind and direction of the average wind changes through the year. The data were taken near Wash., D. C. But some recent work has been done at Puerto Rico by using two frequencies, 2.33 Mc/s and 4.57 Mc/s, and determining the effects of the correlation method with that of similar fades. --N. N.

A-10 Agy, Vaughn and Davies, Kenneth, Ionospheric investigations using the sweep-frequency pulse technique at oblique incidence. U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(2):151-174, Sept./Oct. 1959. 26 figs., table, 24 refs. DWB, DLC--This paper describes the present state of oblique-incidence investigations of the ionosphere, using the sweep-frequency pulse technique, with special reference to the work carried out at the National Bureau of Standards. After a short review of the published literature, oblique-incidence sweeps are presented showing the diurnal and seasonal variations on two east-west paths of lengths 1,150 kilometers and 2,370 kilometers. The discrepancies between observed and calculated maximum usable frequencies are presented for both paths and then various phenomena of interest are shown. Finally, the above phenomena are discussed in the light of existing knowledge and theory and, in particular, it is shown that the discrepancies between observed and calculated maximum usable frequencies are unlikely to be caused by magnetoionic deviation of the ray.--Authors' abstract.

A-11 Aikin, A. C., A tabulation of group height, phase height and nondeviating region absorption at various low frequencies for a number of models of the lower ionosphere. Pennsylvania State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 101, March 1, 1958. 88 p. 4 figs., 5 tables, 9 refs., Oct. 29, 9 eqs. numerous graphs. DWB (M10.535 P415i)--

Methods for obtaining group height, phase height and non-deviative absorption are outlined. These methods are then applied to fifty reasonab le electron density profiles. Tables of the resulting group and phase heights and non-deviative absorption are given for frequencies of 75 kc/sec, 150 kc/sec, 300 kc/sec and 500 kc/sec. The application of the models to sunrise effects is discussed.--Author's abstract.

A-12 Aitchison, G. J. (Dept. of Physics, Univ. of Adelaide), Ionospheric demodulation of radio waves at vertical incidence. Australian Journal of Physics, Melbourne, 10(1):204-207, March 1957. 2 figs., 3 refs., 2 eqs. DLC--In a previous communication, Aitchison and Goodwin (1955) have described an investigation carried out at the University of Adelaide on the demodulation of radio waves at vertical incidence. At a frequency of 1550 kc/s, which is close to the local gyro frequency of approximately 1600 kc/s at the height of the E layer of the ionosphere, marked reductions in the modulation depth were observed on the sky wave. The experimental results tabulated in the previous communication suggested that the effect was greatest at a modulation frequency of the order of 800-1500 kc/s. From subsequent measurements it is apparent that, in the case of F-layer reflection, the demodulation was greatest at a modulation frequency of, very approximately, 1 kc/s; in the case of E-layer reflection, the degree of demodulation did not vary markedly with change of modulation frequency. --Author's abstract.

A-13 Akasofu, Syun-ichi, (Geophysical Inst., Tohoku Univ., Sendai, Japan), Magneto-hydrodynamic waves in the ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):156-160, Sept. 1959. 2 figs., 12 refs., 6 eqs. DLC--The study is made of the magneto-hydrodynamic waves in the ionosphere and the outer atmosphere. The dispersion relations of Alfven waves are obtained and it is shown that various types of geomagnetic micropulsations and ionospheric noises appear in the wide range from audio- to very low-frequency. The Alfven waves with finite amplitude are also studied. It is suggested that the retarded sound-type shock wave may be identified with the descending "cusps" on h'-f curve of ionogram. --Author's abstract.

A-14 Albrecht, Hans J., Investigations on great-circle propagation between eastern Australia and western Europe. Geofisica Pura E Applicata 38:169-180, 1957. 2 figs., 2 tables, 25 refs. English and German summaries. --

From propagation data in the frequency range 3-30 Mc/s collected during the period 1952 to Feb. 1957, the author selected the results representative of conditions prevailing during the sunspot minimum, Nov., 1953 to Dec., 1954. The emphasis being laid on studies concerning propagation near the LUHF, monthly median values of path attenuation, path characteristics, and times of openings are given where the measurements were sufficiently conclusive. All results are discussed with reference to ionospheric predictions.

A-15 Albrecht, Hans J., On instrument effects in ionosphere data. Journal of Atmospheric and Terrestrial Physics, 13(1/2):173-175, Dec. 1958. 2 refs., 3 eqs.

A-16 Albrecht, Hans J. (Schramberg-Sulgen), Further studies on the chordal-hop theory of ionospheric long-range propagation. Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, Vienna, 11(1):84-92, 1959. fig., 4 tables, 9 refs., 5 eqs. German and French summaries p. 84. DWB, DLC--This paper presents new results of the author's investigations on ionospheric propagation in Australia from 1952 to 1957. Considerations on path attenuation are followed by a discussion on the propagation paths to North America and Western Europe, Conclusions are in agreement with the author's previous publications in this field. --Author's abstract.

A-17 Albrecht, Hans J. (Schramberg-Sulgen), Technische Gesichtspunkte bei Ionosphärendatenauswertung und modernem Ionosondenaufbau. (Technical approach to ionospheric data evaluation and modern ion-sonde construction.) Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, Vienna, 11(3):383-391, 1959. 3 figs., 10 refs., eqs. German, English and French summaries, p. 383. DWB, DLC--Using his previous investigations on instrument effects with ionosphere measurements the author deals, in the present paper, with an extension of the theoretical adaptation method. With reference to those results, the modern equipment of ionosphere stations is discussed. --Author's summary.

A-18 Alekseev, P. P. et al., Raketnye issledovaniia atmosfery. (Rocket studies of the atmosphere.) Meteorologiia i Gidrologiia, Leningrad, 8:3-13, 1957. 6 figs. (incl. photos and diagram), table, refs., 8 eqs. DLC. Trans. into English by M. I. Weinreich. Available Sandia Corporation, Albuquerque, N. Mex. DWB (M10 A366ro)--The disposition of meteorological apparatus in the cone of a meteorological rocket, the type of apparatus, the electrical power, etc. are described in detail with the aid of a diagram. The launching of the meteorological rocket and the communication system involved in the reception of signals from the rocket are discussed. Equations are presented showing: (1) the relationship between the fundamental parameters of the radio-telemetric line, (2) the relationship between pressure within the manometer and pressure in the free atmosphere, and (3) the relationship between the temperature of the thermometer and the temperature of the ambient atmosphere. The computation of the terms of the equations and their validity with reference to the apparatus employed are illustrated. A graph and table showing the distribution of pressure, temperature and density with height as obtained from rocket measurements are presented. --I. L. D.

A-19 Allcock, G. Mck., Ionospheric absorption at vertical and oblique incidence. Institution of Electrical Engineers, London, Proceedings, Pt. 3, 101(74):360-367, Nov. 1954. 11 figs., table, 24 refs., 15 eqs. Discussion on the above paper, and (on) two other papers on the ionospheric absorption and reflection of radio waves, before the Radio Section, 5th May, 1954. Ibid., p. 367-370. Authors' replies to the above discussion. Ibid., p. 370. DLC--Measurements of the ionospheric absorption of radio waves of frequency 9.15 Mc/s over an 800-km path, and of frequency 5.455 Mc/s at vertical incidence at the mid-point of this path, have been made simultaneously over a period of 14 months. A discrepancy between the observed results and those predicted by Martyn's absorption theorem is found, which varies diurnally. The oblique-incidence results are examined in detail, and empirical formulas for diurnal and seasonal variation of absorption are derived. --Author's abstract.

A-20 Allcock, G. McK., The prediction of maximum usable frequencies for radiocommunication over a transequatorial path. Institution of Electrical Engineers, London, Proceedings, Pt. B, 103(10):547-552, July 1956. 3 figs., table, 12 refs. DLC --Observations of transmission on 15 Mc/s from Hawaii received in New Zealand (great circle path 7500 km) in 1950. 54 were compared with British, American and Australian methods of predicting m. u. f. and with calculations directly from h'f data in the S. Pacific. The predictions were 4-7 Mc/s too high. Predictions assuming 3 equal length hops were generally too low by 1-2 Mc/s, the discrepancy being attributed to the presence of a sporadic E region. --C. E. P. B.

A-21 Allcock, G. McK. (Dominion Physical Lab., Lower Hutt, New Zealand), The electron density distribution in the outer ionosphere derived from whistler data. Journal of Atmospheric and Terrestrial Physics, New York, 14(3/4):185-189, June 1959. 8 figs., table, 13 refs., 21 eqs. DWB, DLC--

A method, using successive approximations, is given for finding the variation of electron density N with height h in the outer ionosphere, when the variation of whistler dispersion with geomagnetic latitude is already known. From the application of the method to specific whistler data, it is inferred that the electron density distribution in the outer ionosphere decreases exponentially with height at least in the height range 1000 to 13, 000 km, and that during the period January to May 1957 the equation describing the distribution within this height range was: N 5. 75 X 10^4 exp (-h/2640) where N is in cm^{-3} and h in km. --Author's abstract.

A-22 Al'pert, Ia. L., Rasprostranenie radiovoln. Spetsializirovannyi bibliograficheskii spravochnik. (Radio wave propagation. Specialized bibliographic reference book.) Moscow, Izdatel'stvo Akademii Nauk SSSR, 1949. 195 p. At head t-p: Akademiia Nauk SSSR, Otdelenie Fiziko -Matematicheskikh Nauk. DLC--Fifty books are arranged chronologically by imprint and over 1500 articles from periodicals are arranged under the following main headings: I. Propagation of radio waves over the earth's surface (291 refs.), II. Propagation of radio waves in the ionosphere (875 refs.), III. Propagation of the "celestial" ray (199 refs.), IV. Propagation of ultrashort waves (93 refs.), V. Propagation of radio waves in the troposphere (57 refs.) and VI. Investigation on sferics (99 refs.). In some cases, a section is subdivided. References are arranged chronologically within a section (or subsection). Included are a list of 75 periodicals arranged by country (Russian, England, U. S., France, Germany, Italy, Japan, Australia, India and Canada) with abbreviation and an author index alphabetically arranged. All titles are in the original language. Imprints cover the period from 1878 - 1948. --M. L. R.

A-23 Al'pert, Ia. L., Statisticheskii kharakter struktury ionosfery. (Statistical nature of the ionospheric structure.) Uspekhi Fizicheskikh Nauk, Moscow, 44(1):49-91, Jan. 1953. 18 figs., 3 tables, 25 refs., 104 eqs. DLC--An extensive "survey article" reviewing in logical sequence the characteristics of the ionosphere as determined through statistical analysis of radio propagation data. The various layers of the ionosphere from which reflections occur during quiet periods are shown to be connected with the primary, secondary and tertiary reflections of signals (beautifully illustrated by a recorder record). The diffuse, complex and disturbed nature of the ionospheric layers at certain times makes a complicated statistical study necessary to formulate a theory or model of the ionospheric structure and behavior. The measurement of ionospheric drift is taken up in the final paragraph. The author shows a good knowledge of the literature both native and foreign (3/5 of the references cited are from foreign sources). --M. R.

A-24 Al'pert, Ia. L.; Ginzburg, V. L. and Feinberg, E. L., Rasprostranenie radiovoln. (Radiowave propagation.) Moscow, Gos. Izdat. Tekhniko-Teoreticheskoi Literatury, 1953. 883 p. 128 figs., 124 tables, 373 refs. DLC--The most advanced text on theoretical and empirical aspects of radio wave propagation in all bands from microwaves to long waves, and in the troposphere and ionosphere. First there is a historical sketch of progress in radio science since POPOV (1895), especially in Russia. Then in Pt. I, the general theory of radio propagation; Pt. II, theory of propagation in ionosphere (p. 278-546); Pt. III, structure of ionosphere and experimental data on formation; regular and irregular processes in ionosphere (p. 547-680); Pt. IV, experimental investigations on propagation and comparison with calculated data by various methods (p. 681-870). The first part of this voluminous text is mainly theory; the last part is practical — data, tables, recorder records and interpretations, nomograms, etc. All of the layers of the ionosphere are treated, as well as the troposphere in relation to long distance propagation. Radar and impulse propagation are also considered. The extensive bibliography in 5 parts consists of about half Russian and half foreign literature through 1952. --M. R.

A-25 Al'pert, Ia. L. and Borodina, S. V., Issledovanie rasprostraneniia dlinnykh i sverkhdlinnykhradiovoln metodom analiza form atmosferikov. (Analysis of the distribution of long and very long radio waves by means of analysis of the wave form of atmospherics.) Radiotekhnika i Elektronika, Moscow, 1(3):293-305, 1956. 10 figs., tables, 20 refs., 25 eqs. DLC (Slavic, Deck 8)--A method for obtaining data on the propagation of low frequency electromagnetic waves on the basis of a complete harmonic analysis of photo-oscillograms of individual atmospherics, excited by thunderstorm discharges, is described. The experimental installation, results of its testing, and of some measurements are briefly described. Common characteristics of atmospheric configurations, and results of analysis of one of their types are presented. It is shown that the data on the dependence of the field's relative amplitude, and of the average velocity — on the frequency and on distance — are, on the whole, in good agreement with the results of theoretical calculations. --Authors' abstract.

A-26 Al'pert, Ia. L., Kratkii ocherk sovremnnykh predstavlenii o rasprostranenii radiovoln v ionosfere. (A short sketch of present ideas on the propagation of radio waves in the ionosphere.) Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz., No. 11:1418-1430, 1957. 56 refs. DWB--After a brief review of the history of our knowledge of the propagation of radio waves, the author summarizes our present knowledge on the ionospheric propagation of radio waves and, in particular, Soviet contributions to this knowledge. A review of the various studies on the influence of the earth's surface on the distribution of radio waves includes the work of V. A. Fok on the change in the velocity of radio waves with distance, the effects of a plane and spherical earth upon the propagation of radio waves, the influence of the earth's surface on the propagation of long radio waves, the "washing out" and dispersion of the conductive layer of the ionosphere, etc. The discussion of the relationship between the ionosphere and radio waves includes an account of the structure of the ionosphere (electron concentration, etc.), reflections of radio waves in the ionosphere, extinction of waves and plasma as a function of the field charge of incident waves, etc. --I. L. D.

A-27 Al'pert, Ia. L., Electron density fluctuations and the scattering of radio waves in the ionosphere. Soviet Physics JETP, New York, 6(1):167-175, Jan. 1958. Trans. by I. Emin of original Russian Fluktuatsii elektronnoi plotnosti i rasseianie radiovoln v ionosfere, in Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, 33(1):213-224, July 1957. 7 figs., 12 refs., 27 eqs. Also: Proshkin, E. G. and Kashcheev, B. L., On the question of the fluctuations of electron concentration in the F-layer of the ionosphere. Soviet Physics JETP, 6(4):818-819, April 1958. Transl. by H. Zirin of original Russian, K voprosu o fluktuatsiiakh elektronnoi kontsentratsii v F-sloe ionosfery, in Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki, 33(4):1062, Oct. 1957. figs., 2 refs. DLC--A description is given of results from a determination of electron density fluctuations obtained by measuring the "turbidity coefficient" of the ionosphere and energy scattered at very high frequencies. The linear dimensions ξ of inhomogeneities at $\sim$80 km, which are effective in UHF scattering, were also determined. The formulas employed were based on an expression for the scattering cross section σ which was obtained with the autocorrelation coefficient $p(r) \sim \exp \quad - r/\xi)^2$. The author concludes that when the ionosphere is sounded at frequencies below the critical frequency, the received signal comprises, in addition to the "specularly" reflected wave, waves which are principally scattered forward and partly reflected at higher ionospheric levels. In oblique distant UHF transmission through the ionosphere, scattering from inhomogeneities of optimum size makes the largest contribution. Proshkin and Kashcheev report an application of Al'pert's formula to the calculation of the distribution of F layer electron density inhomogeneities effective in ordinary wave scattering (Kharkov, 1955-1956; diagram) and find no altitude dependence of electron density fluctuations. --G. T.

A-28 Al'pert, Ia. L., Ionosfera i iskusstvennye sputniki Zemli. (The ionosphere and artificial earth satellites.) Priroda, Moscow, No. 10:71-77, Oct. 1958. 3 figs. DLC--The author discusses the pre-sputnik knowledge on the concentration and density of electrons above the earth and the importance of more precise data on the distribution of electrons with altitude above 100 km, the effective frequency of collisions of electrons with other heavier gas particles, and the small scale inhomogeneities in the atmosphere. The possible origins of these inhomogeneities, which are characterized by fluctuations of electron concentration, are considered, namely; ionospheric turbulence and longitudinal plasma waves. The special problems arising in the use of satellites to study the atmosphere are considered. These result from the use of radio signals to measure various parameters and the complexity of effects occurring in the vicinity of the satellite. The applications of the coherent Doppler method and of the method of observation based upon radio "rise" and "set" are discussed. --I. L. D.

A-29 Al'pert, Ia. L., Sostoianie vneshnei ionosfery. (The state of the outer ionosphere.) Priroda, Moscow, No. 6:86-87, June 1958. table, 3 foot-refs. DLC--Trans. into English by E. R. Hope issued as Canada. Defence Research Board, Translation T-304-R, Sept. 1958. DWB--The method of radio observations on the first earth satellite is described briefly and the results of such observations at 6 points during Oct. 5, 6 and 7, 1957 are summarized. The electron concentration in the outer ionosphere diminished with altitude considerably more slowly than it increased in its lower portion. A table is presented giving the electron concentration N/cm^3 up to 3100 km and also the density of neutral particles per cm^3 up to the same height. The computation of the density of the latter is described. At dis tances of 2000-3000 km from the earth, the electron concentration is close to $10^3 - 10^2$ electrons/cm^3 and the density of neutral particles is of the order of 1 per/cm^3. Hence the atmosphere approaches the properties of interplanetary gas at 2000-3000 km. The agreement between the data on the outer atmosphere obtained by means of rockets and lunar signals is compared with those obtained with the artificial earth satellite. --I. L. D.

A-30 Al'pert, Ia. L.; Chudesenko, E. F. and Shapiro, B. S., Rezultaty issledovanniia vneshnei oblasti ionosfery po nabliudeniiam za radiosignalami pervogo iskusstvennogo sputnika Zemli. (Results of research on the outer region of the ionosphere from observations of the radio signals of Sputnik I.) Akademiia Nauk SSSR. Mezhduvedomstvennyi Komitet po Provedeniiu MGG, Predvaritel'nye itogi nauchnykh issledovanii... Sputnikov Zemli i raket, No. 1:40-108, 1958. 18 figs., 26 tables, 15 refs., 28 eqs. English summary, p. 51. DWB --The method of research on the upper atmosphere by means of artificial earth satellites described in this paper is based upon the determination of the time of "radioset" and "radiorise" of the satellite. The distribution of the concentration of electrons in the outer ionosphere provides information about the properties of interplanetary gases. The trajectories of radiowaves in the ionosphere and methods of investigating them are described in detail. Results of the theoretical calculations of the maximum horizontal distance of the receipt of radio signals are given. The calculations were made for a spherical earth and the tabulation of the resulting elliptical integrals was carried out with a high speed electronic computer. The calculations used the parabolic model of the lower ionosphere and the exponential decrease of the electron concentration in its outer part. In the analysis of the experimental data the parameters of the lower ionosphere and the altitude of the artificial satellite were used and the maximum distances of signal reception were determined on the basis of ballistic data and other studies of the trajectories of the satellite. The electron concentration of the ionosphere N was found to decrease much slower after its maximum N_m. For the model $N_z \sim N_m e^{-xz}$ the value $X \simeq 3.5 \cdot 10^{-3}$ l/km is obtained. This means that the number of electrons in the outer part of the ionosphere is approximately 3.6 more than in the lower part. Extropolation of the observational data received for the altitudes z300 650 - 700 km to $z \simeq 3000$ shows that with $z \sim 2000 - 3000$ km $N \simeq 200 - 300$ el/cm^3. A curve of the density of neutral particles $n(z)$ according to the life time of the electron and the time between different acts of ionization is drawn. It is concluded that the altitude of the "limits" of the atmosphere (region of contact with interplanetary space) is of the order of 2000 - 3000 km. Appendices contain the following: calculation of the maximum distance of distribution of waves in the approximation of geometrical optics and tables of maximum horizontal distance r_m (in km) for a series of given parameters. --Authors' abstract and I.L.D.

A-31 (American Radio Relay League), Study of transequatorial scatter propagation. Contract AF 19(604)-2171, Final Report, 1959. 25 p. At head of title: IGY project 6.22. --To collect and utilize observations by amateur radio operators in the very high frequency range the APRL-IGY Propagation Research Project was organized. The present paper is a systematic report of how the project was carried out. It discusses in separate chapters the actual nature of the project, setting up the observing group, data processing, data codes, and finally, the results. It is reported that 593 amateurs out of 1320 on the project mailing list, actually submitted the semi-monthly logs requested. Bands available to them are one or more of the following (depending on location): 50-54, 70-72, 144-148, 220-225 and 420-450 mo. The data received was duly processed. The projects results consist of 281,640 punched cards with the following v. l. f. (chiefly 50 Mc) propagation modes, auroral reflection, F2-layer back scatter, sporadic E single and double hop, meteor/ionospheric forward scatter and transequatorial scatter. Upon analysis it is found that transequatorial scatter is not limited to the Americas but occurs in many parts of the world, all paths being roughly symmetrical to the geomagnetic equator. --I. S.

A-32 Anderson, A. D. and Hoehne, W. E., Experiments using window to measure high-altitude winds. U. S. Naval Research Laboratory, NRL Report, No. 4682, Jan. 10, 1956. 9 p. 8 figs., 2 tables, chart, 4 refs. DLC--Strips of metal foil (window), dispersed by balloon and aircraft, have been tracked by radar to measure wind velocities at altitudes up to 74,000 ft. These wind velocities have been compared with those measured over the same altitude range by GMD-1A equipment and radar-target tracking. The results indicate promise for obtaining high-altitude winds by this new technique. Further experiments envisioned for the altitude range from 100,000 to 200,000 ft will necessitate the use of rockets to carry and eject the window. --Authors' abstract.

A-33 Aono, Yuchiro (Radio Research Laboratories, Tokyo), Regional anomalies in foF2 of the ionosphere. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 1(1):30-33, 1953. 3 figs. Also in: International Council of Scientific Unions. Mixed Commission on the Ionosphere, Canberra, Australia, Aug. 24-26, 1952, Proceedings, pub. 1953. p. 167-173. fig., 2 refs. DWB--Charts of the regional anomalies in foF2 of ionosphere for Jan., March and May, for the entire world are presented and are based on ionospheric data from all over the world for four years (1946-50 excluding 1949). Monthly charts were drawn and the 3 presented to show winter and summer conditions. Anomalies are represented as to ratio of average monthly value to highest monthly median value, expressed in percentages, with lines drawn for each 10%. Anomalies are analyzed and discussed. --M. R.

A-34 Appleton, Sir Edward, Geophysical influences on the transmission of wireless waves. Physical Society of London, Proceedings, 37(2):16-22, Feb. 15, 1925. --An early general discussion of the ionosphere.

A-35 Appleton, Edward V. and Barnett, M. A. F., On some direct evidence for downward atmospheric reflection of electric rays. Royal Society of London, Proceedings, Ser. A, 109(752):621-641, Dec. 1925. 8 figs., foot-refs., 7 eqs. DLC--Refers briefly to unsuccessful attempts of Smith-Rose and Barfield to find evidence for the existence of the Heaviside layer. Authors then describe two sets of experiments carried out at the Cavendish Laboratory, Cambridge, in which they compared intensities of fading of signals from London and Birmingham. These experiments were the first direct evidence of the existence of the Kennely-Heaviside layer. Conclusions reached were: 1) atmospheric rays are elliptically polarized, 2) the reflection coefficient of the ionized layer is between 0.2 and 6% and 3) in inferior limit for the number of electrons per cc in the ionized layer is 10^5. --M.L.R.

A-36 Appleton, Sir Edward and Barnett, M. A. F., On wireless interference phenomena between ground waves and waves deviated by the upper atmosphere. Royal Society of London, Proceedings, Ser. A, 113:450-458, 1926. --Using 340-400 meter waves studied interference between ground and sky waves. Study equivalent height.

A-37 Appleton, Sir Edward, The influence of the earth's magnetic field on wireless transmission. International Scientific Radio Union, Recueil de Travaux de l'Assemblee General (Papers), Vol. 1, 1927 (paging not given).

A-38 Appleton, Sir Edward, The existence of more than one ionized layer in the upper atmosphere. International Scientific Radio Union, Recueil de Travaux de l'Assemblee General (Papers of the General Assembly), Vol. 1, 1927 (paging not given). --Finds just before morning on a fixed frequency that the height of reflection increases.

A-39 Appleton, Sir Edward and Ratcliffe, J. A., On a method of determining the state of polarization of downcoming wireless waves. Royal Society of London, Proceedings, Ser. A, 117: 516-588, 1928. --Describe method for polarization measurements.

Find waves elliptically polarized, with usually left-hand sense. Suggest measurements in the southern hemisphere.

A-40 Appleton, Sir Edward, The equivalent heights of the atmospheric ionized regions in England and America. Nature, London, 123:445, March 23, 1929. --Notes American observation of virtual height, as well as the English, can be explained in terms of two layers.

A-41 Appleton, Sir Edward, Polarization of downcoming wireless waves in the southern hemisphere. Nature, London, 128:1037, Dec. 19, 1931. --States that A. L. Green went to Australia and made polarization measurements on waves propagated in the direction of the magnetic field, and observed the component with least absorption to have right hand polarization. Measurements by Appleton in England, with Green's assistance, showed left hand polarization. Check for magneto-ionic theory and explanation of direction finding errors.

A-42 Appleton, Sir Edward and Builder, G., Wireless echoes of short delay. Physical Society of London, Proceedings, 44(1): 76-87, Jan. 1, 1932. --Built a group retardation recorder using pulses, and compare with frequency change equipment. List relative advantages.

A-43 Appleton, Sir Edward, On two methods of ionospheric investigation. Physical Society of London, Proceedings, 45(5):673-688, Sept. 1, 1933. --Interprets P'-f (virtual height versus frequency) data. Finds double refraction in E region and concludes E region is electronic. Finds F1 region in the daytime. Rate of decay of F region ionization was measured, and found not to be explicable in terms of a simple recombination law between ions and electrons. Measured rate of F-ion production at sunrise.

A-44 Appleton, Sir Edward and Builder, G., The ionosphere as a double refracting medium. Physical Society of London, Proceedings, 45, Pt. 2, No. 247:208-220, March 1, 1933. --Verify that splitting of echo traces is due to magneto-ionic effects by checking polarization. Describe the conditions under which the refractive index becomes zero. Point out dependence of transmission type on $2p_L\nu/p_T^2$, and state that for quasi-transverse propagation the separation of f_F^x and f_F^o is $(f_1 - f_2) = (f_H f_1)/(f_1 + f_2)$. For a quasi-longitudinal transmission, however, $f_1 - f_2 = f_H$. Compute limiting polarizations and find them nearly circular. Say extraordinary wave is nearly circularly polarized throughout its path, while ordinary component is changed to linearly polarized at point of reflection, hence there are internal reflections along route, and ordinary echo is not as clear as extra-ordinary echo.

A-45 Appleton, Sir Edward, Fine-structure of the ionosphere. Nature, London, 131:872-873, June 17, 1933. --Discusses results of Schaefer and Goodall, and speaks of notation of E2 region, of which the maximum occurs between E and F 1.

A-46 Appleton, Sir Edward, Radio observations during International Polar Year 1932-33. Royal Institute of Great Britain, Weekly Evening Meetings, Oct. 27, 1945.

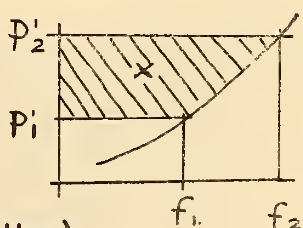
A-47 Appleton, Edward; Naismith, R. and Builder, G., Ionospheric investigations in high latitudes. Nature, London, 132(3330): 340-341, Aug. 26, 1933. DLC--Wireless observations were made during 1932-33 at Tromsø, Norway (lat 69°39.8'W, long 18°56.9'E) on wavelengths 500 to 20 metres. Absence of echo on all wavelengths is caused by absorption-limitation due to production of ionization at abnormally low levels. It is concluded that the ionizing agency that causes magnetic storms can produce ionization at levels below ultraviolet light produced ionization. Difficulties in radio communication on the polar cap are due to absence of reflection from the ionosphere which is associated with conditions of magnetic activity.

A-48 Appleton, Sir Edward, A method of measuring the collisional frequency of electrons in the ionosphere. Nature, London, 135:618-619, April 20, 1935. --States $\log P = -(\nu/2c) \cdot (P' - P)$ where ν is the collisional frequency, P' is group path, P is the optical path. Writes

$$f_1 \log P_1 - f_2 \log P_2 = \frac{\nu}{2c} \; f_2 (P'_2 - P_2) - f_1 (P'_1 - P_1)$$

and since

$$P_2 f_2 - P_1 f_1 = \int_{f1}^{f_2} p'df$$



he gets

$$\frac{\nu}{2c} = \frac{f_1 \log P_1 - f_2 \log P_2}{\text{area X}}$$

(In differential notation, this can be written)

$$\frac{\nu}{2c} = - \frac{1}{f} \quad \frac{\delta (f \log P)}{\delta P'}$$

A-49 Appleton, Sir Edward and Chapman, Sydney, Report on ionization changes during a solar eclipse. Institute of Radio Engineers, Proceedings, 23(6):658-669, June 1935. --Indicate that the time of eclipse should indicate velocity of ionizing agency. Quote conclusions of all observers of eclipse. The existence of a corpuscular eclipse was not proved.

A-50 Appleton, Sir Edward and Ingram, L. J., Magnetic storms and upper-atmospheric ionization. Nature, London, 136:548-549, Oct. 5, 1935. --Observed F2 maximum ionization at midnight, and correlated with magnetic activity. Found correlation coefficient of -0.247. Wonder if cause is expansion of F2-layer due to heating by storm producing agent.

A-51 Appleton, Sir Edward and Boohariwalla, D. B., The influence of magnetic field on the high frequency conductivity of an ionized medium. Physical Society of London, Proceedings, 47(6): 1074-1084, 1935. --Experimentally vary pressure of air in a magnetic field and observe pressure for which RF conductivity is maximum. Compares favorably with theory. Find collision frequency proportional to pressure as expected. In absence of H, conductivity was maximum at 16 cm wave length for p = 0.40 mm Hg; at 20 cm, 0.32 mm; 28 cm, 0.231 mm; 34 cm, 0.19 mm; 80 cm, 0.08 mm; etc.

A-52 Appleton, Sir Edward and Naismith, R., Some further measurements of upper atmospheric ionization. Royal Society of London, Proceedings, Ser. A, 150(871):685-708, July 1935. --Explain E and F1 seasonal changes in terms of variation of ultra-violet light from sun. Believe difference in F2 may be due to seasonal variations in molecular temperature. Think $T > 1200^{\circ}K$ in summer. Consider recombination, attachment, and ionization simply in relation to equilibrium electron density. Describe method of investigation in which carrier is swept past receiver acceptance band. They think recombination in E-layer predominantly $\propto N^2$, since summer-winter ionization checks this assumption well.

A-53 Appleton, Sir Edward, Regularities and irregularities in the ionosphere. Royal Society of London, Proceedings, Ser. A, 162(911):451-479, Oct. 15, 1937. 10 figs., 2 tables, 20 refs., 39 eqs. DLC--In this lecture selected topics derived from radio sounding in the ionosphere are discussed and considered in connection with results derived from a theory of simple layer formation by solar ionizing radiation, travelling rectilinearly and attenuated according to a mass-absorption law. The presentation of the material includes three main subjects discussed in detail in the following order: 1) Simple region formation. a. Height of maximum of ion-production; b. height of under-boundary of layer of ion production; c. variation with height; d. total ion-production in a simple region; e. total transverse conductivity of a simple region; f. absorption of radio waves traversing a simple region. 2) Experimental results and discussion. a. The variation of ionization with the sun's zenith distance; b. variation of absorption with the sun's zenith distance; c. the direct-current conductivity of region E; d. the process of electron production and decay; e. the actual height reached by radio waves and the structure of the atmosphere. 3) Abnormalities. From author's text.

A-54 Appleton, Sir Edward; Farmer, F. T. and Ratcliffe, J. A., Magnetic double refraction of medium radio waves in the ionosphere. Nature, London, 141:409-410, March 5, 1938. Challenge paper of Martyn and Munro (NATRO138) as to interpretation of a rising trace below the gyro frequency. Claim curve similar to ones in England which were found to be ordinary and extraordinary components, with opposite polarization.

A-55 Appleton, Sir Edward; Naismith, R. and Ingram, L. J., The critical-frequency method of measuring upper-atmospheric ionization. Physical Society of London, Proceedings, 51(283):81-92, 1939. --Consider effects of layer thickness on group height, echo-intensity, and frequency. Discuss the selection of critical frequencies from virtual height frequency data. Consider abnormal E-region phenomena.

A-56 Appleton, Sir Edward and Naismith, R., Normal and abnormal region-E ionization. Physical Society of London, Proceedings, 52(291):402-415, May 1940. --Correlate normal and abnormal E-layer phenomena with solar phenomena. The normal E-region follows the sun and sunspots very closely. The abnormal E-region has a tendency to follow the sunspots, but a number of tendencies such as night occurrence seem hard to explain. The corpuscular explanation requires particles capable of penetrating 1 cm of air at atmospheric pressure.

A-57 Appleton, Sir Edward and Beynon, W. J. G., The application of ionospheric data to radio communication problems. Physical Society of London, Proceedings, 52(202):518-533, July 1940. --Consider plane earth oblique and normal incidence (P', f) relations. Find MUF and skip distance for flat and curved earth, assuming mirror reflection (flat ionosphere). Compute MUF factors for flat ionosphere; for maximum possible distance for E-layer, $f_{max} = 5.4 f_c$ while for F-layer a factor 3.5 is practical. Maximum single hop E-layer transmission is 2370 km. Compute frequency-angle-distance relation for parabolic layer and flat earth, then obtain equivalent expressions for spherical geometry. Show that with curved ionosphere and parabolic distribution the propagation is quite similar to that with flat earth if the critical frequency f_c is reduced to

$$f_c \left(1 - \frac{f^2}{f_c^2} \; \frac{y_m}{r_o} \; \sin^2 i_o\right)$$

where r_o is radius to bottom of layer, y_m thickness of layer. Give equations for finding MUF of parabolic layer for flat and curved earth, and find a maximum error of 2.5 percent in using flat ionosphere curved earth formula.

A-58 Appleton, Sir Edward, A simple method of demonstrating the circular polarization of ionospherically reflected radio waves. Nature, London, 141:250, Feb. 27, 1943. --Describes method of determining polarization using two loops at right angles. If their output is beat with another signal, the phase difference in their outputs is maintained between the beats. The other signal can often be the ground wave, the frequency difference arising from Doppler effect due to lowering layer height.

A-59 Appleton, Sir Edward, The scientific principles of radio location. Institution of Electrical Engineers, Journal, Pt. 1, 92 (57):340---, Sept. 1945. General survey, good. Mentions that peculiar bursts occur on frequencies above the critical and plots curve of relative frequency vs height, having maximum at E-layer level. States due to meteors. Also discusses mathematically in appendix, the reflection and scattering of waves from various shapes of metallic reflectors. Article only partly ionospheric.

A-60 Appleton, Sir Edward, Two anomalies in the ionosphere. Nature, London, 157(3995):691, May 25, 1946. 2 figs. DLC --The variation of critical frequency with geographical latitude and with magnetic dip of the F2 layer is discussed.

A-61 Appleton, Sir Edward and Beynon, W. J. G., The application of ionospheric data to radio communication problems, Pt. 2. Physical Society of London, Proceedings, 59:58---, 1947. --Graphs are given from which may be estimated the maximum usable frequency of radio waves reflected by an ionospheric layer in oblique incidence transmission. The curves based on the theory given in Part I of the paper are drawn for such ranges of layer thickness and layer height as are met with in practice. The limitations in the accuracy and applicability of the theory in practice are briefly discussed. Attention is also drawn to the occurrence of abnormal transmission conditions under which long-distance communication via the ionosphere is possible on frequencies exceeding the normally predicted values.

A-62 Appleton, Sir Edward, Geomagnetic control of F2 layer ionization. Science, Wash., D. C., 106(2740):17----, July 4, 1947. --It has been found that for constant longitude, the noon values of ionization at numerically equal north and south latitudes are not equal. Also, there is a variation of noon ionization with longitude along a line of constant latitude. If equinox noon values of F2 critical frequency are plotted versus geomagnetic latitude, the above anomalies disappear. In such a plot, higher values of ionization density are found as one approaches the geomagnetic equator, except for a trough which exists within plus minus 18 degrees of the equator. The reduced densities in the equatorial region are found to be associated with a bifurcation of the F-layer into F1 and F2 much as in northern summer. A long term variation of F2 - layer density with the sunspot cycle is found, with the ratio of maximum to minimum density depending upon season. The ratio is two in the summer, four in the winter. The figures 4 and 2 given in the last paragraph of the letter are in error, and should be interchanged.

A-63 Appleton, Sir Edward; Beynon, W. J. G. and Piggott, W. R., Anomalous effects in ionospheric absorption. Nature, London, 16(4103):967-968, June 19, 1948. --Present results of oblique incidence attenuation measurements which are inconsistent with Martyn's equi-valence theorem. Identified source of additional attenuation as sporadic-E ionization. Path lengths of 715 and 685 km.

A-64 Appleton, Sir Edward, Studies of the F2 layer in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 1(2): 106-113, 1950. 6 figs., table, 5 refs. MH-BH--Seasonal and latitudinal variations in the height at noon of the F2 layer are analyzed and presented in diagrams. Washington, D. C., and Shibata; Trinidad and Huancayo and Wakkanoi, Palau and Christchurch data are compared month by month to show variations at stations in the same latitude in the Northern Hemisphere, at stations the same distance north and south of the equator and at stations in the temperate and tropical zones, respectively. Relations between noon F2 layer height and magnetic dip are compared for over 30 stations in Sept. 1944 (low sunspot activity) and for over 50 stations in Sept. 1948 (high sunspot activity). Change from the Northern Hemisphere type of seasonal variation to the Southern Hemisphere type occur at the magnetic equator not the geographical equator. --M. R.

A-65 Appleton, Sir Edward and Piggott, W. R., World morphology of ionospheric storms. Nature, London, 165(4187):130-131, Jan. 28, 1950. --Find F2 layer critical frequencies at temperate zone stations rise and then fall during storms. In equatorial regions only the positive phase is observed. At high latitudes only the negative phase is found. The major geomagnetic disturbance usually occurs during the positive phase, while during the negative phase of temperate latitude bi-phase disturbance the conditions are quiet. The negative phase in high-latitudes recovers quickly, and seems associated with the rate of change of magnetic field. The temperate negative phase has a slow recovery. Often sudden commencement geomagnetic disturbances are accompanied by foF2 drops of half an hour or so. Think much F-layer variability is due to storminess.

A-66 Appleton, Sir Edward Victor and Piggott, W. R., The morphology of storms in the F2 layer of the ionosphere. 1. Some statistical relationships. Journal of Atmospheric and Terrestrial Physics, London, 2(4):236-252, 1952. 10 figs., 10 tables, 5 refs. MH-BH, DWB--Variations of F2 critical frequency during ionospheric storms show a strong negative departure in middle latitudes (Slough, Washington) usually coinciding with well marked increases at magnetic equatorial stations (Huancayo, Johannesburg), both at sunspot maximum and minimum. Stations widely separated in longitude show little correlation but for the largest deviations there is a positive relation. In temperate latitudes maximum deviation is a little before local noon, recovering slowly. In local winter, disturbances are relatively rare in middle latitudes; there is no relation between N. and S. Hemispheres. Near magnetic pole distribution of + and – deviations is symmetrical. --C. E. P. B.

A-67 Appleton, Edward V., A note on the "sluggishness" of the ionosphere. Journal of Atmospheric and Terrestrial Physics, 3(5):282-284, June 1953. ref., 13 eqs. MH-BH--The physical effect of recombination or attachment of electrons is to delay the response of changes in electron density to changes in rate of electron production. The effect in ionospheric measurements is discussed and the value of αN (α= recombination coefficient) are calculated for D. E. and F layers. --C. E. P. B.

A-68 Appleton, V. Edward and Piggott, W. Roy, Ionospheric storms and the geomagnetic anomaly in the F2 layer. Journal of Atmospheric and Terrestrial Physics, 3(2):121-123, Feb. 1953. 2 figs., 4 refs. DWB--Curves are given showing diurnal course of ratios of critical F2 frequencies at Wakkanai (45° 4' N, 141° 7' E) on disturbed/quiet days, and of Ottawa/Wakkanai. It is found that the geomagnetic distortion anomaly causes a minimum of F2 in forenoon and maximum in afternoon, and this anomaly is accentuated by a weak ionospheric storm. --C. E. P. B.

A-69 Appleton, Sir Edward, Storm phenomena in the atmosphere. Archiv der Elektrischen Übertragung, 273/7(6):271-273, June 1953. 4 figs., 4 refs. German and English summaries p. 271. DLC--Recent advances in knowledge of F2 layer ionospheric perturbations accompanying magnetic storms are summarized. It is shown that these perturbations are subject to a marked diurnal control. Differences between phenomena at high, medium and low latitudes are identified, while an attempt is made to relate ionospheric storm phenomena in medium latitudes to the geomagnetic distortion of the F2 layer previously identified by the writer. For this range of latitudes it is shown that the effect of a storm is to enhance the magnitude of the geomagnetic distortion already present. --Author's abstract.

A-70 Appleton, Sir Edward and Beynon, W. J. G., Radiocommunication on frequencies exceeding predicted values. Institution of Electrical Engineers, Proceedings, 100, Pt. III(66):192-198, July 1953. 8 figs., 4 tables, 10 refs., 5 eqs. DWB--Receipt of Daventry short-wave signals at Gibraltar and Algiers shows that communication is often established on frequencies higher than predicted maximum usable frequencies. Examination shows that during winter and equinoxes noon anomalies are often due to variability in characteristics of the F2 region. In summer the abnormal E region provides copious reflection at oblique incidence. In Japan observations on 30 Mc/s show that transmissions on frequencies above F2 m. u. f. s. are due to abnormal region. --C. E. P. B.

A-71 Appleton, Sir Edward and Lyon, A. J., Ionospheric layer formation under quasistationary conditions. (In: Physical Society of London, The Physics of the Ionosphere, Pt. 1, The lowest Ionosphere. London, Physical Society, 1955. p. 20-39.)

A-72 Appleton, Edward V., The anomalous equatorial belt in the F2-layer. Journal of Atmospheric and Terrestrial Physics, 5(5/6): 348-351, Nov. 1954. 3 figs., 16 refs. DWB--The abnormal upward distension of F2 layer along a strip 4000 km wide centered on magnetic equator at noon, associated with low N_m, is replaced by abnormally high N_m at 18 h, disappearing rapidly after 0h. This crest is attributed to contraction of vertical extent. Curves of fF2 (Mc/s) 80°N - 80°S, March 1951 are shown for 12, 21 and 9 h local time. --C. E. P. B.

A-73 Appleton, Sir Edward, Storms in the ionosphere. Endeavour, London, 14(53):24-28, Jan. 1955. 3 figs., 8 refs., 5 eqs. DLC --The author describes (1) the experimental radio-sounding of the ionosphere for ionospheric forecasting giving the equations for the conditions of reflection at vertical incidence for the ordinary case and for the extraordinary case; (2) the characteristics of the E and F layers; (3) behavior of ionosphere layers at high latitudes; (4) the characteristics of ionospheric storm conditions in equatorial regions; (5) the variation of electron density at noon in the E, F, and F2 layers; (6) the practical implications of storm changes in the F2 layer in relation to radio circuits and (7) the possible physical mechanisms of ionospheric storms. --I. L. D.

A-74 Appleton, Sir Edward and Beynon, W. J. G., An ionospheric attenuation equivalence theorem. Journal of Atmospheric and Terrestrial Physics, 6(2/3):141-148, March 1955. 2 figs., 6 refs., 21 eqs. DWB--The phenomenon of radio-wave attenuation by way of ionospheric partial reflections and scattering is examined theoretically, and an equivalence theorem, relating oblique incidence to vertical-incidence phenomena, is derived. For radio frequencies well in excess of the equivalent critical frequency of the medium this may be written

$$[P]^{f}_{i_\sigma} = \lambda [P]^{f \cos i_\sigma}_{\sigma}$$

where P is the fractional attenuation, f is the frequency, and i_σ the angle of incidence in the oblique-incidence case. Where the radio-wave electric vector is at right angles to the plane of propagation, λ is unity; when the electric vector lies in the plane of propagation, λ is equal to the usual obliquity factor cos 2 i_σ. --Authors' abstract.

A-75 Appleton, Sir Edward, Rocket sounding in the upper air: confirmation of results inferred from radio measurements. Wireless World, London, 61(9):406-407, Sept. 1955. 4 eqs. DLC --In connection with plans for the International Geophysical Year, the article briefly describes methods of measuring pressures and deducing temperatures, and of measuring electron density at a given height by the Doppler effect on the phase velocity of radio waves near the rocket emitter. --C. E. P. B.

A-76 Appleton, Sir Edward V.; Lyon, A. J. and Pritchard, Mrs. A.G., The detection of the Sq current system in ionospheric radio sounding. Journal of Atmospheric and Terrestrial Physics, 7(4/5):292-295, Oct. 1955. fig., 7 refs., 6 eqs. DWB--The behavior of the E layer is inconsistent with CHAPMAN's classical theory. One anomaly is due to the effect of electron transport phenomena on diurnal variation of maximum electron density. The noon delay of maximum differs from that given by CHAPMAN's theory in showing a minimum at the equator and maxima in 40°N and 30°S. This is attributed to the overhead current system. --C. E. P. B.

A-77 Appleton, Sir Edward V.; Lyon, A. J. and Turnbull, Mrs. A. G., Distortion of the E layer of the ionosphere by electrical currents flowing in it. Nature, London, 176(4489):897-899, Nov. 12, 1955. fig., 7 refs., 4 eqs. DWB--

Comparison of the maximum ionization density N_m in the E-layer with that predicted by Chapman's theory shows that a disturbing factor is present, dependent on latitude and even causing afternoon values of N_m near the equator to be less than corresponding morning values. This factor is the vertical drift of neutral ionization, connected with the S_q overhead currents which attain their maximum at 10-11 h local time and are E-W in middle and W-E in low latitudes. There is another factor besides cos χ which causes N_m to be greater in low than high latitudes. --C. E. P. B.

A-78 Appleton, Sir Edward (Edinburgh Univ.), Regularities and irregularities in the ionosphere. (In: Beer, Arthur (ed.), Vistas in astronomu. pub., London, 1955-1956. Vol. 2:779-790. 6 figs., table, 17 refs., 18 eqs.) DWB, DLC (520.82 B415v)--A general survey of ionospheric phenomena is given, in which the regular variations of the E and F1 layers, as illustrated by their intimate dependence on the sun's zenith distance, are contrasted with the anomalous behavior of the F2 layer. Using results from the world's ionospheric stations, such anomalous behavior is identified as geomagnetic distortion, most probably due to atmospheric tidal action operating on an ionized medium in the presence of the earth's magnetic field. As an illustration of such geomagnetic control it is shown that, in the F2 layer, the region of change-over from the Northern to the Southern Hemisphere type of variation is more nearly coincident with the magnetic equator than with the geographic equator. --Author's abstract.

A-79 Appleton, Sir Edward and Lyon, A. J., Studies of the E layer of the ionosphere, Pt. 1, Some relevant theoretical relationships. Journal of Atmospheric and Terrestrial Physics, 10(1): 1-11, Jan. 1957. 11 refs., 34 eqs. DWB--As a preliminary to a detailed study of the E layer, the theoretical basis is considered. The classical Chapman theory of ionized layer production, developed in 1931, does not explain some of the later observations. Developments of the accepted theory are introduced to check experimental data, including assumptions that maximum ionization density in E layer is quasistationary during daylight hours. Formulas are developed for variations from the simple theory, especially the assumption that the E layer is influenced by vertical drift. --C. E. P. B.

A-80 Archiv der Elektrischen Übertragung, Stuttgart, v. 1, July/Aug. 1947 - Latest issue seen, 8(7), June 1954. Monthly. Irreg. Price: DM 15, 50 per quarter. Editor, 1954, Karl W. Wagner. Printer, S. Hirzal Verlag. DLC--

This high quality monthly journal contains theoretical and practical articles in all fields of radio, radar and TV technology, and in addition reviews of books and bibliographic citations (2 pages per month). A number of articles on ionospheric and tropospheric propagation, sferics and meteor or radio astronomy can be found in each volume indexed under the heading Ausbreitung electromagnetischer Wellen. Not all articles are in German. For instance in Vol. 7, there is an article in English by Appleton on Ionospheric storms. --M. R.

A-81 Ardillon, Jeanne-Marie, Influence de l'heure locale dans les perturbations ionospheriques. (Influence of local time upon ionospheric disturbances.) Academie des Sciences, Paris, Comptes Rendus, 234(15):1568-1571, April 7, 1952. DLC--The daily variation of the critical frequencies along the vertical in the F2 layer at Poitiers and Washington was investigated for two years. Drops in frequency were observed between 18 and 24 h and around 6 h at Poitiers and between 22 and 6 h at Washington. It was found that two minima from 6 to 18 h enclose a diurnal maximum. The daily variations in amplitude were more marked during the equinoxes than during any other time of the year. --I. L. D.

A-82 Argence, Émile; Mayot, M. and Rawer, Karl, Contribution a la etude de la distribution electronique de l'ionosphere et de l'absorption des ondes courtes. (Contribution to the study of distribution of electrons in the ionosphere and the absorption of short waves.) Annales de Geophysique, 6(4):242-285, Oct.-Dec. 1950. 13 figs., 9 tables, 23 refs., eqs. English and French summaries p. 242. DBS--From a study of the absorption of reflected and transmitted radio waves, occuring during the collision of electrons with neutral molecules, the authors derive approximate formulas for calculating the absorption decrement δ 2 for complex layers. The model of atmospheric ionization of Chapman, Nicolet, and Bossy are generalized and models with different variations of temperature and dissociation of O_2 the authors consider the problem 1) of parabolic variations of temperature below 100 km, and 2) of a rapid decrease of ionizable molecules above this height. The significance of ionization to D and E layers is discussed. --I. L. D.

A-83 Argence, Émile, Solution analytique approchée du probleme de Poeverlein. (Approximate analytic solution of a Poeverlein problem.) Societe Royale des Sciences de Liege, Memoires, Ser. 4, 12(1/2):253-267, 1952. 5 figs., 8 refs., eqs. DLC--

Theoretical study of the trajectories of an electromagnetic (radio) signal in an ionized medium under the influence of the earth's magnetic field. The trajectories of normal and oblique incidence rays in the plane of the magnetic meridian are calculated, neglecting variations in magnetic inclination. The study shows that rays are deflected in opposite direction at different heights; reflection occurring at lower altitude for extra-ordinary rays and deviation differing markedly in the case of "ordinary" rays. Thus ionospheric soundings can give information on the ionization in various layers of the ionosphere. --M. R.

A-84 Argence, Émile; Rawer, Karl and Suchy, Kurt, Influence du champ magnetique terrestre sur l'absorption des ondes courtes dans l'ionosphere (incidence normale). (Influence of the terrestrial magnetic field on the absorption of short waves in the ionosphere (normal incidence).) Academie des Sciences, Paris, Comptes Rendus, 236(2):190-192, Jan. 12, 1953. fig., 3 refs., 3 eqs. DLC--Using a formula previously developed by ARGENCE and assuming that the collisional frequency follows an exponential law, calculations of the coefficient of absorption K are made for a parabolic E layer with critical frequency 3.5 Mc/s. The results are in good accord with those obtained by the more regorous Appleton-Hartree formula, but are markedly different from those given by the Sellmeyer formula which neglects the earth's magnetic field. However, the effective absorption of a ray reflected by the layer, SK·dz, is little different as the overall magnetic field corrections roughly compensate. --Physics Abstracts, No. 3461, 1953.

A-85 Argence, Émil and Mayot, M., Methode de determination des hauteurs vraies des couches de l'ionosphere, II, Utilisation de la valeur exacte de l'indice de refraction (cas du rayon ordinaire). (Method of determining the true heights of ionospheric layers, Pt. 2. Use of the exact value of the index of refraction (case of ordinary rays).) Journal of Geophysical Research, 58(4):493-496, Dec. 1953. table, 2 refs. DLC--Determination of the characteristic parameters of an ionized layer by the hypothesis where the variation of the electronic density ensues from a parabolic law, to the first approximation, is described. Also shown is the application of the exact value of the refractive index (APPLETON-HARTREE). --Authors' abstract.

A-86 Argence, É. (S. P. I. M. Fribourg), Determination des trajectoires d'energie d'une onde se propageant dans l'ionosphere. Etude de deux cas particuliers (milieu transparent). (Determination of trajectories of energy waves propagating in the ionosphere. Study of two particular cases (in transparent media).) Annales de Geophysique, 10(3):249-253, July/Sept. 1954. 2 figs., 2 tables, 10 refs., numerous eqs. French summary p. 249. DLC--Assuming an ionized transparent anisotropic medium, a direct method for the determination of energy trajectories was developed. Trajectories for normal and oblique incidence are computed for various maximum critical frequencies along the magnetic equator. The mathematical theory is presented in detail. An experimental study for oblique incidence is suggested. --A. A.

A-87 Arkhangel'skiĭ, B. F. and Pabo, N. V., Rasprostranenie radiovoln v vysokikh shirotakh. (Radio wave propagation in high latitudes.) Leningrad. Arkticheskii Nauchno-Issledovatel'skii Institut, Trudy, Vol. 124, 1938. 88 p. 55 figs., 6 tables, refs. at end of each chapter. DLC--A very thorough treatment of all available data on Arctic troposphere and ionospheric radio propagation conditions and their disturbance by solar, magnetic, auroral and static (sferics) activity. Actual recorder records as well as derived diagrams, tables and curves are presented. Numerous references are given to the sources (mostly 1932-1937 in Russian periodicals). Theoretical considerations are not neglected but applications to study of atmosphere – especially the upper layers – and the aurora, ionosphere, terrestrial magnetism and atmospheric electricity are emphasized. The study is based on data obtained in 1932/33 and 1934/35 at Tikhaia (Calm) Bay in Franz Josef Land, and other Polar Year stations in 1932/33.

A-88 Askar'ian, G. A., (Acceleration of charged particles in running or standing electromagnetic waves.) Zhurnal Eksperimental'noi Teoreticheskoi Fiziki, 36(2):619-620, 1959. In Russian. Transl. into English in Soviet Physics, JETP, N. Y. 36(i.e. 9), No. 2:430-431, Aug. 1959. 3 refs.

A-89 Ataev, O. M., Vliianie neodnorodoi struktori ionosferi na poglochshenie radiovoln. (Effect of inhomogeneous structure of the ionosphere on absorption of radio waves.) Radiotekhnika i Elektronika, 2(5):523-530, May 1957. 4 figs., 10 refs., 17 eqs. DLC--Amplitude and heterogenous structure of a multiple ionospheric reflected signal is treated theoretically. Signal intensity from ionospheric layers is $>$ that from regular layers.

A-90 Australia. Commonwealth Scientific and Industrial Research Organization. Fifth Annual Report for the year ending June 30, 1953. Canberra, 1953. 191 p. Meteorology, p. 131-134. DWB --Progress made during the year on a number of projects in the fields of radiophysics and atmospheric physics and astrophysics is described in Ch. 27, 28, 29, on pages 139-147. Special research on the ionosphere, twinkling of radio stars, general circulation, convection, micrometeorology, frost prevention, ozone, evaporation, artificial precipitation, cloud physics, nuclei, high level winds, climatic changes (rainfall), solar physics, radio astronomy, etc. is reported and discussed. Nearly 50 papers published by members of the several divisions related to meteorology are cited. Costs and contributions for the year are tabulated. --M. R.

A-91 Axman, E. and Benner, A. H. (Penna. St. Coll. Radio Prop. Lab.), Preliminary measurements of the vertical incidence ionospheric absorption at 150 Kc/s. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 6, Sept. 30, 1949. 23 p. 82 figs., 5 refs. DWB--The results of manual and semi-automatic measurements of the reflection coefficient at vertical incidence at 150 Kc/s that were performed during Feb. 27 to June 25, 1949 at State College, Penna., are presented in graphs and analyzed on a diurnal basis. Although incomplete, no midday hour reflections were obtained, the data were used in an attempt to find a correlation between SID and the absorption record. No conclusions are drawn. Theory of measurement is discussed along with illustrated description of equipment used.--W. N.

A-92 Bai, C. Lakshmi, Application of the generalized magneto-ionic theory to the propagation of radio waves at the magnetic dip-poles of the earth. Journal of Atmospheric and Terrestrial Physics, 11(1):31-35, 1957. 2 figs., 8 refs., 8 eqs. DWB--The generalized magneto-ionic theory of BOOKER is applied to the propagation of radio waves at the magnetic dip-poles of the earth, to obtain rigorous values for the levels of reflection in the ionosphere, of the magneto-ionic components. The propagation is discussed for various angles of incidence and for operating frequencies greater and less than the magneto-ionic frequency. The application of these results for finding out the maximum usable frequency for a given transmission distance at the magnetic dip-poles is indicated. --Author's abstract.

A-93 Bailey, D. K., On a new method for exploring the upper ionosphere. Terrestrial Magnetism and Atmospheric Electricity, 53(1):41-50, March 1948. fig., table, 18 refs., 6 eqs. DLC--

Conditions above the height of maximum ionization of the F2-layer are not known. Measurements of the refraction experienced by radio waves arriving at the earth after passage through the entire ionosphere can yield information about its uppermost regions. An expression for the refraction of waves which pass through a parabolic-layer model is derived, permitting frequencies to be specified within which profitable refraction measurements can be made. Either the sun, which emits radio "noise," or the moon, which can be used to return radio waves originating on the earth, is a suitable extraterrestrial source of waves. An experimental technique for measuring refraction is described and discussed.

A-94 Bailey, D. K., Bateman, R., Berkner, L. V. (Washington, D. C.) and others, A new kind of radio propagation at very high frequencies observable over long distances. U. S. National Bureau of Standards, Project NBS, 1405-21-6805, NBS Report 1172, Sept. 28, 1951. 10 p. 5 figs., 8 eqs. DWB--Experiments on the propagation of radio waves with a frequency of 49.8 Mc/sec over a distance of 1245 km are reported. "Some preliminary speculations suggest that the mechanism of this type of propagation may be scattering due to ever-present turbulence in the E region, and an approximate transmission equation is derived in terms of parameters describing inhomogeneities in the E region." The influence of passing meteors is discussed. Hourly signal intensities are graphically represented and records showing enhancement and fade-out reproduced. --G. T.

A-95 Bailey, D. K., The effect of echo on the operation of high frequency communication circuits. Institute of Radio Engineers, Professional Group on Antennas and Propagation, Transactions, Vol. AP 6(4):325-329, Oct. 1958. 7 figs., 4 refs. DLC--There are two distinct kinds of echoes dependent on the illumination when occuring. Mode of operation and choice of frequency is discussed and summarized in a six point conclusion toward minimizing the echo interferences.--W. N.

A-96 Bailey, D. K., The effect of multipath distortion on the choice of operating frequencies for high frequency communication circuits. Institute of Radio Engineers. Professional Group on Antennas and Propagation, Transactions, Vol. AP-7, No. 4:397-404, Oct. 1959. 5 figs., 12 refs. DLC--The m. u. f. as calculated for the lowest frequency usable to counteract the multipath distortion involves the new term MRF (multipath reduction factor) specified as a function of path length in this ionospheric model. --W. N.

A-97 Bailey, V. A., Smith, R. A., Landecker, K., Higgs, A. J. and Hibbard, F. H., Resonance in Gyro-interaction of radio waves. Nature, London, 169(4309):911-913, May 31, 1952. 3 figs., 13 refs. DWB--Describes experiments in Australia in which a gyrowave was radiated vertically as square pulses of frequencies 1255 to 1880 kc/s, the local gyro-frequency being estimated from magnetic data as 1530 kc/s. Theory predicted that if another wave (the "wanted wave") is absorbed in the E-layer, resonance will occur. Two-humped resonance was observed on either side of 1530 kc/s. It is considered that this method will lead to fuller knowledge of the E-layer, especially its magnetic field. --C. E. P. B.

A-98 Bailey, V. A., Study of the reflexion of waves from an inhomogeneous medium by means of a new first approximation to a solution of the general, linear, second-order differential equation and by means of iterations with convergence of the second order. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 67, Aug. 1, 1954. 52 p. 16 refs., numerous eqs. MH-BH--The propagation of a plane wave through three media, A. B. C in succession, of which only A and B are homogenous, is studied and two formulas are obtained for the coefficient of reflection in terms of solutions y and u of the Riccati equation corresponding to the one-dimensional wave equation and of the wave equation itself. Application to current work on reflection of long radio waves from D region pointed out--From author's abstract.

A-99 Bailey, V. A. (U. of Sydney, Aust.) and Goldstein, L. (U. of Ill.), Control of the ionosphere by means of radio waves. Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):216-217, 1958. 8 refs. DLC--As a radio wave traverses an ionized gas, consequently raising its temperature, energy is produced. But in the absence of some source of ionizing energy the gaseous plasma disappears. Radio waves of sufficient intensity affect the ionization produced by solar radiation or other agencies in any region of the ionosphere, even when the temperature is as low as 250-300°K. When a rise in temperature has changed the rates of different processes of diffusion, attachment and recombination ionization can still be controlled by the establishment of radio stations on the ground especially when the controlling waves have their frequencies near the gyro-frequency of electrons in the ionospheric region concerned. --N. N.

A-100 Bailey, V. A. (Univ. of Sydney), Some methods for studying wave propagation in a uniform magneto-ionic medium. Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):118-125, 1958. figs., 4 refs., 34 eqs. DLC--

The difficulty in using the classical general formulas of APPLETON, for determining the refractive and absorption indices and the polarization of each of the two wave-modes, is primarily due to the presence of the radical term $\rho = \sqrt{\nu_T^{\,4}\delta^2 + \nu_L^{\,2}}$ where δ is the reciprocal of a given complex number. This difficulty has been overcome by means of each of four methods of calculation developed in the School of Physics of the University of Sydney. The first three, although previously published, are here presented again but briefly. The fourth method makes use of the following approximations:

$$\sqrt{1+s^2} \text{ equals } \frac{4+3s^2}{4+s^2} \text{ or } s\,\frac{4s^2+3}{4s^2+1}$$

according as $|s| \lesseqgtr 1$ (except when $s^2 \doteq -1$). On applying them to APPLETON's formulas, by taking $s = 2\,\nu_L \nu_T^{-2}\,(1 + T + i\beta)$, we obtain the good approximate formulas (32) and (33) for M^2 (square of the complex refractive index) which, in effect, cover all possible situations with an error not exceeding about 1%. Other applications of these approximations to $\sqrt{1+s^2}$ can be made: for example to the polarization numbers R, for, with the same value of

$$R = is^{-1}\left\{1 \mp \sqrt{1+s^2}\right.$$

--Author's abstract.

A-101 Bailey, V. A., Some possible effects caused by strong gyro-waves in the ionosphere, Pt. 1. Journal of Atmospheric and Terrestrial Physics, New York, 14(3/4):299-324, June 1959. 3 tables, 23 refs., numerous eqs. DWB, DLC--The possible increases of collision frequencies $\underline{v}$ and electron densities $\underline{n}$ caused by a powerful extraordinary circular gyro-wave in the nocturnal lower E-region and in the day-time D-region are investigated on the basis of available laboratory experiments on electrons in air and data concerning these regions. The resultant effects of such increases on this wave and on other waves are then examined. It is found that some of these effects are remarkable in magnitude or in kind. Thus, notable self-distortion of gyro-waves and extremely large wave interaction can be caused by such an extraordinary wave when the reduced equivalent electric force Z/p which it produces in the nocturnal lower E region has the value 2. 5 V/cm per mm Hg measured at room temperature. Other possible detectable effects which may be caused at night when Z/p has a value between 2. 5 and 8 include changes in the airglow and in parts of some trails of meteors and fast particles of solar or cosmic origin, changes in radar echoes from such trails and transient changes in the local magnetic elements.--Author's abstract.

A-102 Bain, W. C.; Bracewell, R. N.; Straker, T. W. and Westcott, C. H., The ionospheric propagation of radio waves of frequency 16 kc/s over distances of about 540 km. Institution of Electrical Engineers, Proceedings, Pt. 4, 99(3):250-259, July 1952. 11 figs., 2 tables, 19 refs., 9 eqs. DBS--Previous measurements over 90-200 km distances when compared with experimental results obtained over a distance of 535 km show a marked change in the propagation characteristics of waves at 16 kc/s frequency. The height of reflection varies with the inclination of the sun's rays. From 90-535 km the apparent height is about 74 km at midday and about 92 km at night. Experimental results are discussed and presented in tables. --W.N.

A-103 Bain, W. C., Observations on the propagation of very long radio waves reflected obliquely from the ionosphere during a solar flare. Journal of Atmospheric and Terrestrial Physics, 3(3):141-152, April 1953. 6 figs., table, 19 refs. MH-BH--Describes measurements of amplitude and phase of 16 kc/s sky wave Rugby to Aberdeen. Normal diurnal variation of apparent height of reflection at normal and oblique incidence is shown and sudden field anomalies at Aberdeen and Edinburgh during solar flares illustrated. It is found that during a moderate flare with large zenith distance of sun there is a change of apparent reflection height for vertical but not for oblique incidence. Phenomena are attributed to a double structure of D layer, the lower layer (at 70 km) being responsible for obliqueincidence propagation (including atmospherics) and the upper affected by solar radiation during a flare. --C.E.P.B.

A-104 Bain, W. C., The angular distribution of energy received by ionospheric forward scattering at very high frequencies. Institution of Electrical Engineers, Proceedings, Pt. B, 105(8): 53-55, 74-75, 78, 1958. 3 figs., 6 refs.

A-105 Bain, W. C. and Glass C.B.I., The polarization of very long radio waves reflected from the ionosphere at oblique incidence. Institution of Electrical Engineers, London, Proceedings, Pt. C, 103(4):447-448, Sept. 1956. table, ref., 2 eqs. DLC--A study of some additional evidence has been made to determine the polarization of radio waves reflected from the ionosphere at 16 kc/s over a transmission path 540 km long. The ratio between the amplitudes of the vertical and horizontal electric fields is found to be appreciably greater than unity, the mean value of the determinations made here being 5. --Authors' abstract.

A-106 Baird, K., High multitude radio reflections from the F2 layer of the ionosphere at Brisbane. Australian Journal of Physics, 7(1):165-175, March 1954. 5 figs., 2 tables, 5 refs. MH-BH--Continuous night-time records of multiple F2 reflections at normal incidence have been made at a fixed frequency. The echo patterns have been classified, and qualitative explanations given in terms of humped ionization contours, extending the work of PIERCE and MIMNO (1940). These patterns have been studied also by a variable gain technique. It is concluded that accurate measurements of reflection coefficients cannot be made by this means. Statistical analyses of occurrences of up to the 10th multiple showed that: a) if no account is taken of presence or absence of E_s, the frequency of occurrence increases towards dawn; b) there is no correlation between the number of reflections observed and the virtual height of the region; c) there is no correlation with "range duplications"; d) inverse correlation between high multiple F reflections and presence of E_s occurs only when the lower region is blanketing; e) there is no correlation between high multiples and the travelling disturbances described by MUNRO. A study of the presence of very high multiples revealed maxima at the equinoxes. Oblique incidence recording gave no reflections beyond the fifth multiple. --Author's abstract.

A-107 Baker, W. G. and Martyn, David Forbes, Conductivity of the ionosphere. Nature, London, 170(4339):1090-1092, Dec. 27, 1952. 2 figs., 19 refs., eqs. Singer, S. F., Maple, E. and Bowen, W. A., Dynamo currents and conductivities in the earth's upper atmosphere. Ibid., p. 1093-1094. fig., 15 refs. DWB--By existing theories of ionospheric winds and ionization, conductivity (calculated as less than 4×10^{-9} emu/cm) cannot account for observed geomagnetic daily variations by dynamo theory, which requires 5×10^{-8} emu/cm. Formulas for various types of conductivity are graphed according to height and latitude and an expression for height-integrated effective conductivity deduced. This gives an adequate current mainly between 110 and 150 km., but near magnetic equator in a shallow layer at 100 km. The second paper describes rocket measurements. At time of maximum H at Huancayo, a very rapid decrease (4 milligauss) was found at 93-105 km interpreted as due to an E-W current in a large horizontal sheet, probably produced by Hall polarization. --C. E. P. B.

A-108 Baker, W. G. (Amalgamated Wireless Australasia, Ltd.) and Martyn, D. F. (Radio Research Board of Australia), Electric currents in the ionosphere, Pt. 1-3. Royal Society of London, Philosophical Transactions, Ser. A, 246(913):281-320, Dec. 16, 1953. figs., refs., eqs. DWB--

In the first paper the authors examine quantitatively the theory that the effective conductivity of the ionosphere in the dynamo theory is enhanced by the polarization of the Hall current. The effective conductivities over most of the earth were found to satisfy this theory. In a narrow strip at the equator the conductivity is enhanced, accounting for the excessively large magnetic variations found there. In the second paper (by BAKER) three examples are given of the flow of current in plane sheets, due to the application of steady electric fields, for cases where this inhibiting polarization is absent, partial or complete, respectively. In the third paper (by Martyn) the mass motion and velocity of the ionization in the ionosphere under the influence of an electric field, and/or atmospheric wind are discussed. --M. R.

A-109 Balser, M.; Smith, W. B. and Warren, E., On the reciprocity of HF ionospheric transmission. Journal of Geophysical Research, 63(4):859-861, Dec., 1958. (QC811.J6) DLC--Experiments of July-Aug. 1957 with oblique sounding equipment, transmitting pulses of 35 microsec. duration 15 times per sec. between the terminals Ottawa and Winnipeg are reported. Fade in one direction was not duplicated in the other, and with lesser exceptions, the reciprocity appears pretty equal. Whether the effects are purely ionospheric will be checked in the future. --W. N.

A-110 Bandyopadhyay, P., Models of the lower ionosphere as may be inferred from absorption results. Indian Journal of Physics, 31(6):297-308, June 1957. 8 figs., 10 refs., 2 tables, 11 eqs. DLC--Values of deviate and non-deviate absorption and their variations with cos χ are calculated for some of the proposed D and E region models. The results obtained are compared with the available experimental data. It is found that so far as the E region is concerned, A. P. Mitra's theoretical model is most consistent with the observed diurnal variation of absorption. For the E region, the model as proposed by Jones, is found to be unacceptable. Conditions which are to be satisfied by an acceptable E region model are discussed. --Author's abstract.

A-111 Bandyopadhyay, P. (Univ. of Calcutta, India), The early morning E2-layer and some evidence of pre-sunrise F-layer "splitting". Journal of Atmospheric and Terrestrial Physics, N. Y., 16 (1/2):84-92, Oct. 1959. 6 figs., 12 refs. DWB, DLC--Two early morning phenomena, one relating to the E2-layer cusps and ridges and the other to the F-layer traces as observed in the h'-f records made at Haringhata (Calcutta) are described and discussed. The early morning E2-layer cusps and ridges are found to be a regular sunrise feature of the ionograms.

They show marked seasonal variation of character and frequency of occurrence and are most prominent in winter. The early morning F-layer records show, also in winter, a peculiar kind of "splitting" which is quite distinct from regular F1-, F2-bifurcation. This F-layer "splitting" and its possible bearing on the E-layer phenomena described above are discussed. Representative ionograms of the two phenomena are given. --Author's abstract.

A-112 Banerjee, S. S. and Mehrotra, R. R., Multiple reflections and undulations in the F2-region of the ionosphere. Science and Culture, 16(2):72-73, Aug. 1950. 3 figs., 3 refs. MH-BH --The anomalous behavior of the amplitude of multiple reflected pulses from the F2 region was found to occur even when the transmitter and receiver were situated very close to each other. Photographs of observations, showing the amplitude of higher order echoes to be higher than that of lower order echoes, are presented and analyzed. It is suggested that the anomalous variations in intensity of the reflected waves from the ionosphere are produced by undulations in the lower structure of the F2 region. --I. L. D.

A-113 Banerjee, S. S.; Mehrotra, R. R. and Rajan, V. D., Scattering of radiowaves and undulations in the ionosphere. Science and Culture, Calcutta, 17(4):45-46, July 1951. refs. DWB--The authors discuss a type of ionospheric scattering which is observed before the frequency of transmission reaches the critical frequency, and the centers of which appear to be in the F2 region of the ionosphere and which may be observed with low power transmitters. A description is given of this ionospheric scattering as observed by radiation of pulses at vertical incidence during evening and night, and photographs are included. --I. L. D.

A-114 Banerjee, S. S. and Mehrotra, R. R., Intensity variation of short wave signals and their bearing on the ionosphere. Journal of Scientific and Industrial Research, Delhi, 11(1):11-13, Jan. 1952. 4 figs., 15 refs. DWB--Theory of fading and history of work along that line is briefly reviewed. Fading patterns are classified under periodic and random types, with many subdivisions of these. This classification system has proven useful in predicting nature of fading patterns. Special interest attends periodic fading patterns. It is possible to calculate from records obtained during this type (such as illustrated) the rates of change of electron density and the semi-thickness of change of electron density and the semi-thickness of the ionized layer. Also, undulations in ionosphere affect short wave radio fading patterns, such as illustrated. --M. R.

A-115 Banerjee, S. S. and Mehrotra, R. R. (Benares Hindu Univ.) Equivalent paths of the extraordinary waves for oblique incidence at the ionosphere. Journal of Scientific and Industrial Research, New Delhi, Sec. B, 11(6):216-218, July 1952. fig., 3 refs., 10 eqs. DWB--Presents the method of deriving an equation useful for drawing the curves of the extraordinary wave, explaining the formation and features of the fading pattern observed near the maximum usable frequency (m. u. f.). --W. N.

A-116 Banerjee, S. S. and Banerjee, D. K. (Eng. Coll., Banaras Hindu Univ.), Scattering of radio waves and horizontal gradient of ionization in the ionosphere. Journal of Scientific and Industrial Research, Sec. B, 12(6):277-279, June 1953. 3 figs., 4 refs. DWB--Multiple scattered signals obtained at vertical incidence with a low-power (2.5 kW) pulse transmitter are discussed. The mode of propagation between ground and ionosphere is explained and illustrated. From echoes obtained on Feb. 14, 1953 the horizontal gradient of ionization in the atmosphere is determined and found to be in agreement with electronic densities measured by the Research Department of the All India Radio. --G. T.

A-117 Banerjee, S. S.; Banerjee, D. K. and Rajan, V. D., (Eng. Coll., Banaras Hindu Univ.), Scattering of short wave radio signals and their bearing on the ionosphere. Journal of Scientific and Industrial Research, Sec. A, 12(6):278-282, June 1953. 5 figs., 15 refs. DWB--After reviewing earlier investigations of scattered radio echoes, the authors report recent research on the scattering of short wave radio signals conducted at the Banaras Hindu Univ., Engineering College laboratory. Observations were made with a high-power transmitter at oblique incidence and a low-power transmitter at vertical incidence. Results of the observations are discussed. A marked correlation is found to exist between the thickness of the ionized layer and the intensity of scattered signals. --G. T.

A-118 Banerjee, S. S. and Banerjee, D. K. (Eng. Coll., Banaras Hindu Univ.), Variation of horizontal gradient of ionization in the ionosphere. Journal of Scientific and Industrial Research, Sec. B, 13(1):72-73, Jan. 1954. 2 figs., table, 7 refs. DWB--Values of the horizontal gradient of ionization (difference per 100 km between critical frequencies for F_2 region at Banaras and at Delhi) in the morning and in the afternoon are presented for Oct. and Dec. 1952. Variations of the gradient show much wider range and higher average in the afternoon than they do in the morning. --G. T.

A-119 Banerjee, S. S. and Surange, P. G. (Engr. Coll., Banaras Hindu Univ., Banaras), Scattering of radio waves and the horizontal gradient of ionization in the ionosphere. Science and Culture, Calcutta, 21(12):750-753, June1956. 3 figs., 2 tables, 4 refs., 4 eqs. DLC--Besides the normal horizontal gradients of ionization in the ionosphere there are shown to be short regions with sharp horizontal gradients which modify the propagation of radio waves so as to produce non-linear P'f curves for back-scatter. A uniform ionosphere (linear) curve and a non-uniform (non-linear) case are shown graphically, based on pulse signals on Feb. 10 and Feb. 15, 1955, respectively (at Banaras, India). Data are also presented in tables.--M. R.

A-120 Banerji, R. B., Studies on the sporadic E-layer. Indian Journal of Physics, 25(8):359-374, Aug. 1951. 6 figs., table, 11 refs., 13 eqs. DLC--This investigation shows that: 1) the echo of a transmitted radio signal consists of one component due to random scattering and another component due to steady reflection, hence 2) the E-region consists of one ion-cloud region and one regularly reflecting region. A method for estimation of the average number density of electrons in the cloud shows the number density to be below that required for total reflection of the transmitted wave. An advanced formula that can be applied to investigations of the structure of that part of the E-region that gives rise to the steady echo is discussed. --W.N.

A-121 Banerji, R. B., Some studies on random fading characteristics. Physical Society of London, Proceedings, Ser. B, 66(2):105-114, Feb. 1, 1953. 4 figs., 13 refs., 32 eqs. DWB--The theory of random fading of pulses singly reflected from the ionosphere is examined. Velocity distribution of fading is found to be independent of the power spectrum of the returned wave. This invalidates the accepted explanation of certain observed departures from theory. An alternative explanation is given and discussed. --Author's abstract.

A-122 Banerji, R. B., Autocorrelogram of randomly fading waves with applications to wind measurements at 150 kc/s. Pennsylvania State Univ. Ionosphere Research Lab., Contract AF 19(122)-44, Scientific Report, No. 59, March 15, 1954. 29 p. 6 figs., table, 7 refs., 30 eqs. DWB--The greatest difficulty in the computation of wind velocities from the autocorrelogram analysis of radio wave fading patterns has so far been supposedly random fluctuations of the derived autocorrelograms. A method is developed to test the significance of autocorrelograms. It is shown that no more than 250 independent data on the original fading pattern are needed to distinguish between turbulent and drift velocities. The power spectrum that can be expected from an irregular ionosphere is also considered. It is found that the autocorrelograms of the fading of 150 Kc/s waves obtained bear out these discussions. The orientation of the antennae seems to have a very profound influence and it may be expected that the fading observed with two adjacent aerials at different orientations may yield as much information regarding wind velocities as spaced receiving aerials. --From author's abstract.

A-123 Banerji, R. B., The mechanism of fading of 150 kc pulses. Pennsylvania State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 71, Nov. 15, 1954. 29 p. 9 figs., table, 17 refs. DWB--A statistical theory of fading due to random absorption of downcoming waves has been worked out. Comparison of this with the theory of random scattering indicates a major point of difference which can be distinguished experimentally. Statistical results obtained with 150 kc waves at the Penna. State Univ. indicate that it is the absorption phenomenon which gives rise to the fading of these waves. On the basis of this result, the statistical theory has been extended to yield a method for the measurement of the height of the irregularities which give rise to the fading. Results indicate a diurnal variation — lower heights in the day and higher at night. A discrepancy with the theory of random fading which was noticed by previous authors working with short waves has not appeared with data at Penna. State Univ. The reason for the difference is discussed. --Author's abstract.

A-124 Banerji, R. B., Distribution-in-speed of fading of 150 kc/s waves. Nature, London, 176(4472):131, July 16, 1955. fig., 5 refs. DWB--No significant difference from normality was found in the distribution of speed of fading of 150 kc/s waves. This bears out the prediction that similarity to the normal distribution would be more pronounced for long than short waves. --C. E. P. B.

A-125 Banerji, R. B., The autocorrelogram of randomly fading waves. Journal of Atmospheric and Terrestrial Physics, 6(1):50-56, Jan. 1955. 3 figs., 6 refs., eqs. DWB--The autocorrelograms of fading patterns from rough ionospheres characterized by pure drift and pure turbulence are calculated and that from a combination of the two is deduced. The reality of oscillations in the tail of the correlogram, and hence the distinction between the two types, can be established if more than 220 points are available. A correlogram obtained by R. W. E. McNicol (1949), which resembles the theoretical one for a drifting ionosphere, is regarded as real. --C. E. P. B.

A-126 Banerji, R. B., Methods of analyzing fading records from spaced receivers, including preliminary analysis of such data at 75 Kc/s. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 81, Jan. 15, 1956. 53 p. 8 figs., table, 12 refs., 63 eqs. DWB--The statistics of the fading of radio waves from spaced receivers has been reconsidered to interrelate the existing methods of drift measurement and compare their effectiveness. An extension of the Putter technique has been made to the case of random motions and indications are given concerning the extension to the case of anisotropy. Experimental results concerning the fading of 75 kc/s waves observed at State College during 1955 are briefly discussed. --Author's abstract.

A-127 Banerji, R. B. (Indian Statistical Inst., Calcutta), Method of measuring ionospheric winds by fading at spaced receivers. Journal of Atmospheric and Terrestrial Physics, N. Y., 12(4): 248-257, 1958. 3 figs., 12 refs., 31 eqs. DLC--The different statistical methods developed for the measurement of ionospheric drifts by spaced receivers have been reviewed and the essential unity of the basic model brought out. The geometrical method of PUTTER and the probability-distribution method of the Cambridge School have been merged into a single method which promises to be less laborious than the autocorrelation methods but of comparable accuracy. --Author's abstract.

A-128 Baral, S. S. (Ionospheric Lab., Inst. of Radio Phy. and Electronics, Univ. Col. of Sci., Calcutta), Studies on sporadic E. Journal of Scientific and Industrial Research, New Delhi, Sec. A, 11(7):290-296, July 1952. 4 figs., 26 refs. DWB--Author discusses the results of his analysis of world data, 1945-1951, available on sporadic E (Es) of which the highlights are: 1. The main source of Es ionization is the meteoric impacts. 2. Both intensity and frequency of occurrence have two maxima: (a) one near the equator and (b) another near 70° lat. The author speculates on whether or not the pronounced effect found over the geomagnetic equator has some bearing on the upper atmospheric (electro-jet) current system over Huancayo. 3. The diurnal variation of Es falls off from the equator towards the higher latitudes. 4. Of the two theories of the structure of the Es, the "thin layer" and the "ionized patch," the latter is strongly favored because of observational evidence. --W. N.

A-129 Barber, N. F. and Crombie, D. D. (both, Dep. Scientific & Indust. Res., Lower Hutt, New Zealand), V.L.V. reflections from the ionosphere in the presence of a transverse magnetic field. Journal of Atmospheric and Terrestrial Physics, N. Y. 16(1/2):37-45, Oct. 1959. 4 figs., 14 refs., 20 eqs. DWB, DLC

--The reflection coefficient is found for waves that are incident on a sharply bounded ionosphere and have their electric vector in the plane of incidence. The earth's magnetic field is assumed to be horizontal and perpendicular to the direction of propagation. Hence, the analysis is appropriate for propagation round the magnetic equator. It is found that the reflection coefficient for waves incident from the west is numerically greater than that for waves incident from the east, when the angle of incidence is large. --Authors' abstract.

A-130 Barre, M. and Rawer, Karl, Une perturbation ionospherique extraordinaire observee en terre Adelie. (An extraordinary ionospheric disturbance observed in Adelie Land.) Annales de Geophysique, 6(4):309-317, Oct. -Dec. 1950. 7 figs. French and English summaries p. 309. DBS--A detailed analysis of the ionospheric disturbance that was observed at Adelie Land and in its vicinity between Feb. 2 and 5, 1950. The high absorption occurring in a limited region of the atmosphere is attributed to increased ionization in the D as well as in the F2 layer. --I. L. D.

A-131 Barre, M. and Rawer, K., Quelques resultats d'observation ionospheriques effectuees pres de la Terre Adelie. (Some results of ionospheric observations made near Adelie Land.) Journal of Atmospheric and Terrestrial Physics, 1(5/6):311-314, 1951. fig., 3 refs. DWB--The ionospheric observations in this region show many anomalies due to the proximity of the magnetic pole. The E, F, and F2 echoes are often scattered, especially the F2 echoes, due to ionic clouds at the E level. Characteristic photographs are added. --A. A.

A-132 Barron, D. W., 'Waveguide Mode' Theory of radio wave propagation when ionosphere is not sharply bounded. Philosophical Magazine, 4(45):1068-81, Sept. 1959.--Propagation of radio waves can be treated by considering space between earth and ionosphere as waveguide and discussing properties of various waveguide modes; method of calculating mode characteristics for any horizontally stratified ionosphere in which electron density and collision frequency vary with height in some arbitrary prescribed manner; theory given in full for flat, perfectly conducting earth with no magnetic field.

A-133 Baruah, H. K. and Baruah, Parukutty, A high precision ionosphere sounding equipment. Science and Culture, Calcutta, 17(7):305-306, Jan. 1952. 2 figs. MH-BH--Brief description is given of new radar equipment installed at the Institute of Nuclear Physics, Calcutta. The instrument is claimed to have an accuracy better than 1 km as opposed to 10 km which is declared to be the accuracy of apparatus used up to present. The instrument is being used for studies on magnetoionic splitting. Some technical details concerning the equipment are indicated and two photos of echoes presented. --G. T.

A-134 Bateman, R. (Page Communications, Eng. Inc., Wash. D. C.); Finney, J. W.; Smith, E. K.; Tveten, L. H. and Watts, J. M. (all, Natl. Bur. of Standards, Boulder, Colorado), IGY observations of F-layer scatter in the Far East. Journal of Geophysical Research, Wash., D. C., 64(4):403-405, April 1959. 2 figs., tables, 2 refs. DLC--Peculiar signal enhancements observed during transmissions at 36 to 50 Mc/s between the Philippines and Okinawa appear to represent F-layer scatter. These signals are observed nightly for periods of several hours during the months of September and October. Pulse tests indicate F-layer heights for these signals. Considerable pulse broadening is observed and the signals generally arrive from somewhat off the great circle path. --Authors' abstract.

A-135 Bates, David R., The temperature of the upper atmosphere. Physical Society of London, Proceedings, B, 64:805-821, 1951. 7 tables, 51 refs., 23 eqs. DWB--Assuming that 110 km temperature is about 300°K and particle concentration 7.4×10^{12} $/cm^3$, effects of various temperature gradients up to 200-500 km surmounted by an isothermal region are tabulated and the thermal equilibrium in the F region studied. The estimate, based on radio measurements, of the energy gained from ionizing photons is insufficient to balance loss by conduction and emission, and it is suggested that the estimated gain of energy is too low, heat being also supplied to upper atmosphere by unobservable ionization. This should vary with sunspot cycle, agreeing with a suspected sunspot cycle in variation of level and temperature of ionosphere layers. --C. E. P. B.

A-136 Bates, D. R. (ed.), The earth and its atmosphere. N. Y., Basic Books, Inc. 1957. 324 p. figs., photos, tables, bibliog. p. 303-308. DLC (AC806. B34) Earlier edition issued under title, The Planet earth, London, Pergamon Press, 1957. 312 p. The 17 chapters in this up-to-date collection of articles contain discussions by experts in the several fields of: 1) The IGY (S. CHAPMAN); 2) Origin and age of earth (KUIPER); 3) Earth's core (K. E. BULLEN); 4) Crust (J. T. WILSON); 5) Oceans (DEACON); 6) Magnetism (VESTINE); 7) Composition and structure of atmosphere (D. R. BATES); 8) Climate (EADY); 9) General circulation of atmosphere and oceans (EADY); 10) Ice ages (OPIK); 11) Meteorology (B. J. MASON); 12) Ionosphere (RATCLIFFE); 13) Airglow (D. R. BATES); 14) Aurorae and magnetic storms (FERRARO); 15) Meteors (LOVELL);

16) Cosmic radiation (J. G. WILSON); 17) Genesis of life (HALDANE). Numerous illustrative graphs and schematic diagrams and tables are included. The information, while not presented in a technical style, is substantial enough to satisfy anyone who is not an authority on the given subject. (For listing of contents, see Pt. III of this issue of MAB; articles abstracted separately.)--M. R.

A-137 Bauer, Siegfried J., A possible troposphere-ionosphere relationship. Journal of Geophysical Research, 62(3):425-430, Sept. 1957. 2 figs., 6 refs. DLC--This analysis shows statistically significant relationship between tropospheric frontal passage and minimum virtual height of the F2 layer and is discussed in light of Martin's theory, in consequence showing consistency with the concept of troposphere-ionosphere dynamic coupling. --W.N.

A-138 Bauer, Siegfried J. (U. S. Army Signal Engin. Labs., Fort Monmouth, New Jersey), An apparent ionospheric response to the passage of hurricanes. Journal of Geophysical Research, Wash., D. C. 63(1):265-269, March 1958. 5 figs., 5 footrefs. DLC.

A-139 Bauer, Siegfried, J. and Daniels, Fred B. (both, U.S. Army Signal Res. & Dev. Lab., Fort Monmouth, N. J.), Measurements of ionospheric electron content by the lunar radio technique. Journal of Geophysical Research, Wash., D. C., 64(10):1371-1376, Oct. 1959. 7 figs., 9 refs., eqs. DLC--Measurements of the Faraday rotation of lunar radio echoes on a frequency of 151 Mc/s are used to determine the time variation in the total ionospheric electron content. Absolute values of ionospheric electron content are determined from these measurements in conjunction with information on the electron content below the F2 peak computed from vertical incidence sounding data. Diurnal, day-to-day, and seasonal variations in the total electron content are presented. The ratio n_a: n_b of the number of electrons above the F2 peak to that below is found to be in the order of 4 to 5 during three summer nights (June) before sunrise and about equal to 3 after sunrise. For two days in November the ratio n_a : n_b is found to be equal to about 3 both before and after sunrise. Possibilities of inferring other characteristics of the upper ionosphere from observed variations in the total electron content are briefly discussed. --Authors' abstract.

A-140 Beagley, J. W. (Dir. Geophysical Obs., Dept. of Sci. & Ind. Res. N.Z.), Ionosphere research. (In Simpson, Frank A. (ed.), The Antarctic today. Wellington, Reed, 1952. p. 279-293. fig., photos, 15 refs.) DWB--

A survey of the research which has been and is being done in New Zealand and the neighboring Antarctic regions in an attempt to solve the fundamental problems of ionospheric research. First proof of the Kennelly-Heaviside layer is said to have been made by APPLETON and BARNETT (a New Zealander) in 1924 • The places where research on ionospheric wave propagation is carried on are listed and the work described (Christchurch, Raoul Island in Kermadec Group, Campbell Island, Pitcairn Island, Rarotonga, Fiji). Plates show the layout of the weather station on Marion Island. --M. R.

A-141 Becker, Walter, Über die Dampfung der ausserordentlichen Komponente in der El-Schicht der Ionosphäre. (On the damping of the abnormal component in the El layer of the ionosphere.) Journal of Atmospheric and Terrestrial Physics, 1(2): 73-81, 1950. 6 figs., 4 refs., 2 eqs. MH-BH--The experimental observation, that no extraordinary radio echoes can be received from the normal E layer around sunrise and sunset for frequencies from 1.39 to 2.5 Mc/sec., is shown to be in accordance with theory. Many experimental and theoretical curves are presented in support of this. --From author's abstract.

A-142 Becker, Walter and Dieminger, Walter, Zur Definition der E2-Schicht. (On the definition of E2 layer.) International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 126-138. 6 figs., 2 tables, 21 refs. English and French summaries p. 138. DWB--A study of the thin homogenous layer between the E and F layer which is called the E2 layer. It was discovered as a result of observations with high power, multi-frequency recording system. The E2 layer is observed with great regularity, is very stable and easily distinguished from the other intermediate layers that are seldom recorded at Lindau; the limiting frequency is only 0-2 to 0-3 MHz greater than that of the El layer, and shows direct dependence on solar altitude. --M. R.

A-143 Becker, Walter, Typische Streuprozesse radiofrequenter Strahlung an Elektronenwolken der sporadischen Es-Schicht dargestellt an Hand ausgewahlter Durchdrehaufnahmen. (Typical processes of scattering of radio waves by electron clouds in the sporadic E layer, as shown by selected revolving-camera photographs.) International Council of Scientific Unions. Mixed Commission on the Ionosphere, Canberra, Australia, Aug. 24-26, 1952, Proceedings, p. 186-193, pub. 1953. 6 figs., 12 refs. DWB--

The correctness of T. L. ECKERSLEY's disclosure of the influence of electron clouds of the sporadic E layer on the propagation of electromagnetic waves which can be of different horizontal extension is confirmed by a number of selected multifrequency photographs representing Eckerley's typical scattering phenomena in E clouds made at the Institute for Ionosphere Studies at Linden. --A. M. P.

A-144 Becker, Walter, Typische Streuprozesse radiofrequenter Strahlung an Elektronenwolken der sporadischen Es-Schicht dargestellt an Hand ausgewahlter Echolotungsaufnahmen mit veranderlicher Frequenz. (Typical processes of scattering of radio waves from sporadic E clouds illustrated with selected echo sounding records of varying frequency.) Archiv der Elektrischen Übertragung, 7(8):375-378, Aug. 1953. 6 figs., 12 refs. DLC--Various possible modes of scattering from sporadic E clouds are considered and typical (P', F) records are reproduced to illustrate these modes.--Electrical Engr. Abstracts, No. 1255, 1954.

A-145 Becker, Walter, Winde und turbulente Luftströmungen in der Ionosphäre. (Winds and turbulent air currents in the ionosphere.) Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, 6(3/4):417-439, 1954. 6 figs., 5 tables, 51 refs. English and French summaries p. 417-418, DLC--Methods of observation are classified as non-electric (rockets, volcanic dust, aurora, luminous clouds, meteor trails), and radiowave techniques (1 to over 1000 m). The range of velocities is 50-400 m/s (one observation of 1100); maximum frequency is 60 m/s at 80-120 km and 100 m/s in F layer, but standard deviation is several hundred percent. Determinations of turbulence are discussed; their period is inversely proportional to observation radio frequency. In the F-layer the propagation of deviation centers is proportional to the geomagnetic character figure. In the E-layer solar and lunar tides give a velocity range of 35 and 25 m/s. --C. E. P. B.

A-146 Becker, Walter, Über ein Verfahren zur routinemässigen Bestimmung der wahren Verteilung der Elektronendichte in einer Ionosphärenschicht aus den Durchdrehaufnahmen dieser Schicht. (A method for routine determination of the true distribution of electron density in an ionospheric layer from sweep frequency records for this layer.) Archiv der Elektrischen Übertragung, Stuttgart, 10(5):207-214, May 1956. 9 figs., 2 tables, 4 refs. German and English summaries p. 207.

Also his: Méthode graphique pour la détermination courante des distributions verticales de la densité électronique dans les couches ionosphériques d'après les enregistrements obtenus par balayage de fréquence. (Graphical method for routine determination of vertical electron density distribution in ionospheric layers from sweep frequency. records.) Annales des Telecommunications, Paris, 12(5):141-145, May 1957. 6 figs., table, 3 refs. DLC--The Booker-Seaton (1940) method of determining electron density from height and sweep frequency records is discussed critically and illustrated, and a generalized method is extended to enable one to calculate the electron density and the form of the ionospheric layer (whether Epstein, cosine or parabolic shape) and the influence of the geomagnetic field. It also enables one to determine the half thickness of the layer. --M. R.

A-147 Becker, W.; Ferraro, A. J. and Gibbons, J. J., Coupling and polarization computations approximated by a single discontinuity in the medium. Pennsylvania, State Univ., Contract AF 19(604)-1304, Scientific Report No. 104, July 1, 1958. 33 p. 13 figs., tables, 11 refs., eqs. DWB--Following an initial suggestion by one of the authors that coupling can be approximated by considering slabs of uniform electron density around the coupling level, the problem has been further simplified by employing a step discontinuity at the N_c level. This gives a quick approximate method for computing the effect of coupling. Coupling is concentrated by appropriately deforming the N-h and v-h curves in a region around the level of N_c; the deformation is done in such a manner that the gradient of electron density and collision frequency is zero as one approaches the level of N_c from either below or above. At this level there is, then, a step discontinuity in the N and v profiles. W. K. B. solutions are used as the wave functions and the coupling between the ordinary and extraordinary modes is taken into account by solving a boundary value problem at the discontinuity. Formulas have been developed for the polarization of the upgoing back scattered wave and the downgoing forward scattered wave. Results are compared with those obtained by presumably more accurate methods Parkinson (1955). Even near critical coupling, the approximation gives fairly satisfactory results for the polarization of the "main" echo at 150 kc/s. --Authors' abstract.

A-148 Becker, Walter (Max-Planck-Inst., Hannover, Germany), Sporadic ionization of the E-region of the ionosphere above Lindau/Harz during the past year. AGARDograph, Paris, No. 34:59-65, Sept. 1958. 3 figs., 5 tables. DWB (629.1323 N864a)--

The concept "Sporadic Ionization of the E-Region" covers all ionization steps between 60 and 190 km height that are sporadic in time and hence not due to normal ultraviolet solar irradiation. A classification of these ionization steps is adopted. It agrees with the proposals of the World-Wide Soundings Committee as far as highly intense echo traces are concerned. A statistical investigation of the characteristics of these traces is presented. The characteristics were deduced from multi-frequency records taken at hourly intervals from July 1, 1957 to June 1, 1958. A well pronounced daily seasonal dependence of the maximum frequency of the most significant Es trace on each record, with a clear maximum at noon and summer, could be shown. The same relationship was found for secondary Es traces which were not mainly continuous. No distinct height ranges for the different Es types or intense Es ionization steps, nor a daily-seasonal dependence of the heights could be found. Homogeneous, layerlike reflections were observed mostly about noon. Each second record showed such intense Es reflections. Nothing new about the occurrence frequency of weak meteoric traces could be found. Low level ionization steps below 85 km height only observed during daytime, with a winter maximum (rate of winter observations: 50%). It is assumed that different ionization mechanisms must be responsible for the observed sporadic ionization of the E-region. --Author's abstract.

A-149 Becker, Walter, Das Vergleichsverfahren der Station Lindau/Harz zur Bestimmung der wahren Verteilung der Elektronendichte in der Ionosphare. (Comparison method of the Lindau/Harz station for determining the real distribution of electron density in the ionosphere.) Archiv der Elektrischen Übertragung, Stuttgart, 13(2):49-57, Feb. 1959. 8 figs., 2 tables, 25 eqs., 5 refs. German and English summaries p. 49. DLC --The principle of the method was described by the author in an earlier paper in this periodical. In the meantime the method was considerably expanded, for by now all calculated and observed ordinary echo sounding records of variable frequency are compared. The comparison of the extraordinary sounding traces has also been included. The basic advantage of the last-named comparison is the fact that the extraordinary sounding trace is fully within the measuring range of the customary ionospheric probes (1 to 16 Mc/s), while formerly assumptions of some kind had to be made concerning the lacking ordinary trace between 0 and 1 Mc/s. Greater ease in height determination also results from a comparison of the extraordinary traces. To allow the method to be adopted by other stations having a similar terrestrial magnetic inclination (67°6 '), the mathematical fundamentals, the required tables, and a description of the evaluating device are given. --Author's abstract.

A-150 Becker, Walter (Max-Planck-Institut, fur Aeronomie), Die allgemeinen Verfahren der Station Linau/Harz zur Bestimmung der wahren Verteilung der Elektronendichte in der Ionosphare. (The general methods of the station Lindau/Harz for determining the electron density distribution in the ionosphere.) Archiv der Elektrischen Ubertragung, Stuttgart, 13(9):373-382, Sept. 1959. 9 figs., 11 refs., 27 eqs. German and English summaries p. 373. DLC--Three nonelectronic methods are described. The "general method" is free of all restrictions. It is based on the fact that with a terrestrial-magnetic inclination of 67° or more a purely longitudinal propagation can be assumed for the extraordinary component so that Rydbeck's inversion for purely longitudinal propagation can be applied. The two correction methods intended for a reduction of the ordinary and extraordinary sounding traces, respectively, depend in their accuracy somewhat on the degree to which the observed shape of the layer agrees with the profile of a reference layer to be determined previously with the author's comparison method. The two methods determine the corrections to be applied to this reference profile for obtaining the unknown profile. In their practical realization all three methods make use of the slide rule principle. A 10-point N(h) analysis takes two hours for the general method and 1.5 hours for each of the correction methods. The accuracy of all three methods is inherently greater than the practical measuring accuracy. Their advantage over the present electronic methods resides in the fact that they take also into account an extrapolation of the sounding traces down to the abcissa origo f = 0 and f = fH, respectively, with the dependability of the comparison method. --Author's abstract.

A-151 Becker, W. (Max-Planck-Inst. fur Aeronomie, Lindau am Harz, Germany), New methods and some results concerning true ionospheric height calculations. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2):67-83, Oct. 1959. 20 figs., 2 tables, 10 refs., 7 eqs. DWB, DLC--The methods can be listed as follows: (a) Optical-graphical comparison method, comparing, for certain layer-types, calculated ordinary and extraordinary h'(f)-traces with observed h'(f) records. It is possible to determine the best fitting layer-types and its parameters within 8 min. (b) General method, applicable to any monotonic h'(f) trace. This method is based on Rydbeck's solution of the respective integral equation. A 10 point h'(f)-reduction according to this method takes 2 hr. (c) Correction method, combining the methods (a) and (b). Thus the time Necessary for a 10 point h'(f)-reduction can be reduced to 5/4 hr. The following results are reported: (a) Good agreement between actual layer shape and parabolic N(h)-distribution for the undisturbed night-time F-layer on Aug. 8, 1957. (b)

(b) Periodic movements (T∼1 hr, amplitude∼ 8 km) of the F-layer during a magnetically undisturbed night, 7-8 Aug. 1957. (c) Sudden ascent of the F-layer during a "Polar Sudden Commencement" (Δ h ∼ 60 km) within ½ hr on Sept. 15-16, 1956. (d) Existence of an N(h)-minimum above the normal E-layer above Lindau, Germany on Aug. 20, 1957, 1545 hrs. --Author's abstract.

A-152 Becker, Walter, Die Bestimmung der wahren Verteilung der Elektronendichte in der Ionosphäre. (Determination of the true distribution of electron density in the ionosphere.) Archiv der Elektrischen Übertragung, 13(1):26-32, Jan., 1959. 6 figs., table, 17 refs.--The methods known for determination of electron density profiles as based on variable frequencies of sounding were discussed in an earlier paper. Here is the accuracy of the method discussed and all of them found completely uncertain.

A-153 Beckmann, B.; Menzel, W. and Vilbig, F., Über streuende Reflexionen der Ionosphäre. (The scattering reflexions of the ionosphere.) Germany. Forschungsanstalt der Deutschen Reichspost, Mitteilungen, Band 4:45-50, 1939. 6 figs., 3 eqs. DLC--Characteristics of the apparent periodic scattering in the E-region may be ionized clouds. In the F-region characterized by vertical (and sharp) reflexion. Origin of these clouds, irregularly distributed in 100-200 km is assumed to be an after effect of aurora borealis. --W. N.

A-154 Beckmann, B.; Menzel, W. and Vilbig, F., Über die praktische Bedeutung der Ionosphärenforschung für den Funkdienst. (The practical significance of ionospheric research to the radio service.) Forschungs anstalt der Deutschen Reichspost, Mitteilungen, 6:29-40, 1941. DLC--The several types of fading are discussed separately accompanied by sample recordings or graphs. Finally is summed up some countermeasures and means whereby radio communication can be maintained or conditions for the communication predicted. --W. N.

A-155 Beckmann, B., Erste Ergebnisse der Satellitenbeobachtung für die Kenntnis der Wellenausbreitung. (Initial results of satellite observation contributing to the knowledge of wave propagation.) Nachrichtentechnische Zeitschrift, 12(7):335-343, July 1959. 23 figs., 5 refs. --

A-156 Belgian Congo and Ruanda. Service Meteorologique. Ionosphere: publication mensuelle du Bureau de Geophysique. (The ionosphere: monthly publication of the Bureau of Geophysics.) Vol. 6, No. 12, Dec. 1957. 116 p. Almost entirely tables. Data from Leopoldville, Binza, Elisabethville, Karavia, Bunia, Ruampara. DWB (M10. 535 B429io)--

This publication gives data on ionospheric observations made in the Belgian Congo at Leopoldville, Binza, Elisabethville, Karavia, Bunia and Ruampara during Dec. 1957.

A-157 Bellchambers, W. H. (Royal Society Base, Halley Bay, Antarctica) and Piggott, W. R. (Radio Research Station, Ditton Park, Slough, Bucks), Ionospheric measurements made at Halley Bay. Nature, London, 182(4649):1596-1597, Dec. 6, 1958. fig., 2 refs. DWB--Some results of the ionospheric measurements carried out in 1957 at the Royal Society Base at Halley Bay are presented. Activity due to the incidence of corpuscular radiation reaches a maximum near 1400 L. M. T. (30°W) and more than 2/3 of the examples are found between 0100 L. M. T. and 1000 L. M. T. The incidence of high absorption is increased greatly at the equinoxes. The auroral radio echo index at Halley Bay shows a similar diurnal variation but shifted in phase toward the earlier hours. Consistent recurrent diurnal changes in the F-layer are present; these indicate that the station is favorably located for studying regular variations of this layer at high altitudes. 'The ionograms obtained near midnight in winter months show two distance reflecting structures in the F-region; one which is sequentially continuous with the F-layer of the previous day, and the other, which usually first appears with the characteristic shape normally attributed to oblique reflexion from a tilted layer, develops into the F-layer of the subsequent day. The main features of the diurnal variation of the F-2 layer, critical frequency, f_oF2 indicates the following: (1) the large diurnal variation of electron density in winter, evident also in the total electron content of the layer, having a maximum near noon L. M. T. despite the absence of significant photoionization due to solar radiation; (2) the seasonal maxima of electron density in the day found at the equinoxes, these are similar to those found at Port Luckroy and Port Stanley; (3) small diurnal variation in electron density in summer showing a maximum near midnight L. M. T.

A-158 Bender, Hertwig K., Erfahrungen bei neueren Messungen der atmosphärischen Störungen des Funk-Empfangs vorzugsweise auf 9 MHz. (Results of new measurements of atmospheric disturbances of radio reception, principally on 9 MHz.) Germany, Deutscher Wetterdienst in der US-Zone, Berichte, No. 12:161-166, 1950. 6 figs., 2 refs. MH-BH--Three methods of recording disturbances in wireless communication are described. Diurnal variation of static and influence of thunderstorms and fronts are discussed and a possible effect of penetrating cosmic rays considered. No connection was found with reflection or damping in the ionosphere. --C. E. P. B.

A-159 Ben'kova, Natal'ia Pavlovna, Mezhdunarodnyi geofizicheskii god i issledovaniia verkhnikh sloev atmosfery. (The International Geophysical Year and research in the upper layers of the atmosphere.) Moscow, Gosud. Izdatvo Literatury po Voprosam Sviazi i Radio, 1958. 47 p. 18 figs., 12 refs. DWB (M10. 53 B468me)--A general review of the IGY program is presented with a systematic discussion of investigations to be carried out in the upper atmospheric layers which are closely related to the propagation of short radio waves. These investigations will include: 1) vertical soundings of the ionosphere (ionospheric stations and their operation, 20 such stations in the U.S.S.R.); 2) measurement of radio wave absorption in the ionosphere and of ionospheric winds and drifts; 3) study of atmospheric disturbances and geomagnetic variations; 4) studies of auroras and night sky glow; 5) investigations to be carried out with the aid of rockets and artificial satellites in the U.S.S.R. A calendar of regular world days and of world meteorological intervals is appended. --A. M. P.

A-160 Benner, Arthur H., Predicting maximum usable frequency from long distance scatter. Institute of Radio Engineers, Proceedings, 37(1):44-47, Jan., 1949. 5 figs., 4 refs., eqs. DLC--E-layers are responsible for the leading edge of the echo, whereas maximum amplitude is returned from the ground. On this basis, calculating the maximum frequency from time delay of the scatter, provides method of prediction. --W. N.

A-161 Benner, Arthur H., Second report on measurements of the vertical incidence ionospheric absorption at 150 Kc/s. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 13, June 20, 1950. 16 p. 14 figs., 4 tables, graphs, 18 refs. DWB--A direct continuation of the measurements of radio waves at vertical incidence at 150 Kc/s covering the period from July 1, 1949-Jan. 31, 1950. The data obtained are presented as diurnal plots of the total absorption. --W. N.

A-162 Benner, Arthur H. (Penna. St. Coll, Radio Propagation Lab.) Interim report on long wave ionospheric absorption theory. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 10, Jan. 20, 1950. 27 p. 32+ figs., 27 refs., 41 eqs. DWB--As an initial step toward the explanation of the causes and mechanism of ionospheric absorption of long waves at vertical incidence at 150 Kc/s, this theoretical attack is restricted to the special conditions at State College, Penna. Based on the Appleton-Hartree dispersion equation, expressions were obtained for the absorption coefficient for various types of reflecting layers in the lower E region. --W. N.

A-163 Benner, Arthur H., Vertical incidence ionospheric absorption at low frequencies. Pennsylvania. State College, Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 18, Jan. 15, 1951 (rev. Jan. 30, 1952). 84 p. 32 figs., 5 tables, graphs, 22 refs. DWB--This study includes an examination of the complex index of refraction at frequency 150 Kc/s with the aid of the Appleton-Hartree dispersion equation. The E layer coefficient is obtained, the values of which are dependent on the characteristics of the E region at maximum of ionization. Contributions of the deviating E and the non-deviating D region are calculated as the total absorption, however it is tentatively concluded that the D region is not a pure electron layer; ions must be considered too. Data on typical vertical incidence at 150 Kc/s from March 1949 through June 1950 are presented and analyzed for correlation with some meteorological factors. Several conclusions and new problems pertinent to the subject are presented. A detailed description of the automatic measurement equipment is given. --W.N.

A-164 Bennington, T. W., Short-wave radio and the ionosphere. With special reference to everyday professional and amateur problems of short-wave transmission and reception. 2nd ed. Wireless World, Iliffe and Sons, 1950. 138 p. 57 figs., 2 photos. GB-MO--While this book deals mainly with the theory of radio transmission it has considerable interest for meteorologists, including accounts of the formation and structure of the ionosphere, the technique of ionospheric measurements, regular and anomalous variations of height and ionization, radio noise and ionospheric storms, with relevant curves and world charts. --C.E.P.B.

A-165 Bennington, T. W., Propagation of v.h.f. via sporadic-E. Wireless World, 58:5, 1952. --Clouds of abnormally dense ionization occuring within the normal E region can enable waves of frequency up to 100 mc to be propagated over oblique paths. Temperate-zone-type records of sporadic-E obtained by vertical-incidence measurements at Slough, Fraserburgh, De Bilt, Lindau, Freiburg, Domont and Poitiers are analyzed. It appears possible to trace the growth and movement of these clouds from observations at a number of stations.

A-166 Bennington, T. W. and Prechner, L. J. (both, B.B.C.), The B.B.C. ionospheric storm warning system. British Broadcasting Corporation, The B.B.C. Quarterly, 7(2), Summer 1952. 13 p. 9 figs. Abstracted from reprint. DWB--

The Ionosphere Section of the Engineering Information Dept. of the British Broadcasting Corp. has issued warnings of imminent short period deviations from normal ionospheric characteristics from its Tatsfield Receiving Station since Sept. 1941. Forecasts are also issued regularly for internal use and guidance in preparing warnings. Details of the warning system, accuracy of warnings, observational and collection work of the B. B. C. 's Ionospheric Section, correlation with measurements of terrestrial magnetism, and with reception data for North Atlantic circuits, annual and monthly frequency of warnings (disturbances), duration of warnings (disturbances), diurnal variation in start of warnings, correlation with sunspots, 27-day recurrence tendency of storms, elements forecast and accuracy of forecasts are all discussed in detail and evaluated graphically. --M. R.

A-167 Bennington, T. W., Critical frequency variations. Wireless Engineer, London, 30(7):175-179, July 1953. 8 figs., 3 tables, 2 refs. DLC--Twelve-month running averages of critical frequencies for the F2 layer are plotted against twelve-month running averages of sunspot numbers for two stations in the Northern Hemisphere and two in the Southern Hemisphere, as well as for one station near the equator. It is found that, whereas in the Northern Hemisphere there is a pronounced tendency for the rate of increase of critical frequency to become smaller for the higher values of sunspot number, this tendency is not evident in the Southern Hemisphere. Near the equator the critical frequency behaviour lies between that for the Northern and Southern Hemispheres respectively. A suggestion is made that a 'saturation' effect may occur for high values of sunspot number in the Northern Hemisphere at the time of the annual minimum, which occurs in local summer, but not in the Southern Hemisphere where there are two annual minima, one of which occurs in local winter. --Author's abstract.

A-168 Bennington, T. W., Observations of the effects of ionospheric storms over a North Atlantic circuit. Journal of Atmospheric and Terrestrial Physics, 7(4/5):235-243, Oct. 1955. 4 figs., table, 3 refs. DWB--The maximum usable frequency (MUF) of the WWV signals from Washington received at Tatsfield, England, on 5, 10, 15 and 20 Mc/s were recorded in July-Sept. 1953 in normal and disturbed periods and the diurnal variation of monthly medians extracted. The effect of ionospheric disturbances is to depress the MUF by 10-50%, the greatest reduction occurring between 7-11 h GMT, the least between 12-23 h in summer, 12-20 h at equinox and 12-17 h in winter. The disruptive effect depends also on the value of the MUF at the time, being greater at night than by day, especially in winter. Possible storm effects on the lowest usable frequency (LUF) are briefly discussed. --C. E. P. B.

A-169 Bennington, T. W., Sporadic E and the F2 layer. Wireless World, 65(6):262-263, June, 1959. 4 figs., ref.

A-170 Berg, Hellmut, Bemerkungen zur Meteorologie der Ionosphäre. (Remarks on meteorology of the ionosphere.) Geofisica Pura e Applicata, 19(1-2):33-38, Jan.-March 1951. 3 figs., table, 8 refs. German and English summaries p. 33. DLC--Daytime echoes from the ionosphere were observed on the 80 m band during the fall of 1942 at Cologne. Between Aug. 14 and Oct. 14, 1688 disturbances of the E layer and 1977 disturbances of the F2 layer were observed with prevailing direction from the NE in the E layer (in the F2 layer no noticeable favored direction was found) and speeds ranging from 10 to 370 m/sec for E and F2 layers, respectively. Explanation of this movement is attempted, especially since it is not in agreement with movements observed at night by HOFFMEISTER ("Leuchtstreifen" at 120 km), and are about 90° from direction of winds at 10 km as observed from radiosonde ascents. --M. R.

A-171 Berg, Hellmut, Tagung über Physik der Ionosphäre in Cambridge 6. - 9. September 1954. (Conference on Physics of the Ionosphere in Cambridge, Sept. 6-9, 1954.) Geofisica Pura e Applicata, Milan, 29:230-233, Sept./Dec. 1954. MH-BH--About 40 papers delivered at an International Symposium on Physics of the Ionosphere at Cambridge, Eng. are reviewed. The papers are grouped around the following basic subjects: 1) the lowest ionospheric layers, 2) ionospheric disturbances and ionospheric motion, 3) the F2-layer and 4) mathematical problems of wave propagation in the ionosphere. --G. T.

A-172 Berg, Hellmut, Zur Auswertung und Deutung von Aufnahmen von Ionosphärenstörungen nach der Impuls-Echo-Methode. (Evaluation and interpretation of records of ionospheric disturbances obtained by the impulse echo method.) Beitrage zur Physik der Atmosphare, Frankfurt a. M., 29(4):276-289, 1957. 6 figs., 2 tables, 10 refs., eqs. German, English and French summaries p. 276. DWB, DLC--By means of the usual assumptions in the evaluation of records made by the impulse echo method some conclusions can be drawn which can be checked statistically. The statistical results do not indicate that the very general considerations of PUTTER are realized as a rule. The actual scatter of the time vectors (standard vector deviation) is computed as function of the absolute value of the mean time vectors; these numbers are compared with the values to be expected theoretically.

If σ is the observed scatter, σA the scatter due to the errors in reading off the data, σp the scatter due to the distribution of the end-points of the time vectors on PUTTER's straight line, and σ_T a turbulence scatter, then

$$\sigma^2 = \sigma_A^2 + \sigma_p^2 + \sigma_T^2.$$

The equation is poorly satisfied. The assumptions on which it is based are stated precisely, and the question of their realization in nature is discussed. --Author's abstract.

A-173 Bergman, C. W.; Macmillan, R. S. and Pickering, W. H. (Calif. Inst. of Technology), A new technique for investigating the ionosphere at low and very low radio frequencies. (In: Boyd, R.L.F.; Seaton, M. J. and Massey, H.S.W., eds., Rocket exploration of the upper atmosphere. London, Pergamon, 1954. p. 247-255. 9 figs., 2 refs.) DWB--A continuous wave phase measuring technique for ionospheric observations at low and very low frequency is described. The essential features of the system are: (1) a horizontal transmitting antenna near the surface of the ground, which is resonant at the operating frequency and which transmits no ground wave in the direction of the receiver; and (2) a receiving station located within line-of-sight of the transmitter at which the phase of low frequency sky wave is directly compared with a reference phase transmitted over a very high frequency link. --Authors' abstract.

A-174 Berkner, L. V. and Wells, H. W., Ionospheric research at Watheroo Observatory, Western Australia, June 1938-June 1946; Carnegie Institution of Washington, Publication No. 175, Vol. 13, 1948. 425 p. 29 figs., 390 tables, 110 refs. DLC--Detailed data on virtual height and critical frequencies of the E and F-layers of the ionosphere are given and include a bibliography of 104 entries arranged by subjects. --W.N.

A-175 Berkner, L. V. (Carnegie Inst. of Wash.), Signposts to future ionospheric research. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 12:13-20, 1952. DWB--A survey of the progress in ionospheric research beginning with GAUSS a century ago, furthered by discoveries of MAXWELL and MARCONI and later by CHAPMAN, APPLETON, TUVE and others. The concept of the atmosphere as a series of heat engines, developed by WULF, is extended to include the F region as a fourth heat engine. Future efforts should be along the lines of investigating chemical and photochemical problems, thermo-dynamic processes, atmospheric movements, auroral physics, radio astronomy, and evolution of the earth's atmosphere (and consequent evolution of life on earth). --M. R.

A-176 Berning, Warren W., Charge densities in the ionosphere from radio Doppler data. Journal of Meteorology, 8(3):175-181, June 1951. 5 figs., table, 6 refs., 14 eqs. DWB--A brief description of the DOVAP (Doppler velocity and position) instrumentation and of the principles underlying its operation. The theoretical principles underlying the determination of ionospheric structure from errors in DOVAP data reductions are discussed and an equation is developed which enables the determination of ionization densities from DOVAP records if the true radial velocity of a missile is known along the trajectory. Numerical data on densities of the D, E, and F2 layers are given. --I. L. D.

A-177 Berning, Warren W. (Ballistic Res. Labs., Aberdeen Proving Ground, Md.), The determination of charge density in the ionosphere by radio Doppler techniques. (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), Rocket exploration of the upper atmosphere. London, Pergamon, 1954. p. 261-273, 6 figs., ref., 20 eqs.) DWB--In an earlier paper (BERNING, 1951), the author described a method whereby data from the missile tracking system known as DOVAP could be used to obtain equivalent electron densities in the ionosphere. In the present work this theory is analyzed in slightly more detail to show the accuracy limitations in the method. To illustrate these limitations, a study is made of the ionospheric structure for Dec. 15, 1952, which was obtained from DOVAP tracking of a Naval Research Laboratory Viking rocket. It is of interest to note that the vertical structure of a sporadic E cloud is apparently obtained from the record. --Author's abstract.

A-178 Berning, Warren W. (Ballistic Research Labs., Aberdeen Proving Ground, Md.), Ionospheric structure as determined by a minimal artificial satellite. (In: Van Allen, James A. (ed.), Scientific uses of earth satellites. Ann Arbor, Univ. of Michigan Press, 1956. p. 253-262. 3 figs., ref., 13 eqs.) DWB--A minimal artificial satellite is here defined as one of such small size that internal equipment can consist of no more than a small beacon used in the electronic tracking of the satellite. On the assumption that the beacon transmits a continuous wave, errors will be incurred in the tracking system data whose magnitudes depend on the electron density in the ionosphere and on the frequency of transmission. The material contained herein briefly discusses the problems and develops the analytical methods necessary for determining ionospheric electron densities from trajectory measurements. It is shown that a fairly detailed knowledge of the orbit permits determination of equivalent electron density at the satellite as well as total electron content below the satellite altitude. A small ambiguity in the data may be largely removed by geometrical considerations or eliminated by the suitable placement of additional ground receivers. --Author's abstract.

A-179 Berning, Warren W., Earth satellite observations of the ionosphere. Institute of Radio Engineers, Proceedings, 47(280-288 Feb., 1959. 8 figs., 10 refs., 22 eqs. DLC--A number of so-called "First Generation" experiments for exploring the ionosphere with artificial earth satellite vehicles has either been carried out or is planned by the United States and the Soviet Union. The theoretical and experimental bases of these experiments are outlined and discussed, and their limitations emphasized. The first available results are from the Soviet experiments and these are discussed. Finally, a brief consideration is given to the kinds of satellite orbits desirable for ionospheric experiments. --Author's abstract.

A-180 Best, Nolan R.; Lowell, Robert; Mazur, Daniel G. and Uglow, Kenneth M., The AN/DKT-7( ) 15-Channel PPM Telemetering transmitter. U. S. Naval Research Laboratory, NRL Report, 4016, June 16, 1952. 25 p. 18 figs., 3 plates (fold.), footrefs. DWB--Details are presented of a NRL design of a pulse-position modulation telemetering transmitter for use on medium sized rockets. It operates on 15 channels, weighs 18 lbs, has dimensions 9 1/4 X 113/4 X 9 in., and is contained in a pressurized core. Each of 15 channels is sampled 312.5 times a second, and 4 channels can be used to give a single channel with 1250 impulses a second. Flight calibrator, power supply, control unit and a 227 Mc receiver for use with AN/FKR-1 ground receiving and recording station are described as auxiliary equipment. Tests in laboratory and field indicate 1% accuracy with use of calibrator and 2% accuracy with only preflight calibration. --From authors' abstract.

A-181 Beynon, W.J.G., Propagation of radio waves. Measurements with oblique incidence on the ionosphere. Wireless Engineer, Pt. B, 25(301):322-330, Oct. 1948. 8 figs., 10 refs. --Deals with some of the results of a series of oblique-incidence ionosphere experiments. Using pulse technique the maximum-usable frequency of region F2 was measured over a transmission distance of 715 km in a direction approx. north-south. The mean measured value agrees well with that calculated on a simple theoretical basis from simultaneous normal-incidence equivalent-height measurements made at the two ends of the transmission path. In general, the upper frequency limit of the oblique reflections from near the 100 km level (abnormal E-region echoes) shows no close relationship with the corresponding normal-incidence observations. The mean value of a small number of measurements of the separation between the oblique-penetration frequencies of the two magneto-ionic components is not markedly different from that measured at normal incidence at either end of the transmission path. The mean seasonal variation of maximum-usable frequency factors has been measured and compared with that calculated from normal incidence data.

A-182 Beynon, W.J.G., Evidence of horizontal motion in region F2 ionization. Nature, London, 162(4127):886, Dec. 4, 1948. 2 refs. DWB--During winters 1942 and 1943, relative field strength measurements were made at Slough (England) on signals from the German short-wave sender Zeesen. In addition to regular sunrise ionospheric changes of large magnitudes in the F2 layer, small irregularities were noted that suggest a rapid east-west motion of or within the F2 region with an average velocity of 430 km/hr. --G.J.E.

A-183 Beynon, W.J.G., Some notes on the absorption of radio waves reflected from the ionosphere at oblique incidence. Institution of Electrical Engineers, Proceedings, Pt. 3, 101(69):15-20, Jan. 1954. 7 figs., 2 tables, 9 refs. DLC--The results of some oblique-incidence measurements on the ionospheric absorption of radio waves are considered. For both short and very long distances of transmission it is found that there is a marked discrepancy between the observed values and the values calculated from simple theoretical formulas. The contribution of multiple ionospheric reflections to the intensity of the received signal is briefly discussed. --Author's abstract.

A-184 Beynon, W. J. G., The application of ionospheric data to short wave transmission problems. Physical Society of London, Proceedings, Sec. B, 63:145, 1950. (Summary only).--A short survey is presented of the fundamental theory underlying the application of normal incidence ionospheric data to short-wave communication problems, with particular reference to calculating the maximum usable frequency (M.U.F.). Some aspects of the problem of applying normal incidence data on ionospheric absorption to the calculation of field strength in long distance transmission are also discussed.

A-185 Beynon, W.J.G. and Davies, K., Simultaneous ionospheric absorption measurements at widely separated stations. Journal of Atmospheric and Terrestrial Physics, 5(5/6):273-289, Nov. 1954. 10 figs., 3 tables, 6 refs. DWB--Comparison of normal incidence 2Mc/s ionospheric absorption at Slough and Swansea (230 km apart E-W) shows correlation of 0.74 for year (winter 0.85, summer 0.81). On about 6 Mc/s Slough with Freiburg (400 km) gives 0.40, Swansea with Skelton (330 km) 0.68, Swansea with Allous (666 km) 0.40. Correlation falls off with distance more rapidly in winter than in summer. Some calculations are made of monthly mean ionospheric absorption on 6 Mc/s. --C. E. P. B.

A-186 Beynon, W. J. G. and Thomas, L. (Dept. of Physics, Univ. Coll. of Swansea), Travelling disturbances in region F2 and magnetic activity. (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W., eds., Rocket Exploration of the upper atmosphere. London, Pergamon, 1954. p. 131-132. fig., 3 refs.) DWB--An analysis of the results of a series of simultaneous normal incidence ionospheric records made at Slough, Swansea, and Bangor is presented. The records show that the corresponding large scale irregularities in the F2 layer can be detected simultaneously. The results also show that the magnitude of the apparent velocity is closely correlated with the magnetic disturbance and that there is a marked height gradient in the apparent horizontal motion in the F2 region.

A-187 Beynon, W. J. G. and Thomas, J. O., The calculation of the true heights of reflection of radio waves in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 9(4):184-200, Oct. 1956. 17 figs., 24 refs., 17 eqs. DWB--Electron density in E, F1 and F2 layers is represented by a series of more or less contiguous truncated parabolic sections. An expression is derived for the variations of virtual height with frequency, the parameters being calculated and shown in curves. A numerical example is worked out, giving true height distribution calculated from observed cusp frequency, number of electrons and calculated virtual heights for different wave lengths compared with observed heights. --C. E. P. B.

A-188 Beynon, W. J. G. and Brown, G. M. (eds.), IGY instruction manual: the ionosphere. International Geophysical Year, 1957/1958, Annals, Vol. 3, 1957. 1 vol. bd. in 2, continuously paged. illus., tables, refs., eqs. DWB--The ionosphere instruction manuals for IGY, 1957/58 are divided into 4 main parts or 2 volumes. Vol. 1 contains detailed instructions for vertical-incidence soundings (Pt. I) and Vol. II contains the other 3 parts and is devoted to absorption measurements (Pt. II); drift measurements (Pt. III) and miscellaneous radio measurements (atmos. radio noise, whistlers, the dawn chorus, radio reflections from aurora or meteors and ionospheric scatter) Pt. IV. Not only instructions but basic knowledge of each subject is covered. Pt. 1 was prepared by the National Bureau of Standards at Boulder, Colo. Each section contains several articles written by authorities in the particular field. For listing of contents see p. 636, May 1958, MAB. Articles separately abstracted. --M. R.

A-189 Beynon, W.J.G. and Brown, G.M. (eds.), Miscellaneous radio measurements. International Geophysical Year, 1957/1958, Annals, 3(IGY Instruction Manual):293-381, 1957. figs., tables, refs., eqs. Contents: Horner, F.: The measurement of atmospheric radio noise, p. 295-314. Morgan, M.G.: Whistlers and dawn chorus, p. 315-336. Lovell, A.C.B.; Forsyth, P.A. and Harang, L.: Radio reflections from aurorae, p. 337-341. Lovell, A.C.B.: Apparatus for radio-echo meteor survey, p. 342-345. Bowles, K.L.: Ionospheric forward scatter, p. 346-360. Peterson, A.M.: Ionospheric back scatter, p. 361-381. DWB--This manual gives a thorough treatment of all aspects of measurement of atmospheric radio noise (theory, equipment, observation methods, collection of data in centers, etc.), sferics, tweeks, whistlers, the dawn chorus, multiple whistlers, radio reflections from auroras, radio meteor surveys and ionospheric scatter (forward and backward) for use in IGY program. Samples of observation forms and records, and elegant photos of equipment are included.--M.R.

A-190 Beynon, W.J.G. and Brown, G.M. (eds.), Measurement of ionospheric drifts. International Geophysical Year, 1957/1958 Annals, 3(IGY Instruction Manual):231-287, 1957. figs., tables, refs., eqs. Contents: Briggs, B.H.: The determination of ionospheric-drift velocities from three-receiver fading records, p. 235-249. Huxley, L.G.H. and Greenhow, J.S.: The investigation of winds in the upper atmosphere by means of drifting meteor trails, p. 250-274. Brief summary of other techniques for measuring ionospheric drifts, p. 275-279. Some comparisons of drift observations and techniques, p. 280-283. References, p. 284-285. DWB--A complete and systematic treatment of theory and practice of ionospheric drift measurement. Different methods (and the equipment analysis of records and results obtained to date) are outlined. 3-receiver fading technique, drifting meteor trail studies, coherent pulse method, vertical incidence, ionogram comparison, radio star observation, movement of noctilucent clouds, airglow luminosity changes, auroral drifts, etc. are described. Appendices cover the symbols to be used in recording ionospheric drifts and the IGY program is outlined.--M.R.

A-191 Beynon, W.J.G. and Goodwin, G.L., Horizontal drifts and temperature in the lower part of region E. Journal of Atmospheric and Terrestrial Physics, 13(1/2):180-182, Dec. 1958. 2 figs., 7 refs. DLC--Correlation between drift velocity and temperature was experimentally determined at the Dept. of Physics, Univ. College at Swansea. The pulse transmission of about 2 Mc/s faded "slow" (0.7 fades/min) and "fast" (9 fades/min). The results are discussed briefly.--W.N.

A-192 Beynon, W. J. G. and Brown, G. M., Geomagnetic distortion of region-E. Journal of Atmospheric and Terrestrial Physics, London, 14(1/2):138-166, April 1959. 21 figs., 34 refs., 14 eqs. DLC--A detailed consideration of the behavior of the normal E-region shows the existence of minor perturbations from the classical Chapman theory. It is shown that some of these differences can be ascribed to the influence of vertical drift of ionization resulting from the interaction of the earth's magnetic field and the S_q - current system flowing in or near the E-layer. The resulting distortion of the electron density profile of the E-layer is considered, with particular reference to its effect on the values of the parameter f_oE at different latitudes. The diurnal and seasonal changes in the magnitude of the east-west component current are clearly reflected in the variations of f_oE, and an index n, measuring the sensitivity of the E-layer to seasonal changes, shows marked singularities near the latitudes of the S_q-foci. An analysis of conditions on magnetically disturbed days is also given, and it is concluded that at temperate latitude stations there is a depression in fE at times of magnetic disturbance comparable with the magnitude of that associated with the vertical drift effect of the S_q-current system at noon in the summer. Reference is also made to conditions near and within the auroral zone. Consideration of the effect of sporadic E-ionization shows that this does not appear sereously to influence the tabulated values of fE. --Authors' abstract.

A-193 Bhargava, B. N. (Kodaikanal, India), A new early-morning ionospheric phenomenon. Nature, London, 170(4336):983-984, Dec. 6, 1952. fig., ref. DWB--On 60% of mornings ionospheric echoes ceased some minutes to several hours before sunrise and reappeared about ground sunrise at greater virtual heights (300-500 km). --C. E. P. B.

A-194 Bhargava, B. N. (Kodaikanal Obs., Kodaikanal), Observations of spread echoes from the F layer over Kodaikanal: a preliminary study. Indian Journal of Meteorology and Geophysics, New Delhi, 9(1):35-40, Jan. 1958. 5 figs., 10 refs. DWB, DLC--Occurrence of spread F echoes at Kodaikanal for a period of about one year has been analyzed and diurnal and seasonal characteristics have been found to exist in the frequency of occurrence of these echoes. It has been found that the phenomenon occurs only during nighttime with largest frequency between 1900 and 1400 hrs local time. While the seasonal variation is characterized by equinoctial max, ima as in the case of geomagnetic activity, the day-to-day variations in scattering indicate a negative correlation with the degree of magnetic activity. Thus scattering persists for largest percentage of time during comparatively quiet periods and is often altogether absent on magnetically stormy nights. The phenomenon is discussed in relation to ionospheric irregularities and radio-star scintillation. --Author's abstract.

A-195 Bhargava, B. N. (Kodaikanal Obs., Kodaikanal), Annual wave in the world-wide F-region ionization. Indian Journal of Meteorology and Geophysics, New Delhi, 10(1):69-72, Jan. 1959. 2 figs., 2 tables, 2 refs. DWB, DLC--An analysis of squares of noon median F2 layer critical frequencies for a 3-year period has been made in order to derive the latitude variation of the annual effect in the electron densities and its relation to average F2 layer ionization. The results indicate that the annual component R 1 varies with the latitude in a manner very nearly similar to that of the steady ionization R 0 and that for a given value of R 0 for any latitude, R 1 can be derived approximately from a linear relationship of the type R 1 = 0.3 R 0 - 4.5. A similar analysis of 9-year data for precise phase and amplitude of the annual component for a pair of stations yields a value of R 1, which is of the same order of magnitude as R 0 and which attains a maximum around the epoch of minimum sun-earth distance. --Author's abstract.

A-196 Bhargava, B. N. and Gopala Rao, U. V., Ionospheric disturbances associated with magnetic storms at Kodaikanal. Indian Journal of Meteorology and Geophysics, Delhi, 10(2):203-208, April 1959. 4 figs., table, 9 refs. DWB, DLC--F2 layer disturbances at Kodaikanal have been analyzed for a study of the behavior of the critical frequency and the virtual height during geomagnetic storms. The disturbances have been classified for this purpose into two categories, namely: the positive and negative. The characteristics of Dst and SD variation of f_oF2 and the S_D variation of h' F at night have been discussed. The results have been explained in terms of the quiet and disturbed day vertical drift velocities. --Authors' abstract.

A-197 Bialecke, E. P. and Dougal, A. A. (both, Dept. of Electrical Engin., Univ. of Illinois), Pressure and temperature variation of the electron-ion recombination coefficient in nitrogen. Journal of Geophysical Research, Wash., D. C., 63(3):539-546, Sept. 1958. 4 figs., 11 refs. DLC--The electron-ion recombination coefficient a_{ei} in ionized nitrogen gas is investigated as to its variation with pressure (0.2 to 2 mm Hg) and electron temperature (92°K to 300°K) corresponding to various low electron energies. At 1.3 mm Hg, a_{ei} varies from about 8.5 X 10^{-7} cm^3/sec at 300°K to 6.7 X 10^{-6} cm^3/sec at 92°K, almost an order of magnitude difference. Discussion of the possible modes of recombination in a nitrogen gas plasma is given and dissociative recombination is found to be the most probable means of electron loss. Microwave transmission methods were used in this study. --Authors' abstract.

A-198 Bibl, Klaus, L'ionisation de la couche E: sa mesure et sa relation avec les éruptions solaires. (Ionization of the E - layer: its measurement and relation to solar eruptions.) Annales de Geophysique, 7(4):208-214, 1951. 3 figs., table, 12 refs. French and English summaries. --Criteria for distinguishing between normal and abnormal layers are discussed. Relatively thin layers are classed as abnormal; their ionization distribution corresponds to a power law with index > 2. A definition of foE is given which remains valid for complex layers; foE is the highest critical frequency of a normal layer preceding or coinciding with the first discontinuity between the E and F echoes. Application of this definition to the evaluation of ionosphere observations made at Freiburg during 1950 and 1951 leads to greater constance of the daily variations and monthly means of foE. Examination of the values of foE for three summer months indicates that all deviations > 0.2 mc above the monthly mean are attributable to sudden ionospheric disturbances.

A-199 Bibl, Klaus and Rawer, K., Les contributions des régions D et E dans les mesures de l'absorption ionosphérique. (The contributions of regions D and E in the measurements of ionospheric absorption.) Journal of Atmospheric and Terrestrial Physics, London, 2(1):51-65, 1951. 8 figs., 6 tables, 8 refs., 9 eqs. English summary p. 51. MH-BH--Selective absorptions on frequencies 2 to 5.6 MHz at Slough and Freiburg are used to calculate contributions of D and E layers 1949-1950 by a method which is set out in detail. Values usually attributed to D are found to be due partly to a fairly constant contribution by E. This constant gives a number of collisions in center of E layer in good accord with temperature and pressure at 125 km. --C.E.P.B.

A-200 Bibl, K.; Busch, R.; Rawer, K. and Suchy, K., La nomenclature ionosphérique et les conventions pour le depouillement. (Ionospheric nomenclature and conventions for evaluation.) Journal of Atmospheric and Terrestrial Physics, 6(2/3): 69-87, March 1955. 7 figs., 22 refs., 7 eqs. English summary p. 69. DWB--Proposals are made for classifying ionospheric "regions" and "layers". F region may be divided into F_1, F_2, an intermediate layer $F_{1.5}$ which sometimes occurs in tropics, and transitory layers. E region is divided into E, E_s and I (= E_2 + E_3). Definitions are given of f_{min}, occultation frequency f_a, critical frequency f_c and top frequency f_t. Author also discusses very thin layers, magneto-ionic components and virtual height. Annexes deal with intensity of echoes, influence of transmitter characteristics, ionosphere characteristics and give a list of descriptive symbols. --C. E. P. B.

A-201 Bibl, Klaus; Paul, A. and Rawer, K., Die Frequenzabhängigkeit der ionosphärischen absorption. (Frequency dependence of ionospheric absorption.) Journal of Atmospheric and Terrestrial Physics, N. Y., 16(3/4):324-339, Nov. 1959. 12 figs. table, 11 refs., 8 eqs. DWB, DLC--Detailed analysis has shown that in most cases where observations did not follow the writers' old formula

$$L = B/(f + f_L)^2 + N \cdot \Delta_3(f_oE/f)$$

intense echoes from a blanketing E-layer were present. The theory is generalized to the case of a thin, mirror-like E_s - layer embedded into a parabolic E-layer (model D). This gives a new function depending on a second parameter given by the altitude of the mirror. By application of the new formula (with the actual parameters of each observation) we obtain a much better description of the observed frequency variation. Noon values of B (non-deviative D-absorption) and N - (deviative E-absorption) show opposed seasonal variations, N increasing but B decreasing with the sun's height. The variation of N can be explained satisfactorily by a small decrease of the altitude of the E-layer with increasing height of the sun. --Authors' abstract.

A-202 Bibl, Klaus; Paul, Adolf and Rawer, Karl, Interpretation de l'absorption ionosphérique en fonction de la fréquence. (Interpretation of ionospheric absorption with respect to frequency.) Académie des Sciences, Paris, Comptes Rendus, 248(7):949-952, Feb. 16, 1959. table, 5 refs., 5 eqs. DWB, DLC--Elaboration of a new formula which explains the measurements relating to the reflection coefficient of the ionosphere expressed with respect to the frequency f, through use of the expression of the decrement of logarithmical absorption L. This formula is written

$$L = \frac{B}{(f + f_H)^2} + N\Delta(\eta_i \eta_o)$$

where f_H = gyrofrequency, $1/\eta$ = reduced frequency of normal E layer, B = non-deviative absorption mainly attributed to the D region, N = deviative absorption in the E region. Seasonal variation of N increases with the height of sun, whereas variation of B varies in the opposite direction. The seasonal systematic variation is due rather to the deviative absorption relating to the E region. --A. V.

A-203 Bibl, K. and Rawer, K. (both, Ionosphären-Inst. Breisach, Deutsche Bundespost, Ger.), Traveling disturbances originating in the outer ionosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2232-2238, Dec. 1959. 6 figs., 13 refs. DLC--Some observations that have been obtained with variations of the classical echo-sounding method must be interpreted as resulting from perturbation and/or oscillation phenomena occurring in the outer ionosphere. The vertical velocity component of 'traveling disturbances' coming from outside and propagating through the ionosphere is determined as 115 ± 35 m/sec. Oscillation-like phenomena have a large range of quasi-periods, between 1/4 and 12 hrs. --Authors' abstract.

A-204 Bickel, John E.; Heritage, J.L and Weisbrod, S., An experimental measurement of VLF field strength as a function of distance, using an aircraft. U. S. Navy Electronics Laboratory, San Diego, Calif., Research and Development Report, 767; NEL Report 767, Jan. 28, 1957. 27 p. 29 figs., 9 refs. DWB (M055 U585r)--Records and graphs show comparison of daytime and nighttime very low frequency (VLF) transmission conditions between ground transmitters near Seattle, Wash., San Diego, Washington, D. C., etc. in 1954) and an airplane operating at great distances from the station (to 7600 km). Variations in reception conditions as the plane flies away from or toward the transmitter are vividly depicted and their causes analyzed. Height of reflection of sky waves, interference patterns, phase changes, etc. are interpreted in the light of theory. The recorded curves fall within the general range of the curves for ground wave and for 1, 2, 3, and 4 hop ionospheric reflection, but are far more irregular. Nomograms used in calculation of ionospheric-ground reflection for 10° -2200 km.

A-205 Bickel, John E., A method for obtaining LF oblique-incidence reflection coefficients and its application to 135.6 Kc/s data in the Alaskan area. Journal of Geophysical Research, 62(3): 373-381, Sept. 1957. 7 figs., 3 tables, 2 refs. DLC--Analysis of continuous recordings Aug. 9-Nov. 28, 1954 at Nome and Kodiak. The reflection coefficient was obtained from the ratio of the one-hop sky-wave to the calculated unabsorbed one. Greater seasonal variation of daytime reflection coefficient (at 135 Kc/s ranged 0.009 - 0.032) occurred, and reflection height was found more stable than at night. --W.N.

A-206 Bixby, L.H., Jr., Calculation of high frequency radio field intensity over a 4000 km ionospheric path. Stanford University, Electronics Research Laboratories, Contract CST 10751, Technical Report, May 1953.

A-207 Bixby, L. H., Jr., Interpretation of WWV and WWVH signal strength variations at Stanford. Stanford University, Electronics Research Laboratories, Contract CST 10751, Technical Report, May 1956.

A 208 Bjelland, B.; Holt, O. et al. (all, Norwegian Def. Res. Estab. Kjeller, Norway), The D region of the ionosphere. Nature, London, 184(4691) Supp. 13:973-974, Sept. 26, 1959. 3 figs., 3 refs. DWB--A short note on two sets of observations made at Kjeller near Oslo and near Tromsö in Norway. At Kjeller measurements of ionospheric cross modulation were made during March 1957-May 1958 by means of the pulse technique. Some typical results from these observations are presented. A typical record sample from observations and results from winter observations are graphically represented. Observations were made during 1958 near Tromsö of the D region during disturbed conditions. Some results obtained from the first short series of observations are discussed and graphically represented. --I. S.

A-209 Blackband, W. T.; Burgess, B.; Jones, I. L. and Lawson, G. J. (all, Radio Dept. Royal Aircraft Estab., Farnborough, Hants), Deduction of ionospheric electron content from the Faraday fading of signals from artificial earth satellites. Nature, London, 183(4669):1172-1174, April 25, 1959. 2 figs., table, ref. DWB--There are two classes of fadings involved, viz. (1) those due to change in energy flux at the receiving aerial and (2) those accompanying a rotation of the plane of polarization of this energy. The results of a method used to interpret the fading records of Sputnik 1 and Sputnik 2 taken at Farnborough and Cambridge show good agreement of the values of electron content when compared with those deduced from ionograms taken at Slough and Inverness. The method of analysis discussed here is reliable. The results are shown in a table and two graphs.

A-210 Blair, James C., Frequency dependence of VHF ionospheric scattering. U. S. National Bureau of Standards, NBS Report No. 6049, March 20, 1959. 21 p. 35 figs., table, 9 refs. DWB--This report contains data obtained by recording received signal intensities simultaneously at 5 frequencies over the 1295 km path between the Long Branch transmitting station at Long Branch, Illinois, and the receiving site at Boulder, Colorado (Table Mesa field station.) The data presented here covers the period of Sept. 1, 1957 to June 30, 1958 (except for some later data on meteor burst and sudden ionospheric disturbances). Good simultaneous signal intensity records were obtained for most of this period on 30, 40, 50 and 74 Mc. The available transmitter at 108 Mc was not suitable for continuous reliable records prior to June 5, 1958. In addition to the routine, 24-hour-a-day recording of average received power, a set of high-speed records was made for 10-minute intervals at different times during one day and analyzed for amplitude distribution and fading rate. Also, a low sensitivity recording was made for the study of meteor bursts. Data presented here show the measured results of frequency dependence of average received power and illustrate how the level of average received power is influenced by meteoric ionization, sporadic-E ionization, and ionospheric and magnetic disturbances. A summary of hourly median and upper and lower decile values on all frequencies is included, as well as data on amplitude distributions and fading rates.--From Author's introduction.

A-211 Blanchard, H. P. and Subbotin, B. T., A system to measure the polarization of obliquely-incident pulsed modulated signals. Stanford University, Electronics Research Laboratories Contract W28-099-ac-157. Technical Report No. 6, Oct. 1951.

A-212 Blatt, E.L.; Chaffee, D.C. and Volz, C., 75 Kc/s high power pulse transmitter. Pennsylvania. State Univ. Ionospheric Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 78, Oct. 30, 1955. 63 p. 33 figs., (incl. photos), eqs. --This report is essentially an extension of Scientific Report, No. 40 and attempts to describe in some detail the conversion involved in changing the frequency of the Laboratory's high power, long-wave pulse transmitter from 150 kc/s to 75 kc/s. Considerable detail is given with regard to automatic circuitry which has been developed in order that the equipment may be operated continuously without the presence of an operator. The report is concluded with a very brief description of a synchronizing transmitter, operating on a higher frequency, which is utilized to trigger time bases, and other apparatus, at the various remotely located receiving equipments. This permits recording the 75 kc/s ground pulse. --Authors' abstract.

A-213 Bolgianao, R., Jr. (Cornell Univ., N. Y.), Turbulent spectra in a stable stratified atmosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2226-2229, Dec. 1959. fig., 6 refs., 14 eqs. DLC--After noting the discrepancy between the predictions of turbulence theory and the empirical evidence from radio experiments, the author suggests that this may be the result of modification of the turbulent spectra by the effects of buoyancy in stably stratified layers. He points out that in such situations kinetic energy of turbulence is converted, over a wide range of scales, to potential energy of the resulting density deviations, that this potential energy is subsequently destroyed by the action of further turbulent mixing and molecular diffusion, and, finally, that the primary effect is to reduce the viscous dissipation arte significantly below that which normally would be estimated on the basis of large-scale turbulent motions. Universal forms are predicted for the kinetic energy and density fluctuation spectra, and in the buoyancy sybrange (the part of the equilibrium range that reflects the anisotropy induced by the density gradient) the energy spectrum is found to be proportional to $k^{-11/5}$, the density spectrum to $k^{-7/5}$. --Author's abstract.

A-214 Bolle, A., Silleni, S. and Tiberio, C.A., Registrazioni ionosferiche. (Ionospheric records.) Annali di Geofisica, 2(3):377-387, July 1949. 11 figs., table, 9 refs., 12 eqs. MH-BH--Forecast (made in Washington) and recorded (at Rome) values of F2 perturbations are shown in numerous graphs (Oct. 1948-Feb. 1949). Forecasts of critical ionospheric F2-frequencies and perturbations made by the Central Radio Propagation Laboratory of the National Bureau of Standards (Washington) for period Sept. 1947-March 1949 are compared graphically with the values measured at Rome. --M. R.

A-215 Bolle, A. and Dominici, P., Contributo al calcolo dell assorbimento nella propagazione ionosferica delle onde corte. (Contribution to the calculation of the absorption of the ionospheric propagation of short wave.) Annali di Geofisica, 5(3):377-396, July 1952. 2 figs., 7 refs., 39 eqs. English summary p. 396. MH-BH--The value for the coefficient of atmospheric attenuation for short waves, the absorption applying to the various ionospheric layers and to the various models of propagation of the waves have been calculated. --From author's abstract.

A-216 Bonnet, G.; Hunaerts, J. and Nicolet, M., Analyse de résultats ionosphériques obtenus en Afrique lors de l'éclipse de soleil du 25 février 1952. (Analysis of ionospheric observations made in Africa during the solar eclipse of Feb. 25, 1952.) Belgium. Institut Royal Météorologique, Contributions, No. 38, 1957. 18 p. 9 figs., 6 eqs., 9 refs. DWB--Results of ionospheric observations made in Africa during the eclipse of Feb. 25, 1952 are coordinated and analyzed. E-region maxima were formed by the same type of solar emission at each station, and the recombination coefficient remained the same. The variable parameter is the one which reflects the changes in the vertical atmospheric structure at the geographic, or better still, the geomagnetic equator, and those in higher latitudes. The particular aspects of coronal emission are explained. --A. V.

A-217 Booker, H.G., Ratcliffe, J.A., Shinn, D.H., Diffraction from an irregular screen with applications to ionospheric problems. Royal Society of London, Philosophical transactions, Ser. A, 242(856):579-609, 12 Sept. 1950. 6 figs., 17 refs., 54 eqs. DWB--Discusses the random fading of a radio wave-field reflected from the ionosphere. In Pt. I it is treated as Fresnel diffraction from a rough screen. In Pt. II the variations of the wave field due to a varying ionosphere are considered: first, on the basis of irregularities which have random velocities and second, from an irregular ionosphere moving with a steady velocity. --C. E. P. B.

A-218 Booker, Henry George (Cornell Univ.), Application of the magneto-ionic theory to radio waves incident obliquely upon a horizontally-stratified ionosphere. U. S. Air Force, Cambridge Research Laboratories, Geophysical Research Papers, No. 7:18-55, Dec. 1950. 14 figs., 10 refs., 107 eqs. DWB--An algebraic quartic equation for the vertical component q of the phase propagation vector can be used for the solution of the problem. The roots of q are plotted as a function of the electron-density N for fixed values of the wave frequency, direction of earth's magnetic field and direction of incidence upon the ionosphere. A simplified cubic equation is used for computing limiting curves. Formulas for attenuation, lateral deviation, horizontal range and equivalent paths of magneto-ionically split wave-packets are derived. --A. A.

A-219 Booker, H. G., On the level at which fading is imposed on waves reflected vertically from the ionosphere. Journal of Atmospheric and Terrestrial Physics, 7(6):343-344, Dec. 1955. 4 refs. DWB--The observed width of the autocorrelation function at lower frequencies is 6-7 times that given by theory. Hence the level of the ionospheric irregularities causing fading is where the local wave length is 6-7 times λ_o. --C. E. P. B.

A-220 Booker, H.G.; Nichols, B. et al., Studies on propagation in the ionosphere. Cornell Univ. School of Electrical Engineering, Contract DA 36-039-5c-74903, Quarterly Progress Report, No. 1, Dec. 31, 1957. 19 p. illus.--The advent of satellites has made possible the determination of the height of scintillation by measurements made of radiation from a CW source at various levels in the F region. A new attempt to explain spread F, based on the idea of columns of ionization along the earth's magnetic fields, has been made. --Authors' abstract.

A-221 Booker, Henry G. (Electrical Eng., Cornell Univ., Ithaca, N. Y.), Phenomena of radio scattering in the ionosphere. (IN: American Academy of Arts and Sciences, Atmospheric explorations. Cambridge, M. I. T., 1958. p. 101-125, 24 figs., 35 refs. DLC (QC961.A4)--The nature of the ionosphere and VHF radar reflection records is reviewed and illustrated and nine of the various scattering mechanisms and phenomena explained: 1) fading of quiet echoes; 2) the "spread F" phenomenon; 3) aspect-sensitive echoes; 4) twinkling of point cosmic radio source noise; 5) long duration meteor trail echoes; 6) echoes from below the E region; 7) VHF scatter communication; 8) echoes from auroral ionization, and 9) "sporadic E" phenomena. Many recorder records, graphs and histograms vividly illustrate the nature of these phenomena. The one factor which seems to be common to all of these anomalous conditions in the various ionized media is turbulence, so it is hopes that explanations may be forthcoming in terms of wave statistical turbulence theory.

A-222 Booker, Henry G. (Cornell Univ., N.Y.), Radio-scattering in the lower ionosphere. Journal of Geophysical Research, Wash., D.C., 64(12):2164-2177, Dec. 1959. 10 figs., 2 tables, 6 refs., 33 eqs. DLC--Radio-scattering phenomena at the 80- to 90-km level observed in the frequency range 30 to 100 Mc/sec indicate the presence of irregularities of electron density with scales in the range from 20 to 60 meters (corrugation wave-lengths from 120 to 360 meters). The irregularities are approximately isotropic, and scattered power is inversely proportional to about the sixth power of scale. The power law involved may, however, vary somewhat with the state of the atmosphere. The fading of the radio waves is consistent with random motions of the irregularities with velocities of the order of 25 m/sec. Similar observations of the sporadic-E phenomena occurring at a height of about 110 km show that the scattered power is inversely proportional to something like the eighteenth power of scale while the velocity of irregularities, if interpreted as random, is around 5 m/sec. --Author's abstract.

A-223 Bornholdt, John W. and Jackson, Thomas T. (Pa. St. Coll. Io. Res. Lab.), Oblique incidence measurements at 150 Kc/s. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 21, March 30, 1951. 71 p. 47 figs., 9 refs. DWB--Results of measurements of 150 Kc/s pulse signals ar ranges from 25 kilometers to 180 kilometers are described. A short description of receiving and transmitting equipment is given, followed by a detailed account of methods of data analysis. Data presented includes virtual height and reflection coefficient as a function of range and time, and polarization ellipse specifications as a function of range, time and azimuth. A short study of the fine structure of the lower ionosphere is given, including pulse shape variations and a chart and photographs of "D-layer" echoes. The report is concluded with a section of data interpretation and recommendations for future work. --Authors' abstract.

A-224 Bossolasco, Mario and Masotto, Antonio, La constituzione dell'-alta atmosfera e la Stazione Ionosferica dell'Istituto Geofisico di Genova. (The constitution of the upper atmosphere and the Ionospheric Station of the Geophysical Institute of Genoa.) Geofisica e Meteorologia, Genoa, 2(5/6): 80-86, Sept./Dec. 1954. 4 figs., 2 eqs. DWB--The physical and chemical characteristics of the ionosphere, its role in radio transmission, the electrical density of its various layers, and its ionization phenomena are reviewed and the ionospheric station of the Geophysics Institute of the University of Genoa is described with the aid of a diagram. --I. L. D.

A-225 Bossolasco, M. and Elena, A. (both, Inst. Geof. Geod. Univ. Genoa, Italy), On some characteristics of the E-layer. Planetary and Space Science, N. Y., 1(3):205-212, Aug. 1959. 3 figs., 10 refs. DWB--Some aspects of the dependence of the E_s-ionization on the geomagnetic field are derived, further, an attempt is made to deduce the mean world-wide drift direction of E_s in summer, using the time displacement that occurs for the daily maxima of the hourly median values of $f_o E_s$. --Authors' abstract.

A-226 Boston University. Upper atmosphere Research Laboratory, Investigation of the ionosphere utilizing sounding rockets. Contract AF 19(122)-36, Progress Reports, No. 9 and No. 12, Oct. 24, 1951 and June 30, 1952. two pieces, photos, graphs, diagrs., ref. DWB--Report No. 9--June 1-Aug. 31, 1951: Preparations were made for Aerobee ascent of Aug. 7, 1951. Previously obtained rocket data are being put on IBM cards. The rocket reached 52 mi, just short of the E layer which was determined to be at 60 mi at that time. Recovery of equipment was satisfactory and some of it can be easily prepared for the Oct. 1951 firing. Photographs of equipment before and after firing are included. A television spectroscope has been constructed and preliminary results obtained. Report No. 12--March 1-May 30, 1952: Brief report on firing on April 22, 1952 of Aerobee No. 24 which carried similar instrumentation to Aerobee No. 20 described in Report No. 10. Maximum altitude 70 mi at 180 sec. Some damage occurred to equipment but data were all usable and will be computed in connection with oblique incidence propagation studies. --M. R.

A-227 Bouchard, Jean, Sur la propagation ionosphérique des ondes décamétriques dans les régions polaires arctiques. (On ionospheric propagation of 10 cm waves in the Arctic.) Académie des Sciences, Paris, Comptes Rendus, 236(2):220-222, Jan. 12, 1953. DLC--Systematic study of the propagation of 10 λ waves over great distance shows the influence of ionic disturbances in the Arctic, connected with magnetic disturbances. The signals received at Dijon, France, from the region of the North Pacific (NE Siberia, Alaska, British Columbia, the Pacific Northwest and Hawaii) are distorted when passing through the belt of maximum auroral activity during magnetic storms but signals from other parts of the Pacific (Japan, Mariannes, New Zealand, etc.) are not thus distorted, except when taking secondary paths traversing these disturbed zones. --M. R.

A-228 Bourdeau, R. E., Whipple, E. C. and Clark, J. F., Analytic and experimental electrical conductivity between the stratosphere and the ionosphere. Journal of Geophysical Research, 64(10):1363-1370, Oct. 1959. 4 figs., 29 refs., 13 eqs.

A-229 Bowe, P. W. A. (Cavendish Lab., Cambridge), A study of individual radio atmospherics received simultaneously at two places. Philosophical Magazine, London, 44(355):833-840, Aug. 1953. 4 figs., 3 tables, 4 refs. DWB--A previous paper (BOWE 1951) described a method of studying the propagation of radio waves of frequency 2 kc/s to 10 kc/s over the surface of the earth, by observing the responses of narrow-band receivers to individual radio atmospherics. The present paper describes an extension of these observations in which the same method was used simultaneously at two places, Cambridge and Aberdeen, 550 km apart. The narrow band receivers at both places were tuned to frequencies 7.5, 5.0, 3.5 and 0.6 kc/s. By comparing the responses at the two places, the attenuation factors for each frequency could be found. The sources of the atmospherics were located by the 'Sferic' direction finding system of the Meteorological Office, supplemented by a direction finder at Cambridge. Most of the observations were made at about noon. The results are presented as tables giving the propagation factor for 1000 km path, for the four frequencies studied. It was found that waves of frequency 0.6 kc/s are less attenuated than waves of frequency 3.5 kc/s. The results for 7.5 and 5.0 kc/s appear to indicate that the attenuation is less in winter than in summer. -- Author's abstract.

A-230 Bowhill, S. A., The fading of radio waves of frequencies between 16 and 2400 kc/s. Journal of Atmospheric and Terrestrial Physics, 8(3):129-145, March 1956. 14 figs., 2 tables, 13 refs., 11 eqs. DWB--

The lowest ionosphere, which reflects low frequency radio waves, contains irregularities which cause fading of these frequencies. These have been studied by 3 types of experiment at Cambridge, Eng., using nearly vertical incidence at night. The range 16-200 kc/s shows shallow fading with a quasi-period of 7 min up to 70 kc/s, above this a quasi-period of about 1 min appears as well, increasing until it dominates the slower fading. Two receivers tuned to 85 kc/s separated by various distances gave fading records indicating structure sizes at the ground of 5 km for the slow fading and 1 km for the fast fading. Thirdly, records at 3 receivers at right angles on 70 kc/s show that the slow fading is due mainly to random velocities of about 40 m/s, with a much smaller drift velocity varying irregularly from an average of 20 m/s to NNE at 0130 to 17 m/s to ENE at 1930. A suggested model of irregularities in the D region at night is shown. --C. E. P. B. and author's abstract.

A-231 Bowhill, S. A., Ionospheric irregularities causing random fading of very low frequencies. Journal of Atmospheric and Terrestrial Physics, 11(2):91-101, 1957. 11 figs., 2 tables, 13 refs. DWB--The process by which random irregularities in the ionosphere cause random fading in a reflected radio wave at the ground may be divided into two parts: the scattering process within the layer which builds up an inhomogeneous field in free space immediately beneath it, and the diffraction process by which this field propagates to the earth's surface, possibly changing in form as it travels. The extent of this change is evaluated by finding the correlation coefficients for three pairs of quantities measured experimentally at 75 and 150 kc/s frequency. These are (a) the signal amplitude at two horizontally separated receivers, (b) the amplitudes of the first and second reflections (c) the amplitude and phase of the first reflection. The diffractive changes are found to be considerable, but the wave emerging from the layer is probably modulated in phase rather than amplitude. A study of the variation of fading speed at 75 kc/s with height of reflection appears to confirm existing ideas concerning the presence of small-scale irregularities above a critical height in the lower E-region. --Author's abstract.

A-232 Bowhill, S. A., Ionosphere absorption pulse method. Pennsylvania. State Univ. Ionosphere Research Lab., Report, Sept. 30, 1957.

A-233 Bowhill, S. A., The Faraday-rotation rate of a satellite radio signal. Journal of Atmospheric and Terrestrial Physics, 13(1/2): 175-176, Dec. 1958. fig., ref. DLC--The recorder time constant must be $< 1/16$ of the mean fading period T_2 of the fading function, if the deduced fading speed is to be correct within 5%.

A-234 Bowles, K.L., Observation of vertical-incidence scatter from the ionosphere. Physical Review Letters, 1(12):454-455, Dec. 15, 1958. 2 figs., table, 4 refs. --Experimental verification of the existence of incoherent or semi-incoherent scatter by free electrons was made Oct. 21 and 22, 1958 during daylight hours. "A" scope photographs are shown. --W.N.

A-235 Bracewell, R.N., The propagation of very long radio waves. Institution of Electrical Engineers, Journal, Pt. 3, 95(37):326, Sept. 1948.--Summarized report on the work in progress at Cavendish Laboratory. Observed fluctuations are consistent with horizontally moving ionospheric inhomogenities. --W.N.

A-236 Bracewell, R.N., The ionospheric propagation of radio waves of frequency 16 kc/s over distance of about 200 km. Institution of Electrical Engineers, Proceedings, Pt. 4, 99(3):217-228, July 1952. 16 figs., 11 refs. DBS—Digest version: Ibid., Pt. 3, 99(60)217-221, July 1952. 6 figs., 11 refs. DLC--Features an experimental technique of phase measurement achieved by comparison with a reference signal from transmitter to receiver by land line. It is an extended investigation of 16 kc/s waves over 90 km that began in 1946 and gives results of the experiments carried out at distances up to 200 km. --W.N.

A-237 Bracewell, R.N., Theory of formation of an ionospheric layer below E layer based on eclipse and solar flare effects at 16 kc/sec. Journal of Atmospheric and Terrestrial Physics, London, 2(4):226-235, 1952. 4 figs., 13 refs., eqs. MH-BH, DWB--The CHAPMAN theory of the ionosphere indicates that a decrease in the incident radiation should have little effect on height of reflection. This was tested during partial solar eclipse of April 28, 1949, at Cambridge, England, on 16 kc/sec transmission from Rugby, and a symmetrical anomaly of about 1 km was found. A new theory is presented in which the condition, that electron density is negligible compared with ionizable particles, is removed. This agrees with the eclipse observations; the ionizing radiation originates regularly over the sun's disk and not specially in active regions. --C.E.P.B.

A-238 Bracewell, R.N. and Bain, W.C., An explanation of radio propagation at 16 kc/sec in terms of two layers below E layer. Journal of Atmospheric and Terrestrial Physics, 2(4):216-225, 1952. 5 figs., 18 refs. MH-BH, DWB--Observations of 16 kc/sec transmission from Rugby at Cambridge (90 km) and Aberdeen (535 km) indicate two distinct superposed banks of ionization provisionally named D δ and D β. Heights uncertain but probably about 70 $\pm$ 8 km at noon and 15-18 km higher at night, with a sharp change around sunrise and sunset. --C.E.P.B.

A-239 Bracewell, R. N., Analogues of an ionized medium. Applications to the ionosphere. Wireless Engineer, London, 31(12): 320-326, Dec. 1954. 12 figs., 2 tables, 2 refs., 24 eqs. DLC--A continuous transmission line with series impedance and shunt admittance is compared with a representation of linearly polarized plane waves, first in nonionized free space and then in an ionized medium. Effect of collisions between an electron and positive ions or neutral molecules is equivalent to a mechanical impedance on its motion. Cases of inhomogeneous media are next dealt with and the mechanical analog of a flexible spring strip is introduced. Finally, a partial analogy is drawn between a plane wave in an ionized medium and a wave in a wave guide. --C. E. P. B.

A-240 Bracewell, R. N.; Harwood, J. and Straker, T. W., The ionospheric propagation of radio waves of frequency 30-65 kc/s over short distances. Institution of Electrical Engineers, London, Proceedings, Pt. IV, 101(6):154-162, Feb. 1954. 12 figs., 13 refs. (Same article, digest version), Ibid., Pt. III, 101(70): 108-110, March 1954. 4 figs., 13 refs. DLC--The paper describes experiments carried out at Cambridge on waves of frequency 30-65 Kc/s reflected from the ionosphere at steep incidence. The phases and amplitudes of two linearly polarized components of the downcoming wave were measured with reference to the ground wave. The results for frequencies of 30, 43 and 65 kc/s are considered in turn, and compared with the results for 16 kc/s. The main conclusions were as follows: (a) The day-to-day variations of the downcoming wave were greater at the higher frequencies. (b) The change of height of reflection in passing from day to night was about the same for all the frequencies. (c) In summer, the amplitude by day and by night was very different, except at 16 kc/s. (d) The polarization at all the frequencies was approximately circular, left-hand and constant. The height of reflection of waves of frequency 30 kc/s was determined by using the frequency/change method of APPLETON and BARNETT. --Authors' abstract.

A-241 Bramley, E. N., Direction-finding studies of large-scale ionospheric irregularities. Royal Society of London, Proceedings, Ser. A, 220(1140):39-61, Oct. 22, 1953. 12 figs., 4 tables, 17 refs., eqs. DLC--Directional measurements on pulse signals of 2-15 Mc/s in Britain, reflected from ionosphere at vertical and oblique incidence, are interpreted in terms of ionospheric tilts. Some measurements point to drifting clouds of ionization in Es layer. In the F layer ripples in surface of constant ionization density are found, wave length 50-400 km (peak 150 km), vertical amplitude increasing with wave length to 7 km, speed up to 350 m/s (peak at 150 m/s). They mostly move W-E before 14 h UT, E-W after 14 h, due to a clockwise rotation. --C. E. P. B.

A-242 Bramley, E. N., The diffraction of waves by an irregular refracting medium. Royal Society, Proceedings, A, 225:515-518, 1954. --A method is described of calculating the diffraction effects produced by a thick stratum of an irregular refracting medium. It consists of evaluating the statistics of the phase irregularities in the wave-front after traversing the medium, and treating these irregularities as having been produced by a thin phase-changing screen. For a particular statistical model of the irregularities in the medium the result is shown to be identical with that obtained by Fejer using a different method.

A-243 Bramley, E. N., Some aspects of the rapid directional fluctuations of short radio waves reflected at the ionosphere. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102 (4):533-540, July 1955. fig, 2 tables, 48 eqs. DWB--Measurements have been made of the rapid directional fluctuations observed on single-component first-order ionospheric echoes, at vertical and oblique incidence (range 700 km), and on frequencies of 2.5-10.5 Mc/s. Under quiet ionospheric conditions the r.m.s. angular deviations are of the order of 1° or less, but they are appreciably greater under ionospheric-storm or spread-F conditions. The fluctuations are uncorrelated at an interval of five sec. It is shown that a layer of irregular ionization-density within region E would account for the quiet condition F layer results, and this would require random variations of the phase path through the region of the order of only 3 m at a frequency of 5 Mc/s. The E layer results appear to be affected by partial reflections at different levels within the region. Appendix gives Theory of rapid directional fluctuations produced by ionospheric irregularities.--Author's abstract.

A-244 Bramley, E. N., Some comparative directional measurements on short radio waves over different transmission paths. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102(4):544-549, July 1955. 3 figs., 2 tables, 6 refs., 16 eqs. DWB--From observations of transmissions on 5-8 Mc/s from Aberdeen to Winkfield, entirely over land, and Hemsby, mainly over sea, it is concluded that correlation of closely corresponding components of F layer tilt is generally negligible. A daily variation of tilt approximately E-W occurs at about 0.2°/h. On second order F layer transmissions over 700 km, the land acts as a rougher reflector increasing the rapid directional fluctuations of the echo but not the total bearing variance, mainly caused by ionospheric tilts. --C. E. P. B.

A-245 Bramley, E.N., Directional observations on H. F. transmissions over 2100 KM. Institution of Electrical Engineers, London, Proceedings, Pt. B, 103(9):295-300, May 1956. 5 figs., 3 tables, 5 refs. Also review of above article, entitled Ionospheric reflection of H. F. waves, in Institution of Electrical Engineers, London, Journal, n. s., 2(17):282-283, May 1956. 2 figs. DLC--Previous studies showed that directional fluctuations in receipt of pulsed short wave signals from a distance of 700 km were due to ionospheric irregularities. An extension of this work to a distance of 2120 km at 5 and 11 Mc/s showed that rapid fluctuations were larger than at 700 km (especially at night on 5 Mc/s) and were unaffected by ionospheric or magnetic storms. Experiments were carried out from Dec. 1952 to Oct. 1954 between Malta and Winkfield, Berkshire. Fluctuations about mean were within $\pm 1^{\circ}$ for 1 F and $\pm 2^{\circ}$ for 2 F echoes, and for 1 F echo individual bearings had a s. d. of 0.8° about the mean which was within 0.2° of the correct bearing. --M. R.

A-246 Bray, W. J.; Hopkins, H. G.; Kitchen, F. A. and Saxton, J. A., Review of long-distance of radio-wave propagation above 30 Mc/s. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102(1):87-95, Jan. 1955. 3 tables, 61 refs. DLC--The purpose of the paper is to summarize the present state of knowledge concerning the factors affecting long-distance radio wave propagation at frequencies above 30 Mc/s. Attention is drawn to various ionospheric and tropospheric propagation mechanisms and their broad characteristics. The account of these special processes is preceded by Sections dealing with selected aspects of "normal" propagation. A comprehensive bibliography is included. --Authors' abstract.

A-247 Breit, G. and Tuve, M. A., A test of the existence of the conducting layer. Physical Review, 28(3):554-575, Sept. 1926. 11 figs., table, foot-refs., 20 eqs. DLC--(1) Groups of radio waves arrive at the receiving station separated from their echoes. This shows that the hypothesis of an ionized layer of the atmosphere is correct. (2) The retardation is such as though the layer were at a height of from 50 to 130 miles. The apparent height is greater in the fall than in the summer for 70-meter waves with an 8-mile base. (3) Radio fading is present for reflections alone quite independently of interference between the ground and the reflected waves. (4) A quantitative discussion of the possibilities of refraction shows that in most cases the increase of electronic density must be more sudden and discontinuous than that given by a density proportional to the square of the height or else that not all of the possible states of polarization of the waves in the upper atmosphere are present. --From authors' abstract.

A-248 Breit, G., Group-velocity and long retardations of radio echoes. Institute of Radio Engineers, Proceedings, 17(9): 1508-1512, Sept. 1929. 2 figs., table, 3 refs., 5 eqs. DLC--Up to 15 sec retardations of echoes have been observed by STÖRMER and by VAN DER POL. VAN DER POL's theory that group-velocity may account for STÖRMER's long retardation observation is discussed. Author suggests that STÖRMER's and VAN DER POL's observations were splashes of the very same echo focused accidentally on a favorable patch of ground.

A-249 Breit, G., The significance of observations of the phase of radio echoes. Institute of Radio Engineers, Proceedings, 17(10):1815-1821, Oct. 1929. 8 refs., 14 eqs. DLC--The method of observing echoes, developed by TUVE and HAFSTAD, is discussed in order to show to what extent the phase can be expected to be constant throughout the echo if the frequency-dispersion of the K-H layer is taken into account.

A-250 Bremmer, H., Mode expansion in the low-frequency range for propagation through a curved stratified atmosphere. U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(1):75-85, July/Aug., 1959. 6 refs., 40 eqs. DLC, DWB--The influence of the earth accountable for by an approximate boundary condition at the surface of the earth, the problem is reduced to that of the other medium only for which the coefficients of the mode expansion are derived taking into account earth's curvature. The expansion to be derived is wanted in particular when studying the influence of gradual transition in the electron density with height at the lower edge of the ionosphere. --From author's abstract.

A-251 Brennan, D.G. and Phillips, M.L., Phase and amplitude variability in medium-frequency ionospheric transmission. MIT Lincoln Laboratory Tech. Rpt. 93, Sept. 16, 1957.

A-252 Brice, N.M. (Univ. Queensland, Brisbane), Variations in ionospheric F-region characteristics. Australian Journal of Physics, Melbourne, 11(4):487-591, Dec. 1958. fig., table, 6 refs. DLC--Day and night curves were computed from some Macquarie Island (geomagn. lat. 60°S, local magn. dip angle 78°) h'f records taken since 1950. They are assumed to be the first high southern latitude (N, h) profiles calculated and are presented here along with some derived parameters. The h_{max} and N_{max} refer to the height and electron density at maximum ionization level, and the sunspot maximum and minimum to corresponding observation of activities. The curves aid those working on the theory of the quiet ionosphere, and favor King's statement about the meaningless of h_p F_2 day presence.

A-253 Brice, N. M., Note on short range echoes on ionospheric recorders. Journal of Atmospheric and Terrestrial Physics, 13(1/2):179, Dec. 1958. 4 refs.--Very brief note in favor of Dowden's findings that absence of night echoes may be instrumental and that they may be back scattering from sea waves. Decreased E and F echoes corresponded to increase of sea echo strength during a 1957 expedition to Macquarie Island. --W. N.

A-254 Brice, P. J.; Evans, G. O.; Packer, E. J. and Henbrey, R. S., North Atlantic scatter circuits. Great Britain, Post Office, Engineering Dept., Radio Branch, Radio Report, No. 2652, March 24, 1959. 8 p. 8 figs., 3 tables.

A-255 Briggs, B. H. and Phillips, G. J., Study of horizontal irregularities of ionosphere. Physical Society, Proceedings, Sec. B, 63(371):907-923, Nov. 1, 1950.--Theory of diffraction by random screen as developed by H. G. Booker, J. A. Ratcliffe and D. H. Shinn is presented in convenient form for practical application in ionospheric experiments; measurements of correlation of fading of reflected electromagnetic wave at spaced receiving points can be used to find extent of angular spreading of downcoming wave.

A-256 Briggs, B. H., Phillips, G. J. and Shinn, D. H., The analysis of observations on spaced receivers of the fading of radio signals. Physical Society of London, Proceedings, Sec. B, 63(2): 106-121, Feb. 1950. 8 figs., 5 refs. DLC--Authors point out that fading may be due to drift of a diffraction pattern past a receiver, or to irregular variations in the pattern or both operating a simultaneously. Steady velocity of the drift and rate at which the pattern alters as it moves may be calculated by taking observations at three points at the corners of a right-angled triangle. --G. J. E.

A-257 Briggs, B. H., An investigation of certain properties of the ionosphere by means of a rapid frequency-change experiments, Physical Society, Proceedings, London, Pt. 3, 64(375 B):255-274, March 1, 1951. 12 figs., 22 refs. DWB--"Irregularities of ionization are sometimes found to be localized in height. Observations of the reflection coefficient of the abnormal E-region suggest that there are two distinct types of region, one an irregular region consisting of scattering clouds, the other a coherent layer with a thickness of the order of 5 km."--From author's abstract.

A-258 Briggs, B.H., The determination of the collision frequency of electrons in the ionosphere from observations of the reflection coefficient of the abnormal E layer. Journal of Atmospheric and Terrestrial Physics, 1(5/6):345-348, 1951. 4 figs., table, 7 refs. DWB--The reflection and transmission coefficients of the abnormal E layer were measured by observation of echoes. The abnormal E layer may be a horizontally stratified layer of ionization with a total thickness of 5 km. The collision frequency in the height 110-135 km is found from 1.5 to 4.10^4 sec $^{-1}$. --A. A.

A-259 Briggs, B.H. and Phillips, G.J. (Cavendish Lab. Cambridge, Eng.), The determination of wind velocities in the ionosphere. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 11:199-203, 1952. fig., 3 refs. Discussion. DWB--Drift velocities of 70 m/sec were measured. The W-E component is westward at night, decreases during the day and becomes eastward during the summer months, and is more regular than the N-S component usually of much smaller magnitude. The observations were made during the past three years at the Cavendish laboratory, Cambridge, Eng. The receivers were placed 100-200 ms apart at three points of a rectangle. Wave length about 150 mr. --W. N.

A-260 Briggs, B.H. and Spencer, M., Horizontal movements in the ionosphere. Physical Society of London, Reports on Progress in Physics, 17:245-280, 1954. 21 figs., 4 tables, 40 refs. DWB--In the E region closely spaced receivers and meteor observations give a mean velocity of 80 m/s and regular diurnal variations represented by a vector of 30 m/s rotating clockwise (in N. Hemisphere) in 12 hours, directed N at 0300 and 1500. In summer a mean velocity of 50 m/s towards E is superposed. An upward increase of about 3.6 m/s per km has been observed. In the F region there is a component averaging 100 m/s towards E with diurnal variation and with changes in periods of magnetic disturbance. There is a component towards N in summer and S in winter (in N. Hemisphere). Results of non-radio methods are briefly summarized. --C. E. P. B.

A-261 Briggs, B.H. (Cavendish Lab., Cambridge, England), Some characteristics of sporadic-E ionization as determined by a rapid frequency sweep experiment. AGARDograph, Paris, No. 34:151-161, Sept. 1958. 8 figs., 10 refs., 3 eqs. DWB (629. 1323 N864a)--In the experiments described the frequency of a pulse transmitter was varied rapidly over a frequency range of 1/2 Mc/s in about 1/2 sec., and a receiver was kept in tune by electronic means. The amplitudes of echoes from the Es-layer and the F-layer were recorded as functions of frequency. By comparison with the theory of reflection from a "thin" ionized layer the thickness of the E_s-layer is determined. Some records also enable the collision frequency of electrons to be found from a study of the absorption near the critical frequency of the Es-layer. Other results relating to the fading of the Es and F echoes are described. --Author's abstract.

A-262 Brown, F. W., Radio propagation research at the National Bureau of Standards. American Journal of Physics, 26(9):628-634, Dec. 1958. table. DLC--The brief historical review is followed by a review in summarized form on the regular ionospheric propagation, ionospheric scattering, sporadic E, meteor burst propagation, airglow, radio astronomy, other special investigations and the special efforts during IGY. Results of the studies are claimed to have saved millions of dollars in military application. --W. N.

A-263 Brown, J. N., Automatic sweep frequency ionosphere recorder model C-4. Institute of Radio Engineers, Proceedings, 47(2): 296-300, Feb. 1959. 3 figs., 4 refs. DLC--Modus operandi, along with illustration and block diagram are given. Primarily constructed for "virtual height" measurements, the automatic equipment has been used in oblique-incidence backscatter as well as two-station synchronized pulse experiments. --W. N.

A-264 Brysk, H., Measurement of the scattering matrix with an intervening ionosphere. Communications and Electronics, (39): 611-612, Nov. 1958. eqs. DLC--The brief theoretical discussion on backscattering shows that a complete S-matrix specification needs either (1) an adquate determination of the Faraday rotation or (2) the physical knowledge pertinent to the observation as gained from other sources. --W. N.

A-265 Budden, K. G., I., The propagation of a radio-atmospheric. Philosophical Magazine, Ser. 7, 42(324):1-19, Jan. 1951. 7 figs., 15 refs., 10 eqs., 2 append. DLC--The propagation of sferics depends on the nature of the boundaries of the waveguide. Since the ionosphere is an imperfect conductor, the distance critical frequency and other properties of transmission will vary and the impulses will be distorted at great distances from the source. It is shown that the nature of the source is not important. The model worked out in this paper is idealized and shows the fractional reduction in intensity at 1000 km. for various frequencies, and the wave form and other features for long waves. --M. R.

A-266 Budden, K. G., The propagation of a radio atmospheric, Pt. 2. Philosophical Magazine, London, 7th Ser., 43(346):1179-1200, Nov. 1952. 6 figs., 15 refs. DWB--

The present paper gives the full mathematical theory and shows how the characteristics of the wave-guide modes may be determined in the most general case, provided that the reflecting properties of the earth and the ionosphere are known as functions of the angle of incidence which is, in general, complex. It is found that the wave-guide modes are of two types, which are described as "quasi-transverse magnetic" and "quasi-transverse electric." Allowance can be made for the curvature of the earth. A particular case is then discussed, in which the surface of the earth is assumed to be perfectly conducting, and the ionosphere is assumed to be a homogeneous ionized medium, with the steady magnetic field of the earth superimposed. The results of numerical calculations are given, for a few special cases, in the form of curves. These show (i) the attenuation in the various modes as a function of frequency, (ii) the polarization characteristics of the wave in typical modes and (iii) the amplitudes of the wave which are excited in typical modes by a vertical electric dipole source.--From author's abstract.

A-267 Budden, K. G. and Yates, G. G., A search for radio echoes of long delay. Journal of Atmospheric and Terrestrial Physics, 2(5):272-281, 1952. 23 refs. DWB--An unsuccessful search was made for echoes delayed 3-15 sec. The cause of such echoes is discussed and they are tentatively attributed to "the propagation of guided waves over long curved paths formed by belts of ions outside the earth but fixed relative to it." --C. E. P. B.

A-268 Budden, K. G., The theory of the limiting polarization of radio waves reflected from the ionosphere. Royal Society of London, Proceedings, 215(1121):215-233, Nov. 25, 1952. 2 figs., 10 refs., 97 eqs. DLC--Based on FORSTERLING's coupled wave equation (vertical incidence), equations are obtained by which a solution representing a single characteristic downcoming wave above the limiting region gives criteria for determination of the limiting polarization when the wave reaches the ground. Discussion of the application of the theory to frequencies higher than 1 Mc/s furnishes no new information of significance about the ionosphere. --W. N.

A-269 Budden, K. G., The numerical solution of differential equations governing reflexion of long radio waves from the ionosphere. Royal Society of London, Proceedings, Ser. A, 227 (1171):516-537, Feb. 8, 1955. 22 refs., 85 eqs. DWB--Two methods are described for obtaining numerical solutions of the differential equations which govern the reflexion of long and very long radio waves from the ionosphere at vertical or oblique incidence. Both methods have been used with the EDSAC, the automatic digital computer of the University Mathematical Laboratory, Cambridge, but the paper is not concerned with the details of the EDSAC programming, nor with the large series of results that have been obtained. In the first method the first-order simultaneous equations, derived from Maxwell's equations and the constitutive relations for the ionosphere, are integrated by a step-by-step process proceeding downwards. The integrations are started from properly chosen initial solutions. From the resulting field variables at the bottom of the ionosphere a reflexion coefficient matrix R is derived, whose elements include the familiar reflexion coefficients. Two integrations are needed for each derivation of the elements of R. For the second method, it is shown that the formulae for R for a level below the ionosphere can be applied also within the ionized medium, and define a more general matrix variable whose elements are the dependent variables in a new set of differential equations. These are integrated by a step-by-step process as in the first method. The solution obtained below the ionosphere gives the required set of reflexion coefficients without further calculation. Only one integration is required for each derivation. The equations are given in full for certain important special cases. --Author's abstract.

A-270 Budden, K. G. and Clemmow, P.C., Coupled forms of the differential equations governing radio propagation in the ionosphere, Pt. 2. Cambridge Philosophical Society, Proceedings, 53(3):669-682, July 1957. 10 refs., 97 eqs. Includes errata for Pt. 1 DLC--The four first-order "coupled" equations governing the propagation of electromagnetic waves in the ionosphere, previously obtained in symbolic matrix form (CLEMMOW and HEADING (4)), are expressed explicitly in terms of the ionospheric parameters. The physical significance of the equations is illustrated by considering the energy flux in one characteristic wave when coupling and damping are neglected. Three special cases are then discussed for which second-order coupled equations are also given, namely, the cases of (a) vertical incidence with oblique magnetic field, (b) oblique incidence with vertical magnetic field, (c) norizontal magnetic field in the plane of incidence. For case (a) the second-order equations are those previously derived by FORSTERLING (5). The form of the coupled equations is physically illuminating and, in principle, suitable for solution by successive approximations. Extensive numerical work has indeed been carried out on the second-order coupled equations in case (a) (e.g., GIBBONS and NERTNEY (6), and it is probable that the first-order coupled equations would prove more advantageous. The present authors, however, feel that better methods are available for purely numerical work (e.g., BUDDEN (3)), and that the chief interest of the coupled form is that it shows the scope and limitations of the physical conception of characteristic waves. --Authors' abstract.

A-271 Budden, K.G. (High Altitude Obs., Colo. Univ.), Method of calculating wave-guide mode characteristics when the ionosphere is not sharply bounded. U. S. National Bureau of Standards, NBS Report, 5050, March 15, 1957. 9 p. 6 refs., 22 eqs. DWB--When discussing the propagation of very low frequency radio waves to great distances, it is convenient to treat the space between the earth and the ionosphere as a wave guide. A method is described for calculating the characteristics of the wave guide modes when the electron density and collision frequency vary continuously with height in any specified way. The method is given for the case when the electric field of the wave is in the plane of incidence, but it could be applied also to horizontally polarized waves. The earth's magnetic field is neglected, but a possible extension of the method to include the effect of the earth's field is described. --Author's abstract.

A-272 Budden, K.G. (High Altitude Obs., Colo. Univ.), Effect of small irregularities on the constitutive relations for the ionosphere. U. S. National Bureau of Standards, NBS Report, 5081, May 1, 1957. 32 p. 3 figs., 5 refs., numerous eqs. DWB--Irregularities in the ionosphere which are small compared with one wave length may modify the constitutive relations, and hence, may affect the refractive indices for electromagnetic waves. The modifications are in some ways similar to those which would be introduced into the Appleton-Hartree formula by a Lorentz force. The theory is given first for the case when the irregularities extend only in one dimension, and it is found that even in a loss-free medium the refractive index now has an imaginary part which might be associated with loss of energy from the wave by scattering. The theory for three dimensional irregularities is then discussed, but is more difficult and a method of successive approximations is used. The results indicate that small irregularities may play an important part in the propagation of very low frequency radio waves in the ionosphere. In particular, they may explain why "whistlers" are observed only on comparatively rare occasions. --Author's abstract.

A-273 Bureau, Robert (Nat. Lab. of Radioelectricity, Bagneux, near Paris), Reseau d'enregistreurs de P.I.D.B. (reinforcements brusques) sur 11.000 metres. (Network of recorders of ionospheric perturbations with sudden commencements on 11,000 m.)

International Council of Scientific Unions, Brussels, 8th Report of the Commission for the Study of Solar and Terrestrial Relationships, Rome, Sept. 1952, p. 10-11, pub. 1953. 2 figs. DWB--Running annual sums of monthly numbers of sudden ionospheric perturbations, 1929 through 1951, show a very close parallelism with sunspot relative numbers. P. I. D. B. only give intensifications between wave lengths of about 6000 and 17,000 m. This is illustrated by records on 2 - 24 km at Bagneux and Poitiers, on June 17-18, 1941. --C. E. P. B.

A-274 Burkard, O., Ionosphärenbeobachtungen im Polargebiet. (Observations of the ionosphere in polar regions.) Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, 1(1): 93-99, 1948. 3 figs., table, 4 refs. Summary in German, English and French p. 93-94. DWB, MH-BH--Gives mean hourly values of critical frequency of microwaves reflected from F-layer for each month June 1944-April 1945 at Tromsö, N. Norway; maximum near noon and secondary maximum in early morning. Critical frequency much lower on magnetically disturbed than on quiet days. --C. E. P. B.

A-275 Burkard, O., Studie zur weltweiten Ionosphärenstörung vom 15. Marz 1948. (Study of the world-wide ionospheric disturbance on March 15, 1948.) Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, 2(2-3):314-324, 1950. 4 figs., table, 8 refs., eq. Summary in German, English and French p. 315-316. DWB, MH-BH--Data from 30 magnetic stations in all parts of the world are analyzed (for the strong disturbance of March 15, 1948). Not all stations showed a decrease in the critical frequency. Former theories are revised to show dependence on magnetic field of earth and on local, not universal time. --M. R.

A-276 Burkard, Otto, Der Einfluss des magnetischen Erdfeldes auf die F2-Schicht. (Influence of the geomagnetic field on the F2 layer.) International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 145-154. 3 figs., 6 refs. English and French summaries, p. 153-154. DWB--New discoveries regarding the local temporal variations of the F2 layer obtained from recent ionospheric and magnetic records are: (a) the ionization in the forenoon is related to solar angle according to: $f^2 = \cos X + \beta$ (X = zenith angle of sun); (b) α and β exhibit geomagnetic influence; (c) yearly mean β is directly proportional to product H cos ϕ where H is horizontal component; (d) α shows marked annual variation, with minimum in summer (due to temperature effect); (e) in the morning the equatorial zone (both magnetic and geographic) is strongly ionized in contrast to noon values. --Author's abstract.

A-277 Burkard, Otto, Isanomalen der F2-Ionisation. (Isanomals of F2 ionization.) Journal of Geophysical Research, 56(4):595-600, Dec. 1951. 4 figs., 3 refs. DWB--Author calculated the departures of the maximum electronic concentration in the F2 layer from the corresponding monthly mean value and presents maps with isanomals for northwest and Central Europe. The surprising result is the appearance of intensive turbulence (Grossturbulenz) in the F2 layer. The problem is whether this turbulence phenomenon is connected with shifting of masses or is limited by the electrical state. --A. A.

A-278 Burkard, Otto, Modell der Ionosphäre. (Model of the ionosphere.) Die Naturwissenschaften, Berlin, 45(21):507, Nov. 1, 1958. 1 fig. DLC--Russian commentary, makes mention of an unexpected concentration of electrons at an altitude of 470 cm that was established by a rocket on the 21st of Feb. 1958; so remarkable indications concerning electron concentration in that part of ionosphere have been collected. The author shows that according to these observations the model of the ionosphere he published in Geofisica Pura e Applicata (1957) is valid.

A-279 Burke, M. J. and Jenkinson, I. S. (both, Physics Dept., Univ. of Queensland, Brisbane), Ionospheric drifts at Brisbane. Australian Journal of Physics, Melbourne, 10(3):378-386, Sept. 1957. 7 figs., table, 9 eqs. DLC--Examination of fading of signals recorded at closely spaced receivers has been used to measure the velocity of horizontal drifts of ionization in the ionosphere. Systematic observations have been made for a period of 2 yrs, on a frequency of 2.28 Mc/s. The results show good agreement with the horizontal velocities of ionized irregularities in the E and F2 regions of the ionosphere as determined by other methods at similar latitudes. The speeds are less than those observed at higher latitudes. The results for the E region have been analyzed for 24, 12 and 8 hr solar harmonics. The 12 and 8 hr harmonics show large seasonal phase changes in the northward component, in fair agreement with the results at higher latitudes in summer only, whereas the phase for the eastward component is generally consistent with the results at higher latitudes for all seasons. The F region 12 hr harmonic has a larger seasonal phase change in the eastward component than in the northward component. --Authors' abstract.

A-280 Cahill, Laurence J., Jr. and Van Allen, James A. (both, Dept. of Physics, State Univ. of Iowa), New rocket measurement of ionospheric currents near the geomagnetic equator. Journal of Geophysical Research, Wash., D.C., 63(1):270-273, March 1958. 2 figs. DLC--

Gives record of new rocket measurement of ionospheric currents as conducted by the State University of Iowa Rockoon Flight No. 86 at 161° W long. and 00° lat. on Oct. 18, 1957. The results of this investigation prove the existence of electrical currents in the lower ionosphere. The analyses of other findings are given. Other magnetometer flights are being studied, and they may yield information concerning the latitudinal extent of the equatorial current system. --N. N.

A-281 Cahill, Laurence J., Jr., Detection of an electrical current in the ionosphere above Greenland. Journal of Geophysical Research, 64(10):1377-1380, Oct. 1959. 6 figs., 4 refs. DLC --During a magnetic storm on Aug. 6, 1957, a rocket-borne magnetometer was launched near the coast of Greenland. The time and location of the flight and the magnetic measurements obtained provide evidence that the rocket entered the postulated sheet current flowing across the polar cap. An estimate is made of the magnitude of the detected current. --Author's abstract.

A-282 Calcutta. Univ. Institute of Radio Physics and Electronics, Research Report, Vol. 7, 1954/1955. Issued 1955? 142 p. figs., refs., eqs. DWB (M10. 535 C144r)--This is a series devoted mainly to reprinting articles on ionospheric physics by staff members of the Institute (founded in 1949). Even as early as 1930, the director of the Institute, S. K. Mitra, made ionospheric observations, at that time only experimental ionospheric station in the East. Vol. 7 of these reports contains 10 articles on such subjects as Ionization distribution in F-region, Sporadic E ionization during thunderstorms and on movement of Sporadic E clouds. --M. R.

A-283 Caldecott, R. and Robertson, W. J., Techniques for the study of radio wave propagation in connection with artificial satellites. Ohio. State University, Department of Electrical Engineering, Antenna Laboratory, Contract No. AF 33(616)-6137, Project 889-3, Report, Feb. 28, 1959 (AD 213884).

A-284 Callet, R. M. and Helliwell, R. A., Origin of "very low frequency emissions". U. S. National Bureau of Standards, Journal of Research, 63D(1):21-29, July-Aug. 1959. 4 figs., 2 tables, 14 refs., 9 eqs. DLC--Selective traveling-wave amplification in the outer ionosphere is postulated to explain very low frequency emissions. Phenomena which can be explained qualitatively by the theory are the hiss, quasi-constant tones, dawn chorus, and related transients, and very long trains of whistlers echoes. A quantitative example shows how the theory can produce the general form of certain characteristic discrete spectra "hooks" of emissions, and how this leads to definite values of particle velocity and a law for the distribution of electron density in the outer ionosphere. --From authors' abstract.

A-285 Casselman, C. J.; Heritage, D. P. and Tibbals, M. L. (all, U. S. Navy Electronics Lab., San Diego, Calif.), VLF propagation measurements for the Radux-Omega navigation system. Institute of Radio Engineers, N. Y., Proceedings, 47(5, Pt.1): 829-839, May 1959. 24 figs., 7 refs., eqs. DWB--This paper describes special VLF propagation measurements in connection with a feasibility study of a long range navigation system. Round-trip single-frequency measurement of phase stability was made between Hawaii and San Diego on frequencies from 10.2 kc to 18.2 kc in 1 kc increments. During Jan. 15 to 23, 1958, the standard deviation of phase stability on 12.2 kc was 4 μ sec daytime and 5 μ sec night time. One-way two frequency transmissions were monitered in San Diego and Washington, D. C., to determine the phase stability of a 1 kc difference frequency for pairs of frequencies from 10.2 kc to 18.2 kc. Data analyzed at time of submission of this paper (10.2-16.2 kc) indicate limitations of the two-frequency system for lane identification (resolution of cyclic ambiguities corresponding to one period of the carrier frequency). The techniques used to instrument these tests are considered somewhat unique. Data reported herein are general and applicable to any propagation study. The data being collected are leading to a better understanding of the mechanism of VLF propagation. --Authors' abstract.

A-286 Caton, P. F. G. and Pierce, E. T., The waveforms of atmospherics. Philosophical Magazine, London, Ser. 7, 43(339): 393-409, April 1952. 14 figs., table, 14 refs., 4 eqs. DWB--A number of waveforms observed at Cambridge, Eng., are illustrated, and the technique of photography is described. The forms are classified into 8 types, their occurrence described and origin discussed (initial leader, return strokes, etc). The theory of multiple ionospheric reflections is considered; about 10% of the records give precise values of the height (about 85 km) and distance of reflection. --C. E. P. B.

A-287 Chaffee, D. D., Jr. (Penna. State Univ.), Statistical analysis of "150-km" echo. Journal of Geophysical Research, 59(4):549-550, Dec. 1954. 2 figs., 3 refs. MH-BH--An echo with a marked spring and fall maximum appears in the 150 kc/sec band above the 130 km height and at an average of 150 km (see Lindquist, J. of Atmos. & Terr. Physics, 4:10-27, 1953) was investigated. A strong 27-day periodicity appears on a frequency analysis graph, with probability of random cause 0.05 when 3 years of data were used. It was found that for long duration of the 150 km echo a high Kp (planetary magnetic index) must exist. --M. R.

A-288 Chandra, Sushil; Gibbons, J. J. and Schmerling, E. R., Vertical transport of electrons in the F region. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-3875, Scientific Report No. 124, Oct. 1, 1959. 44 p. 24 figs., 18 refs., 3 eqs. DWB (M10.535 P415i)--The continuity equation of electron density is solved to yield an expression for the vertical transport which can be evaluated from electron-density-true-height profiles. A few numerical computations are presented of the vertical drift-velocities determined for the four I. G. Y. stations — Huancayo, Talara, Panama and Washington. It is shown that the velocity is predominantly downwards during the night and upwards during the day at the equatorial stations. There is an apparent phase reversal from summer to winter at Washington. The order of magnitude of the vertical velocity amplitude is 25 m/sec. There is substantial agreement between the values calculated here from ionospheric data and those deduced from S_q data on the dynamo theory. --Authors' abstract.

A-289 Chao, S. H., Wave theory of low frequency ionospheric propagation. Stanford University, Electronics Laboratories, Contract W23-099-ac-157, Final Report, 1952.

A-290 Chapman, J. H., A study of winds in the ionosphere by radio methods. Canadian Journal of Physics, 31(1):120-131, Jan. 1953.--Winds in the ionosphere have been studied by a method described by S. N. Mitra using the fading of radio echoes at spaced receivers. A mean daily wind variation of nearly semidiurnal period and about 40 meters per second amplitude has been observed at a nominal height of 110 km. (Region E). The wind variation is consistent with the explanation that it is due to tidal oscillations of the atmosphere. A wind variation consistent with that expected from lunar atmospheric tides has also been detected at this level. The winds in the F region appear to increase in velocity with an increase of magnetic activity. A similar effect is not observed in the E region except during severe ionospheric disturbances.

A-291 Chapman, J. (Courtland's Ltd., Coventry), The waveforms of atmospheric and the propagation of very low frequency radio waves. Journal of Atmospheric and Terrestrial Physics, London, 11(3/4):223-236, 1957. 14 figs. (incl. photos), 25 refs., eqs. DLC--Experimental observations upon atmospherics by several techniques are described. It is shown, in particular, that the results obtained for wave forms and for frequency spectra can be interrelated. The frequency spectrum of the electromagnetic disturbance at the source— the lightning discharge — is considered, and evidence is presented indicating appreciable differences, in this respect, between individual flashes. The interpretation of the results, on the basis of wave-guide theory, applied to the space between the earth and the lower ionosphere, is considered; this approach is entirely successful qualitatively, but quantitatively the agreement is less satisfactory. --Author's abstract.

A-292 Chapman, J. and Pierce, E. T. (both, Cavendish Lab., Cambridge, Eng.), Les types d'ondes, les spectres de frequence et la propagation des atmospheriques. (Wave types, frequency spectra and propagation of atmospherics.) L'Onde Electrique, Paris, 37(362):523-525, 1957. 4 figs., 5 refs. DLC--From a statistical analysis of the relation between wave forms and frequencies of sferics recorded at Cambridge, Eng., curves of wave type frequency correlation are deduced. Results of propagation measurement over 18 Mc are consistent with the waveguide mode of propagation advanced by BUDDEN (1951). --G. T.

A-293 Chapman, Sydney, Radio fade-outs and the associated magnetic variations. Journal of Geophysical Research, 42(4):417-419, 1937. --States that Birkeland had some insight into the fade-out types of magnetic disturbance in his 1908 book. Discusses notation. --L. A. M.

A-294 Chapman, Sydney, Some causes of winds in the ionosphere. I. U. G. G. Bulletin d'Information, 3(6):303-311, July 1954. DWB --As the introductory paper of the Conference on Motions in the Upper Atmosphere held at Albuquerque, N. M. (Sept. 7-9, 1953), the CHAPMAN paper was the only one given in extenso in this Bulletin. He discusses many types of evidence of winds in ionosphere, dynamic influences in lower and upper atmosphere, topography, oceanic heat transfer and storage, latent heat, energy of dissociation, ionization and excitation, heat conduction, radiation absorption and emission, friction and turbulence, external impact, electrostatic and electromagnetic influences, dynamo action in ionosphere, turbulence in electromagnetic fields and dynamic action by external forces and, finally, influence of lower atmosphere on ionosphere. Radio observations have played a major role in exploration of the ionosphere. --M. R.

A-295 Chapman, Sydney and Davies, K., On the approximate daytime constancy of the absorption of radio waves in the lower ionosphere. Journal of Atmospheric and Terrestrial Physics, 13(1-2):86-89, Dec., 1958. fig., 7 refs.

A-296 Chappell, D. W. G. and Henderson, C. L., The determination of the horizontal velocity of ionospheric movements from fading records from spaced receivers. Journal of Atmospheric and Terrestrial Physics, London, 8(3):163-168, March 1956. fig., 3 refs., 17 eqs. DWB--RATCLIFFE has shown that, for the Mitra formula for the velocity of ionospheric movements to be valid, a long sample of fading record is necessary. This paper presents a method of deriving the velocity which is not dependent on a long sample of record, and is valid for any arbitrary distribution of orientation of "lines of maximum amplitude." The derived formula is compared with Mitra's formula, and the time delays from a fading record are analyzed. The method is not suitable for use with Philips records. --Authors' abstract.

A-297 Chatterjee, B., Nature and origin of sporadic E regions as observed at different hours (over Calcutta.) Journal of Atmospheric and Terrestrial Physics, 3(5):229-238, June 1953. 5 figs., 19 refs. MH-BH--Reflection coefficients of Es echoes show two types of ionization; a cloud or blob type mainly in early morning attributed to ionization by sporadic meteors, and thin layer type mainly at sunrise in E layer, attributed to photo-detachment of electrons from negative ions of O and O_2 by sun rays from below the horizon. In afternoon and evening Es ionization was mixed thin layer and ion clouds coming from above. Associated with thunderstorms was the mixed type or the "blanketing" type. --C. E. P. B.

A-298 Chatterjee, B. (Inst. of Radio Physics and Electronics, Univ. of Calcutta, Calcutta), Some regularities of the ionospheric F region. Journal of Geophysical Research, Washington, D.C. 58(3):353-362, Sept. 1953. 5 figs., 12 refs. Also his: Regularities in the F-region of the ionosphere. Nature, London, 173(4397):262-264, Feb. 6, 1954. 2 figs., 3 refs. DWB--It has been shown recently by RATCLIFFE that, although the behavior of the critical frequency (and hence the maximum ionization density) of the F2 region is very irregular, that of its total ion content regularities observed by RATCLIFFE are confined only to a few stations and disappear when the F1 - F2 bifurcation is large. It is shown in the present paper that if, instead of the total ion content of the F2 region, that of the F1 cum F2 region (n_T) is considered as a whole, then the regularities become much more marked. Further, the regularities are found to persist for all the three stations considered — Slough (Northern Hemisphere), and Singapore (equatorial region) — even when the bifurcation is large. Certain peaks, however, are found to occur on the otherwise smooth variations of the monthly mean values of n_T. These are explained as due to tidal effects. The paper also shows that the observed regularities of the composite F region are in conformity with the recent hypothesis that F1 and F2 belong really to one ionized region, being produced by a common ionizing radiation from the sun. --Author's abstract.

A-299 Chestnov, F. I., Zagadka ionosfery. (Enigma of the ionosphere.) Moscow, Gosud. Izdat. Tekhniko-Teoreticheskoi Literary, 1954. 54 p. 24 figs. Nauchno-populiarnaia Biblioteka, No. 70. DLC--The detailed structure of the ionosphere is described and shown in an original schematic diagram. Ionization, twilight, night sky light, aurora, diurnal effects, magnetic field, magnetic storms in ionosphere, solar effects, radio propagation (long and short wave), ionospheric soundings by radio impulses, sunspot effects, forecasts of radio propagation, meteor traces, radio radiation from stars and rocket exploration of ionosphere are treated in condensed popular technical form. --M. R.

A-300 Chestnov, F. I., Zagadka ionosfery. (The riddle of the ionosphere.) Moscow, Gosud. Izdat. Tekhniko-Teoreticheskoi Literary, 1956. 62 p. 25 figs., refs. (Nauchno-Populiarnaia Biblioteka, No. 70.) DLC (QC880. C45 1956)--A popular scientific pamphlet discussing (with schematic illustrations) the basic features of the ionosphere - the causes of the ionization, the 4 layers (D, E, F1 and F2) of the ionosphere and their structure; twilight phenomena, light of the night sky, the aurora, ionospheric storms, sunspots, etc.; radio propagation by ionosphere, short wave and radio echo sounding, forecasting radio weather, eclipse effects, radio astronomy, rockets, new methods of ionospheric research, the IGY. The last chapters contain some recent material not included in the 1954 edition. --M. R.

A-301 Chivers, H. J. A. and Wells, H. W. (both, Jodrell Bank Experimental Station, Manchester Univ.), A new ionospheric phenomenon. Nature, London, 183(4669):1178, April 25, 1959. fig., 5 refs. DWB--In order to eliminate man-made noise and interferences a special study of some unusual radiations began at Jodrell Bank in Oct. 1958. Five separate total-power receivers slightly differing but near 80 Mc/s were used;three receivers were at Jodrell Bank, the other two at separate sites at 1 km distance. Some ten instances of isolated increase of the noise level were recorded by some of the instruments while others simultaneously recorded decrease during the period Jan. 3-10, 1959. Again, on March 25, 1959 at 1400 U. T. a very striking isolated event occurred. Facsimile recordings are given. Preliminary investigations of these rare, apparent precursors of stepped-up solar activity and subsequent magnetic storms and auroras, show no unusual solar or terrestrial effect for relationships. --W. N.

A-302 Chu, T. S., Ionospheric scatter propagation at large scatter angles. Ohio. State University, Department of Electrical Engineering, Antenna Laboratory, July 1957. This is a M. S. thesis.

A-303 Chvojkova, E. (Astron. Inst. Ondrejov), Über den Weltumlauf der Radiostrahlen (Refraktion der Kurzwellen in nichtparabolischer Schicht). (Radio propagation around the globe: short wave refraction in a nonparabolic layer.) Bulletin of the Astronomical Institutes of Czechoslovakia, Prague, 5(5, 6): 104-108, 110-111, 1954. 5 figs., 4 refs., 7 eqs. Russian summary p. 111. DLC--Investigators of properties of ionospheric layers usually have a preference for assuming a parabolic layer. In this paper a new type of layer is introduced, very similar to the Chapman layer. This new model makes it possible to analyze the properties of a spherical layer in whose lower boundary the electron density reaches the zero value gradually rather than abruptly. It appears that not only in the middle but also in the lower boundary region of a non-parabolic layer there is a narrow range within which a horizontally propagating wave is forced into a circum-global course as far as the structure of the layer remains unchanged. --Trans. of author's abstract.

A-304 Chvojkova, E. (Astronomical Inst. of the Czechoslovak Academy of Sciences), The refraction of radio waves by a spherical ionized layer. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2):124-135, Oct. 1959. 8 figs., 9 refs., 27 eqs. DWB, DLC--A general expression is derived for the refraction of radio waves passing completely through a spherical ionized layer, using a simple ray treatment. A similar formula is derived for the ray-path length. It is shown that when certain approximations appropriate to the terrestrial ionosphere are made, neglecting absorption and the effect of the earth's magnetic field, the expression for refraction reduces to a simple form which has previously been derived by the author using a less general method. The perpetual propagation of radio waves along two levels in the ionosphere, the condition for which appears in the derivation of the general formula, is briefly discussed. It is shown that with slight modifications the refraction formula is also valid for reflection, and an expression giving the distance of the point of reflection in the ionosphere from the transmitter on the earth's surface is derived. --Author's abstract.

A-305 Chvojkova, E. and Woyk, E. (Astronomical Inst., Czech.), The antipodal reception of Sputnik III. Institute of Radio Engineers, N. Y., Proceedings, 47(6):1144, June 1959. fig., 4 refs. DWB--

Antipodal reception of Sputnik signals at Stanford, Calif. on 20 Mc reported by O.K. Garriott and O.G. Villard between two afternoon passes, arriving from the SE. Conditions under which the signal propagates around the world in either of two ionized layers (a) without reflection or escape, (b) with escape only, and (c) with return to earth, are discussed and illustrated and an explanation given of why the antipodal point is the best for return to earth. At this point transmission can occur with equal probability regardless of which great circle path is followed. Preferred direction of arrival depends on ionospheric conditions at points where ray first touches ionosphere and leaves it, respectively. Critical frequency of layer must increase from point where ray first enters ionosphere in order to prevent escape at next upward penetration of ionosphere. In mid latitudes levels containing the same electron density must be more curved than the earth. No arrival can be expected from polar directions because of rare polar ionosphere which would allow escape before mid latitudes were reached; or from the south, but SW in forenoon and SE in afternoon would be preferred. SW passage would be less frequent than SE, since these SW rays would have to pass the region where the critical frequency falls to its morning minimum. In the sunset, (P.M.) region turbulence might produce multipath propagation, but this would not destroy antipodal reception. Therefore, at Stanford frequent antipodal reception in summer afternoons from SE would be expected.--M. R.

A-306 Clark, Clayton and Peterson, Allen M., Motion of sporadic-E patches determined from high-frequency backscatter records. Nature, London, 178(4531):486-487, Sept. 1, 1956. 2 figs. 10 refs. DWB--Reflection of backscatter from ground or sea by sporadic-E patches has been measured at Stanford, Cal. Mean duration of patches 3 hr, mean speed 300 km/hr with peak at 250 km/hr and a few values exceeding 550. The direction was predominantly towards west. --C.E.P.B.

A-307 Clemmow, P.C. and Heading, J., Coupled forms of the differential equations governing radio propagation in the ionosphere. Cambridge Philosophical Society, Proceedings, 50(2):319-333, April 1954. 15 refs., 73 eqs. DLC--The equations for oblique propagation in a horizontally stratified ionosphere with an oblique magnetic field are put in a form suitable for solution by successive approximations. In the general case this "coupled" form consists of four first-order differential equations, each associated with one characteristic wave. In the special cases of (a) horizontal magnetic field, and (b) plane of incidence perpendicular to magnetic meridian, two second-order coupled equations of a particular type can be derived. each associated with a pair of corresponding upgoing and downgoing characteristic waves. These latter equations include those given previously by FOSTERLING (1942) for vertical incidence. Cases in which there is no coupling are briefly considered from the point of view of the first-order equations. The general formulation provides a basis for assessing the validity of the standard "ray" approximation, alternative to that developed by Booker (1936), and brings out the nature of its breakdown in coupling and reflection regions. --Authors' abstract.

A-308 Clemmow, P. C. and Johnson, M. A. (both, A. S. R. E., Portsdown, Cosham, Hants.), A contribution to the theory of the motion of weak irregularities in the ionosphere. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2_:21-36, Oct. 1959. 3 figs., 3 tables, 3 refs., 62 eqs. DWB, DLC--The motion of weak irregularities in an otherwise homogeneous slightly ionized gas under the influence of electrostatic and magnetostatic fields is investigated. The governing equations are set out and the dispersion equation for harmonic plane wave solutions is obtained and solved. It is shown that, to a good approximation for ionospheric applications, and with the neglect of diffusion, a plane wave travels with negligible attenuation with a velocity which is (a) proportional to the magnitude of the electrostatic field, (b) independent of the wavelength, (c) dependent on the direction of the wave-normal. As a particular consequence, any weak two-dimensional irregularity which is parallel to the direction of the magnetostatic field travels unchanged; so also does any one-dimensional irregularity, and in this case the analysis is unaffected by its strength. The effects of diffusion are examined. --Authors' abstract.

A-309 Cohen, D. S., Hourly measurements of ionospheric characteristics, Macquarie Island, 1950. Australian National Antarctic Research Expedition, 1947-1949, Interim Reports, No. 2, March 1952. 81 p. Mostly tables. DLC (QC973. C6)--Using equipment of the CSIRO Radiophysics Lab., routine h'F ionospheric soundings have been made at Macquarie Island 54°29' S, 158° 58'E; geomag. 61°S, 243°E) since June 13, 1950. In this report, hourly values for June to Dec. 1950 are published for f^oF_2, f^oF_1, f^oE, FE_s, $h'F_2$, hpF_2, $h'F_1$, $h'E$, $h'E_s$, (M3000) F_2, (M3000)F_1. --M. R.

A-310 Cole, A. W., V. H. F. communication by ionospheric scatter. Electronic Engineering, London, 28(340):230-235, June 1956. 6 figs., table, 12 refs. DLC--Scattering by random variations in the E layer is effective below 30 Mc/s for distances up to 1400 mi, and is suitable for telegraphic traffic. The technical problems of transmission and reception are discussed. --C. E. P. B.

A-311 Cologne. Universität. Meteorologisches Institut, Ergebnisse der Ionosphärenbeobachtungen. (Results of ionospheric observations.) No. 1, 1957. Latest issue seen, No. 3, 1958. 18 p. Almost entirely tables. Preface, No. 1, signed H. Berg. --Ionospheric disturbances have been investigated by the impulse-echo method since 1941-42 at the Cologne University. As of 1954 the identical problem was studied simultaneously at the Cavendish Institute in Cambridge, and in 1956 the studies gained by reconstructional improvement of the instrumentation described. The observations are conducted at 00. 00 - 24. 00 3 days a month. The approximately 20 extremes obtained during the 5 min. runs are processed to yield: number of echoes, time differences, amount of mean time vector direction of the mean ionospheric displacement vector, m/sec velocity of the disturbances, apparent height of the reflective layer which are here tabulated accordingly. In issue No. 1, Nov. 7, 1956 - Feb. 18, 1957, in No. 2, March 25, 1957 - Aug. 26, 1957, and in No. 3, Sept. 21, 1957 - May 19, 1958. --W.N.

A-312 Colwell, R.C. and Friend, A. W., The D-region of the ionosphere. Nature, London, 137(3471):782, May 9, 1936. DLC--Characteristics of the D-region were established by transmitting 60 pulses per sec, each pulse of 10 sec duration received visually reflected some 200 m from the transmitter. The experiments were conducted during 1935 at West Virginia Univ. Dept. of Physics. --W.N.

A-313 Commission Mixte de l'Ionosphere. Troisieme reunion. Canberra (du 24 au 26 aout 1952). (Mixed Commission on the Ionosphere. Third meeting. Canberra (August 24-26, 1952).) International Union of Geodesy and Geophysics, Bulletin d'Information, 2(2):377-380, April 1953. DWB--Discussion on Ionospheric storms, changes during solar eclipses, conductivity of ionosphere, radio auroral echoes, and International Geophysical Year 1957-58. A comprehensive program is outlined for the latter. --M. R.

A-314 Cones, H.N.; Cottony, H.V. and Watts, J.M., A 600 ohm multiple-wire delta antenna for ionosphere studies. U. S. National Bureau of Standards, Journal of Research, 44(5):475-488, May 1950. 11 figs. DWB--This paper describes the design and the performance of a multiple-wire delta antenna developed for use with high output impedence, vertical-incidence ionosphere sounding equipment. Graphs are presented showing the terminal impedence of this antenna over the separating frequency range (1 to 25 Mc), using various lengths of open-wire transmission line. The results of pattern measurements using model techniques are given, showing the expected radiation characteristics of the full-scale antenna. A practical test of the comparative merits of the antenna is described in which ionosphere records obtained by the use of this antenna are compared with those obtained by the use of a larger antenna developed previously. --Authors' abstract.

A-315 Coroniti, S. C. and Penndorf, Research concerning ionospheric anomalous propagation in the Arctic. Avco Research and Advanced Development Division, Scientific Report, Feb. 1958.

A-316 Cottony, H. V., Radio noise of ionosphere origin. Science, v. III, p. 41, 1950. --On Nov. 23, 1949, when cosmic noise was recorded at very high levels, a solar radiometer was used to determine whether the noise was coming from the sun or the whole sky. The radiometer was adjusted to 50 Mc/s. No change in intensity was observed when the Wurzburg Antenna was pointed toward different parts of the sky. It is presumed that this noise was of terrestrial origin, generated in the outer atmosphere of the earth.

A-317 Counter, V. A., Propagation of radio waves through the troposphere and ionosphere. Lockheed Missile Systems Division, LMSD-2066-RI, May 14, 1958. (Corrected version of the LMSD-2066).

A-318 Court, G. W. G., Ionospheric wind determination from spaced radio receiver fading records. Journal of Atmospheric and Terrestrial Physics, 7(6):333-340, Dec. 1955. 11 figs., 4 refs. DWB--A method of determining winds is described using a fixed aerial and one moving in a circular path around it. The wind direction is given by the line of the aerials when optimum correspondence of records is obtained, and the time delay indicates the velocity. --C. E. P. B.

A-319 Court, G. W. G. and Gilfillan, E. S., A determination of ionospheric winds for a 24-hour period. Journal of Atmospheric and Terrestrial Physics, London, 8(3):169-170, March 1956. 2 figs., 2 refs. DWB--Records from 3 spaced aerials at Lower Hutt, New Zealand, for 24 hours on Jan. 17, 1953 were analyzed. E-layer wind varied irregularly from S at 0h local time through W and N to SE at 12-14h (0h G. m. t.) and back again. Mean velocity was about 80 m/s. --C. E. P. B.

A-320 Cowen, Robert C. and Landsberg, Helmut, Probing earth's secrets. Christian Science Monitor, June 28, 30, July 5, 7, 12, 14 and 19, 1951. photos. Abstracted from reprint. DWB--The work of the Geophysical Research Directorate of the Air Force Cambridge Research Laboratories is brought to the general public in this series of 7 articles. In the introductory article HELMUT E. LANDSBERG determines the field and explains the importance of geophysics. The remaining 6 articles are by ROBERT C. COWEN of the Christian Science Monitor and bear the titles: 2. Air Center set for research in geophysics; 3. Air Force lifts lid on secrets of atmosphere; 4. Probing sound waves aid in study of atmosphere; 5. Rocket'-labs' keep Air Force informed; 6. U. S. Air Force seeks to end guesswork in forecasts; 7. Radio waves investigate ionosphere. A few photos, mostly showing equipment, are added. --G. T.

A-321 Cracknell, R. G., Transequatorial propagation of VHF signals. QST, 43(12):11-17, Dec. 1959. DLC--Using 50.4 Mc/s transmission, several different propagation types are discussed in general, and in particular the so-called TE propagation. The transmissions were conducted from Salisbury, S. Rhodesia since Sept. 1957. TE propagation is one type between two points of opposite sides of, and at least 1000 miles from the geomagnetic equator.--W. N.

A-322 Crary, J. H.; Helliwell, R. A. (both, Stanford Univ.), and Chase, R. F. (Boeing Airplane Co., Seattle, Wash.), Stanford-Seattle whistler observations. Journal of Geophysical Research, Wash., D. C., 61(1):35-44, March 1956. 6 figs., 4 refs., 4 eqs. DLC--Simultaneous observations of times of occurrence of whistlers were made at Seattle, Wash., and Stanford, Calif., two hours every week from Oct. 1951 to Oct. 1952. Times were measured to an accuracy of about ± 1 sec. The objective was to determine the percentage of whistlers received at either station which were coincident at both. A total of 318 whistlers was received at Stanford and 283 at Seattle during simultaneous observations. The occurrence rate of whistlers (during a two-hour period) varied from 0 to roughly 55 per hour at Stanford and from 0 to 70 per hour at Seattle. The correlation between the occurrence rates was poor. The number of true coincidences was found by subtracting the number of chance coincidences from the number of total coincidences. A method for computing the number of chance coincidences from a knowledge of the time intervals between whistlers at the one station was derived. The analysis showed that approximately 22 percent were observed simultaneously at both stations. This result is examined in relation to possible theories of whistler origin and propagation, and is shown to support the Storey-Eckersley theory.--Authors' abstract.

A-323 Crichlow, William Q. (Natl. Bureau of Standards, Boulder, Colo.), Noise investigation at VLF by the National Bureau of Standards. Institute of Radio Engineers, N. Y., Proceedings, 45(6):778-782, June 1957. 9 figs., 7 foot-refs. DLC--The principal objective of the Radio Noise Section at the National Bureau of Standards is the establishment of a regular service for predicting the levels and characteristics of radio noise. The various steps necessary to establish such a service at NBS are summarized. The characteristics of atmospheric noise vary with location, frequency, and time, and methods of dealing with these variations are discussed. Also discussed are new predictions of world-wide noise levels which have been prepared for the International Radio Consultative Committee (CCIR). --Author's abstract.

A-324 Crichlow, W.Q.; Disney, R.T. and Samson, C.A., Atmospheric radio noise summary for the period June 1 through Nov. 30, 1957. U. S. National Bureau of Standards, NBS Report 5556, Feb. 20, 1958. 25 p. 8 figs., 16 tables. DWB (621.384 U58at). Also their Atmospheric radio noise for the period Dec. 1, 1957 through Feb. 28, 1958. Ibid., 5580, June 23, 1958. 3 p. 7 figs., ref. DWB (M94.6 C928at)--The first article is a summary report of noise measurements made during the period June 1 through Nov. 30, 1957 by stations in the recording network which is supervised by the National Bureau of Standards. Stations engaged whole time or part of the period were as follows: Boulder, Colo.; Bill, Wyo.; Front Royal, Va.; Marie Byrd Base, Antarctica; Balboa, Canal Zone; Ibadan, Nigeria; Thule, Greenland. Studies in this field are intended to produce more specific recommendations for future noise predictions. In the second article, radio noise measurements during the period Dec. 1, 1957 through Feb. 28, 1958 have been summarized for the following stations: Boulder, Colo; Bill, Wyo.; Front Royal, Va., and Balboa, Panama Canal Zone. Details of data analysis show the existence of contamination from signals, man-made noise, and receiver noise. A procedure adopted to eliminate these effects and to obtain a "best estimate" of a true atmospheric noise level at each station is described. Differences between the predictions and observations are discussed by time blocks. --N.N.

A-325 Crombie, D.D. (Phys. Lab. D.S.I.R. Lower Hutt, New Zealand), Differences between the east-west and west-east propagation of VLF signals over long distances. Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):110-117, 1958. 3 figs., 3 tables, 10 refs., 2 eqs. DLC--An early suggestion by ROUND, ECKERSLEY, TREMELLEN and LUNNON that VLF signals received from the west are less attenuated than those from the east is investigated. The original evidence, together with further experimental data, give strong support to the hypothesis. The outline of a possible explanation of the effect is given. --Author's abstract.

A-326 Crombie, D. D.; Allan, A. H. and Miss Newman, M., Phase variations of 16 Kc/s transmissions from Rugby as received in New Zealand. Institution of Electrical Engineers, Proceedings, B, 105(21):301-304, May 1958. 4 figs., 9 refs., eqs. DLC--The results of approximately one year's measurements of the diurnal phase variation, in New Zealand, of the highly stable 16 Kc/s transmission from GBR are given and discussed. It can be considered that the signal is received by the short great-circle path, the observed phase variations appear to be in accordance with propagation via the TM_{01} - mode which exists between parallel plane metallic sheets. --Author's abstract.

A-327 Crompton, R. W., Huxley, L. G. H. and Sutton, D. J., Experimental studies of the motions of slow electrons in air with application to the ionosphere. Royal Society of London, Proceedings, Ser. A, 218(1135):507-519, July 23, 1953. 7 figs., 3 tables, 14 refs., 30 eqs. Also: Huxley, L. G. H., Alternative developments of the theory of radio wave interaction. Ibid., p. 520-536. 3 figs., 2 tables, 13 refs., 56 eqs. DLC--Empirical formulas are found for drift velocity, collision frequency, electronic temperature and mean energy loss per collision. Collision frequency can be related to pressure (p mb) by $v = 7.02 \times 10^7 p$. The average energy lost in a collision is computed and applied to radio wave interaction. It is found that the theory of this interaction requires revision, and an alternative theory is given in the second paper. --C. E. P. B.

A-328 Croom, Sheila, Robbins, Audrey; Thomas, J. O., Two anomalies in the behavior of the F2 layer of the ionosphere. Nature 184 No. 4704, 2003 (Dec. 26, 1959). 3 figs., table, 6 refs. DLC--This brief discussion treats (1) the geomagnetic anomaly and (2) an unexpected diurnal asymmetry. N(h) profiles for some selected stations were computed and tabulated and curves featuring magnetic dip. Pre-noon electron densities were found to be $>$ the corresponding afternoon ones, at fixed F - regions in Sept. 1957. Further investigation may establish the extent of the diurnal asymmetry. --W. N.

A-329 Crow, D. A.; Kitchen, F. A.; Isted, G. A. and Millington, G., A disturbing factor in very high frequency communications via ionospheric forward scatter. Nature, London, 178(4545):1280-1283, Dec. 8, 1956. 10 figs., 5 refs. DLC--

Investigations into the cause of the radio interference disastrous to teleprint communication on 37.30 Mc/s between Gibraltar and the United Kingdom in 1955 are reported on. Indirect pulse modulation of the transmissions identified the components of the multi-hop delayed signals discussed. A safe 10 db signal/interference ratio requires a 30 db improvement of the present array. --W. N.

A-330 Crow, Edwin L. and Zacharisen, Donald H., Pilot study of the preparation of world maps of F2 critical frequencies and maximum usable frequency factors. U. S. National Bureau of Standards, NBS Report 5560, Feb. 28, 1958. 68 p. 15 figs., 13 tables, 3 refs., 15 eqs. DWB (621.384 U585pil)--The Central Radio Propagation Laboratory is undertaking the preparation of G. M. I. contour maps, possibly semipermanent, for predicting F2 layer maximum usable frequencies. Maps are to be given for each month of the year and each even hour of G. M. T. A degree of semipermanency is hoped for by presenting maps of foF2 and the 4000 km muf factor for 12-month running average Zurich sunspot number of 50, and also of the rates of change of these parameters with sunspot number. Thus radio propagation conditions can be predicted directly from these maps once the average sunspot number is predicted. The pilot study reported herein examined the available data from about ten ionospheric sounding stations in detail and drew 74 contour maps from data of all stations in order to evaluate the precision attainable with such maps and to choose between alternative methods of preparation. The total standard deviation of the error in predicting muf with these maps was found to be about 0.9 Mc at zero distance and about 3.1 Mc at 4000 km, increasing slightly with sunspot number. A comparison of these maps, CRPL Series D, and Radio Research Station, Slough, maps with foF2 observations recorded in the F series gave total standard deviations of predictions of, very roughly, 1.1, 1.1 and 1.6 Mc respectively. --Authors' abstract.

A-331 Cummack, C.H.; King, G., Disturbance in the ionospheric F region following the Johnston Is nuclear explosion. New Zealand, Journal of Geology and Geophysics, 2(3):634, 1959.

A-332 Cummack, C.H. (Christchurch Geophys. Observ., New Zealand), "Chapman behaviour' in the lower ionosphere. Journal of Atmospheric and Terrestrial Physics, New York, 14(3/4): 229-235, June 1959. 4 figs., 6 refs., 9 eqs. DWB, DLC--It is shown that Chapman's relations for the variation of critical frequency and height of a layer with solar zenith angle can be applied to any point on that layer and that it is not necessary to assume monochromatic radiation. These results are then applied to electron density vs. height profiles and it is shown that "Chapman behaviour" can be detected to a height of 160 km being consistent with a scale height of 10 or 15 km. --Author's abstract.

A-333 Cutolo, M.; Carlevaro, M. and Ghergi, M., Esperionze sull' interazione con risonanza fra radioonde nella ionosfera. (Observations on the interaction of waves in the ionosphere in relation to the gyrofrequency.) Alta Frequenza, 15(2):111-117, June 1946. fig., table. DLC.

A-334 Cutolo, M., Determinazione sperimentale delle curve di risonanza nel moto degli elettroni lenti dell' alta atmosfera. (The experimental determination of the resonance curve in the motion of slow electrons in the upper atmosphere.) Il Nuovo Cimento, Ser. 9, 9(5):391-406, May 1, 1952. 6 figs., 2 tables, 9 refs. English summary p. 406. DWB--Review of "cross modulation" in the ionosphere between two electric waves of very different frequencies. The cross modulation is especially well expressed if the frequency of the modulated wave is about equal to the local gyrofrequency — a resonance effect called "gyro interaction." Italian observations show an appreciable influence of the sunspots on this phenomenon. --A. A.

A-335 Cutolo, M., Su di un nuovo fenomeno di interazione fra onde ed elettroni liberi sottoposti al campo magnetico terrestre. (On a new phenomenon of interaction between waves and electrons subjected to the field of terrestrial magnetism.) Il Nuovo Cimento, Ser. 9, 9(8):687-698, Aug. 1952. 3 figs., 2 tables. English summary p. 698. DLC--The curious phenomenon of a wave with frequency near the gyrofrequency that interacts on itself is discussed and nomenclature suggested. Graphical presentation on how the modulation percent of the received radiation decreased to less than 40% of the originally transmitted 80% is given. Technical difficulties retarded exact measurements of the frequency at which the minimum was obtained hence the determination as to whether or not the values were higher or lower than the calculated gyrofrequency, because of ionospheric conditions, remains unsolved. --W. N.

A-336 Cutolo, M., Measurements of the terrestrial magnetic field in the E-layer. Nature, London, 172(4382):774-775, Oct. 24, 1953. fig., table, 2 refs. DWB--Describes briefly a method of determining total intensity of earth's magnetic field by self-demodulation of radio waves. Values found in Italy in 1949-1951 are around 0.43 oersted. --C. E. P. B.

A-337 Dalgarno, A. (GRD, ARDC, Bedford, Mass.), Ambipolar diffusion in the F2-layer. Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):219-220, 1958. table, 18 refs., 3 eqs. DLC--The densities of the diffused free-charges in the F2-layer are considered too small by a factor of at least 4 or 5 and unacceptably rapid at the neutral particle concentration as indicated by rocket measurements. Several scientists and their research on the mobilities of ions in their gaseous states are referred to. The commonly accepted diffusion coefficient D, for an ion of mass M_1 in a gas composed of particles of mass M_2, is expressed thus:

$$D = \frac{3\pi^{\frac{1}{2}}}{16 n_2} \left(\frac{2KT}{\mu}\right)^{\frac{1}{2}} P^{-1},$$

where K is Boltzmann's constant; T, the absolute temperature; μ, the reduced mass $m_1 m_2/(M_1 + M_2)$; N_2, the gas number density; and P, the average effective diffusion cross-section. This is an important parameter in the discussions. --N.N.

A-338 Daniels, Fred B. and Bauer, Siegfried J. (both, U.S. Army Signal Engineering Laboratories, Fort Monmouth, N.J.), Measurement of the ionospheric Faraday effect by radio waves reflected from the moon. Nature, London, 181(4620):1392-1393, May 17, 1958. 2 figs., 2 eqs. DWB--Using the rotation of the plane of polarization of radio echoes from the moon it is possible to determine the change in total electron content of the ionosphere. This is a report on such an experiment made the night of Jan. 8-9, 1958. Results indicated a change about 2.2 times that computed for a parabolic layer using vertical sounding data recorded at the transmitting site. --Based on Physics Abstracts, No. 5543, 1958.

A-339 Daniels, Fred B. and Bauer, Siegfried J. (both, U.S. Army Signal Research and Development Lab., Fort Monmouth, N.J.), Faraday fading of earth satellite signals. Nature, London, 182(4635):599, Aug. 30, 1958. 2 refs., eq. DWB--Very brief note on British attempts to estimate ionospheric integral electron content up to the satellite's height by means of rate of fading due to the Faraday effect. Too high values were obtained which may be explained by the omission of the satellite's radial velocity component in the theoretical expressions. --W.N.

A-340 Daniels, F.B. and Bauer, S.J., The ionospheric Faraday effect and its applications. Franklin Institute, Journal, 267(3): 187-200, March 1959. 7 figs., 8 refs.

A-341 Datta, S. and Datta, R.N., Gyro-frequency in the Ionospheric regions. Indian Journal of Physics, 33(7):316-324, 1959. 5 figs., 3 tables, 11 refs., 9 eqs. DLC--Gyro-frequencies in E, F1 and F2 regions over Haringhata, were calculated from measurements of ordinary (f_o) and extraordinary (f_x) critical frequencies. Findings include the following: 1) magnetic fields were higher than those expected from extra polation of the magnetic field at ground level to the heights of the regions by inverse cube law. 2) The marked semi-diurnal variation of the gyro-frequency of the E region reaches minimum at midday. 3) No such variation found in F1 nor F2, average winter value of the latter exceeds the summer value by 9%. 4) $f_x - f_o$ depends on high frequency values being lower than those at lower levels, as may be expected in quasi-transverse propagation. --From authors' abstract.

A-342 Davids, Norman, Theoretical group heights of reflection of 150 kc/s radio waves vertically incident on the ionosphere. Journal of Atmospheric and Terrestrial Physics, 2(6):324-336, 1952. 6 figs., 4 tables, 6 refs., 28 eqs. DWB--"It is found that the rapid changes in polarization near the lower edge of the E-region, called the 'coupling region,' are very effective in generating reflected waves or pulses under suitable conditions. . . . At a higher level in the layer rapid variations in the index of refraction for one of the characteristic wave components occur in what is called the 'reflection region'." The theory agrees with experimental results. --Author's abstract.

A-343 Davids, Norman (Penna. St. Coll., Ionosphere Res. Lab.), Dispersion effects at 150 Kc/s a particular E-layer model. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionospheric Research, Scientific Report, No. 31, Jan. 30, 1952. 62 p. 9 figs., 3 tables, 9 refs., 48 eqs. Appendix A, p. 35-62, Schrag, R.L., Magneto-ionic calculations for a nighttime E-layer model at 140, 150, and 160 Kc/s. DWB.

A-344 Davids, Norman (Ionos. Res. Lab., Penna. St. Coll., State College, Pa.), Optic axes and critical coupling in the ionosphere. Journal of Geophysical Research, Washington, D.C., 58(3):311-321, Sept. 1953. 3 figs., 9 refs., eqs. Also in: Pennsylvania. State College. Ionosphere Research Laboratory, Scientific Report, No. 43, Jan. 30, 1953. 20 p. 3 figs., 8 refs., eqs. DWB--Critical coupling arises when, for a certain critical $N = N_c$ and $v = v_c$ the coupling factor, which measures the degree of interaction between the ordinary and extraordinary modes, becomes infinite. Instead of attempting to solve the standard coupled wave equations at or near this singularity, a different reference system is introduced based on the principal directions of the three-dimensional dielectric ellipsoid. These directions depend only on the direction of the earth's field, and are thus essentially constant over the ionosphere. Analogy with crystals, as pointed out by LANGE-HESSE, suggests the possibility of optic axes in the ionosphere. It is shown here that such axes can exist in the presence of collisions and that this is precisely the condition for critical coupling. The ionosphere acts isotropically at such a level, with no principal modes being singled out. Some application to data at 150 kc/sec is made. --Author's abstract.

A-345 Davids, Norman and Parkinson, R. W., A long-wave solution near critical coupling. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 54, Nov. 25, 1953. 8 figs., tables, 17 refs., eqs. DWB--By using the reference system based on the principal directions of the three-dimensional dielectric ellipsoid, it is possible to put the coupled wave-propagation equations into a form where the coefficients are well behaved. This is particularly desirable for ionospheric models containing regions near critical coupling. It is shown how the more usual equations can be transformed. "First order" results are obtained for data at 150 kc/s, including scattering coefficients. It is also shown that reflections exist at critical coupling, but that their magnitudes are less than 10%. Methods of solution for the exact equations are described. --Authors' abstract.

A-346 Davidson, David, Characteristics of sporadic-E ionization at middle latitude. Harvard Univ. Cruft Lab., Technical Report No. 230, June 15, 1955. 85 p. tables, 41 refs., eqs. numerous figs. (incl. photos). DWB--A major report on results of 1951-1954 studies of sporadic E phenomena using a 3-station (Concord, Gloucester and Sandwich, Mass.) base line of 100 km. Cloud velocities of 400 to 1000 km/hr, prevailing from the ENE, around midnight local time, and favoring periods of marked geomagnetic or auroral activity, were noted. Several forms were observed, but the predominant form was that of multiple reflections from a thin layer at 100-120 km height. In Oct. through Dec. there was an inverse relation between sunspot and sporadic E incidence and even better if the square of the foF2 non median values is used instead of sunspot number. This relation breaks down at the equinoxes. Data, charts, graphs and references are given in extenso. --M. R.

A-347 Davies, Frank T. (Telecommunications Estab., Defence Res. Bd. of Canada), The ionosphere over northern Canada. Arctic, Montreal, 7(3/4):188-190, 1954. DLC--Ionospheric research carried out in Canada by the Telecommunication Div. of the Dept. of Transport in cooperation with the Radio Physics Lab.

of the Defence Research Board is reviewed. The extent of ionospheric stations established, the results of studies on prediction of average height and electrical density of the ionosphere for given times of day and season, the radio noise level of northern Canada and contemplated ionospheric research are discussed. --I. L. D.

A-348 Davies, Kenneth and Hagg, E. L., Ionospheric absorption measurements at Prince Rupert. Journal of Atmospheric and Terrestrial Physics, 6(1):18-32, Jan. 1955. 10 figs., table, 12 refs., 7 eqs. DWB--Observations in 1949-50 on 20 Mc in 54.3°N, 130.3°W, near the auroral zone are discussed. Noon values of absorption show little dependence on solar zenity angle χ but are abnormally high in winter. Diurnal variation of -log ρ is represented roughly by β (cos χ)^{n} where β varies from 9 to 35 and n from 0.82 to 0.29 in individual months; mean values 20 and 0.5. Value of -log ρ increases linearly with 3-hour magnetic index K when K is above 4; mean correlation 0.59. There is a less close relation (0.31)with sporadic E ionization. After discussion of these results it is concluded that near the auroral zone ionization by UV radiation is modified by the influence of charged corpuscles. -- C. E. P. B.

A-349 Davies, Kenneth, Some studies of the transmission of high frequency radio waves via the ionosphere at oblique incidence. Brown Univ. Div. of Engineering, Providence, Rhode Island, Contract AF 19(604)-2066, Scientific Report AF 2066/2, June 1958. 34 p. 17 figs., table, 14 refs., 42 eqs. --The anomalous reflection of high frequency radio waves from the ionosphere at frequencies near the maximum observed frequency is described with graphical illustrations. The elementary theory of its transmission via the ionosphere at oblique incidence and the analytical results of the investigation are discussed. This report also covers a description of the sweep frequency pulse measurements conducted in the United States and in Canada during 1952 through 1954. The data on how the anomalons propagation depends on the angle of incidence is obtainable from Canada where paths varying in length from about 1000 km to 6000 km are operated simultaneously. --N. N.

A-350 Davis, R. M., Jr. and Finney, J. W. (Central Radio Propagation Lab., NBS, Boulder, Colo.), Interference effects of F2 propagation at VHF. U. S. National Bureau of Standards, NBS Report, 6004, Oct. 15, 1958. 18 p. 14 figs., 5 tables, 5 refs. DWB (621.384 U585in)--F2 layer propagation is a major source of longrange interference connected with operation of ionospheric-scatter communications circuits. The magnitude and variations of the interference are investigated in this report by means of a study of the maximum usable frequencies for 4000 km transmission (F2 4000 MUF). The variable selected for study is the frequency exceeded by the MUF for a given percentage of the total time over all the hours of the day. Values of this variable have been derived for each 10° of latitude in the E, I, and W zones, at three seasons of the year (December solstice, June solstice, and equinox) and for low and high sunspot numbers. The basic data used for the computation of F2 4000 MUF were the charts of this parameter predicted in the CRPL D-Series for 12-month periods representing low and high sunspot numbers. The data were reduced to the desired values of F2 4000 MUF exceeded 1% and 10% of the total time by a machine computation method. This consisted of the selection and testing of successive trial frequencies until values were found that corresponded to the 1.0% and 10.0% MUF's to the nearest tenth of a percent. The statistical considerations underlying the use of this method are discussed in some detail. An outline is given of the exploratory steps that led to the procedure finally adopted. Substantial revisions were made in the values of F2 4000 MUF originally derived, on the basis of observations of this quantity at several positions on the earth's surface. The final data were incorporated in world charts applying to a given level (1% or 10%), a given season, and either low or high sunspot number. A procedure is described for using the charts to find the frequency required to limit scatter circuit interference to a specified level. Mention is made of the uncertainties and limitations inherent in any effort to predict the interference effects of F2 layer interference. The twelve world charts of F2 4000 MUF can be used to estimate both the mutual interference and the self-interference likely to affect a given scatter-communications circuit. --Authors' abstract.

A-351 Davis, R.M., Jr.; Smith, E.K. et al. (all, Natl. Bureau of Standards, Boulder, Colo.), Sporadic E at VHF in the U.S.A. Institute of Radio Engineers, N.Y., Proceedings, 47(5, Pt. 1): 762-769, May 1959. 11 figs., 2 tables, 15 refs. DWB--An analysis is made of sporadic E propagation observed on the Cedar Rapids to Sterling path during the four years, 1952-1955. VHF transmissions over this path at frequencies of 27.775 mc and 49.8 mc provided the Es data. At this latitude, the summer months receive the preponderance of sporadic E. Diurnally, sporadic E occurrence tends to favor the daytime and evening hours with peaks of incidence about 1000 and 1800. No variation with sunspot number has been discerned. As a rule, higher Es signal intensities are recorded at 28 than at 50 mc. Cumulative distributions of signal intensity are presented for the two frequencies. A relationship is found between the frequency dependence of Es signal intensities ≧ -70 db, relative to inverse distance, and the distribution of fEs values at Washington, D.C. The relationship promises to be useful in the prediction of Es signal intensities on a world-wide basis. An inverse correspondence is shown between sporadic E occurrence and geomagnetic activity. The correspondence holds only over selected time intervals. The frequency dependence of received power under sporadic E conditions is different from that during normal scatter. The median frequency exponent is two or more times as large for sporadic E, and the exponents cover a much wider range of values. This is tentatively explained by considering the Es region to be composed of patches of intense nonuniform ionization, an hypothesis previously used to explain vertical incidence data. --Authors' summary.

A-352 de Bettencourt, J. E. and Klemperer, H., The beacon technique as applied to oblique incidence ionosphere propagation. Institute of Radio Engineers, Proceedings, 38(7):791-792, July 1950. 3 figs., refs., eqs. DLC--Determining the transmission time of a given mode via the ionosphere a technique similar to that used in microwave beaconry is described. An interrogator-responsor and a beacon transpondor was used over the 2615 km path. --W.N.

A-353 Dedrick, K.O.; Lynch, W.M. and Blanchard, H.P., A brief survey of 180 kc/s propagation. Stanford University, Electronics Laboratories, Contract W28-099-ac-157, Technical Report, July 1950.

A-354 Delobeau, F., La haute atmosphère: état actuel des recherches sur les vents ionosphériques. (The upper atmosphere: the current state of research on ionospheric winds.) La Météorologie, Paris, Ser. 4, No. 47:379-392, July/Sept. 1957. 13 figs., 16 refs., 15 eqs. French, English and Spanish summaries p. 379. DWB--The existence of local irregularities in the distribution of ionization in the upper atmosphere gives rise to ionospheric winds. The author then reviews the structure of the ionosphere including Chapman's hypothesis on the production of electrons as a function of height, the equations for the movement of electrons in the ionization layer, etc. The procedure, theory and equations underlying the various methods for measuring the speed of ionospheric winds are presented in detail; these methods are the method of MITRA which observes at three neighboring points the fluctuation of an ionospheric echo from a vertically directed radio-electric emission, the observation of meteor trails by radioelectric methods and MUNRO's method which involved the recording of the heights of reflection of a wave of fixed frequency in the F layer and in three very distant points. The method of three receivers has revealed the existence of variable winds in the E layer with a mean velocity of 80 met/sec (extremes of 20 and 300 m/sec); also the winds manifest a regular semidiurnal rotation. Comparable results have been obtained with the meteor method. In the F layer the regular semidiurnal rotation is not observed, instead there is a 24-hour period. The amplitude of the velocities is of the order of 100 m/sec. --I. L. D.

A-355 Delloue, Jean, Sur la direction d'arrivée et la polarisation des atmosphériques siffleurs. (Direction of incidence and the polarization of whistling atmospherics.) Académie des Science, Paris, Comptes Rendus, 244(6):797-799, Feb. 4, 1957. DLC--An apparatus used for selective observation of whistling atmospherics is described. Observations made with the apparatus show that whistling atmospherics always come from a direction close to that of the geomagnetic field. The direction of an individual whistler varies simultaneously with its polarization. The existence in the high atmosphere of very small ionized regions of short duration was ascertained. --Trans. of author's abstract.

A-356 de Maximy, Georges, L'ionosphère et la prévision des fréquences en télécommunications (propagation des ondes décamétriques). (The ionosphere and the forecasting of frequencies in telecommunications: propagation of decametric waves.) Paris, Editions Chiron, 1953. 54 p. 23 figs. (Les Cahiers de l'Operateur Radio). DLC (QC973.M3)--A practical manual with tables, nomograms, graphs, forms and examples, covering in several chapters the basic information on radio propagation, the ionosphere (structure, sounding, variations, storms), refraction and absorption in D layer, forecasting frequencies, solar relations, curves for prediction of propagation of decameter waves and tables for determining the most useful frequencies. --M. R.

A-357 Demers, Pierre, Theory of diffusion in the course of development of the lower ionospheric clouds. Canadian Journal of Physics, 36(6):704, June 1958.

A-358 Denisov, N. G., O vzaimodeistvii neobyknovennoĭ i obyknoennoĭ voln v ionosfere i effekte umnozheniia otrazhennykh signalov. (Interrelation between anomalous and ordinary ionospheric waves and the reinforcement of reflected signals.) Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki, Moscow, 29(3, i.e. 9):380-381, Sept. 1955. 4 refs., 5 eqs. DLC--The usual and the anomalous ionospheric waves cannot be considered as independent since the media, while inhomogeneous, are not sharply bounded or separated. Only in the regions far from the boundary layers can the two types be considered as separate or independent phenomena. Proof of the dependence in the boundary regions is given mathematically. --M. R.

A-359 De Voogt, A.H., <u>The calculation of the path of a radio-ray in a given ionosphere.</u> Institute of Radio Engineers, New York, Proceedings, 41(9):1183-1186, Sept. 1953. 5 figs., 6 refs., 14 eqs. DWB--A third degree function is presented giving in a hypothetical way the electronic density in the ionosphere as a function of height or distance to the earth center; by inserting appropriate values of the constants, in accordance with measured values from ionospheric sounding stations, it is possible to arrive at any desired or proposed form of distribution (CHAPMAN, HACKE), though there is no physical base for this third degree curve given in this paper. This function allows, after substitution, to calculate exactly, i.e., without any approximation, traveling-time, maximum height, and distance on the earth's surface reached by a radio-ray radiated at a given angle. Briefly, the calculation of the ray-path in an ionosphere based on measured values and heights of ionization-maxima at the ionospheric stations and based on arbitrarily selected values of gradients is shown to be possible. --Author's abstract.

A-360 Dickson, David V., <u>Nomogram and slide-rule for solution of spherical triangle problems found in radio communication.</u> Journal of Geophysical Research, 56(2):163-175, June 1951. 8 figs., tables, 3 refs. MH-BH--For prediction of communication frequencies and other ionospheric measurements which vary with latitude and longitude, a nomogram and slide rule based on NAPIER's proportions has been devised and the theory, data, the nomogram and slide rule and examples of their use are presented. It enables a fix to be made speedily from bearings taken at two points some distance apart. It is especially valuable where a great circle path intersects the edge of a polar gnomonic chart and must be carried across to another gnomonic chart. --M.R.

A-361 Dieckmann, Max, <u>Funktechnische und atmosphärisch-elektrische Probleme der Stratosphärenforschung.</u> (Radio engineering and atmospheric-electric problems of stratospheric research.) Deutsche Akademie der Luftforschung, Munich, Schriften, No. 46:117-146, Sitzungsperiode 1939/1940, pub. 1941. 17 figs., table, 12 refs. Discussion p. 145-146. DLC--The atmosphere is considered as consisting of two layers, from sea-level to the lower surface of the ionosphere, and the ionosphere. The wind direction and velocity are obtained from a small transmitter with antenna, carried by a sounding balloon. Heights are determined from the speed of ascent or barometric data. The radio waves emitted by the transmitter are received by two DF-receivers on the ground which measure the angles between the radio waves and N. From the position and height of the transmitter at successive times the wind is computed. The most suitable wave length is 10-11 m. The propagation characteristics are discussed theoretically and a formula for the computation of propagation distance, which could be reached under conditions that the transmitter and receiver are placed in an open space, is given:

$r = \frac{9.55.10^{-3}}{s} N$, where N = emission intensity, r = distance reached, s = required receiving field intensity in $\frac{\text{Volt}}{\text{m}}$. Direction finding and DF-receivers net is further discussed. The second part takes up the atmospheric-electric problems. Vertical distribution of the electric potential gradients and of transmission current values is shown on graphs, taken from EVERLING and WIGAND, up to 9 km. --C. E. P. B., N. A. Zikeev.

A-362 Dieminger, W., Über Echolautungen der Ionosphäre bei Schragen Einfall. (Echo soundings of the ionosphere at oblique incident.) Zeitschrift für Angewandte Physik, (3/4):90-96, March 20, 1951. --Review of methods of synchronizing transmitter and receiver for fixed- and variable-frequency working. Traces recorded using quartz-clock synchronization for pulse reception and receiver tuning are shown, and results are briefly discussed.

A-363 Dieminger, W., The scattering of radio waves. Physical Society of London, Proceedings, Sec. B, No. 64:142, 1951.--A review of the recent work on scattering draws attention to a number of discrepancies in the interpretation of the data. Most workers believe that the scattering is due to clouds in the E layer. The experiments described in this paper indicate that there are several types of scattering phenomena. It is concluded that the most common source of scatter is the reflection of waves from irregularities on the surface of the earth. In this case the wave path is from the sender to F layer--earth--F layer and hence to receiver, i. e. is analogous to a 2 x F reflection. The characteristics of the different types of scattering and their effects on the propagation of short waves are discussed.

A-364 Dieminger, Walter, Über die Ursache der excessiven Absorption in der Ionosphäre an Wintertagen. (On the causes of excessive absorption in the ionosphere on winter days.) Journal of Atmospheric and Terrestrial Physics, 2(6):340-349, 1952. 9 figs., 23 refs. English summary p. 340. DWB--On many winter days echoes are received on 1.6-4 Mc/sec from 75-90 km with a regular diurnal variation of height, minimum at noon, merging with a level of sporadic echoes at 95 km between sunset and sunrise, independent of frequency. The height of the echoes is closely related to short-wave absorption and they are attributed to partial reflection at sharp boundary of an ionized region extending downwards from E layer. It is possible that sporadic night reflection is due to volcanic dust. --C. E. P. B.

A-365 Dieminger, Walter (inst. for Ionosphere Investigation, Hanover, Germany), Origin of ionospheric scattering. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 11:175-194, 1952. figs., 21 refs. Discussion. DWB--Deals with occurrence and origin of scattering (scattered echoes) as observed at Lindau during 1947 and 1948. Dividing the echo types into: (1) E-scatter, (2) 1F-scatter, (3) 2F-scatter, (4) G-scatter, author discusses each type in some detail. The 2F type is due to ground irregularities, and is present regularly, the other types only under suitable ionospheric conditions. --W. N.

A-366 Dieminger, W., Ein neuer Ausbreitungsweg fur Ultrakurzwellen über grosse Entfernungen. (A new way of transmitting ultra short waves to great distances.) Umschau, 54(4):118-119, Feb. 15, 1954. DWB--Range of ultra-short waves is increased about 1/3 by refraction which varies with pressure, temperature and water content in lower atmosphere. Very abnormal ranges are due to reflection at ionosphere. This has been achieved regularly (up to 2000 km) in America by a special technique; the cause is discussed. --C. E. P. B.

A-367 Dieminger, Walter, Neue Erkenntnisse über die Entstehung der Streustrahlung bei Kurzwellen und ihre praktische Bedeutung. (New knowledge of the scattering of short waves and its practical importance.) Umschau, 54(10):300-303, May 15, 1954. 6 figs., 9 refs. DGS--An account of results of recent research at Lindau/Harz and Stanford Univ., California, with diagrams of reflection at F layer and scattering at earth's surface or occasionally at sporadic E layer. Scattering is mainly due to irregularities of earth's surface. Echo soundings can explore the ionosphere not only directly above the transmitter but for some thousands of km around it. --C. E. P. B.

A-368 Dieminger, Walter (Inst. für Ionosphärenforschung Max-Planck -Gesellschaft, Lindau), Über die Wirkung solarer Korpuskeln in der Ionosphäre. (Changes in the ionosphere from solar corpuscles.) Archiv der Elektrischen Übertragung, Stuttgart, 8 (6):259-268, June 1954. 16 figs., 32 refs. English summary p. 259. DLC--The paper discusses typical changes occurring in the ionosphere during the penetration of solar corpuscles inside and outside the zone of northern lights. This is followed by a report on an extension of the theory of CHAPMAN - FERRARO by MARTYN that allows the observed phenomena in the ionosphere and in terrestrial magnetism to be explained in the same basic manner. The essential idea is here that the corpuscles emitted from the "ring current" transfer the radial field of polarization of this current to the zone of northern lights. The meridional electrical field set up there brings current systems into motion and modifies as a secondary effect the distribution of the charge carriers in the F2 layer. --Author's abstract.

A-369 Dieminger, Walter, Short wave echoes from the lower atmosphere. (In: Physical Society of London, Physics of the Ionosphere, Pt. 1. The lowest ionosphere. London, Physical Society, 1955.

A-370 Dieminger, W., Das Internationale Geophysikalische Jahr, III, Die Pläne der Ionosphärenforschung. (The I. G. Y., Pt. 3, The plan of ionosphere investigation.) Umschau, 57(5):132-134, March 1, 1957. 2 figs. DLC--More than 200 stations are planned to investigate ionosphere during IGY, forming a wide network along geomagnetic equator, strips on 70°W, 10°E and 130°E, and special networks in auroral zones in Canada and Antarctica. German program is described. --C. E. P. B.

A-371 Dieminger, W.; Moeller, H. and Rose, G., Long-distance single F-hop transmission. Journal of Atmospheric and Terrestrial Physics, 13(1/2):191-192, Dec. 1958. 5 refs. --Observation of the high angle ray of single F-hop beyond the limiting distance of the ray radiated tangentially with the earth was predicted in 1955 by Dieminger and Moeller. This is a brief report on observations supporting their theory. --W. N.

A-372 Dieminger, Walter E (Max-Planck Inst. for Aeronomy), Clouds in the sporadic E-layer. Annales de Geophysique, Paris, 15 (1):23-30, Jan./March 1959. 8 figs., 24 refs. French summary p. 23. DLC--The sporadic E layer with its drifting clouds is still an unsolved problem of the ionosphere. Several questions are discussed here. To explain the fact of transparency, the hypothesis fitting best the bulk of observations is that of a nebulous structure of the Es layer. Horizontal extension, development and drifting away of these banks of clouds are studied. Finally, the possible origins of auroral E and sporadic E in moderate and equatorial latitudes are discussed. Auroral E seems to be produced by solar corpuscles penetrating as low as 100 km, or by radiation (probably X-rays) produced by the solar particles at greater heights. The release of energy stored during daytime by dissociation or ionization seems to be the most probable origin of sporadic E. --A. V.

A-373 Dieminger, W.; Möller, H.G. and Rose, G., Further results of sweep-frequency oblique incidence pulse transmissions. Journal of Atmospheric and Terrestrial Physics, 14(1/2):179-180, April 1959. 2 figs. DLC--Brief report on results of experiments by sweep-frequency oblique incidence pulse over N. European 2000 km path. It is shown that omission of F1 reflections gives (not the true distorted) propagation conditions. Preliminary conclusion that strong variations of F2-MUF are caused by variations of virtual height (probably because of Fl retardation) rather than by changes of critical frequency will be analyzed in detail. --W. N.

A-374 Dieminger, Walter, Transient fine structure of the E-layer. Journal of Atmospheric and Terrestrial Physics, 16(1/2):179, Oct. 1959. DLC--Routine ionograms as obtained at Lindau (über Northeim, Hannover) since 1950 show a complicated fine echo structure between foE and fminF2 varying from one record to another. In anticipation of detailed analysis it is suggested: 1) variation of virtual height of the intermediate echoes are due to varied retardation controlled by electron density within the stratification; 2) the multiple structure of the retarded F2 trace may be explained by vertical and off-vertical reflections. --W. N.

A-375 Dinger, Harold E. (Naval Research Lab., Wash., D.C.), Report on URSI Commission IV Radio noise of terrestrial origin. Institute of Radio Engineers, Proceedings, 46(7):1366-1372, July 1958. Also in: National Research Council, Publication No. 581:102-114, 1958. DWB, DLC--Commission IV deals with study of sources, propagation and effects of atmospherics, whistlers, dawn chorus and other VLF emissions of natural origin. Nine sessions were held, dealing with whistlers and other VLF emissions, use of atmospherics to investigate propagation phenomena, IGY projects, atmospheric sources, characteristics of noise and relation between source and atmospheric. These subjects are discussed and 6 resolutions on various aspects presented in detail. --M. R.

A-376 Dinger, Harold E., A four-year summary of whistler activity at Washington, D.C. Journal of Geophysical Research, 65(2): 571, Feb. 1960.

A-377 Dokuchaev, V.P., O vliianii magnitnogo polia Zemli na vetry v ionosfere. (Effect of the earth's magnetic field on ionospheric winds.) Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz. No. 5:783-787, 1959. 16 refs., 19 eqs. DWB, DLC--The author shows that in the theoretical interpretation of winds above 100 km it is necessary to take into account possible deviation from the geostrophic wind associated with the action of electromagnetic forces. The relationship between electrodynamic and hydrodynamic processes in the ionosphere is established by the action of the magnetic field of the earth upon the induction current arising during the movement of the conducting medium within this field. In magnetic hydrodynamics, for a medium posessing electrical conductivity, the equations of Navier-Stokes include the total electrodynamic force. If Coriolis force and the force of gravity are added then the equations assume the form

$$\frac{\partial V}{\partial t} + (V\nabla)V = \frac{\nabla p}{\rho} + \frac{1}{\rho c}\left[\dot{j} \times H_0\right] - g + 2[\omega V] + \nu\nabla^2 V$$

where and - velocity and density of the medium respectively; v - kinematic viscosity; g - acceleration of gravity; w - angular rotation of the earth; H_0 - magnetic field of the earth; j - density of the electric current. In case of an anisotropic medium the generalized ohm's law for an incompletely ionized gas is written as

$$\dot{j} = \sigma_0 (E' h_0) h_0 + \sigma_1 [h_0 \times E'] \times h_0 + \sigma_2 [h_0 \times E'],$$

where E - potential of the electric field, h_0 - unit vector of the magnetic field and σ_0, σ and σ_2 are parallel conductivity, transverse conductivity and the conductivity respectively. On the basis of these expressions the author obtains a simplified system of equations of x, y coordinates,

$$\frac{du}{dt} - \left(2\omega_z + \frac{\sigma_2 H_0 H_z}{\rho c^2}\right) v + \frac{\sigma_1 H_0^2}{\rho c^2} u = \frac{1}{\rho} \cdot \frac{\partial p}{\partial x},$$

$$\frac{dv}{\partial t} + \left(2\omega_z + \frac{\sigma^2 H_0 H_z}{\rho c^2}\right) u + \frac{\sigma_1 H_z^2}{\rho c^2} v = \frac{1}{\rho} \cdot \frac{\partial p}{\partial y}.$$

The solution of this system of equations is presented. In the stationary state the velocity of the wind in the E-layer is given by

$$u = - \frac{\Omega}{\rho(\lambda^2 + \Omega^2)} \frac{\partial p}{\partial y}, \quad v = - \frac{\lambda}{\rho(\lambda^2 + \Omega^2)} \frac{\partial p}{\partial y}$$

where

$$\lambda = \frac{\sigma_1 H_z^2}{\rho c^2} \quad \text{and} \quad \Omega = 2\omega_z + \frac{\sigma_2 H_0 H_z}{\rho c^2}$$

The stationary gradient wind in the F-layer is given by

$$u = -\frac{\Omega}{\rho \lambda^2} \frac{\partial p}{\partial y} \quad \text{and} \quad v = \frac{1}{\lambda \rho} \frac{\partial p}{\partial y}$$

--I. L. D.

A-378 Dolukhanov, M.P., Rasprostranenie radiovoln. (Radiowave propagation.) Moscow, Gosud. Izdatvo Literatury po Voprosam Sviazi i Radio, 1952. 490 p. refs., numerous figs., tables, and eqs. DLC)QC661.D6)--A textbook on radio propagation, going quite extensively into surface propagation, ionospheric propagation (p. 145-245), long wave, short wave, and ultrashort wave propagation and, finally, atmospherics and cosmic noise. Tropospheric meteorological factors are discussed on p. 436-461, in the chapter on ultrashort wave propagation. Theory, curves, etc. are given for humidity and temperature effects, channels and turbulent dispersion, absorption and beyond-the-horizon propagation. --M. R.

A-379 Dominici, Piero, Sulla misura dell'assorbimento ionosferico. (Measurement of the ionospheric absorption.) Annali di Geofisica, Rome, 5(4):561-568, Oct. 1952. 2 figs., English summary p. 568. MH-BH--Methods of ionospheric absorption measurement developed since APPLETON (1925) are briefly reviewed. The basic principles of two groups of such methods (the method of the continuous wave and the pulse method) are explained. An installation for absorption measurement to be established near Rome by the Istituto Nazionale di Geofisica is announced. It will consist of a 3-Mhz transmitter and a synchronized receiver placed 10 km from the transmitter. Transmission will be disrupted every 10 minutes for the purpose of identifying interference and disturbances. --G. T.

A-380 Dowden, R.L. and Goldstone, G.T., "Whistler mode" echoes from the conjugate point. Nature, London, 183(4658):385-386, Feb. 7, 1959. fig., 3 refs. DLC--Whistler mode transmission experiments were conducted from Tokyo, Japan to check the Eckersley-Storey theory "that whistler mode signals from Tokyo would return to the earth's surface at a point near Darwin, Northern Territory, some 3500 km from Hobart. They apparently did, and the 0.2 sec delay was found in agreement with the geomagnetic latitude. --W. N.

A-381 Drachev, L.A. and Berezin, U.V., (The effect of large inhomogeneities in the F2-layer on the reflection coefficient of radio waves.) Radiotekhnika i Elektronika, 2(10):1234-1239, Oct. 1957. In Russian.

A-382 Driatskii, V.M. and Besprozvannaia, A.S., Ionospheric conditions in the circumpolar region. Annales de Geophysique, Paris, 14(4):438-455, Oct./Dec. 1958. 13 figs., 11 photos, 3 refs. DLC--Ionospheric observations from the drifting station SP-3 during the period May 15, 1954 to April 14, 1955, and especially observations made during the Arctic night, are given. The authors give a short description of the characteristics of the apparatus and of the magnetic field state. The results of the observations are given for the normal E layer, the Es sporadic ionization, the $E2_s$ sporadic ionization, the normal F1 and F2 layers and the anomalous absorption of radio waves. Of greatest interest are the results received under the conditions of the Arctic night in connection with the F2 layer. The critical frequency for F2 layer during this period was unexpectedly high, reaching 5-6 mc at times. The evident sporadic type of the layer being expressed in the sharp change of the critical frequency in the layer from hour to hour and from day to day, a definite connection with the state of the magnetic field proves its corpuscular nature. At the same time, the distinct shape of height-frequency diagrams, normal for reflections from the F2 layer, stipulated by a wave radiation, can hardly be taken to agree with the corpuscular conception. It is still impossible to solve the problem of the nature of observed high ionization in the F2 layer during a Polar night. --A. V.

A-383 Drummond, J. E., The connection between ionospheric patterns and field strengths reflected on the ground. Journal of Atmospheric and Terrestrial Physics, 9(5/6):282-294, Nov. 1956. 3 figs., table, 8 refs., eqs. DWB--If the ionosphere is regarded as a plane, patchy reflector, it can be shown by using Doppler shift theory and wave theory that drift and turbulent processes with periods less than $\lambda/2 \sin \alpha$ (λ is the radio wavelength and 2α is the angle subtended by the reflecting area on the ground) do not produce patterns on the ground and other short-length processes are attenuated. The correlogram of the reflected signal is also correspondingly modified, and some ionospheric observations are examined in the light of this theory. --Author's abstract.

A-384 du Castel, François; Misme, Pierre and Voge, Jean, Réflexion d'une onde électromagnétique par une couche d'atmosphère présentant une variation de l'indice de réfraction. (Reflection of an electromagnetic wave on an atmospheric layer having a variation of the refractive index.) Académie des Sciences, Paris, Comptes Rendus, 246(12):1838-1840, March 24, 1958. DLC--More general formulation of the reflection coefficient, which may be interpreted as an increasing function of the atmosphere thickness where great stability prevails, is presented. --A. V.

A-385 Dumont, René, L'ionosphère et l'optique géometrique des ondes courtes. (The ionosphere and the geometric optics of short waves.) Paris, Dunod, 1958. 100 p. 33 figs., 11 refs. (Monographies Dunod, No. 3.) DWB (M10.535 D893io), DLC (QC879.D85). Review in La Météorologie, Paris, Ser. 4, No. 49:75, Jan./March 1958. --

A pocket-size textbook giving basic and up-to-date information on the ionosphere and its formation, structure, radio wave propagation, sounding by vertical pulses and by study of photochemistry, absorption, geomagnetic fluctuations, optical phenomena, meteors and rockets. Characteristics of the different layers, applications to long-distance radio, propagation, forecasting of ionospheric and radio propagation conditions, etc. are discussed. Aurora, airglow, sunspots, satellites, ionospheric tides and various theories are treated incidentally. Numerous schematic diagrams, an author and subject index are included. --M. R.

A-386 Duncan, R. A. (Radio Res. Labs., Commonwealth Sci. & Industrial Res. Organiz., Australia), Computations of electron density distributions in the ionosphere making full allowance for the geomagnetic field. Journal of Geophysical Research, Wash., D.C., 63(3):491-499, Sept. 1958. 3 figs., 18 refs., 18 eqs. DLC--JACKSON's method of computing electron density distributions from h'f records has been modified slightly and adapted for use on an electronic computer. Reduction of a single h'f record takes about 20 sec of computer time. The method makes allowance for the geomagnetic field and is exact save for the uncertainty about the electron density between ionospheric layers which is inherent in the method of pulse sounding from the ground. Rocket measurements (SEDDON et al., 1954) enable a reasonable resolution of this uncertainty. Some examples of electron density distribution at Brisbane are given. It is shown that the night-time distributions are much closer to the Chapman than the parabolic form. This is to be expected (Martyn, 1956) in a region in which the electron distribution is determined by the opposing processes of downward diffusion under gravity, and a height gradient of electron decay. The effect of geomagnetic disturbance on the day and night electron density profile is illustrated and discussed. --Author's abstract.

A-387 Dungey, J. W., Electrodynamics of the outer atmosphere. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 69, Sept. 15, 1954. 52 p. refs., p. 52., eqs. MH-BH--Because of relative motion between the Earth and the interplanetary gas the geomagnetic field is confined to the inside of a Chapman-Ferraro cavity. The physics of the charged particles and electromagnetic field inside this cavity, but above the ionosphere, is studied. Their static condition is described by isothermal diffusive equilibrium and hydrogen is predominant. STOREY's value of the electron density is adopted. The dynamics of the outer atmosphere may be described in terms of ALFVEN waves. The normal modes of oscillation are discussed and it is also shown that travelling waves must be generated at the outer surface, because of the motion of the interplanetary gas. The possible applications of this study to geomagnetic micropulsations and to travelling disturbances in the ionosphere are considered. --Author's abstract.

A-388 Dungey, J. W., Propagation of Alfven wave through the ionosphere. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report No. 57, Feb. 15, 1954. 19 p. table, 4 refs., 22 eqs. DWB--As a preliminary to a study of micropulsations, it is necessary to investigate the propagation of Alfven waves through the ionosphere. General results are obtained for waves travelling parallel to the magnetic field, and approximations are then made, which are valid for periods of the order of a minute. Numerical values are given for the ionosphere and results are given for the simple case when the magnetic field is vertical. An approximate discussion is also given of waves propagated obliquely to the magnetic field. --Author's abstract.

A-389 Dungey, J. W. (A. W. R. E., Aldermaston Berkshire, England), Effect of a magnetic field on turbulence in an ionized gas. Journal of Geophysical Research, Wash., D.C., 64(12):2188-2191, Dec. 1959. fig., 24 eqs. DLC--The problem is formulated using the equations of motion for each constitutent of the gas. Approximations are discussed, and idealizations are adopted appropriate to the ionosphere. A physical picture is given for the generation of irregularities in electron density by shear flow in the neutral air. Given the motion of the air, the electron density can be calculated, and this calculation is carried out in the linear approximation for an arbitrary Fourier component. --Author's abstract.

A-390 Dyce, R. B., Studies on propagation in the ionosphere. Cornell Univ. School of Electrical Engineering, Research Report EE 209, 1954.--The author of the body of this report, R. Dyce, has for the past two years been recording signals received at Ithaca from transmitters located at Cedar Rapids, Iowa. These transmitters have been operating continuously, radiating CW at frequencies of 49. 6 and 49. 8 mc/sec in connection with another experiment. During the period a study has been made of the times when these signals have been received here by auroral and sporadic E propagation. From this data curves are in surprisingly good agreement with those obtained by visual observations. The Sporadic-E curves are consistent with other radio observations of this phenomenon. Rough measurements of the distribution of signal strengths have also been made.

A-391 Ebert, W.; Ehlers, H.; and Dobiasch, R., Übersicht über den Stand der Arbeiten der Union Europeenne de Radiodiffusion (UER) über die Ionosphärische Ausbreitung der Lang und Mittelwellen. (Review of the European Broadcasting Union's works. Ionospheric propagation of long and medium waves.) Rundfunktechnische Mitteilungen, 3(5):205-, 1959. --The purpose of the work which started Oct. 1952 was to establish generally recognized curves of the nocturnal propagation. Description of measuring methods and statistical evaluation procedures given here include initial results of some all-night recordings and comparison with available data elsewhere. --W.N.

A-392 Elliott, G.L. and Weller, R., Some navigation problems at a guided missile range. Navigation, Los Angeles, 4(4):145-151, Dec. 1954. 4 figs., eqs. DWB--Discusses problems connected with the operation of guided missile ranges in general and the Point Mugu, Calif., sea test range in particular. Radio wave propagation effects, gravity anomalies, aerology and wind effects are among the problems mentioned in connection with navigational, tracking and plotting operations. --G.T.

A-393 Ellis, G.R., Angle of arrival of Z echoes. Nature, London, 171(4345):258-259, Feb. 7, 1953. fig., ref. DLC--Measurements made at Hobart (mag. lat. 51°S) during July-August 1952 on 4.65 Mc/s to test SCOTT's hypothesis that the weak third F2 penetration frequency (Z mode) observed at high magnetic latitudes is due to longitudinally propagated waves reflected from an area near the magnetic zenith. The Z echo reflection height was 170-210 km, and mean direction 7.8°N of the vertical in the magnetic plane. These results are inconsistent with the collisional frequency required on SCOTT's theory. --Physics Abstracts, No. 3771, 1953.

A-394 Ellis, G.R., F-Region triple splitting. Journal of Atmospheric and Terrestrial Physics, 3(5):263-269, June 1953. 7 figs., 2 tables, 8 refs. MH-BH--Measurements of the direction of arrival of Z echoes have been made at Hobart, Tasmania. The results indicate that F-region triple splitting is caused by back scattering from a rough layer. The directions observed are consistent with the assumption that reflection at the Z level occurs when the angle of incidence is such that the wave normal becomes parallel to the geomagnetic field at the ordinary level of reflection. --Author's abstract.

A-395 Ellis, G.R., On the propagation of radio waves through the upper ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 9(1):51-55, July 1956. fig., 2 tables, 7 refs., 7 eqs. DWB--

Since it is likely that electron densities of more than 0.1 electron per cm^3 exist at distances of several thousand kilometres from the earth, the propagation of the two low-frequency extraordinary modes through the ionosphere is improbable. Of the five possible ways in which waves can penetrate the lower ionosphere, we therefore have only three which can also penetrate the upper ionosphere. Of these three, the oblique longitudinal ordinary mode can produce only second-order observational effects in the absence of strong discrete sources of extra-terrestrial radiation, since its angular range is only about 1 degree (ELLIS, 1956). The low-frequency limit for the observation of cosmic radio emission will, therefore, in general be that given by fo F2, and the observation of these radiations from below the ionosphere is unlikely at frequencies much less than 1 Mc/s. --Author's conclusion.

A-396 Ellis, G. R., The Z propagation hole in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 8(1/2):43-54, Feb. 1956. 7 figs., 2 tables, 8 refs., 4 eqs. DWB--The occurrence of F region triple-splitting allows us to examine experimentally the properties of an unusual propagation hole in the ionosphere. Two methods of estimating the angular size of the hole are discussed. The first is based on the beam effect of Z echoes, according to which Z echoes are returned to the ground in a narrow beam. The second follows from an analysis of the distribution of angle of arrival of Z echoes. It is found at Hobart, with a wave frequency of 4.65 Mc/s, the hole is approximately circular with an angular width to half-power points of less than 0.84°. Under certain circumstances the propagation hole provides a means by which waves can pass completely through an otherwise reflecting ionospheric layer. --Author's abstract.

A-397 Ellis, G. R. A., Directional observations of 5Kc/s radiation from the earth's outer atmosphere. Journal of Geophysical Research, 65(3):839-843, March 1960. 3 figs., 2 tables, 5 refs. DLC--Low-frequency radio noise burst were observed by an Australian network of direction finders Sept.-Oct. 1959. Tabulated recordings and facsimilies are presented featuring bursts from sources in 40° - 50° lat. between 135° and 155°E long. Scanning of the projected world image by a satellite-borne 5 Kc/s receiver is suggested. --W. N.

A-398 Ellyet, C. D., Echoes at D-heights with special reference to the Pacific Islands. Terrestrial Magnetism and Atmospheric Electricity, 52(1):1-13, March 1947. 3 figs., 2 tables, 22 refs. DLC--Frequency range, diurnal and seasonal variations and echo strengths are analyzed and compared with those taken during 1944 and 1945. --W. N.

A-399 Ellyett, C. D. and Leighton, H., Solar cycle influence on the lower ionosphere and on VHF forward scatter. Institute of Radio Engineers, N. Y., Proceedings, 46(10):1711-1716, Oct. 1958. 4 figs., 2 tables. DLC--A brief survey of published literature indicates that the electron concentration in the D-region of the ionosphere changes with the solar cycle. Such changes should also be apparent in the VHF forward scatter signal intensities. Analyses have therefore been made of seven years' results, at 49.8 mc from the Cedar Rapids, Iowa, to Sterling, Va., forward scatter path (1243 km). On an annual basis, it is found that the monthly median received signal intensity, for the noon and afternoon period only, follows the same trend as the mean monthly sunspot number. The effect is still more pronounced when comparison is made with magnetic disturbance indexes. However, when the comparison with magnetic indexes is made using a direct comparison in each 3-hr period, and eliminating long-term trends, no observable increase of the signal intensity is found as the magnetic conditions become disturbed. This is in sharp contrast to the behavior of such circuits in auroral regions. Further analysis shows that a weak increase in signal intensity with a rising magnetic index does occur if the analysis is confined to the midday period. It is concluded, therefore, that any magnetic influence is smaller on middle than on high latitude scatter circuits, but an effect can be clearly discerned by studying the magnitude of the received signal through a solar cycle. These results show that VHF forward scatter signals are not caused by the reflection from meteor trails alone.--Authors' summary.

A-400 Ellyett, C. D. (U. Canterbury, Christchurch, New Zealand) and Watts, J. M., Stratification in the lower ionosphere. U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(2):117-134, Sept./Oct. 1959. fig., 2 tables, 149 refs. DWB, DLC--A survey of the evidence for stratification in the ionosphere below 100 km is given, covering radio and optical observations, and rocket measurements. The conclusion is reached that one stratum at about 85 km is observed consistently, and that other fine structure exists but has no long time constancy of height or pattern. There is no series of preferred heights below 100 km. The authors consider explanations which may account for the observations, and advocate the testing of radio methods of exploration in conjunction with rocket measurements in order to develop the most practicable means of obtaining accurate electron density versus height profiles on a synoptic basis. --Authors' abstract.

A-401 Engel, Leonard, Mystery of the air we explore. New York Times Magazine, Section 6, April 15, 1956. p. 27, 62-64. illus. DLC--A popular article on the structure, composition and methods of exploring the atmosphere, especially in the highest layers (by ionospheric radio sounding, rockets, satellites, etc.). The jet stream is also discussed and a cross-section showing atmospheric structure to 800 mi and various sounding devices presented. --M. R.

A-402 Eshleman, V. R., Theory of radio reflections from electron-ion clouds. Institute of Radio Engineers, Professional Group on Antennas and Propagation, Transactions, Vol. AP-3, No. 1: 32-39, Jan. 1955. Also issued as Stanford University, Electronics Laboratories, Contract N6 onr 251(07), Report No. 72, Dec. 1, 1953.

A-403 Etzweiler, G. A. and Schmerling, E. R., Measurements of the vertical incidence ionospheric absorption at 75 Kc/s. Pennsylvania. State Univ. Ionosphere Research, Contract AF 19(604)-1304, Scientific Report No. 109, Aug. 15, 1958. 125 p. 4 figs., 8 refs., 5 eqs. (Appendix: 112 p. of tables) DWB—(M10. 535 P415i)--The results of measurements of the absorption of radio waves at vertical incidence at a frequency of 75 kc/s are presented. The measuring techniques and equipments are described. The data are presented as diurnal plots of absorption for the period from Oct. 1, 1955 through April 25, 1957 and as monthly means for the interval Oct. 1955 through April 1957. --Authors' abstract.

A-404 Ewing, R. A., The determination of upper winds by electronic means. Sixth New Zealand Science Congress 1947, Proceedings, Royal Society of New Zealand, Transactions, 77(5):76-78, Nov. 1949. DLC--Discusses advantages and disadvantages of British and U. S. radio-direction finding methods and New Zealand microwave radar. The 700 and 900 megacycle pulse repeater is considered most accurate. --C. E. P. B.

A-405 Ewing, R. A., Use of radar as an economical means of obtaining upper wind data. New Zealand. Meteorological Service, Technical Note, No. 111, March 19, 1954. 7 p. 8 tables. Attached, Addendum, No. 1, 1954. Figures for tables shown in the note. 1 p. DWB--The economics of wind finding by primary radar and light-weight balloon-borne reflectors are discussed. The performance figures for the type ME 7 radar used by the N. Z. Meteorological Service are quoted. It is concluded that the system can meet the needs of most services where temperature soundings are not required to accompany each upper wind measurement. --Author's abstract.

A-406 Fanselau, Gerhard, Über die Störung der Ionosphäre vom 24-26 Januar 1949. (On the disturbance of the ionosphere from January 24-26, 1949.) Zeitschrift für Meteorologie, 3(4):100-110, April 1949. 6 figs., 5 tables. DWB--On Jan. 21st two large spots approached central meridian of sun. A magnetic storm began on Jan. 24th and is described in detail. Reception of the 1,250 m space radio wave from Kalundborg showed great variations. 27-day recurrences are clearly shown in Potsdam magnetic character figures from Dec. to March. Associated auroras on Jan. 24-26 are listed and described.--C.E.P.B.

A-407 Farley, D.T., Jr., A theory of electrostatic fields in the ionosphere at nonpolar geomagnetic latitudes. Journal of Geophysical Research, 65(3):869-877, March 1960. 9 figs., 7 refs.--This theoretical examination shows that coupling between the dynamo region and the F-region will be stronger at the poles, weaker at equator and can appear at all latitudes. Strength of the electric source field as produced by an irregular, horizontally stratified wind in the dynamo region is computed and the brief examination as to whether electrostatic fields may cause electron density variations in the F-region was negative.

A-408 Fedorova, L.N., Ionosfera i ee znachenie dlia radiosviazi. (Ionosphere and its importance in radio communication.) Meteorologiia i Gidrologiia, No. 2:57-58, March/April 1955. DLC--In this brief note, the author describes the composition and characteristics of the ionosphere, the study of the ionosphere by the analysis of radio signal, the characteristics of the various ionospheric layers and their relationship to radio propagation.--I.L.D.

A-409 Feinstein, J. (Natl. Bureau of Standards, Wash., D.C.), Higher order approximations in ionospheric wave propagation. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950. Proceedings, pub. 1951. p. 207-215. 12 eqs. DWB--Lengthy solution of theory of wave propagation in ionosphere shows that although the higher order terms produced by non-linearity of medium are negligible in the absence of resonance, the ionosphere cannot be considered as a simple anisotropic medium which can be represented by a tensor type dielectric constant, or in other words a charged medium cannot be reduced to one that is passive.--From author's abstract.

A-410 Feinstein, J., Ionospheric wave propagation at low frequencies. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 166-175. 3 figs., 3 refs. DWB--Theoretical and empirical comparison of wave theory and ray theory for propagation and reflection in a geomagnetic field. A true wave theory, not a ray or even a modified ray theory, is held to be the only reliable approach to solution of the observed characteristics of the ionosphere. --M. R.

A-411 Fejer, J. A., The diffraction of waves in passing through an irregular refracting medium. Royal Society of London, Proceedings, Sec. A, 220:455-471, 1953. --A relation is derived between the angular power spectrum of waves emerging from a thin diffracting screen random in two dimensions and the auto-correlation function describing the irregularities of the field as it emerges from the diffracting screen. The special case of an isotropic screen characterized by an auto-correlation function which depends only on distance and not on direction is discussed for normal and oblique incidence. Multiple scattering of waves caused by volume irregularities of the dielectric constant is considered. The angular power spectrum and the auto-correlation function describing the irregularities of the diffraction field caused by multiple scattering in a thick slab are determined. The results are compared with those obtained by Hewish for a thin phase--changing screen. The results are discussed in terms of problems arising in the study of radio-wave propagation.

A-412 Fejer, J. A., The interaction of pulsed radio waves in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 76 (6):322-332, Dec. 1955. 4 figs., 13 refs., 19 eqs. DWB--It has been established that radio-wave interaction between pulsed radio waves with frequencies of the order of 2 Mc/s takes place above the Transvaal during the day at heights of about 70-90 km. The use of this effect appears to be a promising method of exploring the lowest regions of the ionosphere. The results of the present observations support, for the case of small excess electron energies, the original form of the BAILEY-MARTYN (1934, 1935) theory of radio-wave interaction rather than the modification suggested by HUXLEY (1953). The results for the collision frequency appear to agree well with those of other workers. --From author's abstract.

A-413 Fejer, J. A. and Vice, R. W. (both, Nat. Inst. for Telecommunications, Res., Johannesburg, So. Africa), The use of full-wave solutions in the interpretation of ionospheric absorption measurements. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(3/4):307-317, Nov. 1959. 5 figs., 15 refs., 13 eqs. DWB, DLC--

A numerical method is developed for solving the equations of ionospheric wave propagation for vertical incidence. The method, which neglects coupling, is used for the calculation of ionospheric absorption. The absorption is first calculated in the usual manner by using the Appleton-Hartree formula and integrating up to the theoretical height of reflection. A "full-wave" correction to this result is then obtained from a step-by-step integration of the wave equation. The thickness of the region, for which this integration has to be carried out, is only a few free space wavelengths, and therefore, the additional time required for the calculation of the "full-wave" correction is relatively short. Numerical examples show that for frequencies of about 2 Mc/s this correction cannot be neglected. The method is applied in a preliminary interpretation of observed values of absorption. It is concluded that more than half of the observed absorption occurs less than 2 km below the theoretical height of reflection. --Authors' abstract.

A-414 Fejer, J. A. and Vice, R. W. (both, Nat. Inst. for Telecommunications Res., Johannesburg, S. Africa), An investigation of the ionospheric D-region. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(3/4):291-306, Nov. 1959. 11 figs., 8 refs. DWB, DLC--Two previously described methods of ionospheric investigation, the observation of weak echoes from the D-region (GARDNER and PAWSEY, 1953) and the measurement of ionospheric wave interaction (FEJER, 1955), are used to determine tentative profiles of electron density and collision frequency for the ionosphere below about 85 km. --Authors' abstract.

A-415 Fejer, J. A. (Defense Res. Telecommunications Establishment, Ottawa, Canada), Electrodynamic stability of a vertically drifting ionospheric layer. Journal of Geophysical Research, Wash., D. C., 64(12):2217-2218, Dec. 1959. fig., 2 refs., 8 eqs. DLC--The electrodynamic stability of a vertically drifting ionospheric layer is examined under certain simplifying assumptions. No evidence of instability is found. --Author's abstract.

A-416 Fennel, Perry, Winds in the ionosphere indicated by radio reflecting "clouds" of high ionic density. American Meteorological Society, Bulletin, 25:371, Nov. 1944. DLC--This brief excerpt from "Somewhere in India", Feb. 12, 1944, reports an observation of constant air currents at about 110 km elevation of approximately 100 km per hour. --W. N.

A-417 Ferraro, A. J., Experimental and theoretical investigations of the low frequency polarization at 60, 75 and 150 kc/s. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 121, July 31, 1959. 96 p. 55 figs., 2 tables, 15 refs., eqs. DWB (M10.535 P415i)--The instrumentation for recording the state of polarization of 60 kc/s and 75 kc/s echoes for vertical incidence radio soundings is described in detail. Basically, the equipment resolves the polarization ellipse into its two circularly polarized components: the ordinary and extraordinary modes. The results of thirteen months of recording in the intervals of Dec. 1956 to April 1957 on 75 kc/s and Oct. 1957 to May 1958 on 60 kc/s are presented as monthly averages. In addition, a few typical daily curves of polarization for magnetically quiet and disturbed days are discussed. A catalogue of 25 ionospheric models for which the group height, phase height, absorption, and polarization have been computed for 60-75 kc/s and 150 kc/s are presented. From this catalogue a sequence of models are selected which adequately explains the "sunrise effect" as observed on 75 kc/s. In addition, a model is found which explains the average night-time data on 60-75 kc/s and 150 kc/s. --Author's abstract.

A-418 Ferraro, A. J. and Gibbons, J. J. (Ionosphere Res. Lab., Pennsylvania State Univ., Pa.), Polarization computations by means of the multislab approximation. Journal of Atmospheric and Terrestrial Physics, 16(1/2):136-144, Oct. 1959. 6 figs., 2 tables, 7 refs., 4 eqs. DWB, DLC--Becker et al. (1951-1958) discussed a step-discontinuity approximation method for rapidly determining the polarization of low frequency echoes including the effect of collisions and the earth's magnetic field. In the present paper, the results of this method are compared with those of a multislab approximation, and it is shown that the step method yields satisfactory results. For two electron density profiles (one near critical coupling and one far removed) the Rydbeck coupling region was subdivided into slabs of uniform media; by matching the fields between adjacent slabs, N-1 simultaneous equations (for N slabs) were obtained. Because of the complexity of these equations, digital computer techniques were employed to obtain the desired solutions. The rate of convergence was estimated by using an increasing number of slab approximations (as high as 10). --Authors' abstract.

A-419 Ferrell, O. P., Upper-atmosphere circulation as indicated by drifting and dissipation of intense sporadic-E clouds. Institute of Radio Engineers, New York, Proceedings, 36:879-880, July, 1948. 7 figs., 11 refs. DWB--Co-operative research program was initiated by author in 1947 to study effects of sporadic-E reflections in the radio amateur band (50-56 Mc.). Observations of two sporadic-E clouds show drifts in one case due west with a speed of 130 m/sec and in the second a northwest ward drift of 40 m/sec. --G. J. E.

A-420 Findlay, J. W., Measurements of changes of the phase-paths of radio waves in the ionosphere. Nature, London, 159(4028): 58-59, Jan. 11, 1947. 3 figs., 3 refs. --A modification of the pulse method to determine both the magnitude and the sense of a change of pulses from E and F layers using 150 m and 75 λ show an accuracy better than 100 m in path change occurring in some few minutes. An explanation for the change is offered. --W. N.

A-421 Findlay, J. W., An investigation of sudden radio fadeouts on a frequency near 2 Mc/sec. Journal of Atmospheric and Terrestrial Physics, 1(5/6):367-375, 1951. 2 figs., 3 tables, 12 refs., 8 eqs. DWB--Observations on 105 fadeouts were made on frequencies near 2 Mc/sec^{-1} to determine the height at which extra ionization is produced during a sudden fadeout. This height was found less than 101 km with a collision frequency of about $4. 10^5$ sec^{-1}. --A. A.

A-422 Findlay, J. W., The phase and group paths of radio waves returned from region E of the ionosphere. Journal of Atmospheric and Terrestrial Physics, 1(5/6):353-366, 1951. 11 figs., 2 tables, 18 refs., 14 eqs. DWB--In measuring the daily and seasonal variations of phase paths of radio waves of the frequency 2.4 Mc/sec^{-1} returned from the E layer it is found that the results disagree with those found for Chapman-region. --A. A.

A-423 Fitch, E., The problem of introducing ionospheric scatter communication systems into the European frequency region. AGARDograph, Paris, No. 26:43-56, July 1957. 9 figs., table, 3 refs. DWB (629.1332 N864a)--Radio propagation (at 37.3 Mc/s) by scatter from the ionosphere or meteor trails, and problems due to interference from local sources, troposphere, meteor trails, sporadic E, F2, etc. both from a scatter system to other systems, and to a scatter system are discussed. Based on 1955 studies at Malta and 1956 and 7 from Gibralter or Keflavik to England conclusion is that choice of highest possible frequency minimizes these interferences and eliminate the F2 layer interference. Examples of types of interference are shown on records; careful site location (e.g. on a coast backed by a high cliff) will eliminate local interference. Most of the energy will come from meteor trail scatter - some from turbulent scatter. --M. R.

A-424 Fleming, John Adam, (ed.), Terrestrial magnetism and electricity. Contributors, J. Bartels and others. (Reprinted with corrections.) N. Y., Dover Publications, (1949). numerous figs., tables, eqs. Physics of the Earth, v. 8. DLC--An excellent reference work on all aspects of the subject. It contains 12 chapters written by experts in the fields, and a comprehensive bibliography of 1523 refs. in ch. 13. Three chapters particularly applicable to this bibliography are: ch. 9, Berkner, L. V., Radio exploration of the earth's outer atmosphere (p. 439-491). Ch. 10, Hulburt, E. O., The upper atmosphere (p. 492-572). Ch. 13, Harradon, Harry Durward, Bibliographic notes and selected references (p. 679-778). Section D of the bibliography (p. 749-758) contains 183 references to works on the ionosphere. The bulk of the material was published in the 1920's and 1930's.--M. L. R.

A-425 Florian, Endre, Radiohullamok az ionoszferaban. (Radio waves in the ionosphere.) Termeszet es Tarsadalom, Budapest, 115(6):355-359, June 1956. photos, diagrs. DLC--The role of various atmospheric layers in the propagation of radio waves of different lengths is discussed; the geometry of ionospheric reflection is explained with the help of schematic diagrams. Since 1955 regular hourly measurements of ionospheric parameters have been made at Budapest (height and density of ionospheric layers, etc.). Ionospheric research activities in Hungary are being conducted with two objectives in mind, namely (a) to determine (and soon to forecast) radio propagation conditions and (b) to find relationships between ionospheric anomalies, temperature variations, etc. and weather development in the lower atmospheric layers. --G. T.

A-426 Forsgren, Sven K. H., Some calculations of ray paths in the ionosphere. Gothenburg, Sweden. Chalmers Tekniska Hőgskola, Handlingar, No. 104, 1951. 22 p. graphs, diagrs., refs. Price Kr. 3. (Gothenburg, Sweden. Chalmers Tekniska Hőgskola, Research Laboratory of Electronics, Report No. 17.) DWB--Due to earth's magnetic field, waves in the ionosphere deviate horizontally. Purpose of this paper is an attempt to calculate the magnitude of the different deviations of waves. During ionospheric disturbances, when large horizontal gradients of electron density occur, the phenomenon becomes more marked. The site of Kiruna is favorable for these studies. Results are presented in elaborate diagrams and approximate theory developed for the refractive index and deviations at vertical incidence. --W. N.

A-427 Försterling, Karl and Wüster, Hans-Otto, Über die Entstehung von Oberwellen in der Ionosphäre. (Generation of higher harmonics in the ionosphere.) Journal of Atmospheric and Terrestrial Physics, 2(1):22-31, 1951. 5 refs., eq. English summary p. 22. DWB--It is shown, in continuation of earlier work on the propagation of plane electromagnetic waves in an inhomogeneous stratified medium, that the strength of the electric field parallel to the plane of incidence shows a singular point near a zero of the dielectric constant and, in the absence of damping, becomes infinite. Power series are developed for the case of a single null point. With a double null point the singular points can be represented by known functions. The singular points so determined give rise to higher harmonics which are not radiated by the transmitter. --C. E. P. B.

A-428 Forsyth, P. A.; Currie, B. W. and Vawter, F. E., Scattering of 56 Mc/s radio waves from the lower ionosphere. Nature, London, 171(4347):352-353, Feb. 21, 1953. ref. DWB--A persistent scatter echo was recorded at Saskatoon (52.1°N, 106.6°W). It was strongest in March and in the morning hours. Estimated height of scattering region 85 km. --C. E. P. B.

A-429 Franklin Institute. Laboratories for Research and Development, Phila., Development, design, instrumentation. Blossom 4 series. Contract AF 19(122)-33, Final Report F-2106, March 1, 1950. 2 V. (401 p.) numerous figs. (some fold., also many photos, some in color), refs. (vol. 2, p. 306-308), bibliog. (Vol 2, p. 401.) DWB--The details of history, organization, design, development, instrumentation and launching of the V-2 rockets at White Sands (Blossom I, II-A, II-B and III and Aspect I, II, and III from Feb. 29, 1947 to June 11, 1949 in Missiles No. 20, 28, 37 and 39) are treated in Vol. 1, along with complete information about the development of the V-2 and other rockets in Germany from 1932-1942. The second volume deals with the design, development and instrumentation of the Blossom IVseries. Blossom IV-A was carried by V-2 rocket No. 41 fired on March 21, 1949. Radiation, electrical pressure, temperature, ionospheric and other data were obtained by parachute, radar, radio and optical methods. Blossom IV-B was fired June 14, 1949. --M. R.

A-430 Friedman, Bernard and Russek, Joy (N. Y. Univ. Wash. Square Coll.), Addition theorems for spherical waves. N. Y. University. Washington Square College of Arts and Science. Mathematics Research Group, Contract AF 19(122)-42, Research Report, No. EM-44, June 1952. 19 p. 10 refs., 39 eqs. DWB--

Expansions or "addition theorems" for the spherical wave functions:

$$J_n (KR)P_n^{(m)} (Cos\ 0)\ e^{im} \varnothing\ hn^{(1)}$$

$$(KR)P_n^{(m)} (Cos\ 0)\ e^{im} \varnothing \text{ and } h_n (2)\ (KR)^{(m)} (Cos\ 0)\ e^{im} \varnothing.$$

With reference to the origin 0, have been obtained in terms of spherical wave functions with reference to the origin 0; where 0 has the coordinates (h_o, 0_o $\varnothing_o$) with respect to 0. Using the above mentioned addition theorems, we have obtained an expansion for

$$\frac{e^{i k r_{12}}}{r_{12}}$$

a wave which is spherically symmetric about the source Q, where Q is referred to the origin 0, in terms of products of spherical waves with respect to origin 0 and spherical waves with respect to 0'. --Authors' abstract.

A-431 Friedman, Herbert, Rocket observations of the ionosphere. Institute of Radio Engineers, Proceedings, 47(2):272-280, Feb. 1959. 9 figs., 2 tables, 26 refs., 2 eqs. DLC. Correction in Ibid, 47(4):567, April 1959, Eq. no. 2 on p. 275 should read: $N_2^+ + 0 \rightarrow NO^+ + N$. --Daytime electron density profiles measured at Fort Churchill have been found to be similar to those observed at White Sands. One winter nighttime flight showed very little ionization, less than 20,000 electrons per cc up to 165 km. Polar blackout produced strong enhancement of the D-region electron density down to 55 km. NO^+ is the predominant ion below 200 km during the night, but 0^+ becomes the most abundant ion above 150 km during the day. Solar flares are accompanied by X-ray bursts capable of penetrating to the 60 km level and sufficiently intense to account for sudden ionospheric disturbances. At night a diffuse glow of Lyman -α is visible over the entire sky. From the observed intensity it is possible to estimate the electron density of interplanetary space. --Author's summary.

A-432 Fuchs, J., Eine Radio Methode zur Bestimmung de Absoluttentemperatur der Ionosphäre. (A radio method for determination of the absolute temperature of the ionosphere.) Meteorologische Zeitschrift, 53(2):41-44, Feb. 1936. tables, 10 refs., 13 eqs. DLC--The method is used here to show that the F-region temperature of 400° - 1,000°C near the equator largely depends on the electron density indicating that the temperature aloft is controlled by the absorbed UV-energy in the ionization process. --W. N.

A-433 Fulton, B.; Sandoz, O. and Warren, E. (all, Defence Res. Telecommunications Estab., Ottawa, Canada), The lower frequency limits for F-layer radio propagation. Journal of Geophysical Research, Wash., D.C., 65(1):177-183, Jan. 1960. 12 figs., 4 refs., 13 eqs. DWB, DLC--The band of frequencies propagated via the ionosphere by the high-angle ray and that propagated by the low-angle ray are both limited at their low-frequency ends by reflections that occur at lower ionospheric heights. Methods are developed in this paper for the calculation of these limits.--Authors' abstract.

A-434 Furutsu, K., One communication in the sea by VLF electromagnetic waves. Japan. Radio Research Laboratory, Journal, 5(19):19-33, Jan. 1958. 15 figs., ref.

A-435 Gallagher, P.B., Analysis of a new type of radio scattering from the ionospheric E-region. Stanford University, Electronics Laboratories, Contract N6 onr 251(07), Technical Report No. 107, May 7, 1956.

A-436 Gallagher, P.B. and Villard, O.G., Jr., Radio reflections from artificially produced electron clouds: Smokepuff II. Stanford University, Electronics Laboratories, Contract AF 19(604)-2075, Scientific Report No. 1, Dec. 1958.

A-437 Gallet, R.M. and Helliwell, R.A., Origin of "Very-low-frequency emissions". U.S. National Bureau of Standards, Journal of Research, 63D(1):21-27, July-Aug. 1959. 4 figs., 2 tables, 14 refs.

A-438 Gallet, R., Une nouvelle station ionosphérique à Dakar. (A new ionospheric station at Dakar.) Annales de Géophysique, 5(3):248-249, July-Sept. 1949. 3 refs., eq. MH-BH--The author discusses the value of this station for studying the following ionospheric phenomena; the effect of longitude upon the ionization of the F2 layer, the characteristics of the sporadic E layer at equatorial latitudes, precise measurement of the critical frequency of the normal E layer, absorption in the D layer and "fade out." The geographic and geomagnetic coordinates of the station are given.--I.L.D.

A-439 Gallet, Roger, Sur la nature de la couche E sporadique et la turbulence de la haute atmosphère. (On the nature of the sporadic E layer and the turbulence of the upper atmosphere.) Académie des Sciences, Paris, Comptes Rendus, 233(25):1649-1650, Dec. 19, 1951. ref., eq. DWB--An attempt to formulate the relation between the optical turbidity, the changes in molecular density (turbulence) and the electronic density in the high atmosphere as a method of explaining and measuring the fluctuations in the ionospheric E layer.--M.R.

A-440 Gallet, R. M. (Nat. Bur. Standards, Boulder, Colo.), Aerodynamical mechanisms producing electronic density fluctuations in turbulent ionized layers. Institute of Radio Engineers, N. Y., Proceedings, 43(10):1240-1252, Oct. 1955. 8 figs., table, 7 foot-refs., bibliog. p. 1252, numerous eqs. DLC--Various radio effects of the turbulence in the low ionosphere are discussed with a view toward determining the order of magnitude of the turbulence parameters in this region. These effects include vhf scattering, sporadic E layer phenomena, and diffraction patterns in reflection. The required electron density fluctuations $(\Delta N 1 N)^2$ fluctuate around 10^{-4} and the scale of the turbulence is roughly 100 to 200 m. The latter quantity measured directly in the troposphere is of about the same order of magnitude. The underlying purpose of the paper is to study the aerodynamical mechanisms of turbulence. Pressure fluctuations result from the "collisions and extensions between turbulent eddies" in a uniform gas, or from vertical transport in the atmosphere with its varying pressure. It is shown that such pressure fluctuations are soo small, by a factor of about 10^{-4}, to produce the observed density fluctuations. However, the vertical transport mechanism produces two other effects which are independent of the energy of the turbulence and are of the right order of intensity. First, in a nonadiabatic atmosphere the vertical transport of air masses produces fluctuations of temperature. These, in turn, give rise to air density fluctuations, and proportional electron density fluctuations. Second, fluctuations of electron density result directly from transport in the presence of a gradient of electron density. These two effects, for the same uniform turbulence, occur at different levels in an ionospheric layer. They are sufficient to explain the stratification properties of sporadic E. An expression for the scale of turbulence is obtained from the gradients of winds circulating in the low ionosphere. Hence, the properties of sporadic E phenomena should be interpreted in terms of meteorological factors (winds, synoptic masses of air, fronts, etc.). It is pointed out that the same transport mechanisms are acting in the troposphere, the gradients of water vapor content playing the role of the gradients of electron density. --Author's abstract.

A-441 Gallet, Roger M. (Nat. Bur. of Stands., Boulder, Colo.), The spectrum of the electron density fluctuations in the ionosphere. (In: Polar Atmosphere Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionospheric Section. N. Y., Pergamon Press, 1958. p. 165-170, fig., 4 refs., 18 eqs.) Also issued in Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, Pt. 1, 1957, pub. 1958. p. 165-170. DWB, DLC--

A theory of atmospheric temperature and density fluctuations and of their effect upon ionospheric electron density is developed and the application of this theory to the scattering of radio waves is discussed. --G. T.

A-442 Gallet, R. M. and Helliwell, R. A., Origin of "Very-Low-Frequency Emissions". U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(1):21-27, July/Aug. 1959. 4 figs., 2 tables, 14 refs., 9 eqs. DLC, DWB--Selective traveling-wave amplification in the outer ionosphere is postulated to explain very-low-frequency emissions, a class of very low-frequency (1 to 30 kilocycles per second) natural noise. By analogy with the mechanism of traveling wave tubes, low-level ambient noise in the outer ionosphere is amplified in streams of incoming ionized solar particles at frequencies for which the stream and wave velocities are equal. Required velocities are in the range 0.01 to 0.1 c (where c is the velocity of light). Streams with densities of the order of one electron per cubic centimeter would provide sufficient energy. Phenomena which can be explained qualitatively by the theory are the hiss, quasi-constant tones, dawn chorus and related transients, and very long trains of whistler echoes. A quantitative example shows how the theory can reproduce the general form of certain characteristic discrete spectra "hooks" of emissions, and how this leads to definite values of particle velocity and a law for the distribution of electron density in the outer ionosphere. --Authors' abstract.

A-443 Gardner, F. F., The use of atmospherics to study the propagation of very long waves. Philosophical Magazine, London, 41(323):1259-1269, Dec. 1950. 6 figs., 4 refs. DLC--The "level" of integrated atmospherics received on narrow-band receivers tuned to a series of different frequencies between 3.5 and 50 kc/s has been recorded and the results analyzed. The most significant effect is a marked attenuation of waves of frequency below 10 kc/s when travelling over distances of 1,000 km or more. This attenuation is discussed and is related to the quasi-sinusoidal waveform often assumed by atmospherics which have travelled great distances. A decrease in the level of atmospherics has been found to occur during sudden ionosphere disturbances on frequencies below about 10 kc/s. This contrasts with the known increase on frequencies above about 20 kc/s. --From author's abstract.

A-444 Gardner, F. F. and Pawsey, J. L., Study of the ionospheric D-region using partial reflections. Journal of Atmospheric and Terrestrial Physics, 3(6):321-344, July 1953. 18 figs., 2 tables, 9 refs., 6 eqs. MH-BH--

A method is described of regularly observing echoes at vertical incidence down to 60 km, using high sensitivity on 2 Mc/s at a low-noise site near Sydney, Australia, and of determining electron density and collision frequency from them. It is found that the ionosphere below the normal E region includes a region at about 70 km with maximum ionization at midday, disappearing at night, and one at 90 km extending up to normal E region and, by day, descending to merge with lower region. This is the main cause of medium and short wave attenuation. --C. E. P. B.

A-445 Gardner, F. F., Ionospheric thermal radiation at radio frequencies. II, :Further observations. Journal of Atmospheric and Terrestrial Physics, 5(5/6):298-315, 1954. --Observed ionospheric noise at 2 Mc/s at a quiet location in Australia. Found midday temperature of 200 to 250° K. During SID's the temperature went up 40° K, probably due to a change in height of the absorbing region. By comparing O and X noise, it was shown that the temperature decreased with height. Explains results in terms of a fixed temperature-height model similar to that determined from rocket measurements, but having a minimum of 217° K at 80 km. Used a single horizontal dipole antenna 80 feet high and 235 feet long. Measured aerial temperature by comparison with a dummy antenna. --L. A. M.

A-446 Gardner, F. F., The effect of sudden ionospheric disturbances (SID) on 2. 28 Mc/s pulse reflections from the lower ionosphere. Australian Journal of Physics, 12(1):42-53, March 1959. 7 figs., 2 plates, 10 refs..

A-447 Garriott, O. K., A note on whistler propagation in regions of very low electron density. Journal of Geophysical Research, 63(4):862-865, Dec. 1958. 4 figs.

A-448 Gates, D. M., Preliminary results of the National Bureau of Standards radio and ionospheric observations during the International Geophysical Year. U. S. National Bureau of Standards, Journal of Research, 63D, No. 1:1-14, July-Aug. 1959. 10 figs. 2 tables, 18 refs.

A-449 Gautier, T. N., Jr. and Sargent, C. J., Prediction of the likelihood of interference at frequencies of 30 to 42 megacycles in Alaska. U. S. National Bureau of Standards, Journal of Research, 52(1):21-31, Jan. 1954. Research Paper, No. 2468. 50 figs., 3 refs. DLC--The likelihood of interference with very-high-frequency networks in Alaska from stations operating on similar frequencies in other parts of the world, as a function of season, sunspot number, and time of day, is presented. This example serves as a model for similar computations for other communication links. Calculations are based upon regular reflection from the F2 layer, and data are supplied for estimating the probability of interference from sporadic E reflections. --Authors' abstract.

A-450 Gerson, Nathaniel C., Large-scale sporadic movements of the E-layer of the ionosphere. Nature, London, 166(4216):316-317, Aug. 19, 1950. fig. DWB--Preliminary results given of work on sporadic movements of E-layer, undertaken by radio amateurs (operating on 50 Mc/s) situated in various parts of North America. Observed direction of movements and speeds of 4 reflecting regions suggest an anticyclonic circulation. --G. J. E.

A-451 Gerson, N. C., Noise levels in the American Sub-Arctic. Institute of Radio Engineers, Proceedings, 38(8):905-916, Aug. 1950. 15 figs., table, 6 refs. DLC--Detailed results of a six months study of the atmospheric static intensity at 150 Kc in northern and southern Canada are discussed. The noise equipment comprised an 18-tube superheterdyne receiver (Kammarlund Super Pro, Type BC-779-A along with an automatic recorder (Esterline Angus). --W. N.

A-452 Gerson, N. C., Summary of a meeting on mathematical problems in ionospheric research. U. S. Air Force, Cambridge Research Center, Geophysical Research Papers, No. 7; 175-176, Dec. 1950. DWB--Short discussion on a number of problems, mainly in the fields of the propagation of short and long radio waves, the magnetoionic theory, and tropospheric influences and the solar ionosphere. --A. A.

A-453 Gerson, N. C., Continental sporadic E activity. American Geophysical Union, Transactions, 32(1):26-30, Feb. 1951. 8 figs., 2 refs. MH-BH--Numerous reports of abnormal radio propagation, due to reflections from a sporadic E layer, were received from ham radio operators all over the United States and are plotted on hourly charts for the period 2300 GMT, June 17 to 0500, June 18, 1949. Movements of the centers of mass of the Es layer are also shown on a composite map. One layer was in the southeast (moving west), one in the Montana area (moving south) and one in the Nevada area (moving west). --M. R.

A-454 Gerson, N. C., Abnormal E region ionization. Canadian Journal of Physics, 29(3):251-261, May 1951. 10 figs., 12 refs. DWB--The occurrence and sweep of sporadic E over North America was studied with the cooperation of radio amateurs transmitting in the frequency range 50-54 mc/sec. The movement and geographical extent of the reflection areas were determined by oblique incidence radio observations. The behaviors of two sporadic E centers observed on June 13, 1949 are described. --I. L. D.

A-455 Gerson, Nathaniel C. (Air Force Cambridge Res. Labs., Mass.), Sporadic E investigations. International Council of Scientific Unions, Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 121-125. fig., 3 refs. DWB--Methods of exploring the ionosphere with radio (vertical incidence back scatter, and by networks of amateur stations) are reviewed, and the program initiated by the U.S. Air Force for collection of sporadic E layer data by the last named method described. Charts of sporadic E layer reflection points for 0100Z and 0500Z May 20, 1949, when 426 radio contacts were reported show a "cloud" moving from Arkansas toward the NNW at average velocity of 125 km/h. --M. R.

A-456 Gerson, N. C., Bewegungen der abnormalen E-Schicht der Ionosphäre. (Movements of the abnormal E layer of the ionosphere.) Zeitschrift für angewandte Physik, 4(3):81-82, March 1952. 3 figs. DLC--Observations of Es "clouds" (with the help of radio amateurs) at about 110 km in U. S. June 16-17, 1949, are plotted. One in the northeast moved from ENE at 130 km/h. A smaller one in 100°W moved from SSE, 300 km/hr, and a third near 40°N, 115°W moved from E at 100 km/hr. The sudden appearance and disappearance of the clouds is attributed to vertical movements. --C. E. P. B.

A-457 Gerson, N. C. (Geophysical Res. Dir., Cambr., Mass.), A note on the conference on ionospheric physics. U. S. Air Force. Cambridge Research Center, Geophysics Research Papers, No. 11:13-14, 1952. DWB--The author, in his introductory remarks to the conference reports, brings out the fact that physicists have neglected many important fields of research such as were represented in this conference (physics of the high atmosphere and study of planetary atmosphere) while concentrating on nuclear and cosmic ray research. The atmosphere is considered as comprising several shells; the ionosphere (80-400 km), the mesosphere (400-1000 km) and the exosphere (above 1000 km). Specific problems which are being solved are: dissociation and recombination processes, correlation of solar and ionospheric phenomena, improvement of spectroscopic methods and microwave observational techniques. --M. R.

A-458 Gerson, N. C., Sporadic E propagation. Journal of Atmospheric and Terrestrial Physics, 6(2/3):113-116, March 1955. fig. DWB--Observations in N. America mostly in summer of long range communication on 50 Mc/s due to Es reflection showed most frequent station separation around 1500 km. Results are analyzed into single hop, double hop (one cloud, peak about 1300 km) and a few double hop (2 clouds). Es cloud diameter is 600-1250 km (mean 925 km) E - W, probably more N - S. Possibility of 50 Mc/s communication up to 7000 km is discussed. --C. E. P. B.

A-459 Gerson, N. C. (AVCO Manufact. Corp., Boston, Mass.), Latitude effects in sporadic E observations. AGARDOgraph, Paris, No. 34:81-96, Sept. 1958. 11 figs. DWB (629.1323 N864a)--During the period 1949-1951, North American radio amateurs participated in a cooperative study of abnormal propagation conditions in the VHF band. About 350 amateurs were involved, mainly from the United States and Canada, but also from Mexico and Central America. The study was made at a radio frequency of 50 Mc/s with some observations also obtained at 144 Mc/s. Reports were prepared by the amateurs whenever they contacted or received another transmitter operating in this frequency range, because of unusual propagation effects. The reports provided such factors as the terminal points of the propagation path, the time, signal strength, character of the signal, and so on. Several conclusions have been drawn regarding the geographical distribution of sporadic E but, to determine the long-term Es climatology, additional observations over many years are necessary. --Author's abstract.

A-460 Gerson, N. C. (Trapels Road, South Lincoln, Mass.), Annual distribution of sporadic E. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2):189-191, Oct. 1959. 2 figs., DWB, DLC--This study is based on some 19,000 VHF contact reports during 1949 over North America. The Es cloud location from each contact was determined and summarized into number of hours of occurrence of reflections within a degree square (area bounded by 1° lat. and 1° long) and mapped in isopleths. A diagram featuring monthly distribution of sporadic E shows it is almost entirely a summer phenomenon in the northern hemisphere. --W. N.

A-461 Gerson, N. C., Very long distance ionospheric propagation. Journal of Atmospheric and Terrestrial Physics, 13(1/2):169-172, Dec., 1958. 2 figs., table, 26 refs.

A-462 Gherzi, Ernest, Ionospheric reflections and weather forecasting for Eastern China. American Meteorological Society, Bulletin, 27(3):114-116, March 1946. 4 refs. MH-BH--Investigations at the Zi-Ka-Wei Observatory (Shanghai) during the last 5 years show: (1) with dominant Pacific trade wind air mass: E layer reflection, (2) with Siberian air mass: F layer reflection and (3) with tropical air mass, in most cases: F2 layer reflection.

A-463 Gherzi, Ernest (Macao Met. Ser.), A ionosfera eo tempo. (Ionosphere and weather.) Aquaceiros em Macau durante a Moncao de sudoeste. (Showers at Macao during the south western monsoon.) Macao. Servico Meteorologico, Notas Cientificas, Nos. 3 and 4, 1952. 2 pieces. In English and Portuguese. DWB--In contrast to a number of bad forecasts made in 1949-51 by Far East weather services, the author maintains that his method (first used in 1939) of predicting weather from the height of the ionospheric layer which reflects pulses (6 Mc) would have given correct forecasts every time. If the reflecting layer is at 230-280 km then Siberian (polar continental) air is expected for 12 hours, and if it is an F layer at $\geqslant$ 300 km, then a tropical air mass is expected. If a typhoon is about 400 km from Macao it will not reach station if echo is from 230-280 km, but will from 300 km region. --M R.

A-464 Ghosh, Mrinmayee, Determination of the F-region collisional frequency over Calcutta. Journal of Atmospheric and Terrestrial Physics, London, 8(1/2):116-118, Feb. 1956. 2 figs., 2 refs. DWB--The diurnal variation of the collisional frequency of the F region, calculated from the absorption of a radio wave passing through it, varies from 102/sec at midnight to 5 X 10^3 /sec near noon. The rate of rise increases with cos X, which is explained by a rapid rise of temperature in the F region with the approach of noon. --C. E. P. B.

A-465 Ghosh, S. N., (Harvard Univ.), Methods for the measurement of upper atmospheric characteristics. Journal of Scientific and Industrial Research, Sec. A, New Delhi, 14(6):277-284, June 1955. 6 figs., 12 refs., 2 eqs. DWB--A review of technical methods, both direct and indirect, for sounding the upper atmosphere. Indirect methods include radio echoes for probing ionosphere, acoustical sounding, searchlight methods for determining density, meteor and auroral observations and spectroscopic studies of dissociation and recombination. Direct methods include airglow, rocket and balloon measurements and direct determination of temperature, winds and ionization in the ionosphere. Laboratory and theoretical studies of microwave propagation and photochemistry are also outlined and illustrated. --M. R.

A-466 Ghosh, S. P., Long distance radio communication. Application of records kept at ionospheric observatories. Science and Culture, Calcutta, 6:199-204, 1940. 6 figs., table. DLC --First is the role of the ionosphere considered, then the characteristics for both vertical and oblique propagation, and finally, some frequency problems are discussed. Plottings of MUF data per se and vs. local time is shown and how to obtain optimum frequencies over a given distance are graphically presented. --W. N.

A-467 Gibbons, J. J. and Nertney, R. J., A method of obtaining the wave solutions of ionospherically reflected long waves, including all variables and their height variation. Journal of Geophysical Research, 56(3):355-371, Sept. 1951. 8 figs., table, 3 refs., 25 eqs. MH-BH--Solution of one-dimensional wave equation with application of wave theory to study of wave propagation in the ionosphere. Reflection coefficients are presented graphically for several distributions of electron density and results compared with experiment. Solution presented here is compared with W. K. B. method. The author's method gives heights far too low for E layer, but phase heights are consistent with experimental data. --M. R.

A-468 Gibbons, J. J. and Nertney, R. J. (Penna. St. Col., Ionospheric Res. Lab.), Wave solutions, including coupling, of ionospherically reflected long radio waves for a particular E region model. Journal of Geophysical Research, 57(3):323-338, Sept. 1952. 9 figs., table, 10 refs., 10 eqs. DWB--This paper extends previous work to the solution of coupled wave equations arising in ionospheric wave propagation to diurnal and seasonal models of E-region above Pennsylvania, in which a Chapman E-region has maximum electron density at constant height. A wave traversing a coupling region below the "reflection" level excites a new wave propagated in the same direction and a reverse back-scattered wave, which appears as a reflected wave. In 150 kc/sec waves these effects occur near $N = 300\ e/cm^3$. At night the increase in height of the bottom of the layer increases the effect and causes stronger split echoes and greater polarization, but the experimental results require also a D-layer. --C. E. P. B.

A-469 Gibbons, J. J. and Bellas, F. E., Pt. I. A method of treating the plane wave equation. Pt. II. The coupling problem at 150 Kc/sec. Pennsylvania. State College, Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 42, Oct. 15, 1952. 22 p. 2 figs., 5 refs., 16 eqs. DWB--This report is concerned with two separate topics: (1) a method of attacking the wave equation in an inhomogenous medium and (2) a method of reducing the coupling between ionospheric modes, so as to treat the coupling problem as one of regular reflection due to a variation in refractive index. It was first thought that the method of (1) would be applied to the coupling problem (2), but actual calculation showed this to be pointless; the solutions were so closely W. K. B. that the problem would be no test of any practical computation method. Moreover, some questions of boundary conditions in problem (1) are not yet settled; we prefer to consider that part of the report as a preliminary investigation. --Authors' abstract.

A-470 Gibbons, J. J., Schrag, R.L. and Waynyck, A. J., Long delay ionospheric echoes at 150 kc/s. Nature, London, 171(4349): 444-445, March 7, 1953. fig., 7 refs. DWB--Authors find virtually total reflection from a virtual height of 940 km. Records for Nov. 10, 1952, shown. Possible causes are discussed. --C. E. P. B.

A-471 Gibbons, J. J. and Rao, B. R., Calculation of group indices and group heights at low frequencies. Pennsylvania State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 92, April 1, 1957. 35 p. 7 figs., 3 tables, 7 refs., 59 eqs. DWB--In this report is given a method of obtaining a set of curves from which the group height to be expected from a given electron density profile at a given frequency can be quickly determined. Such curves are presented for 75 kc/sec, 150 kc/sec, and 500 kc/sec. A formula is derived from which the group index u' is easily computed as a function of u and x. --Authors' abstract.

A-472 Gibbons, J. J. and Waynick, A. H., The normal D region of the ionosphere. Institute of Radio Engineers, Proceedings, 47(2):160-161, Feb. 1959. 10 refs., eqs. DLC--The general theory of low frequency sounding in the lower ionosphere is discussed in order to indicate the radio transmission characteristics which a D-layer model must satisfy. D layers based on the fundamental physical processes from 60 to 90 km, which have been presented up to now, have not been completely satisfactory. There is indication that the more accurately determined values of fundamental parameters now available, such as reaction rates, will lead to a more satisfactory model. --Authors' summary.

A-473 Ginzburg, V. L., O vliianii mezhduelektronnykh soudarenii na pogloshchenie radiovoln v F-sloe i v solnechnoi korone. (The influence of collision among electrons on absorption of radiowaves in F layer and in the solar corona.) Zhurnal Tekhnicheskoi Fiziki, Moscow, 21(8):943-947, Aug. 1951. 10 refs., 9 eqs. DLC--

Using the previous results obtained by himself and other authors, the author derives a formula for the calculation of the frequency of the impacts between electrons and molecules. The use of this formula, however, requires the knowledge of the temperature of the ionized layer, or other corresponding data, which must be obtained independently of the measurement of the absorption of the radio waves. In principle, as the author shows, the measurements of this absorption might be sufficient to determine the frequency of electron-electron impacts, but this could hardly be applied in actual practice, because the electron-electron impacts would have but very little influence upon the absorption in comparison with the electron-molecule impacts, unless the wavelength is very much larger than 200 m, and this does not seem to be of practical interest. The author suggests, however, that means for the measurements necessary for the calculation of the frequency of electron-molecule impacts in the ionized layers could be devised. --Physics Abstracts, No. 338, 1953.

A-474 Gnanalingam, S., An apparatus for the detection of weak ionospheric echoes. Institution of Electrical Engineers, London, Proceedings, Pt. III, 101(72):243-248, July 1954. 6 figs., 7 refs., 12 eqs. DWB--Transmitting frequency follows a cycle, increasing linearly for a time and then returning rapidly to the original value. A point some distance away receives each signal twice, by ground path and ionosphere reflection, the resulting interference giving an oscillation with beats at which there are wave discontinuities. The beat frequency can be detected with a narrow band filter. Wiring diagram, detailed theory, determination of echo height and calibration are described. With a transmitted power of 250 watts and output band width of 1 c/s, echoes could be detected with a reflection coefficient of 3×10^{-5}. Height determination is accurate to 1.4 km. --C. E. P. B.

A-475 Goldstein, L.; Anderson, J. M. and Clark, G. L. (Univ. of Illinois, Urbana.), Interaction of microwaves propagated through a gaseous discharge plasma. Physical Review, 90(1): 151-152, April 1, 1953. 2 figs., 8 refs. DWB--Experimental test of the extended theory of ionospheric cross modulation proved that a transmitted wave can be increased and/or decreased in attenuation as a result of interacting of a disturbing pulse. A predicted modulated wave was produced in helium at 12 mm Hg and in argon at 2.7 mm Hg. --W. N.

A-476 Golitsyn, G. S. (Academy of Sciences, Moscow), On the influence of the magnetic field on the character of turbulence in the ionosphere. Journal of Geophysical Research, Wash., D. C. 64(12):2212-2214, Dec. 1959. table, 4 refs., 11 eqs. DLC--

The influence of the earth's magnetic field on the character of turbulence in the ionosphere is considered on the basis of the equations of magnetohydrodynamics. The estimates given show that its influence in the lower ionosphere up to heights of 150 to 200 km can be neglected. At heights greater than 200 km the influence of the earth's magnetic field must be considered in the dynamics of the medium. The fact that the gases are highly rarefied constitutes an additional problem in formulating a theory of turbulence for the upper regions of the ionosphere. It is shown here that the ratio of Kolmogoroff's inner scale of turbulence to the mean free path of neutral molecules decreases with the decrease in number of particles n and $n^{1/4}$ reaching the value of the order 30 or less at the height of 250 km. Therefore, the theory of turbulent motions at such heights should not entirely neglect the molecular structure of the medium. --Author's abstract.

A-477 Goodwin, G.L. (Physics Dept. Adelaide Univ. Australia), The movements of sporadic E layer clouds. Journal of Atmospheric and Terrestrial Physics, London, 11(3/4):177-186, 1957. 3 figs., table, 10 refs., 5 eqs. DLC--An account is given of some measurements of the magnitude of the drift velocity of isolated sporadic E clouds, using a C. W. technique. The method involves determining the rate of change of phase path of a wave reflected at almost vertical incidence, by measuring the rate of fading of the received signal due to interference between the reflected and ground waves. A method using two spaced loop-aerials is suggested for determining the direction of drift. Some experimental evidence is described indicating that the angular spread of scatter from Es clouds is larger at night than during the day. --Author's abstract.

A-478 Goodwin, G.L. (Dept. of Physics, Adelaide Univ.), A discussion of ionospheric demodulation near gyro frequency. Australian Journal of Physics, Melbourne, 12(2):157-163, June 1959. 4 figs., 15 refs., 3 eqs. DLC--Observations made in Adelaide of the ionospheric demodulation of radio waves near gyro frequency at vertical incidence are discussed. The effect occurs in the region of about 90 km, and does not appear to decrease through dawn. An F layer reflected wave is demodulated by unequal amounts during its two passages through the region. The large magnitude of the effect and its lack of dependence on modulation frequency seem to be inconsistent with the theory of wave interaction. --Author's abstract.

A-479 Goody, R. M. (St. John's College, Cambridge), The physics of the stratosphere. Cambridge, Eng., University Press, 1954. 187 p. 60 figs., 17 tables, bibliog. p. 176-181, eqs. Price: $5.00. Cambridge Monographs on Physics. DLC--A simple but up-to-date and accurate treatment of the structure, composition and energy conditions in the upper atmosphere, with emphasis on experimental rather than theoretical results. The latest equipment, including rockets, is considered. The layer between that wherein "weather" plays an important role, and the ionosphere (e.g., from 12 to 80 km) is emphasized. The several chapters take up the following subjects: 1) Discovery and nomenclature of stratosphere; 2) Temperature and its measurement by sound propagation, meteor and rocket techniques; 3) Composition (H_2O, CO_2, rare gases, etc.); 4) Ozone; 5) Winds and turbulence in the stratosphere; 6) Radiation. The last chapter is especially complete and up-to-date, taking up the latest theoretical and experimental knowledge of the radiation balance in the stratosphere, the effects of various gases (H_2O, CO_2, NO and O_2) on the absorption of solar and terrestrial radiation, line shapes, spectroscopy and, finally, the effect of radiation balance on tropopause temperatures and vice versa. --M. R.

A-480 Goroshankina, A. A., K voprosu o lokalizatsii neodnorodnostei v ionosfere. (Localization of heterogeneity in the ionosphere.) Akademiia Nauk SSSR, Doklady, 93(3):459-461, Nov. 21, 1953. 2 figs., 6 refs. DLC--Inhomogeneities, which cause oscillations of signal amplitudes reflected from the F layer can be located, according to the author, by means of ionospheric soundings at different points at different frequencies simultaneously. Preliminary results of 14 observations carried out by the author are presented and discussed. --A. M. P.

A-481 Goudet, G., Radiation and propagation of electromagnetic waves of short wavelength. Annales des Telecommunication, 3:74-84, 113-125, 155-179, 182-208, 233-256, March-July, 1948. --A survey of recent work both theoretical and experimental on cm and dm waves, with a bibliography of 137 important papers mentioned in the text. Part 1 discusses electromagnetic radiation theory and cm-wave equipment. Part 2 discusses reflection, refraction, diffraction, properties of the ionosphere, and the effect of meteorological conditions. Radar receives special attention.

A-482 Grace, Clinton H.; Kelso, J. M. and Miller, J. W., The experimental determination of the scale height, height of the bottom and true height of the maximum ionization of the E-layer under undisturbed conditions. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF(122)-44, Technical Report, No. 3, June 15, 1949. 15 p. 28 figs., 7 tables, 8 refs., 10 eqs. DWB--Since published data pertinent to the subject can be classified into (1) undisturbed and (2) disturbed categories, authors determined and developed the respective parameters and present the detailed data obtained for the normal conditions of the E layer which are discussed in relation to the data for abnormal or disturbed conditions. --W.N.

A-483 Grace, Clinton H. and Underhill, C. R. (Penna. St. Coll., Radio Propag. Lab.), Measurements of sporadic E ionization at State College, Pennsylvania. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 14, June 30, 1950. 18 + p. 7 figs., tables. DWB--The detailed data on sporadic E layer for the year 1949 are presented. Sporadic E layer is more prevalent in summer than in winter. However the highest frequency at vertical incidence, approximately 18 Mc, occurred on Nov. 1st. An example of the unpredictability of the sporadic E layer is presented as well as details of the stormy conditions of Nov. 2, 1949. --W.N.

A-484 Grace, Clinton H. (Penna. St. Col. Ionos. Res. Lab.), High-power manually-operated vertical incidence ionospheric height measuring equipment. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 22, June 25, 1951. 39 p. 17 figs., 4 refs. DWB--Detailed description in text, photos and block diagrams of the new and modified measuring equipment used to determine the vertical incidence equivalent height of ionosphere layers by the Breit-Tuve method. The equipment is capable of operating continuously from 250 kc/s to 5 Mc/s in several bands. Peak power output approaches 100 kw. --W.N.

A-485 Granalingam, S. and Weekes, K., Weak echoes from the ionosphere with radio waves of frequency 1.42 Mc/s. Nature, London, 170(4316):113-114, July 1952. ref. DWB--By a new technique, reflections were observed from 75-80, 90-95, and 112 km in winter, and 102-105 km since mid-March. --C.E.P.B.

A-486 Grant, J.P., More on the 'Plymouth effect". Wireless World, 64(12):587-590, Dec. 1958. fig., table, 4 refs.

A-487 Great Britain. Dept. of Scientific and Industrial Research. Radio Research Board, Fundamental principles of ionospheric transmission produced by the Inter-Service Ionosphere Bureau at the Great Baddow Research Laboratories of the Marconi Wireless Telegraph Company Ltd., Sept. 1943. Its Special Report, No. 17, 1948, reprinted 1952. 81 p. 69 figs., eqs. DWB --A thorough and systematic survey of knowledge of many aspects of ionospheric transmission or reflection of electromagnetic waves. History, structure, physics, geometry, geography, ionization, polarization, formation of ionosphere, diurnal and seasonal variation, reflection from multiple layers, effect of frequency, corpuscular radiation, expansion, sunspot cycle, fading, magnetic storms, abnormal E, long distance scatter and spread F echoes. The name "Ionosphere" is said to have been suggested by WATSON-WATT. --M. R.

A-488 Great Britain. Dept. of Scientific and Industrial Research. Radio Research Board, Characteristics of the ionosphere observed in Great Britain 1930-1946: Measurements made at the Radio Research Station, Slough, England, 1930-1946 and at Burghead, Scotland, 1941-1946. Its Special Report No. 23, 1953. Vi + 16 p. 9 figs., tables, 21 refs. DLC, GB-MO--The introduction gives a history of the methods of ionosphere investigation — critical frequency, pulse method, etc. In Pt. 2 the observations at Slough and Brughead, Scotland, are described. Appendixes define units and symbols and list the hourly measurements. Microfilm or enlarged copies can be bought.

A-489 Great Britain. Hydrographic Office, The Admiralty list of radio signals, Vol. 4, Meteorological observation stations. London, 1954. 263 p. printed on one side only. DWB--Complete list of some 12,000 world meteorological stations arranged by countries, with station no., lat., long., and altitude (ft). --C. E. P. B.

A-490 Greenhow, J.S. and Neufeld, E.L., Large scale irregularities in high altitude winds. Physical Society of London, Proceedings, 75(2):228, Feb. 1. 1960.

A-491 Gregory, J.B. (Canterbury Univ. College, Christchurch, N.Z.), Ionospheric reflections from heights below the E region. Australian Journal of Physics, Melbourne, 9(3):324-342 Sept. 1956. 6 figs., 5 tables, 2 plates, 18 refs. DLC--The pulse method of radio sounding has been used at 1.75 Mc/s to detect low ionospheric regions whose voltage reflection coefficient exceeds 4×10^{-6}. Observations from Feb. to July 1955 have revealed reflections, from 95 km vertical height and of day-time occurrence only, which are believed to originate in the lower E region. A region with a lower boundary predominantly at 85 km has been found to exist continuously, and previous suggestions as to its meteor origin are queried. A series of complex partial reflections have been detected during day-time only down to 53 km, with significant heights near 75, 67, and 55 km. The occurrence and strength of these lower reflections increases markedly during winter. From records of high absorption conditions during winter days, a connection between the decrease in strength of E region reflections and the increase in strength of partial reflections between 63 and 88 km approximately is demonstrated. --Author's abstr.

A-492 Gregory, J. B. (Physics Dept., Canterbury Univ. College, Christchurch, N. Z.), The relation of forward scattering of very high frequency radio waves to partial reflection of medium frequency waves at vertical incidence. Journal of Geophysical Research, Wash., D. C., 62(3):383-388, Sept. 1957. 5 figs., 7 refs. DLC--A comparison is made between published VHF forward-scatter data and results of vertical-incidence investigations of the lower ionosphere, mainly at a frequency of 1.75 Mc/s. The received waves in each type of transmission are shown to have many similar characteristics, such as temporal variations, and to originate in the same height regions. It is concluded that the two types of transmission have a common origin. --Author's abstract.

A-493 Grenet, Gaston, La conductivité électrique de l'ionosphère et les perturbations du champ magnétique terrestre de fréquence musicale et plus basses. (Electric conductivity of the ionosphere and geomagnetic field disturbances in the audible and lower frequency ranges.) Académie des Sciences, Paris, Comptes Rendus, 242(3):401-403, Jan. 16, 1956. table, 2 refs. Also: Benoit, Rene, Sur le bruit radio-electrique basse frequence du champ magnetique terrestre. (On the radioelectric low frequency noise of the geomagnetic field.) Ibid., 242(21): 2534-2535, May 23, 1956. fig. DLC--The first paper contains theoretical considerations (involving ionospheric critical frequencies, conductivities and layer thickness) from which it appears that low-frequency electromagnetic waves cannot pass through the ionosphere and consequently the origin of geomagnetic field disturbances in the audible range must be other than extraterrestrial. BENOIT reports measurements of low-frequency noise, made by himself in Bani-Abbes (Algerian Sahara). During a ten-day period only isolated noises (due to sferics) registered at the rate of one per min. It is concluded that either the time and place of measurement were exceptionally calm or low-frequency radio noise is entirely due to sferics, or both assumptions are true, which would confirm GRENET's theory. --G. T.

A-494 Griffiths, H. V., Focusing of waves in radio reception. Nature, London, 175(4465):948-949, May 28, 1955. 2 figs. DWB--Describes occasional sudden increases for about 20 min from 1 to 20-30 mv/meter on 9700 kc/s transmission from Sofia received in S. E. England. --C. E. P. B.

A-495 Griffiths, H. V., Long distance V. H. F. reception. Observations and an analysis of the causes of interference in band 1. Wireless World, 65(4):179-181, April 1959. 2 figs., 3 tables.

A-496 Gringauz, K. S., Raketnye izmereniia elektronnoi kontsentratsii v ionosfere pri pomoshchi ul'trakorotkovolnnovogo dispersionnogo interferometra. (Rocket measurements of the electron concentration in the ionosphere by means of an ultrashort wave dispersion interferometer.) Iskusstvennye Sputnik Zemli, Moscow, No. 1:62-66, 1958. 4 figs., 8 refs., 4 eqs. DLC. Translation issued in Soviet Physics, Doklady 3(3):6209, 1959. --The author presents the results of measurements of the vertical distribution of electron concentration in the ionosphere from high altitude geophysical rockets released in the U. S. S. R. during 1954-1958 - one rocket attained a height of 473 km. The determination of electronic concentration involved the use of a dispersion interferometer to measure the dispersion of radio waves emitted by a rocket. The rocket, which was released at a small angle to the vertical, was equipped with a transmitter emitting radio waves in the ultraviolet range with a frequency of f_1 and $f_2 = P f_1$. The radiowaves from the rocket were received at two points on the earth and the phase differences and level of oscillations received were recorded continuously. The coordinates of the rocket were measured simultaneously by optical radio methods and the ionosphere was probed by means of a panoramic ionosphere station close to the point of rocket release. The results of measurements which are presented concern frequencies of $f_1 = 48 \times 10^6$ Hz and $f_2 = 144 \times 10^6$ Hz (p = 3). The coefficient of refraction η_1 was computed by the equation

$$\eta_1 \approx 1 - \frac{Ne^2}{2\pi m f^2}$$

(N - effective concentration of electrons, e and m - charge and mass of electron, f - frequency Hz). The phase difference of the two receivers referred to the higher frequency is given by

$$\phi = \frac{2\pi p f_1}{c} \int_0^L (t\eta_{pf} - \eta_{f^2})\, dl$$

The variation of ϕ with variation of L from L to L + ΔL, taking into account η_1 is given by

$$\Delta \phi = \frac{e^2}{m c f_1}\left(\frac{P_2 - 1}{p}\right)\int_{L}^{L+\Delta L} N\,dl$$

and the mean value of N over Δ L is given by

$$N_{me} = \frac{1}{\Delta L}\int_{L}^{L+\Delta L} N\,dl = \frac{c m f_1}{e^2}\ \frac{p}{p^2 - 1}\ \frac{\Delta \phi}{\Delta L}$$

The rockets were released in middle latitudes. The results of the measurements relative to the region lying below the maximum F ionization indicate that a clearly marked E layer does not exist. The active height, at which radiowaves of the ionospheric station in the F layer are reflected lies 50-150 km lower than the active heights recorded by the ionospheric station. --I. L. D.

A-497 Groenewold, H. J. (Royal Netherlands Met. Inst., DeBilt), Triple splitting in a regular layer. International Council of Scientific Unions. Mixed Commission on Ionosphere, Second Meeting, Brussels, Sept. 1950. Proceedings, pub. 1951. p. 201-205. 8 refs., 8 eqs. DWB--Solution to equations to account for observed types of triple splitting of the ionospheric layer in mid-latitudes. Like reflection, it is explained as coupling between elementary ray solutions. For vertical incidence Bremmer's solution is presented in a more tractable form. --From author's abstract.

A-498 Grosskopf, J., Einige Bemerkungen zur Schwundanalyse im M und DM-Bereich. (Some remarks to the fading analysis pertaining to the meter and decimeter regions.) Nachrichtentechnische Zeitschrift, 11(11):577-586, Nov. 1958. 10 figs., 9 refs. DLC.

A-499 Grosskopf, J., Hohenabhängigkeit und Einfallswinkel bei Streustrahlung im 100 MHz-Bereich. (Dependency of height and angle of incidence of the scatter radiation in the 100 Mc/s region.) Nachrichtentechnische Fachberichte, 12:99-102, 1958. 9 figs. DLC.

A-500 Grosskopf, J., Die überreichweiten extrem kurzer Wellen. (The propagation range of ultra-short waves.) Elektrische Fernmeldewesen, Jahrbuch (Germany), Vol. 10:34-72, 1958. 32 figs., 14 refs.

A-501 Gusev, V. D.; Huang, Si-wen and Li, Jun, On the use of the correlation method for determining the parameters of the inhomogeneities of the ionosphere. Acta Scientiarum Naturalium Universitatis Wuhanensis, No. 6:23-28, 1959. Original in Chinese unchecked. Abstract in English in Science Abstracts of China: Earth Sciences, Peking, No. 6, 1959, Abstract No. 176.

--In applying the correlation method to the study of the parameters of the inhomogeneities in the structure of the ionosphere, it is generally assumed that the contour surfaces of concentric ellipsoids for ρ, the correlation function of the amplitudes of reflected waves, are similar. In this article, the authors have taken up a study of the methods of examining this hypothesis. Examination of the records made both at Wuhan and at Moscow shows that for 70% of the cases the contour surfaces for ρ are ellipsoidal. But for different values of ρ, there are only a few cases which have similar surfaces. therefore for different contours, the parameters for the inhomogeneities are different. --Authors' abstract.

A-502 Haas, Herbert W., Telemetering notch antenna 225.0 Mc/Sec Aerobee Hi rocket. New Mexico. College of Agriculture and Mechanic Arts. Physical Science Laboratory, Contract AF 19(604)-409, Scientific Report, No. 2, Feb. 6, 1956. 35 p. 27 figs. (incl. photos.)--The design and development of a 225.0 Mc/Sec notch antenna for the Aerobee Hi rocket is presented. A detailed radiation pattern study has been made of the antenna installed in a full scale size rocket mockup. The radiation patterns have been measured for linear, right circular and left circular polarization. Measured power contour plots are presented to show the distribution of power in the aft region of the missile. A number of photographs of the antenna, rocket mockup and antenna range facilities are included in this report. Electrical and mechanical details of the antenna are shown by the drawings. --Author's abstract.

A-503 Hachenberg, Otto, Sonnentätigkeit und Ausbreitung der elektrischen Wellen in der Erdatmosphäre. (Solar activity and propagation of electrical waves in the earth's atmosphere.) Leipzig, Urania-Verlag, 1955. 27 p. 10 figs. Gesellschaft zur Verbreitung Wissenschaftlicher Kenntnisse. Vortragsreihe Naturwissenschaften, Vol. 13. DLC--A pamphlet giving the basic material, with illustrations, of a popular science lecture on the ionospheric structure, ionospheric propagation of radio waves and sounding by impulses or waves, and solar ionizing influences on the ionosphere. The separate layers (D, E, F1 and F2) and their formation are treated in detail, and records are reproduced showing variations and characteristics of these layers, or of disturbances in the layers. --M. R.

A-504 Hacke, James E., An approach to the approximate solution of the ionosphere absorption problem. Institute of Radio Engineers, Proceedings, 36(6):724-727, June 1948. 5 figs., 5 refs., 24 eqs. DLC--The general problem of group delay and absorption is mathematically discussed. --W.N.

A-505 Hafstad, L. R. and Tuve, M. A., Further studies of the Kennelly-Heaviside layer by the echo-method. Institute of Radio Engineers, Proceedings, 17(9):1513-1522, Sept. 1929. 10 figs., table 6 refs. DLC--The results of experiments with multivibrator modulation are discussed. Two 24-hour series of observations showed a distinct diurnal variation in the height of the layer. Daytime heights, during a number of Autumn days in 1928, are given.

A-506 Hagen, John P. (Naval Research Lab.), Radio tracking, orbit and communication for the earth satellite. Aeronautical Engineering Review, N.Y., 16(5):62-66, March 1957. 3 figs. DLC--A chain of receiving stations, extending from Washington, D.C., to Santiago, Chile, is being set up to create a radio fence which will intercept a satellite each time it circles the earth. This system was chosen to prove that a satellite is in orbit and to derive geophysical information from perturbations of that orbit. --Author's abstract.

A-507 Hagfors, Tor (Norwegian Defence Res. Establishment), Results of scatter measurements at 36 Mc/s over a 1200 Km path. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957 (Proceedings of the Polar Atmosphere Sympos ium, Oslo, 1956, Pt. 2), issued 1958. p. 205-209. 5 figs., 5 refs., 3 eqs. DLC--The experimental set-up of this work consisted of a transmitter situated in the south of Norway and a receiver in the north with a distance of 1130 km separating the two. The results of the experiment include the diurnal signal variation, the relation between field strength and ionospheric and magnetic data, the angular dependence of scattering cross section, frequency dependence of transmission loss and the signal fine structure. --N.N.

A-508 Hagfors, Tor (Norwegian Defence Research Establishment, Kjeller, Norway), Preliminary results of studies of the angular distribution of a VHF ionospheric forward scatter signal. Journal of Atmospheric and Terrestrial Physics, N.Y., 12(4): 340-341, 1958. 2 figs., 4 refs. DLC--This is a brief report on results obtained at 46.8 Mc/s over an 1150 km NS path at the Norwegian Defence Research Establishment, Kjeller, Norway, Oct. 28, 1958. The experiment described was made in order to determine the angular spectrum of the received waves by measuring the correlation over the wavefront. The graphical presentation of the recording yields valuable information on the background signal and on the angular spectrum. --W.N.

A-509 Hagfors, Tor, Investigation of the scattering of radio waves at metric wavelength in the lower ionosphere. Geofysiske Publikasjoner, Oslo, 21(2), Aug. 1959. 58 p. 6 figs., 6 + tables, 16 + eqs., 41 refs.

A-510 Hagg, E.L.; Muldrew, D. and Warren, E., Spiral occurrence of sporadic E. Journal of Atmospheric and Terrestrial Physics, 13(3/4):345-347, June 1959. 2 figs., table, 5 refs.

A-511 Hagihara, Y., Rapport du Commite de Recherches ionospheriques Japonais de 1946 a 1948. (Committee report of the Japanese ionospheric research 1946-1948.) URSI, Bulletin No. 63: 8-17, 1950.

A-512 Hajkova, Jaroslava and Mrazek, Jiri (both, Geophysical Inst. of Czechoslavakia, Akad. d. Wiss., Prag), Ein Zusammenhang der nachtlichen E-Schicht mit der geomagnetischen Aktivität. (Relationship of the nocturnal E-layer to geomagnetic activity.) Studia Geophysica et Geodaetica, Prague, 3(2): 195-198, 1959. 4 figs., 4 refs., eq. Russian summary, p.198. DWB--Based on observations at the ionospheric observatory at Lindau (50°39'N, 10°8'E), and the geomagnetic observatory at Wingst (53°45'N, 9°4'E), the relationship between the night sporadic E (Es) and geomagnetic activity is shown. More often geomagnetic disturbances result from Es changes than Es changes follow geomagnetic disturbances. The various types of geomagnetic phenomena must be tested separately: geomagnetic storms, bay disturbances and pulsations. --M. R.

A-513 Halley, R.; Lepechinsky, D, and Mouchez, P., Comparison des methodes de orevision a long terme du CRPL du SPIM. (Comparison between the CRPL's and SPIM's methods of long range forecast.) Annales des telecommunications, Paris, 13 (9/10):254-264, Sept.- Oct. 1958. 6 figs., 7 refs. DLC--Recall of the leading ideas of the two principal methods used for studying ionospheric propagation; the method of the Central Radio Propagation Laboratory (CRPL) and that of the Service de Previsions Ionospheriques Militaire (SPIM). The authors s how the points through which these methods are divergent. The second part of the article introduces and gives an interpretation of the differences appearing in forecast established through the two methods although starting from the same physical parameters of the ionosphere. --A. V.

A-514 Hanson, G.H.; Serson, H.V. and Campbell, W., Maximum usable frequencies and lowest usable frequencies for the path Washington and Resolute Bay. Journal of Geophysical Research, 58(4):487-491, Dec. 1953. 3 figs., 3 refs. DLC--The standard frequency transmissions of WWV were monitored at Resolute Bay for one year. Using a method developed by SCOTT, maximum usable (MUF's) and lowest usable frequencies (LUF's) have been obtained for the path Washington to Resolute Bay for that period. Comparison with the predictions made by the Central Radio Propagation Laboratory in Washington indicates that the predicted MUF's are too low during the night and, for some months, too high during the day. The LUF's are lower than would be expected if the propagation were all by one reflection from the F2 layer. --Authors' abstract.

A-515 Harang, Leiv (Norwegian Defence Res. Establishment), Results of ionospheric drift measurements in Norway. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957 (Proceedings of the Polar Atmosphere Symposium, Oslo, 1956, Pt. 2), issued 1958? p. 28-32. 12 figs., ref. DLC--During 1953-1955 E-layer drift measurements were made in Norway according to the Mitra method. The graphs presented show the diurnal variations during the year together with the annual means for the two years. Values of drift for Kjeller, Norway are compared with similar recordings from Washington and Cambridge. The wind vectors for Kjeller are schematically illustrated together with the distribution curves. --N.N.

A-516 Harang, L., Scattering of radio waves from great vertical distances. Terr. Magn. Atmos. Elect. 50, 287-296, Dec. 1945. --Using a pulse-transmitter of high power, scattered reflections corresponding to virtual reflection-distances of 500 to 2, 500 km have been obtained. The test frequencies used (10-11 mc/s) were usually greater than the critical penetration frequencies of the F2 layer. Records on a fixed frequency over a number of days have been taken in order to study the diurnal variation and dependence on geomagnetic activity and aurora. Four different phases in the diurnal variation have been recorded. During the two day phases it has been shown that the scattered reflections cannot come in vertically as they are not cut off by the F layer. During the zenith at heights of 500 and 800 km, small geomagnetic disturbances increased the scattering at these heights. Stronger perturbations were accompanied by scattering from down to 100 to 200 km.

A-517 Hardwick, B., Two cases of large F2 region disturbance associated with small magnetic disturbance. Journal of Atmospheric and Terrestrial Physics, 3(6):347-349, July 1953. fig., ref. MH-BH--Large but local ionospheric disturbances were recorded on International Magnetically Quiet Days, at Canberra on Oct. 26-27, 1947 and at Chungking, Palmyra and Rarotonga on Jan. 11, 1947. --C. E. P. B.

A-518 Harnischmacher, Ewald, Prevision de la propagation ionospherique pour les distances superieures a 10,000 km. (Forecasting ionospheric propagation for distances over 10,000 km.) Academie des Sciences, Paris, Comptes Rendus, 237(18):1071-1073, Nov. 2, 1953. 3 refs. DWB--A method is outlined for determining mixed trajectories of long-distance ionospheric radio wave propagation. The method accounts for the fact that radio waves follow trajectories adapted to ionospheric conditions. The accuracy of a propagation forecast for a distance of 17,000 km was confirmed in experimental operation. --G. T.

A-519 Harnischmacher, Ewald and Rawer, Karl, L'interprétation des observations du vent ionosphérique suivant la méthode des "fadings." (Interpretation of ionospheric wind observations by the "fading" method.) Académie des Sciences, Paris, Comptes Rendus, 243(9):747-750, Aug. 27, 1956. table, 4 refs. Also their: Résultats d'observations systématiques du vent ionosphérique dans la région E. (Results of systematic observations of ionospheric wind in the E region.) Ibid., 243(10):782-783, Sept. 3, 1956. DLC--KRAUTKRÄMER's method of ionospheric wind determination by means of comparison of fadings using three antennas, is found to be more accurate than anticipated on the basis of theory. Regular observations made by this method at Neuf-Brisach between Dec. 1955 and Aug. 1956 show average monthly wind velocities of 60-100 m/s in winter and 40-70 m/s in summer. Wind direction undergoes two complete revolutions in 24 hrs on 80% of all days in winter and one revolution at night in summer. --G. T.

A-520 Harnischmacher, E. and Rawer, Karl, Ergebnisse ionosphärischer Windmessungen in der E-region. (Results of ionospheric wind measurements in the E-region.) Beiträge zur Physik der Atmosphäre, Frankfurt a. M., 29(4):253-268, 1957. 13 figs., 4 refs. German, English and French summaries p. 253. DWB, DLC--The ionospheric drift in the E-layer is observed with KRAUTKRÄMER's fading method. The evaluation is simply based on the median of several successive determinations of the apparent drift-vector. Results in terms of amplitude and direction are given in graphical form from Nov. 1955 until Oct. 1956. --Authors' abstract.

A-521 Harnischmacher, E., Observation du vent ionosphérique. (Observation of ionospheric wind.) Annales des Telecommunications, Paris, 12(5):159-161, May 1957. 6 figs., 2 refs. DLC --Measurements of ionospheric winds made by the method of fadings at Neuf-Brisach, France (since Nov. 1955), at Cambridge, Eng., and at Kootwijk, Netherlands, are compared and found to be in fair agreement in respect to direction but less good for speed. --G. T.

A-522 Harnischmacher, E., Ionospheric drifts in Puerto Rico obtained by the method of analysis developed in Neuf-Breisach. Puerto Rico Univ. College of Agriculture and Mechanic Arts, Contract AF 19(604)-2036 (Study of ionospheric winds), Scientific Report No. 5, Dec. 1958. 15 p. 28 figs., table. DWB --The method of similar fades for determination of ionospheric drifts with spaced receivers is first discussed together with modification and simplifications in the calculating procedure introduced at Neuf-Breisach. The records used and their analysis according to this method are then discussed. The results are then set forth together with comments on certain regularities observed in the ionospheric drifts. --Author's abstract.

A-523 Harnischmacher, E. and Rawer, K., Ionospharische Windmessungen in der E-region Nov. 1956 bis Jan. 1957. (Ionospheric wind measurements in the E region Nov. 1956 - Jan. 1957.) Beitrage zur Physik der Atmosphare, Frankfurt, A. M., 31(1/2):131-134, 1958. 3 figs. DWB, DLC. Continuation of the measurements published Ibid., 29(4):153-168 (see 520). Graphs giving mean hourly ionospheric wind velocities in m/sec in the E layer obtained during November and December 1956, and January 1957, are presented. --I. L. D.

A-524 Harnischmacher, E. and Rawer, Karl, Drift observations evaluated by the method of "similar fades". Journal of Atmospheric and Terrestrial Physics, London, 13(1/2):1-16, Dec. 1958. 12 figs., 12 refs., 16 eqs. DLC--A regular interference model of the fading pattern is considered as opposed to the usually accepted purely random model. It would appear that some of the observed features are well explained by a model which is intermediate between these two types insofar as regular interference perturbations are concerned, but one in which a finite lifetime for the irregularities is supposed. It appears that with the "similar fade" analysis there is a marked tendency to select those periods where the interference is quite regular and the rather small angular dispersion found in most sets of observations can thus be explained. The observed big dispersion of the speed is at least partially due to a small vertical component of the movement. --Authors' abstract.

A-525 Harris, K. E. (Dir. of Development, A. C. Cossar, Ltd.), Secondary radar applications. Communications and Electronics, London, 1(3):57-61, Dec. 1954. photos, diagr., table. DWB --The various uses for radar are outlined and secondary uses such as for upper air wind measurement emphasized. Illustrations of use of Mullard Radar Sonde System including diagram of complete radar wind, radar sonde and ground station equipment are presented, with specifications listed. --M. R.

A-526 Hartman, L. M. and Haviland, R. P. (both, Gen. Elec. Co.), A satellite propagation experiment. (In: Van Allen, James A. (ed.), Scientific uses of earth satellites. Ann Arbor, Univ. of Michigan Press, 1956. p. 268-275. table.) DWB--A satellite ionosphere and propagation experiment is proposed. Satellite equipment consists of a low-power c-w transmitter operating on a frequency near the ionosphere cut-off frequency corresponding to maximum geometric line-of-sight distances from the satellite. Statistical data on coverage are sought by enlisting aid of operators in the Radio Amateur Service. Particular measurements to be made at specially equipped stations are reviewed. --Authors' abstract.

A-527 Hartsfield, W. L. and Silberstein, R., A comparison of CW field intensity and backscatter delay. Institute of Radio Engineers, Proceedings, 40(12):1700-1706, Dec. 1952. 6 figs., 14 refs. DWB--The relationship of back-scatter to skip phenomena was studied for several months by comparing the field intensity of 15,000 kc/s (15 Mc/s) W. W. W. signals received at White Sands Proving Ground, New Mexico with recorded delay times of the back-scatter received over the 2700 km distance at Sterling, Va. The results are given in A-scope photos, graphs and curves. Back-scatter data may provide an indicator even better than the direction finder technique in forecasting disturbances. --W. N.

A-528 Harvard College Observatory. Rocket Panel, Pressures, densities, and temperatures in the upper atmosphere. Physical Review, 88(5):1027-1032, Dec. 1, 1952. 3 figs., 3 tables. DWB--Smoothed curves of pressure, density and temperature from 0 to 220 km from results of 68 V-2, 63 Aerobee and 7 Martin Viking rocket ascents at White Sands, N. Mexico. The panel is not so foolish as to call this a standard atmosphere, but merely the combined results of numerous investigations as of Jan. 1952. Temperature calculations by many groups are tabulated and the weighted means and adopted values shown. Below 30 km values are obtained from radiosonde ascents at White Sands. No correlation has been made for dissociation of $O_2 > 80$ km, nor for seasonal effects, daylight effects or instrumental errors (the latter may be greater than real variations). Other soundings with rockets (on the equator) or by meteors and acoustical means in the Arctic (Fairbanks) and tropics are related to these data. The whole matter is still pending. --M. R.

A-529 Harvey, J. A. (Electrical Eng. Dep., Univ. of Sydney), Movement of sporadic E ionization. Australian Journal of Physics, Melbourne, 8(4):523-534, Dec. 1955. 10 figs., table, 13 refs. DLC--

The horizontal movement of patches of daytime sporadic E ionization has been observed by using a system of spaced pulse transmitters and a central recorder. The directions of movement are mainly towards the north and west, with speeds mainly between 40 and 80 m/sec. These velocities differ in direction from the F region disturbances recorded at the same time and have only about half the speed. --Author's abstract.

A-530 Harwood, J., Spaced-receiver experiments on radio waves of 19 km wavelength. Institution of Electrical Engineers, Proceedings, Pt. 4, 101(7):183-196, Aug. 1954. 3 figs., 11 refs. DLC--The signals from the Post Office sender GBR at Rugby on a frequency of 16 kc/s (wavelength 19 km) were received at a distance of about 100 km at two sites whose distance apart was, on one occasion, 15 km, and on another occasion 40 km. Examination of the fading records of the amplitude of the wave reflected from the ionosphere showed that it consisted of a steady component on which was superimposed a randomly varying component. The correlation between records at two points 15 km apart was about 0.8, and at 40 km was 0.35. The time variations of the random component could have been produced by reflection from scattering centers in the ionosphere which moved with random velocities having an r.m.s. value of about 8 m/s in the line of sight, or which drifted steadily with a velocity of about 100 m/s in a direction predominently east-west. --Author's abstract.

A-531 Harwood, J. (Radio Research Station, Eng.), Atmospheric radio noise at frequencies between 10 KC/S and 30 KC/S. Institution of Electrical Engineers, London, Proceedings, Pt. B, 105(2):293-300, May 1958. 9 figs., 2 tables, 4 refs., 11 eqs. Abstract in Institution of Electrical Engineers, Journal, 4(41):265, May 1958. DLC--Measurements of the characteristics of very-low frequency atmospheric noise in southern England have been made with automatic equipment during the last few years. The results are described in terms of statistical parameters of the envelope at the output of a narrow-bandwidth receiver (300 c/s between 3 dB points). A 2-form structure of the envelope is described. Intensity and structure variations with frequency and bandwidth were examined.--From Author's abstract.

A-532 Haselgrove, J. (Univ. Math. Lab., Cambridge), Oblique ray paths in the ionosphere. Physical Society of London, Proceedings, Pt. B, 70(7):653-662, July 1, 1957. 6 figs., 6 refs., eqs. DLC, DWB--An electronic digital computer has been used to calculate ray paths in a parabolic ionospheric layer when the waves are incident in the plane of the magnetic meridian. This is a special application of a very general method. The results of the calculations are compared with what would be deduced from vertical soundings by the standard approximations of using Martyn's and Breit and Tuve's theorems as if there were no field. --Author's abstract.

A-533 Haubert, A., Echos radioélectriques observés sur la houle à la station de sondages ionosphériques de Casablanca. (Radio echoes from sea waves observed at the ionospheric station of Casablanca.) Annales de Géophysique, Paris, 14(3):368-372, July/Sept. 1958. 7 figs., 3 refs., 7 eqs. DLC--Echoes thought to be reflected from virtual heights lower than 100 m (D region of the ionosphere), have been recorded since the end of 1953, at the ionospheric station of Casablanca. The particular forms of these echoes suggested possible reflections from sea waves, the ionospheric station being located near the sea shore. The results of experiments are in agreement with the theory of a Doppler effect of sea waves. Consequently, the measurements of sea wave periods and lengths, from distances as far as 100 km, would be possible by means of ionospheric sounders equipped with special devices. --Author's abstract.

A-534 Haubert, A., Le renforcement du champ en ondes longues et les évanouissements en ondes courtes. (Intensification of field strength of long waves and the fading of short waves.) Journal of Atmospheric and Terrestrial Physics, 13(3/4):379-381, Feb. 1959. 2 figs., ref.

A-535 Haviland, R. P. (Special Defense Projects Dept., General Electric, Philadelphia), What the future holds for the earth satellite. General Electric Review, Schenectady, N.Y., 59(5):10-16, Sept. 1956. 10 figs., 2 tables. DLC--The possible orbits and respective areas of the earth which could be seen from a satellite at 300 mi, 4000 mi; or the areas over which a satellite at 22,300 mi height could relay radio or TV signals from hemisphere to hemisphere or within the Western Hemisphere are shown on maps. Tables give distances of vision, field of view, etc. for heights of 257, 620, 1210, 2222, 4000, 7650, 19,000 and 22,300 mi. Weather charting and forecasting possibilities are also considered. Hurricanes, clouds, albedo and solar radiation could be measured or observed from such a station. --M. R.

A-536 Haycock, Obed C., Experimental plan and instrumentation for the determination of the electron density in the ionosphere. Utah. Univ. Upper Air Research Laboratories, Contract AF 19(604)-384, Scientific Report, No. 1 (and) Final Report on the Contract, June 1, 1952-April 30, 1957, pub. May 21, 1957. 129 p. 37 figs., foot-refs. --

A complete summarization of the essential results of a 10 year study of the electron density of the ionosphere (E layer to 37 km) by pulse transmissions at or slightly above the critical frequency (F_o) of the layer penetrated by the sounding rocket, compared with the non-delayed signal at a frequency so high it would not be affected by the ionization of the layer in question. Both upward and downward transmissions were used. Equipment was automatic but reduction of data was tedious. Plan of experiment, of circuits, changes in plans as time passed, details of operation and results are presented graphically and described. Electron density increases markedly from 85 km (0) to 2 X 10^{11} per m^3 at 115 and 130 km. --M. R.

A-537 Heading, J. and Whipple, R. T. P., The oblique reflection of long wireless waves from the ionosphere at places where the earth's magnetic field is regarded as vertical. Royal Society of London, Philosophical Transactions, Ser. A, 244(887):469-503, April 3, 1952. 24 figs., 2 tables, 15 refs., 92 eqs. DWB--"Equations are developed for the electromagnetic field in a horizontally stratified medium of varying electron density, the presence of a vertical external magnetic field and the collision frequency of the electrons with neutral molecules being taken into account." In certain conditions the ionosphere splits into two, for each of which the equations can be solved exactly. --C. E. P. B.

A-538 Heading, J., The reflexion of vertically-incident long radio waves from the ionosphere with the earth's magnetic field is oblique. Royal Society of London, Proceedings, Ser. A, 231(1186):414-435, Sept. 6, 1955. 8 figs., 11 refs., 89 eqs. DWB--Approximate equations are developed for the reflexion of plane electromagnetic waves from a horizontally stratified anisotropic ionosphere, when the earth's magnetic field is in an arbitrary direction. Two distinct regions of height arise in the theory, each governed by its respective equations of propagation. For the special case of vertical incidence in an oblique magnetic field when the distribution of electron density is exponential, the equations for the lower region are solved analytically in terms of hypergeometric functions. The equations for the upper region are solved in terms of generalized hypergeometric functions under more general conditions, namely for oblique propagation when the plane of incidence coincides with the magnetic meridian. Explicit expressions in terms of F functions of complex arguments are obtained for the reflexion and transmission coefficients of the lower region, and for the reflexion and conversion coefficients of the upper region. The theory is illustrated numerically by a typical model. --Author's abstract.

A-539 Heaviside, Sir Oliver and others, Telegraphy. Encyclopaedia Britannica, London & Edinburgh, Adam and Charles Black, 1902. 10th ed. v. 9 (i. e. v. 33 of 9th ed.), p. 213-235. refs., 20 eqs. DLC--On p. 215 of this comprehensive treatise on the recent discoveries in theory of electromagnetic propagation in air, sea, earth and wires, and applications to wireless and land and submarine telegraphy, the author hints at the possibility of "a sufficiently conducting layer in the upper air" to serve as one plane of a wave guide— the other plane being the sea surface. Then the theoretical equations for propagation of signals between two such guides are developed. It was years before the author completely accepted his own theory as there was no experimental proof other than the fact of transatlantic propagation up to 2100 mi, but with legible messages received at only 700 mi by day and 1500 mi by night (p. 233). --M. R.

A-540 Hedlund, B. A. and Edwards, L. C., Polarization fading over an oblique incidence path. Institute of Radio Engineers, Transactions, AP-6:21-25, Jan. 1958.

A-541 Heightman, D. W., Propagation of metric waves beyond optical range. Institution of Radio Engineers, Journal, 10( ):295, 1950. --A qualitative survey of tropospheric and ionospheric wave propagation in the frequency band 30-200 mc. Theoretical treatment is limited to explanations of the basic principles involved. A knowledge of the easily recognized meteorological conditions associated with variations in tropospheric propagation is useful in short-term prediction of radio conditions. Extended ranges are, in general, of little practical value owing to interference from distant transmitters. A selection of long-term observations over various land and sea paths, both tropospheric and ionospheric, is presented in graphical form and results are discussed.

A-542 Heitler, Walter, The quantum theory of radiation. 3rd ed. Oxford, Clarendon Press, 1954. 430 p. 32 figs., 13 tables, numerous refs. and eqs. International Series of Monographs on Physics. DWB--This 3rd edition of HEITLER's text on quantum theory is greatly enlarged, but additions have been confined to the electrodynamics of electrons and positrons; while the electrodynamics of mesons and nucleons, and nuclear physics have been omitted. The major sections are: I. Classical theory of radiation, II. Quantum theory of pure radiation field, III. Electron field, IV. Perturbation theory, V. Radiation processes, VI. Radiative corrections and VII. Penetrating power of high energy radiation. Emission and absorption, line breadth, dispersion, Bremsstrahlung, etc. are discussed in Sec. V and action of cosmic rays on matter due to collision (cascade showers, etc.) under Sec. VII. A subject and author index are provided. --M. R.

A-543 Helliwell, R. A., Ionospheric virtual height measurements at 100 kc. Stanford University, Electronics Laboratories, Contract CST-10751. Summary, Aug. 1948.

A-544 Helliwell, R. A.; Mallinckrodt, A. J.; Kruse, F. W., Jr.; and Wambaganss, B. A., Pulse studies of the ionosphere at low frequencies. Stanford University, Electronics Research Laboratories, Contract CST-10751, Technical Report, March 1950.

A-545 Helliwell, R. A.; Mallinckrodt, A. J.; Kruse, F. W., Jr. and Wambasganss, B. A., Pulse studies of the ionosphere at low frequencies. Stanford Univ. Electronics Research Laboratory, Contract CST-8966, July 1, 1948-June 30, 1949. March 15,1950. 132 p. 55 figs., eqs. DWB--A voluminous report of pulse studies made at Stanford on low frequencies (100, 325, 350, 560, 850, 1120 and 1415 kc) from July 1948 to Sept. 1949. Weak echoes occurred from 35-85 km but those below 65 km are of doubtful origin. Apparatus for transmitting and receiving, notes on low level echoes, diurnal variation, splitting, vertical gradients of ionization, night time critical frequency of E region, diurnal and annual height trends, polarization, sunrise effect and sferics are treated in detail. The ionospheric storm of May 11-13, 1949 is analyzed and discussed at length. --M. R.

A-546 Helliwell, R. A.; Mallinckrodt, A. J. and Kruse, F. W., Fine structure of lower ionosphere. Geophysical Research v. 56, March 1, 1951. p. 53-62. --Pulse soundings of ionosphere at vertical incidence taken at 100 and 325 kc show pronounced splitting of echoes received at night; most echo components found to lie between about 90 and 130 km; it appears that lower ionosphere contains at night a system of reflecting strata at discrete heights, capable of both reflecting and transmitting incident electromagnetic energy. --E. I. S.

A-547 Helliwell, R. A., Sporadic E stratification and correlation with low-frequency soundings. Institute of Radio Engineers, Transactions, PGAP-3:140-142, Aug. 1952.

A-548 Helliwell, R. A. (Stanford Univ., Stanford, Calif.), Graphical solution of sky-wave problems. Electronics, 26(2):150, 152, Feb. 1953. 2 figs. DLC--If any two of the following factors are known: 1) great circle distance between transmitter and receiver, 2) virtual height of reflection, 3) equivalent path distance between transmitter and receiver, 4) angle of departure and 5) angle of incidence at the ionosphere, the other three are easily found by the use of a sky wave transmission chart, the use of which is shown by examples. --W. N.

A-549 Helliwell, R. A.; Crary, J. H.; Smith, R. L.; (all, Radio prop. Lab., Stanford Univ., Stanford, Calif.), and Pope, J. H. (Geophysical Inst., Univ. of Alaska, College, Alaska), The "nose" whistler-a new high-latitude phenomenon. Journal of Geophysical Research, Wash., D. C., 61(1):139-142, March 1956. fig., 4 refs., 2 eqs. DLC--A peculiar type of whistler recorded at College, Alaska on July 10, 1955 (65° lat) not detectable by ear is illustrated and the origin speculated on. A general form of Eckersley's dispersion law gives a predicted form of impulse similar to the observed nose whistlers. The usual whistlers are thought to be the descending portion of nose whistlers. They may give information on conditions in the ring current region and explain the dawn chorus. --M. R.

A-550 Helliwell, R. A. (Stanford Univ. Calif.) and Morgan, M. G. (Dartmouth College, New Hamp.), IGY whistler observations. Science, Wash., D. C., 123(3201):788, May 4, 1956. DLC--Notes on the program of synoptic observation of whistlers in the Northern and Southern Hemispheres, respectively, as outlined at the Boulder, Colo. meeting Feb. 14-16, 1956 for the IGY, 1957/8. Whistlers are thought to be signals from lightning discharges that follow longitudinal lines of magnetic force and where the high frequencies arrive ahead of the low, producing a descending note or whistle. They are believed to follow a path 2 or 3 earth radii out in space, so would give indications of ionization at very high altitudes. Stations proposed are listed in 3 groups: The Atlantic, Pacific, and Mid-Continent Group. --M. R.

A-551 Helliwell, R. A., Low frequency propagation studies, Pt. I, whistlers and related phenomena. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-795, Final Report, Dec. 1956.

A-552 Helliwell, R. A., Low frequency propagation studies, Pt. II, Low and medium propagation studies. Stanford University, Electronics Laboratories, Contract AF 19(604)-795, Final Report, Sept. 1956.

A-553 Helliwell, R. A. and Gehrola, E. (both, Radio Prop. Lab., Stanford Univ.), Observations of magneto-ionic duct propagation using man-made signals of very low frequency. Institute of Radio Engineers, Proceedings, 46(4):785-787, April 1958. 2 figs., 6 refs. DLC--A unique mode of very low frequency radio transmission (from Annapolis, Md. to Cape Horn, South America) is reported; its close similarity to whistler propagation is claimed to provide new evidence in support of the ECKERSLEY-STOREY theory of whistlers. Details of the apparatus and operation are given and records obtained are presented. The technique (being controlable) is considered superior to the whistler method for the study of the outer ionosphere. --G. T.

A-554 Henissart, Martha, Low frequency noise in the range 0.5-20 cycles per sec. Nature, London, 172(4380):682-683, Oct. 10, 1953. 4 figs., 3 refs. DWB--Describes measurements in Massachusetts and New Mexico; records of noise storm and quiet periods are shown. Storms were frequent and are often correlated with ionospheric storminess, K-index, and solar radio noise (including a peak at lags of 29 and 37 days). A regular diurnal variation was found. --C. E. P. B.

A-555 Hennessey, James J. and Torres, J. S., Experimental ionospheric observations of the solar eclipse of June 20, 1955 at Baguio City, Philippines. Special supplement to: Journal of Atmospheric and Terrestrial Physics,

A-556 Hepburn, F. and Pierce, E. T., Atmospherics with very low-frequency components. Nature, London, 171(4358):837-838, May 9, 1953. 4 refs. DWB--The 'slow tails' (100-500 c/s) parameters of atmospherics: t, time between start of main oscillation and commencement of slow tail, and quarter cycle $\tau/4$ of the tail are represented for distances D up to 5000 km by $t = K(D - D_o)$ and $\tau/4 = \tau + cD$; $D_o = 1000$ km and τ 500 μ sec. By day K = 0.33 and c = 0.23; by night k = 0.13 and c = 0.08. The results indicate propagation between earth and an equivalent homogeneous ionospheric layer, height 65 km and conductivity 5×10^3 e.s.u. by day, 90 km and 11×10^3 by night. --C. E. P. B.

A-557 Hepburn, F., Atmospheric waveforms with very low-frequency components below 1 kc/s known as slow tails. Journal of Atmospheric and Terrestrial Physics, 10(5/6):266-287, 1957. 10 figs., 3 tables, 21 refs. DWB--Origin of "slow tails" is discussed. Recent observations of form, magnitude, quasi-period and delay of slow tails are described and their theoretical explanation in terms of source and propagation set out. Examples of slow tails are illustrated and diurnal variation with respect to sunset at source plotted. Amplitude increases from day to night, quarter period by day and with storm distance. Delay increases more rapidly by day than night and more rapidly than quarter periods. Theory of origin is discussed; day and night ionosphere parameters are evaluated for heights of 50-90 km.

A-558 Hepburn, F. (Physics Dept., Univ. of Nottingham), Classification of atmospheric waveforms. Journal of Atmospheric and Terrestrial Physics, London, 12(1):1-7, 1958. 3 figs., 12 refs. DLC--The desirability and requirements of a systematic classification of atmospheric wave forms are discussed. An observational scheme is suggested and interpreted in terms of known properties of the discharge and propagation mechanisms. This data is reviewed to clarify application of the scheme to individual wave forms. The relationship of the classification to previous inadequate groupings is indicated. --Author's abstract.

A-559 Heritage, J.L.; Weisbrod, S. and Fay, W.J., Evidence for a 200 megacycle per second ionospheric forward scatter mode associated with the earth's magnetic field. Journal of Geophysical Research, 64(9):1235-1241, Sept. 1959. 8 figs., 4 refs.

A-560 Hess, H.A., Kurzwellenausbreitung über Polargebieten. (Short wave propagation over polar regions.) Das Elektron, 3(6):218-226, June 1949. 8 figs., 12 refs. eqs. DLC--The "split-up" Morse signals characteristics for Polar regions due to heavy changes in the reflexibility of the ionospheric layers were investigated and analyzed (1942-1945). Oscillograph recordings of signals photographed in slow motion technique are presented and some possible ways to overcome the splitting are offered. It is concluded that short-wave propagation is bound to several reflections between ionosphere and ground. --W.N.

A-561 Hess, H.A., Investigations of high-frequency echoes, Pt. 3. Institute of Radio Engineers, N.Y., Proceedings, 40(9):1065-1068, Sept. 1952. 4 figs., 6 refs. DLC--The author gives a detailed account of radio wave propagation carried out in Germany in Nov. 1944, on a frequency of 19,947 kc. First and second circuits (around the globe) and signals reflected from the ionosphere were recorded and timed. Original records of the received signals are reproduced and time-amplitude curves presented. Around-the-globe trajectories of radio waves are shown in a diagram representing them as a beam of great circle lines with intersections at antipodal points. The ratio between the circuit period and the height of the reflecting F2 layer is graphically represented. (For Pts 1 and 2 see I.R.E., Proceedings, 36:981-992, Aug. 1948 and 37:986-989, Sept. 1949.)--G.T.

A-562 Hibberd, F. H., Theoretical resonance curves in the gyro-interaction of electromagnetic waves in the ionosphere. Il Nuovo Cimento, 10(4):380-385, April 1, 1953. 2 figs., footrefs. Italian summary p. 385. DLC--In a recent communication Dr. Motzo has considered the gyro-interaction of radio waves in the ionosphere when the disturbing wave is incident vertically. She concludes that for this case one would expect to observe always a single maximum in the index of interaction as the frequency of the disturbing wave is varied through the gyro-frequency. It is possible to show that with larger approximations in the calculations either single or double maxima may occur and that there is little difference in the general shape of the resonance curves resulting from vertically incident and obliquely incident disturbing waves. A qualitative outline is given of the theory of gyro-interaction of V. A. Bailey. --Author's abstract.

A-563 Hibberd, F. H., Ionospheric self-interaction of radio waves. Journal of Atmospheric and Terrestrial Physics, 6(5):268-279, May 1955. fig., 12 refs., 28 eqs. DWB--A theory is developed for the self-interaction of a modulated continuous wave in the ionosphere. In general, self-interaction will result in a reduction of modulation of a modulated wave and in the generation of harmonics of the original modulation frequency in its passage through the ionosphere. The effects should be greatest for a high-power, medium- to low-frequency wave with low modulation frequency. The magnitude of the demodulation appears to be sufficiently large to measure. It is possible to determine from it the electron collision frequency in the lower E layer. Effects near the gyro-frequency have not been considered. --Author's abstract.

A-564 Hibberd, F. H., Self-distortion of radio waves in the ionosphere, near the gyro frequency. Journal of Atmospheric and Terrestrial Physics, 11(2):102-110, 1957. table, 9 refs., 14 eqs. DWB--In a previous paper (1956) the self-distortion (or self-interaction) of a low frequency radio wave in the ionosphere was considered, neglecting the earth's magnetic field, and it was shown that self-distortion results in a small reduction of the modulation depth of a modulated wave. The theory is extended here, with the inclusion of the magnetic field, for frequencies near the gyro frequency. It is shown that the reduction in modulation depth varies only slowly with wave frequency near the gyro frequency, and shows no resonant-like variation. The reduction is proportional to the power radiated, is greatest for low modulation frequencies and decreases rapidly as the modulation frequency is increased. With 100 kW radiated, the fractional reduction in modulation depth of a modulated gyro wave is expected to be of the order of 1 part in 100. Recent experiments that have been claimed to have demonstrated large self distortion effects near the gyro frequency are discussed. --Author's abstract.

A-565 Hibberd, F.H., The Faraday fading of radio waves from an artificial satellite. Journal of Geophysical Research, 64(8): 945-948, Aug. 1959. figs., 5 refs.

A-566 Higgs, A.J. (Australian Sci. Liaison Off., Wash., D.C.), Radiophysics in Australia. Science, 117(3031):3, Jan. 30, 1953. DWB--The Radiophysics Lab. in Sydney began in 1949 as a wartime radar research establishment but is now famous for its peacetime work in radio astronomy and radar and is concerned with ionospheric and upper atmosphere investigations. Work in Australia on cloud physics and "rain making" was spectacular in the early stages (1947). Recently, good results have been obtained by the Laboratory in studies of rain from non-freezing clouds, and of the relative importance of coalescence in raindrop formation. --M. R.

A-567 Hill, R.A. and Dyce, R.B. (both, Stanford Res. Inst., Menlo Pk., Calif.), Some observations of ionospheric Faraday rotation on 106.1 Mc/s. Journal of Geophysical Research, Wash. D.C., 65(1):173-176, Jan. 1960. 6 figs., table, 4 refs., 4 eqs. DWB, DLC--The polarization twist imposed on 106.1 Mc/s radio waves by the ionosphere has been investigated by using the moon as a passive reflector, the purpose being to determine the total electron column density even at altitudes above the known ionosphere. Because the antenna is capable of being continuously directed at the moon for 12 consecutive hours, observations are possible from the pre-dawn ionization minimum to the noon-time maximum. A true-height profile computed from vertical-incidence ionosonde data of Sept. 16, 1957, suggests that the total electron content throughout the entire ionosphere is not a constant factor of the integrated electron content computed up to the level of maximum ionization density. --Authors' abstract.

A-568 Hineken, F.W. and Bruin, F. (Zeeman Lab., Amsterdam Univ., Netherlands), Some measurements on refractive indices of gases in the microwave region. Physica, Amsterdam, 20(6): 350-360, June 1954. 4 figs., 2 tables, 16 refs. DWB, DLC--A method is described to measure refractive indices of gases at atmospheric pressure and at a frequency of 25,000 Mc/s. The method is based on the change in resonance frequency of a cavity, first filled with a reference gas (nitrogen) and after that with the gas of which the refractive index is to be determined. However, instead of measuring the frequency change of a fixed cavity the authors measure the change in length of the cavity, necessary to keep it tuned in both cases to the frequency of the (6, 6) inversion line of ammonia. Subsequently the reading with a nitrogen filling is compared to the one of the evacuated cavity, so that all refractive indices are obtained with respect to vacuo. Results of these measurements for ten gases are given. As the absorption is extremely small and the inaccuracy of measurements of refractive indices amounts to one or two parts in 10^6 for these gases, the introduction of a complex refractive index is found to be unnecessary. --Author's abstract.

A-569 Hines, C.O., Wave packets, the Poynting vector, and energy flow, Pt. 4, Poynting and Macdonald velocities in dissipative anisotropic media (conclusion). Journal of Geophysical Research, 56(4):535-544, Dec. 1951. 11 refs., 24 eqs. DLC--Deals with the path of electromagnetic energy flow in media of complex nature (propagation of radio signals in the ionosphere). Direction obtained by POYNTING's or MACDONALD's methods shows a discrepancy with that found by the probably more reliable packet method.--A. A.

A-570 Hines, C.O., Electron resonance in ionospheric waves. Journal of Atmospheric and Terrestrial Physics, London, 9(1): 56-70, July 1956. 3 figs., table, 10 refs., 43 eqs. DWB--Large-scale travelling disturbances, now frequently observed in ionospheric F layer, are interpreted in terms of an electron resonance. This phenomenon arises when an initial atmospheric disturbance sets the electrons into natural modes of oscillation, and the resultant increase of electron displacements then enhances the likelihood of detection by present (radio) techniques. Certain qualitative features of the observed disturbances can be explained on this basis, and a quantitative comparison provides estimates for several ionospheric parameters which are in good agreement with the values expected. Further application of an improved theoretical development may well provide an extremely useful method of investigating the physical properties of the ionosphere.--Author's abstract.

A-571 Hines, C.O., Heavy-ion effects in audio-frequency radio propagation. Journal of Atmospheric and Terrestrial Physics, 11 (1):36-42, 1957. 2 figs., 5 refs., 16 eqs. DWB--The usual theory of whistler propagation, in which the effects of electrons alone are considered, leads to the conclusion that whistler ray directions cannot differ markedly from the direction of the geomagnetic field. When the effects of heavy ions are considered, however, it is found that all directions of propagation are possible at audio frequencies, and that the dispersion of frequencies takes place in opposite senses for longitudinal and transverse propagation. These theoretical results may suggest new possibilities for the detection of heavy ions and for the interpretation of some types of audio-frequency observations. --Author's abstract.

A-572 Hines, C.O., Motions in the ionosphere. Institute of Radio Engineers, N.Y., Proceedings, 47(2):176-186, Feb. 1959. 3 figs., 70 refs., 2 eqs. DLC--The ionosphere, even in its "undisturbed" state, is constantly in motion. Its charged and uncharged constituents may travel together or independently, while irregularities in the distribution of charge may take a different course again. The pertinent observational data are extensive and, in some cases, conflicting; their interpretation is seldom direct. The theoretical factors affecting that interpretation are becoming clear, though in some cases their areas of relevance are still subject to divergent opinions. An attempt is made here to bring into focus the theoretical factors themselves, to record their bearing on the observations wherever it has been established, and to suggest paths of future progress wherever it has not. Details of observational results and theoretical developments are largely suppressed, and with them the conflicts and discrepancies which, however, real, would obscure the presentation of the principles involved. --Author's summary.

A-573 Hines, C.O., An interpretation of certain ionospheric motions in terms of atmospheric waves. Journal of Geophysical Research 64(12):2210-2211, Dec. 1959. 5 refs., 2 eqs.

A-574 Hines, C.O. (Defence Res. Board, Ottawa, Canada), On the rotation of the polar ionospheric regions. Journal of Geophysical Research, Wash., D.C., 65(1):141-143, Jan. 1960. 2 refs., 12 eqs. DWB, DLC--The possibility of magnetic coupling between the polar regions of the earth's ionosphere and the interplanetary gas has led to the suggestion that the polar ionosphere may not rotate with the earth. The depth to which the effects of the interplanetary drag might penetrate is examined here with the aid of two simple models. The results are not conclusive, but they do indicate that heights as low as the E region may be involved. --Author's abstract.

A-575 Hoffman, William C., A theoretical model for high-frequency backscatter from the sea surface via the ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 7(4/5):278-284, Oct. 1955. 2 figs., table, 12 refs., 14 eqs. DWB--The sizeable backscatter from the ocean for high-frequency radio waves propagated via the ionosphere is accounted for, using an essentially realistic model of the sea surface. The sea surface is in fact random; however, a good working approximation (at least in the case of high-frequency radio waves) is a perfectly conducting doubly-trochoidal or doubly sinusoidal surface. The average far-zone backscattered power is computed for each type of surface on the basis of the "current distribution" method and Breit-Tuve theorem. The assignment of realistic values to the ocean parameters then yields values of the backscattered power which are of the same order of magnitude as those observed. --Author's abstract.

A-576 Hoffman, W. C., A possible mechanism for radiation and reflection from ionized gas clouds. Institute of Radio Engineers, Proceedings, 47(7):1274-1275, July 1959. ref.

A-577 Hofmeyer, W.L., A statistical analysis of radar winds over Pretoria in winter. South Africa. Weather Bureau, Notos, 1(4):186-192, 1952. 4 figs., 7 tables, 6 refs. DWB--Upper winds obtained by radar at Pretoria have been statistically analyzed for the winter 1952. The results indicate that these winds are on the whole north-easterly near the surface and that they frequently back through north to westerly at a fairly low level in the free atmosphere. Average velocities vary from approximately 10 knots near the surface to a maximum of the order of 60 knots at about 200 mb. Above this level, velocities decrease rapidly and directions deviate from mainly westerly at 200 mb to practically all points of the compass at 60 mb. Other statistical results are in respect of standard deviations, frequency distributions and correlation coefficients of the west to east and south to north components and, in certain cases, of the resultant vectors. --Author's abstract.

A-578 Hok, Gunnar; Spencer, N. W. and Dow, W. G. (Dept. of Elec. Engr., Michigan Univ., Ann Arbor), Dynamic probe measurements in the ionosphere. Journal of Geophysical Research, 58(2):235-242, June 1953. 6 figs., 3 refs. Also in: Michigan Univ., Engineering Research Institute, Contract W-33-038-ac-14050, Project M824, Upper Air Research Program, Report No. 3, Nov. 1951. MH-BH, DWB--Preliminary rather successful attempts to determine the ionization in the E-layer by means of a probe technique are described. The probe current showed an extremely rapid rise between 90 and 105 km altitude. The result indicates a positive-ion density about ten times larger than the electron density. Further measurements with improved equipment are recommended. --Authors' abstract.

A-579 Hok, Gunnar and Dow, W. G. (Electrical Eng. Dept., Michigan Univ.), Exploration of the ionosphere by means of a Langmuir-probe technique. (In: Boyd, R. L. F., Seaton, M. J. and Massey, H. S. W. (eds.), Rocket exploration of the upper atmosphere. London, Pergamon, 1954. p. 240-246. 6 figs., 5 refs.) DWB--Irving Langmuir and his team developed in 1920 a method of measuring the concentration and energies of ions and electrons in electrical discharges in gases. A cylindrical probe was used to observe the positive ions in the current. Today, high-flying rockets have carried the probes into the ionosphere where ion electron plasma exists. From White Sands Proving Grounds in New Mexico, reducible data were obtained on Dec. 8, 1947 at an altitude a little more than 60 km. The evidence of the positive ion current continued to increase with the altitude. The results of the probes have been remarkable. The rockets have reached a maximum altitude of 104 km at a time when the height of E-layer was 110 km. --N. N.

A-580 Hok, Gunnar; Sicinski, H. S. and Spencer, N. W. (all, Dept. of Elec. Engr., Univ. of Michigan), Temperature and electron density measurements in the ionosphere by a Langmuir probe. (In: Van Allen, James A. (ed.), Scientific uses of earth satellites. Ann Arbor, Univ. of Michigan Press, 1956. p. 263-267. fig., 4 refs.) DWB--Langmuir probe techniques offer interesting possibilities for obtaining important data by measurements from an ionospheric satellite. The feasibility of such measurements has been demonstrated in a preliminary manner on rockets in the lower E-layer of the ionosphere. The most straightforward data calculated from probe records are for temperature. Approximate thermal equilibrium is assumed in each stratum of the ionosphere. During part of each voltage sweep predominantly electrons are collected; this electron current yields both temperature and electron density. The collection of positive ions appears difficult to translate into useful information. --Authors' abstract.

A-581 Holt, Olav and Landmark Bjørn (both, Norwegian Defence Res. Establishment, Kjeller), Some statistical properties of the signal fine structure in ionospheric scatter propagation. Geofysiske Publikasjoner, Oslo, 20(8), March 1958. 7 p. 7 figs., 7 refs., eqs. DLC, DWB--Some statistical properties of the signal fine structure for a VHF ionospheric scatter circuit between northern and southern Norway have been examined. It is shown that the background component of the signal has statistical properties in agreement with those to be expected for Gaussian noise, and that this signal therefore can be explained in terms of scattering from a large number of irregularities. The fading of the enduring meteoric bursts, on the other hand, must be explained in terms of interference between a few reflected components resulting from bending of the trail due to large scale wind gradients. --Authors' abstract.

A-582 Hopkins, H. G. and Reynolds, L. G., An experimental investigation of short-distance ionospheric propagation at low and very low frequencies. Institution of Electrical Engineers, Pt. 3, 101(69):21-34, Jan. 1954. 10 figs., 13 tables, 19 refs. DWB--The properties of the lower portion of the ionosphere have been studied at selected low and very low frequencies by observations of commercial continuous-wave transmitters located at distances of about 100 km from the receiving point. Attention has, in general, been confined to the horizontally-polarized electric component of the ionospheric wave received by means of a vertical loop set normal to the plane of propagation. Using mainly twin-channel recording equipment, an outline description of which is given, the pick-up on this loop has been compared in phase and magnitude with that on another vertical loop arranged in the plane of propagation. Changes in the apparent height and conversion coefficient of the reflecting layer have been studied, mainly at 16 and 70.8 kc/s, in terms of a simple model under both normal and disturbed conditions. The data serve generally to the measurements of other observers, but some discrepancies are discussed. It is considered that pulse-sounding technique has advantages over the continuous-wave method for ionospheric measurements in the frequency band under review, particularly at the higher frequencies. --Authors' abstract.

A-583 Hormuth, W., Statistik der Schwundabhängigen Gerauschleistung fur Breitband-Richtfunkverbindungen mit vielen Funkfeldern. (Statistics on the fading-dependent noise yield of centimeter directional radio communications with several radio fields.) Archiv der Elektrische Übertragung, 12(8):346-356, Aug. 1958. 7 figs., 8 refs.

A-584 Horner, F., Measurements of atmospheric noise at high frequencies during the years 1945-1951. Great Britain. Dept. of Scientific and Industrial Research, Radio Research, Special Report, No. 26, 1953. 40 p. numerous figs., 8 tables. DWB --Results of measurements at 20 noise measuring stations in all parts of the world are analyzed for period 1945-51. Year to year, seasonal and diurnal variations as well as geographical differences are revealed in graphs and text. Various frequencies (2.5, 5, 10, 15 and 20 mc/s) are considered. Changes in methods of prediction for 2.5 and 5 mc/s are indicated as a result of this survey. No changes in 15 and 25 mc range seems necessary. This is thought to be due to the fact that higher frequency noise comes from distant thunderstorms and lower frequencies from more critical local thunderstorm areas. --M. R.

A-585 Horner, F. and Harwood, J., An investigation of atmospheric radio noise at very low frequencies. Institution of Electrical Engineers, Proceedings, Pt. B, 103(12):743-751, Nov. 1956. 11 figs., 8 refs., 9 eqs. DLC--Technical aspects of noise measurements for long wave reception; nature of noise; average probability and amplitude distribution of voltage peaks; time distribution of peaks; measuring equipment; pen records, diurnal and seasonal variations in field strength, noise structure, amplitude probability, distribution of envelope and time distribution of major impulses are analyzed and discussed. Examples are cited and illustrated by records and curves for varying situations of thunderstorm incidence during July-Sept., 1955 in southern England (Radio Research Station). --M. R.

A-586 Horner, F., La relation entre la propagation des ondes tres longues et la direction. (Relation between the propagation of very long waves and their direction.) L'Onde Electrique, Paris, 37(362):535-538, May 1957. fig., 2 tables, 7 refs. DLC--Measurements made in England on 16 kc near vertical incidence show that about half the incident power is reflected from the ionosphere at night, the reflected signal being polarized elliptically toward the left. Results obtained in August over two short paths in different directions are in agreement with the hypothesis that the long axis of the ellipse of electrical polarization forms a 70° angle to the magnetic north, the eccentricity being 0.55. These results are similar to those published earlier for frequencies of the order of 100 Kc. --Trans. of author's abstract.

A-587 Horner, F. (Radio Res. Station, Slough, Eng.), Polarization of atmospherics. Nature, London, 181-(4624):1678-1679, June 14, 1958. 2 figs. DWB--A complex type of trace was obtained with a twin-channel cathode-ray direction finder. This paper contains assumptions and deductions on the polarization of the echoes that were received after varying numbers of reflections between earth and ionosphere. It is concluded that the trace can be produced by a vertical discharge to the ground, and not by a horizontal discharge channel. --N. N.

A-588 Hosking, R.H. (Dep. of Physics, Queensland Univ., Brisbane), The mean thickness of night-time Es clouds at Brisbane. Australian Journal of Physics, Melbourne, 19(1):220-221, March 1957. 3 refs. DLC--Measurements of thickness of Es (sporadic E clouds) at night by measuring (a) the equivalent paths of echoes from their under surfaces and from the F region, and from internal reflection between the F region and the top of the Esc before returning to the ground, at 2.28 Mc/s at Brisbane for range 0-500 km during 1952, 1953 and 1954 were analyzed and the mean of 98 measurements gave a thickness of 0.33 km with a standard error of 0.23 km. --M. R.

A-589 Houston, Robert E., Jr., 75 Kc/s in phase height instrumentation and data. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 93, May 1, 1957. 68 p. 34 figs., table, 14 refs. DWB(M10. 535 P415i)--The instrumentation utilized in measuring changes in phase of a pulsed radio signal, whose carrier frequency is 75 kc/s and is vertically incident on the lower ionosphere, is described. The various components in the equipment are discussed in some detail. Block and schematic diagrams and photographs are included. It is pointed out that the entire apparatus acts as a radio interferometer and recorder. Illustrations of the various types of records obtained are shown, and the method of reduc ing them to monthly averages is indicated. Where enough daily records were available, the monthly average of the change in phase height of the main E layer reflection is given. It is concluded that the operation of the equipment is satisfactory. The received signals are phase stable and resolved sufficiently to be measured. A recommendation for the study of anomalous events in the ionosphere is made. --Author's abstract.

A-590 Howe, G. W. O., Radio waves and the ionosphere. Institution of Radio Engineers, Journal, 7(1):36-42, Jan.-Feb. 1947. 5 figs., eqs. DBS--In this historical survey is shown what happens to a radio wave during its passage through the ionosphere as a dispersive medium, like a glass prism. --W. N.

A-591 Howells, I. D. (Cavendish Lab., Cambridge, Eng.), On the spectrum of electron density produced by turbulence in the ionosphere in the presence of a magnetic field. Journal of Geophysical Research, Wash., D. C., 64(12):2198-2199, Dec. 1959. ref., 5 eqs. DLC--The work described in this paper starts from Dungay's results, and obtains approximate equations for number density of ionization, under the action of turbulence, diffusion, and a magnetic field, in various limiting cases. The principal result is that this mechanism cannot be expected to produce irregularities that are strongly elongated along the magnetic field. A form is obtained for the spectrum function of number density below 140 km.

A-592 Hugenholtz, E. H.; Seljak, A. and Towle, A., Frequency stepper for radio propagation tests. Electronics, 32(4):44-46, Jan. 23, 1959. --Schematic and descriptive details are given.

A-593 Hultqvist, Bengt, On the interpretation of ionization in the lower ionosphere occurring on both day and night side of the earth within a few hours after some solar flares. Tellus, 11(3): 332-343, Aug. 1959. 9 figs., 3 tables, 23 refs., 6 eqs.

A-594 Hultqvist, Bengt and Ortner, Johannes (both, Kiruna Geophys. Observ., Kiruna C., Sweden), Strongly absorbing layers below 50 km. Planetary and Space Science, N.Y., 1(3):193-204, Aug. 1959. 8 figs., table, 34 refs., 8 eqs. DWB--In a few cases of very strong absorption of very long duration observed at Kiruna Geophysical Observatory during the summer of 1958, the height of the upper boundary of the ionized layer has been found to be about 50 km. It is shown that this height value accords well with what is to be expected if the ionizing agent consists of protons. Earlier proposed interpretation is discussed with regard to this new height information. --Authors' abstract.

A-595 Humby, A.M.; Minnis, C.M. and Hitchcock, R.J., Performance characteristics of high-frequency radio-telegraph circuits. Institution of Electrical Engineers, London, Proceedings, Ser. B, 102(4):513-522, July 1955. 21 figs., table, 8 refs. DWB --Operational data from several important long-distance radiotelegraph circuits have been analyzed and the results discussed in relation to variations in solar and magnetic activity. It is shown that the lowest operational efficiency on radio circuits need not necessarily occur at the same time as the lowest level of solar activity. For example, in 1952 the performance of many difficult radio circuits deteriorated considerably, coincident with a peak of magnetic activity, but subsequently recovered although solar activity continued to fall. On certain circuits there is a pronounced seasonal asymmetry of performance in the two directions of the route; to confirm that this is due to propagation effects, data from different organizations operating on substantially the same radio path are compared—particular reference being made to the United Kingdom-South Africa and the United Kingdom-Australia circuits. Suggestions are put forward as to the possible reasons for this asymmetry with season, and consideration is given to effects such as ionospheric propagation, atmospheric noise and the path taken by the ray. Mention is also made of other propagation phenomena, such as echo signals, maximum latitude of ray path and M reflections, which have a bearing on the operation of radiotelegraph circuits. For the purposes of the paper all references to seasons relate to the Northern Hemisphere. --Authors' abstract.

A-596 Huxley, L.G.H. and Ratcliffe, J.A., A survey of ionospheric cross-modulation. Institution of Electrical Engineers, Proceedings, Pt. 3, 96(43):433-440, Sept. 1949. 3 figs., table, 24 refs., 17 eqs. DLC--History, detailed theory and results of recent experiments on cross-modulation in ionospheric research. Theories of Bailey and Martyn revised. Magnitude of cross-modulation effect can be calculated for any pair of stations. Methods of observation described. --M.R.

A-597 Huxley, L. G. H. (Adelaide Univ., S. Australia), A synopsis of ionospheric cross modulation. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 11:137-170, 1952. figs., tables, 23 refs. DWB. Also in: Nuovo Cimento, Ser. 9, 9(1), Suppl. p. 59-82, 1952. 6 figs., 2 tables, 22 refs., 41 eqs. DLC--Ionospheric cross modulation (radio wave interaction) observations made at Cambridge and Birmingham show agreement with theory of MARTYN and BAILEY based on knowledge of chaotic motion of free electrons in gases and electric fields. The theory is developed in detail, the experimental set up described and illustrated, and the seat of cross modulation located at 85 to 90 km, with a scale height of about 8. 5 km for $\bar{V}$ at 90 km. Pressure deduced from these data agree with rocket data for 90 km height. A formula for power supplied per electron from the disturbing wave, generalized to include oblique incidence, gives values to T_o close to those observed in nature (neglecting influence of earth's magnetic field). --M. R.

A-598 Huxley, L. G. H., The interpretation of measurements of radio-wave interaction. Journal of Atmospheric and Terrestrial Physics, London, 8(1/2):118-120, Feb. 1956. 7 refs., 6 eqs. DWB--The original theory of interaction of radio waves is modified to take account of the molecular concentration instead of the collisional frequency. --C. E. P. B.

A-599 Inoue, Yuji (Technical Research Inst., National Defense Agency, Tokyo, Japan), On the ionization mechanism in the ionosphere. Japanese Journal of Geophysics, Tokyo, 1(3): 21-120, March 1957. 8 figs., 21 tables, 71 refs., 141 eqs. DWB--The theories proposed so far on the formation of the ionosphere are criticized. In particular, those on the formation of the E layer are inspected and discussed. The arguments of criticism are based on rocket measurement data, variations of the ionosphere during solar eclipses, results of recent researches in solar physics, and experimental data about rates of various reactions. It is shown that all the formation theories put forward so far are incomplete. In this paper, a new interpretation of the effective recombination coefficients of an electron in the ionosphere is developed. A new theory for the ionization mechanism in the ionosphere is also brought forward. With respect to the dissipation of electrons it is suggested that an electron is attached to molecular oxygen located at a vibrationally excited level; as a result, a stable negative ion of molecular oxygen is formed; subsequently, a mutual neutralization between this negative ion and a positive ion becomes effective. Attachment processes of a slow electron to molecular oxygen are discussed. A favorable process for stabilization is found. The principal part of positive ion -

concentrations is of atomic oxygen; the concentration of positive ions of molecular nitrogen is negligible. When a mutual neutralization between a negative ion of molecular oxygen and a positive ion of atomic oxygen takes place, the resulting atomic oxygen is almost all in a highly excited state whose energy is more than 9.11eV as compared with its ground state. This atomic oxygen gives rise to the emission of photon of its resonance lines as a result of the spontaneous transition from its highly excited state to the ground state. The resonance lines of atomic oxygen are of 1302-1306 Å (OI, $3s^3S^o$ -$2p^3P$) and 1025.7 Å (OI, $3d^3D^o$ -$2p^3P$). These lines were observed at 115 km as an emission line by the rocket-borne spectrograph of U.S. Naval Research Laboratory. It appears that these lines are "ionospheric" and "non-solar". The photons of the resonance lines, which appear as a result of the ionospheric recombination, are absorbed by oxygen atoms and the oxygen atoms in the highly excited states are resulted, from which they are ionized with the aid of a visible radiation, being in abundance. The photons of the resonance lines permeate in a scattered radiation down into the E layer, and then they are richly stored up in the E region. The ionization in the E layer is that from the highly excited states of atomic oxygen due to a visible radiation. Such an ionization mechanism explains the variation of the E layer during solar eclipses. With respect to the permeation of the resonance radiations of atomic oxygen, the effects of molecular absorption in the ionosphere are discussed. It is concluded that the incident ionizing radiations come from the chromosphere as well as the corona. --Author's abstract.

A-600 International Council of Scientific Unions. Joint Commission on Radio-Meteorology, Brussels, Aug. 16-18, 1954. Proceedings of the 3rd meeting. pub. 1955. 30 p. t-p. in French and English. Text in French or English. DWB--On p. 18-26 the work of WMO in the field of sferics research is summed up (in French). A report is included on a special meeting held in Zurich in May 1954 by sferics experts delegated by the governments of the United Kingdom, France and Switzerland. Discussions and resolutions of this meeting concerning various applications of sferics observations, comparison of different instruments and methods, international coordination, etc., are summed up. Reference is also made to the most important sources of information on sferics. --G. T.

A-601 International Council of Scientific Unions. Mixed Commission on the Ionosphere, 2nd Meeting, Brussels, Sept. 1950 Proceedings. Brussels, Pub. by the Council, 1951. 230 p. figs., tables, refs., eqs. DWB--

The Mixed Commission on the Ionosphere consists of members from the International Scientific Radio Union, the I. U. G. G., the International Astronomical Union and the International Union of Pure and Applied Physics. Over 30 papers on the ionosphere, aurora and upper atmospheric investigations and theory which were read at the 1950 meeting in connection with the meeting of the I. U. G. G. in Brussels, are presented in English, with illustrative material included. Minutes of the sessions of the 4th and 6th of Sept. 1950, names of members, those attending, and discussions of papers, Commission resolutions and a proposal for an International Polar Year (1957/8) are included. Each paper has been abstracted separately and many are included in this bibliography. --M. R.

A-602 International Council of Scientific Unions. Mixed Commission on the Ionosphere. N. Y. Univ., Aug. 14-16, 1957. Proceedings of the fifth meeting. Ed. by W. J. G. Beynon. Journal of Atmospheric and Terrestrial Physics, London, 15(1):1-176, Sept. 1959.--The Fifth Meeting of the Mixed Commission on the Ionosphere of I. C. S. U. was held at New York University, Aug. 14-16, 1959. The present issue consists of two parts, viz: 1. Proceedings of the meeting as follows: Session I - Sir Edward Appleton: Global morphology of the E- and F-1 layers of the ionosphere. W. J. G. Beynon: Vertical drift effects in region E. Session II - J. A. Ratcliffe, A. R. Robbins and J. O. Thomas: Movements in the quiet F-layer over Slough. Session III - P. Lejay: Irregularites ionospheriques. S. Chapman: Disturbances in the lower auroral ionosphere. K. Rawer: Irregularities and movements in the F-region. Sessions IV and V - S. Chapman: The outermost ionosphere. S. F. Singer: Geophysical effects of solar corpuscular radiation. J. L. Pawsey: The question of radio emission by the ionosphere. M. G. Morgan: Whistlers. K. Maeda and I. Kimura: Calculation of the propagation path of whistling atmospherics. Session VI - Resolutions. Part 2 includes the following 26 papers submitted to the Commission. S. Matsushita: The morphology of the lower ionospheric region in auroral latitudes. J. M. Watts: Interpretation of some features of low-frequency ionograms. I. Shimazaki: Effect of the S_q current system on the ionospheric E- and F1 - layers. A. Haubert: Les gradients de temperature dans les regions-E et -F1, d'apres les sondages ionospheriques effectues a Casablanca. A. Haubert: L'ionisation nocturne de la region-E et l'activite geomagnetique. Y. Inoue: On the importance of the resonance-lines of atomic oxygen to the ionospheric ionization. T. Yonezawa: A new theory of formation of the F2 layer. J. W. Chamberlain: Excitation of the oxygen red lines in twilight. J. W. Chamberlain: Recombination in the F2 layer and the oxygen red lines in the airglow. G. J. Gassmann: Tides in the F-layer. A. R. Robbins and J. O. Thomas: The disturbed F-layer over Slough. T. Shimazaki: Dynamical structure of the ionospheric F2-layer as deduced from the world-wide daily variations. T. Sato: Ionospheric F2-disturbances associated with geomagnetic storms. R. W. Wright and N. J. Skinner: Equatorial spread-F. I. Kasuya: On the occurrence of the F1½ -layer at Tokyo. M. Ose, K. Aida and H. Okamoto: Latitude dependence of f_oF2 over the range of 20°N to 69°S, obtained by ship-borne ionospheric sounder. W. G. Elford: Winds in the upper atmosphere. L. A. Manning: Air motions at meteoric heights. K. Rawer: Drift in the E-region. A. Haubert: A propos des grands mouvements verticaux de la region-F. M. Hirono, H. Maeda and S. Kato: Wind systems and drift motions in the ionosphere deduced from the dynamo theory. K. Sinno: On the origin of the long-lived solar corpuscular streams which appeared during the last solar cycle, 1950-53. S. Akasofu: Magneto-hydrodynamic waves in the ionosphere. W. Pfister and J. C. Ulwick: Analysis of pulse-delay data from rockets for the determination of electron density. W. J. G. Beynon and G. M. Brown: Region E and solar activity. L. Vegard: Report on spectrographic work at Tromsø and Oslo. The list of membership of the Mixed Commission on the Ionosphere is followed by the names of representatives participating at the New York meeting. The alphabetical author index also serves to denote participation in the discussion of the papers presented. --W. N.

A-603 International Geophysical Year, 1957/1958. Comité Special, Meeting of the Special Committee of the International Geophysical Year, Rome, Sept. 30-Oct. 4, 1954. 12 sections, each separately paged. Mimeo. DLC--Includes reports of the following groups: 1. World days, 2. Meteorology, 3. Geomagnetism, 4. Airglow and aurora, 5. Ionosphere, 6. Solar activity, 7. Cosmic rays, 8. Latitudes and longitudes, 9. Glaciology, 10. Oceanography and 11. Rockets. A complete list of attendants, transactions of the assembly of CSAGI at Rome from Sept. 30-Oct. 4, 1954, including resolutions and recommendations, lists of stations, program of work, etc. for each of the 11 sub-committees named above plus work of the 12th and 13th sub-committees (Geophysical distribution and Publications and publicity) and names of chairman and members of the 13 committees. The activities of the President (S. Chapman), Vice President (L. V. Berkner) and Secretary General (M. Nicolet) in 1953 and 1954 are reported. --M. R.

A-604 International Geophysical Year, 1957/1958. Comite Special (CSAGI), Second Meeting, Rome, Sept. 30-Oct. 4, 1954 (Proceedings, continued). Its Bulletin d'Information, No. 5, 1955. 79 p. tables. DWB. Preprint from International Union of Geodesy and Geophysics, IUGG Bulletin d'Information, News Letter, No. 11, 1955. --

This report lists stations in all parts of the globe, with geographical and magnetic coordinates, proposed for IGY, 1957/58, under headings of Meteorology (including ozone, radiation and spherics stations), Geomagnetism, Aurora and Airglow, Ionosphere, Solar activity, Cosmic ray, Latitude and longitude, Glaciology, Oceanography, Rockets and according to Arctic, Antarctic, Equational, 80° - 70°W, 10°E and 140°E longitude lines. In all, several thousand stations are listed. --M. R.

A-605 The International Geophysical Year: Indian Programme. Journal of Scientific and Industrial Research, Sec. A, 16(6):231-233, June 1957. DWB, DLC--A score of governmental, semigovernmental and private institutions and universities in India are listed as cooperating in the IGY effort, as well as the meteorological and magnetic network of the Indian Meteorological Department. The special program in meteorology, geomagnetism, aurora and airglow, ionosphere, solar activity, cosmic rays, glaciology, oceanography, satellite tracking, seismology and gravity is outlined. In meteorology, 10 stations will make upper air soundings, 4 will conduct ozone measurements, 4 radiation and thermal balance measurements, 2 radar storm tracking (long range), and 2 or 3 local storm studies with radar. Two will measure the electrical potential gradient, 2 sferics, 12 evaporation and 8 auroral observations. --M. R.

A-606 International Geophysical Year, 1957/1958. U. S. National Committee, Antarctic program. National Academy of Sciences— National Research Council, Publication, No. 553, Sept. 1957. 58 p. 17 plates, photos, 13 tables. DWB--This monograph gives a list (and map) of U. S. IGY stations in the Antarctic, a summary of activities in 10 fields, plus special studies undertaken. A summarization of scientific and support personnel in each discipline and of each type at each station, station facilities and equipment, communications by land, sea, air and radio, time table of operations for 1954-5, 1955-6, 1956-7 and 1957-8, etc. is included. Station layouts at 7 places, buildings, site plans and photographs of stations and facilities are shown graphically. --M. R.

A-607 International Scientific Radio Union. Mixed Commission of the Ionosphere. Reunion de Bruxelles du 28 au 30 julliet 1948. Brussels Meeting 28th to 30th July 1948. International Scientific Radio Union, Bulletin Mensuel, No. 50:18-20, Aug. 1948. DLC--The subjects for discussion with introductory speaker at the successive meetings were: 1) knowledge of the ionosphere by radio sounding methods (APPLETON); 2) knowledge of the ionosphere from studies of auroras (VEGARD); 3) atomic processes in the ionosphere (NICOLET); 4) solar knowledge relevant to the ionosphere (WOOLEY) and correlation of ionospheric with astrophysical phenomena (STRATTON); 5) knowledge of the ionosphere from studies of geomagnetism (CHAPMAN) and 6) general discussion on the work of the Commission. List of previous attendings and resolutions drawn up by the Commission are included. --M. R.

A-608 International Scientific Radio Union. Proceedings of the 11th Assembly, The Hague, Aug. 23-Sept. 2, 1954, Vol. 10, Pt. 4, Commission 4 on Radio Noise of Terrestrial Origin. pub. 1955. 60 p. refs. DWB--In addition to minutes of the several sessions, a number of reports concerning observations of sferics in Australia, Canada, France, Germany, Great Britain, Japan, Sweden, Switzerland and the U. S. A. by chairmen of the National Committee of those countries (including A. EHMERT, F HORNER, A. KIMPARA, H. NORINDER, J. LUGEON and H. DICKSON) are included in these Proceedings. Reference to numerous papers on atmospherics, including meteorological aspects as well as recording and radio aspects, are presented by most countries. Resolutions with respect to preparation of revised sferics charts, study of wave forms, IGY program etc. are appended.-- M. R.

A-609 International Scientific Radio Union, Information Bulletin, Brussels, No. 92, July/Aug. 1955. 27 p. 3 figs., refs. DWB--Reports on membership of National Committee of India and U. S. A., a bibliography on effects of solar eclipses on the ionosphere, on the recording of sudden enhancements of sferics and on radio astronomy in Belgium, etc. --M. R.

A-610 International Scientific Radio Union, Information Bulletin, Brussels, No. 93, Sept./Oct. 1955. 45 p. 11 figs., 3 tables, refs., 17 eqs. DWB--Reports on 11th General Assembly by National Committee of India and Japan on symposis on ionospheric drifts and on ionospheric storms, respectively, on ionospheric stations, ursigrams, IGY (Resolution of WMO respecting a center for observational data, bibliography and documentation for IGY and standard forms for surface and upper air data), etc. --M. R.

A-611 Ionescu, T. V., Sur la diffusion des ondes électriques de très grande fréquence dans l'ionosphère. (Ionospheric scattering of very high frequency electric waves.) Academie des Sciences, Paris, Comptes Rendus, 245(5):520-522, July 29, 1957. 3 refs. DLC--The author points out that the diffusion of very high frequency electric waves can be explained through the negative molecular oxygen ions, which possess their own vibration periods and are produced in great number at altitudes from 50 to 90 km. This theory concerning diffusion of electric waves in the ionosphere makes it possible to calculate the diffused power value. --A. V.

A-612 Israel, H. and Kasemir, H. W., In welcher Hoehe geht der weltweite luftelektrische Ausgleich vor sich? (At what height does atmospheric electric equilibrium take place?) Annales de Geophysique, 5(4):313-324, Oct.-Dec. 1949. 3 figs., 2 tables, 16 refs., 23 eqs. French and German summaries. MH-BH--Integration of the partial derivatives to find the time that would be required for a charge introduced at a point in a conductive layer sandwiched between two nonconductive layers to be uniformly distributed throughout the former layer. This theory and calculation is applied to the ionospheric layers over the globe. --M. R.

A-613 Isted, G. A., Atmospheric electricity and long distance very high frequency scatter transmission. Marconi Review, London, 17(113):37-60, 2nd quarter, 1954. 10 figs., 15 refs. DLC--During an investigation into the behavior of long distance transmissions on very high radio frequencies a new phenomenon has been encountered which has a direct relation to electrical discharges from ordinary clouds in the lower atmosphere. Signals radiated in the 30-100 Mc/s band and transmitted to distances of 500 km and more, arrive at the receiver in a succession of impulsive bursts. A theory has been evolved to show how electrical discharges from clouds can form pockets of intense ionization in the E region; furthermore, the theory suggests that ordinary clouds, distinct from thunderstorm clouds, may be the chief electrical generators which maintain the fine weather vertical potential gradient. It is also suggested that when energy is transferred from discharging clouds to fine weather areas, continuous partial ionization of the E region conduction path is set up and in extreme cases may result in the formation of sporadic E. --From author's abstract.

614 Isted, G. A., Round-the-world echoes. Marconi Review, London, 21(131):173-183, 1958. 4 figs., 13 refs. DLC--Observations made during an investigation into ionospheric scatter propagation at a frequency of 37 Mc/s have shown that round-the-world echoes were present along a south-north route even when both the transmitting and receiving terminals were well inside the daylight hemisphere. Under the conditions of the experiment the signal seemed to have been propagated through areas where, in the normally accepted sense, the F2 region could not have been the supporting mechanism. Round-the-world echoes have also been observed from the signals radiated at 20 Mc/s by Satellite 1957 Alpha. Analysis

of the records revealed the existence of two distinctly different beat notes, one from the square-wave signals themselves, the other occurring during the intervals between them. The suggestion is put forward that transmission round the world is made possible by launching a radio wave against the ionosphere at an extremely small angle of incidence to produce a succession of reflections which are confined to the ionosphere itself. --From author's abstract.

A-615 Isted, G. A., Analysis of Gibraltar-United Kingdom ionospheric scatter signal recordings. Institution of Electrical Engineers, Proceedings, Pt. B., Vol. 105, Suppl. No. 8:36-44, 73-74, 77, 1958. table, 3 refs.

A-616 Istomin, V. G., Issledovaniia ionnogo sostava atmosfery Zemli na raketakh i sputnikakh. (Investigations of the ion composition of the earth's atmosphere by rockets and satellites.) Iskusstvennye Sputniki Zemli, Moscow, No. 2:32-35, 1958. fig., 3 refs. DLC--The construction and use of the 5. 7 cycle variant of the radio frequency mass spectrograph of Bennet for measuring the ionic composition of the atmosphere are described. Its range is 6-50 atomic units of mass; the time of measurement for this range is 1. 7 sec. The resolution in the region of mass number M = 28 is equal to $R = \frac{M}{\Delta M} \approx 28$, where ΔM - width of the peak measured at its base in atomic units of mass. The tube can be taken apart and is of metal glass construction. The radio frequency analyzer is joined to the ionic source by means of vacuum condensation to a copper gasket. The calibration characteristics were made on the basis of five points on the mass scale. A^{40}, A^{36}, N_2^{28}, N_e^{22} and N_e^{20}. The first vertical ascent was made with a rocket in Sept. 1957, and the results are presented in a graph. The results showed that ions with mass number 20 predominated at 105-206 km. Ions with other mass numbers were present at 105-190 km in an amount not exceeding 20% of the maximum concentrations of ions with mass number 30. Ions with mass number 16 (atomic oxygen) were recorded only from 192-206 km. The results of measurements carried out with the third artificial earth satellite indicated the following, viz: ions with mass number 16 ($0+$) predominated at heights above 250 km; these ions were recorded between 230 and 885 km. The second constituent was ions of mass number 14 ($N+$). In addition to the peaks corresponding to 0^+ and N^+ there were obtained peaks corresponding to ions of mass 18 (H_2O^+). --I. L. D.

A-617 Iwai, Akira and Outsu, Jinsuke, On an investigation of whistling atmospherics in Japan. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 4:29-47, Dec. 1956. 17 figs., 3 tables, 9 refs., eqs. DWB--As part of the Study Program of IGY, we have prepared an observation of whistling atmospherics. Since Jan. 1956, continuous observations of whistlers have been made at Toyokawa (geomag. lat. 24.5°). Simultaneous observations at Toyokawa and Wakkanai (geomag. lat. 35.3°) were made for one month beginning July 13, 1956. The results obtained in the analysis of the dispersion of whistlers were essentially similar to those reported by STOREY. But, at Toyokawa, long whistlers, whistler trains and whistler pairs have not been observed, only short whistlers being observed. The greater part of the observed whistlers occurred in winter; in other seasons it was scarcely possible to detect them. At Wakkanai, long whistlers and whistler pairs have been observed this summer, but whistler trains have not been observed during this period. --Authors' abstract.

A-618 Iwai, Akira and Outsu, Jinsuke, On the characteristic phenomena for short whistlers observed at Toyokawa in winter. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 5:53-63, March 1958. 7 figs., 2 refs., 6 eqs. DWB--About 84% of short whistlers observed at Toyokawa on winter nights were recognized by analysis to be preceded by tweek type atmospherics, which made it possible to measure distances between the observation station and the sources of short whistlers. And at Toyokawa in winter, dispersions of short whistlers were found to decrease regularly towards midnight. A variation of electron density in the outer ionosphere is calculated from this variation of dispersions. --Authors' abstract.

A-619 Iwai, Akira and Outsu, Jinsuke, On an investigation of the field intensity of whistling atmospherics. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 5:50-52, March 1958. 5 figs., 4 tables. DWB--An apparatus is described and its wiring illustrated (diagrammatically), for creating a pseudo-whistling tone to compare with an actual whistler in order to gage the field intensity of the latter. The full intensity is calibrated in microvolts/meter and the record can be obtained in 1-2 sec by a skillful operator. A "sona gram" of the pseudo-whistling tone generator is illustrated and a typical example of data obtained at Toyokawa on Feb. 12, 1957 tabulated (an unusually frequent series of whistlers). These occurred about sunset on several days in Feb. 1957. It is concluded that the frequency and full intensity of whistlers varies greatly with geomagnetic latitude, etc. --M. R.

A-620 Jacchia, Luigi G. (Astrophysical Obs., Smithsonian Inst.), Basic orbital data for satellite 1957 Beta one. Smithsonian Institution. Astrophysical Observatory, IGY Project No. 30.10, Special Report, No. 9, Feb. 21, 1958. 7 p. fig., 3 tables, 3 refs. Also issued in "edited form" as Smithsonian Contributions to Astrophysics, Wash., D.C., 2(10):285-236. DWB, DLC--Results of 1100 optical and radio observations of satellite 1957 Beta one during Nov., Dec. 1957 and Jan. and Feb. (to Feb. 100 1958 are tabulated and discussed. --M.R.

A-621 Jackson, Howard J.; Smith, Harold D., and Post, Cecil C., Performance of the 580-600 megacycle slot antenna for the aerobee rocket. New Mexico. College of Agriculture and Mechanic Arts. Physical Science Laboratory, Contract AF 19(604)-409, Scientific Report No. 3, Feb. 7, 1956. 16 p. 13 figs. (incl. photos.), ref. --Antenna pattern measurements for the 580-600 Mc/sec 3-slot array antenna were made on a section of the Aerobee rocket. Measurements were made in the principal planes through the center of each slot. Measurements of the transmission loss and phase characteristics of the 3-slot array antenna feed harness were made. Transmission loss was found to be 0.5 db + 0.2 db per section, and the relative phase difference at the output of each section was found to be not greater than ±2 degrees. Voltage standing wave ratio measurements were taken on each slot and its associated feed harness, as well as on the complete 3-slot array. --Authors' abstract.

A-622 Jackson, John E. (Naval Res. Lab., Wash., D.C.), Rocket borne instrumentation for ionosphere propagation experiments. U. S. Naval Research Laboratory, Upper Atmosphere Research Report, No. 13, Jan. 9, 1952. 39 p. 22+ figs., table, 15 eqs. U. S. Naval Research Laboratory, Report 3909. DWB --The rocket-borne equipment used for the ionosphere propagation experiments conducted during V-2 and Viking flights has been developed and improved to the extent that satisfactory operation has been obtained in all recent flights. Various problems were encountered in the development owing to the limitations imposed by the research vehicle and the method of experimentation. Space and weight, as well as freedom from interference with other cooperating agencies, has to be considered. In addition, the equipment has to be physically rugged and electrically stable to operate successfully under the several conditions of vibration, aerodynamic drag, and temperature changes occurring during flights. The experiments were conducted by transmitting two crystal-controlled c-w radio -frequency signals, one of such frequency as to be substantially affected by the ionosphere and the other of such frequency as to be essentially unaffected. Thus, since the antenna pattern has to be favorable toward the receiving stations on the ground, a diplexing whip antenna having a pattern similar to that of a dipole has replaced the earlier V-2 tail antennas. In recent flights, experiments were begun 80 seconds after take-off at an altitude of approximately 35 miles. Autotune circuits were added to accomplish tuning, i.e., matching between transmitter and antenna impedances, at this time and a retuning unit was developed to initiate second tuning at a much higher altitude. Antenna impedances during flight could be determined from the telemetering data of the micromatch circuit and of the matching transformer variable condenser position. The problems connected with ionosphere research instrumentation are no longer considered major sources of difficulty, certain aspects of the antenna problem which will still remain to be solved tend to reduce radiation efficiency, but apparently do not introduce serious errors in the propagation data provided that the rocket does not spin or tumble. --Author's abstract.

A-623 Jackson, John E., Measurements in the E-layer with the Navy Viking rocket. Journal of Geophysical Research, 59(3): 377-390, Sept. 1954. 10 figs., 8 refs., 7 eqs. MH-BH--Two signals of frequencies at a ratio of 1 to 6 were transmitted from the rocket, which reached a peak altitude of 174 km. The highest altitude in which the Seddon experiment for the determination of the electron density was performed up to this time. For this purpose the indices of refraction were measured which decreased from about 1 at 90 km to 0.72 at 110 km (electron density 1.3×10^5 el/cc) and further to 0.61 at 165 km (density $1.8 > 10^5$ d/cc). Questionable data above height show a rapid increase in the index. A value of 0.488 oersted was computed for the earth's magnetic field at 139 km with an upper limit of 10^4 per second for the electron collision frequency. Factors affecting the results are analyzed, especially the role of the rocket. --A. A.

A-624 Jackson, John E.; Kane, J. A. and Seddon, J. C., Ionosphere electron-density measurements with the Navy Aerobee-Hi rocket. Journal of Geophysical Research, Wash., D.C. 61(4):749-751, Dec. 1956. 4 refs. Also: Jackson, John E. and Seddon, J. Carl, Ionosphere electron-density measurements with the Navy Aerobee-Hi rocket, Ibid., 63(1):197-208, March 1958. 9 figs., Table, 9 refs., 2 eqs. DLC--In the first report, electron densities were measured at White Sands, N. Mexico., continuously from the E region up to the lower F2 region. This was done by measuring the Doppler shift in a 7.75 Mc signal from the rocket. The electron densities measured were:

Ht (km)	85	100	150	240	260
Electrons /cc	10^4	$16X10^4$	$28X10^4$	$28X10^4$	$36X10^4$

Electron densities measured on this flight (June 1956) were about 50% greater above 100 km than those on the flight of May 1954. This is in accord with the greater solar activity since 1954. In the second report, electron densities in the ionosphere above White Sands were measured continuously from the E region up to the lower F2 region with Aerobee-Hi NRL-50, a rocket instrumented by the U.S.N.R.L. The results confirm the general structure of the daytime ionosphere above White Sands as deduced from previous NRL flights, namely that the ionosphere remains dense between the E and F2 regions, with only minor valleys in the electron-density profiles. The electron-density distribution is shown to be consistent with the P'-f records obtained during the rocket flight. The sporadic E condition, seen on these ionograms, was found to be associated with a sharp spike in the electron-density profile at an altitude of 101 km and approximately 1 km thick. This sporadic condition extended over a horizontal distance of at least 80 km. --Authors' abstract.

A-625 Jackson, John E. and Kane, J. A., Measurements of ionospheric electron densities using an RF probe technique. Journal of Geophysical Research, 64(8):1074-1075, Aug. 1959. fig., 4 refs.

A-626 Jackson, J. E. and Kane, J. A., Breakdown and detuning of transmitting antennas in the ionosphere. U. S. Naval Research Lab., NRL Report, Upper Atmosphere Research Report No. 36, Aug. 24, 1959. 23 p. 15 figs., table, 20 refs., 19 eqs. DWB (M11 U58u)--Impedance measurements made on a 7.75 Mc rocket-borne antenna during several rocket flights indicate at altitudes above 110 km a capacitance change whose magnitude can be used to determine ambient electron densities. In the 50 to 100 km region the antenna undergoes a radio frequency glow discharge resulting in a severe resistive loading and reduction of radiated power. The properties of this breakdown were investigated both theoretically and by laboratory experiments. The use of a dc bias on the antenna was found helpful in preventing breakdown. The knowledge acquired from this project is being applied to the development of improved rf probe techniques for the direct measurements of electron densities in the ionosphere. --Authors' abstract.

A-627 Jackson, J. E. and Spaid, G. H., Ground stations for NRL rocket studies of the ionosphere. U. S. Naval Research Lab., NRL Report 5342, Upper Atmosphere Research Report No. 35, Aug. 31, 1959. 33 p. 18 figs., figs. in appendix, 11 refs., eqs. DWB (M11 U58u)--Between 1946 and 1958, a total of 23 rocket flights have been instrumented by NRL to measure electron densities in the ionosphere and to investigate various related phenomena. The measurements were based upon the transmission of cw signals from a rocket to receiving and recording stations on the ground. The nature of the experiments required phase comparisons between two harmonically related frequencies. Since commercial receivers are unsuitable for this purpose, special receiving equipment was designed by NRL scientists to meet the experimental requirements. Particular considerations were given to bandwidth, noise, dynamic range, phase stability, signal-strength metering, and input circuitry. The extremely narrow-bandwidth operation which is possible with the cw method led to the design and use of a new type of crystal filter in the receiving system. The need for separate reception of the ordinary and extraordinary modes of propagation led to a novel adaptation of the magic T at 7.75 Mc. A two-station system, first used at White Sands, New Mexico, was later, during IGY, transferred to Ft. Churchill, Canada. A number of unusually stable, narrow-band rf sweep generators were developed to test, adjust, and calibrate the ground-station equipment. A greatly improved knowledge of the ionosphere at middle and arctic latitudes has resulted from the data acquired at these ground stations. --Authors' abstract.

A-628 Jackson, Willis (ed.), Communication theory. Papers read at a Symposium on "Applications of Communication Theory," held at the Institution of Electrical Engineers, London, Sept. 22-26, 1952. London, Butterworth, 1953. 532 p. figs., tables, refs., eqs. DWB--The book consists of 40 articles on communication theory of experts in all phases of this new and important field. Among the subjects treated are coding, feedback mechanics, noise and transmission through noise by telegraph, radio, radar or television, storage time, propagation time, relaxation filters, transmission of drawings, color television transmission, hearing, information in words or speech, telephone circuits, communication rate, semantic communication and application to optics. The possible applications to various phases of meteorological practice are too numerous to mention. The theory is applicable, for instance, in telecommunication, radar and TV observation, coding of reports, teletransmission of automatic recording instruments, radiosonde work and even library and bibliographic work. --M. R.

A-629 Jacobs, George, Ionospheric propagation conditions. CQ, Radio Amateurs' Journal, New York, 9(7):41, 69, July 1953. DWB--Regular column giving monthly outlook of radio propagation conditions, namely of possibilities in long-distance communication, atmospheric noise, ionospheric storminess and sporadic E or "short-skip" activity. --G. T.

A-630 Jaeger. J. C., Equivalent path and absorption in an ionospheric region. Physical Society of London, Proceedings, 59(331):87-96, 1947.--Computes and tabulates results on the equivalent path and absorption for vertical incidence reflection or transmission on either side of a Chapman-region. Compares with results for parabolic distribution. The magnetic field is not included. --L. A. M.

A-631 Jancel, Raymond and Kahan, Theo, Phenomenes electromagnetiques dans l'ionosphere: Effets croises d'un champ magnetique constant et d'un champ electrique oscillant. (Electromagnetic phenomena in the ionosphere: combined effect of a constant magnetic field and an oscillating electric field.) Academie des Sciences, Paris, Comptes Rendus, 236(8):788-790, Feb. 23, 1953. 4 refs., eqs. DLC--The effect of a constant magnetic field and an oscillating electric field on the velocity distribution of free electrons in an ionized medium is investigated by applying Boltzmann's general equation. The results obtained include the particular cases of DRUYVESTEYN, CHAPMAN-COWLING and MARGENAU. --Transl. of authors' abstract.

A-632 Jancel, Raymond and Kahan, Theo, Propagation des ondes electromagnetiques planes dans l'ionosphere. (Propagation of plane electromagnetic waves in the ionosphere.) Academie des Sciences, Paris, Comptes Rendus, 236(21):2045-2047, May 27, 1953. refs. DWB--The propagation of electromagnetic waves is described by a dielectric tensor based on the Maxwell equations, computing the refraction indexes for particular cases. A formula for the attenuation of the waves and for group velocities is derived. --A. A.

A-633 Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere and Space Research in Japan, Vol. 1, 1946(?)- Latest issue seen, Vol. 13, No. 2, 1959. (Note: Vol. 1-Vol. 12 issued under title: Report of Ionosphere Research in Japan). DWB, DLC--(Holdings incomp.) Each issue contains a few substantial papers dealing with ionospheric cosmic-ray distribution, radio-wave propagation, magnetic storms, night-sky light measurements, electric conductivity of the ionosphere, etc. In the late issues (after 1950) the articles are in English; in the earlier ones they are in

Japanese with English summaries. Most papers contain tabular and graphical data and mathematical analyses. Several of the papers appear in this bibliography. --G. T.

A-634 Japan. Science Council. Ionosphere Research Committee. Catalogue of disturbances in ionosphere, geomagnetic field, field intensity of radio wave, cosmic ray, solar phenomena and other related phenomena, No. 10, the 31st cooperative observation, June 10-July 10, 1951. (1951?) Note: latest such title is No. 29, April 19, 1958. 39 p. graphs, tables. DWB--This observation period is especially interesting owing to a great solar eruption with two severe magnetic storms and a conspicuous decrease of cosmic ray intensity. A photo of the eruption is added and the observation results are presented in numerous graphs and tables. --A. A.

A-635 Japan. Science Council. Nat. Committee for Geodesy and Geophysics, Japanese national report on terrestrial magnetism and electricity. I. U. G. G. Association of Geomagnetism and Aeronomy, Rome, Sept. 1954, Transactions, pub. 1957. p. 175-188, bibliog. p. 178-188. DWB, DLC--In addition to a bibliography of 247 Japanese papers published in 1950-1953 on geomagnetism, geoelectricity, atmospheric electricity, sferics (20 refs.), ionosphere, cosmic rays and solar-terrestrial relationships, this report contains brief notes on Japanese research achievements in each of these fields. --G. T.

A-636 Jastrow, Robert (Nat. Aero. & Space Admin., Wash., D. C.), Symposium on the Exploration of Space: introductory remarks. Journal of Geophysical Research, Wash., D. C., 64(11):1647-1651, Nov. 1959. DLC--The first nationally sponsored conference devoted to space physics was held April 29-30 in Washington, D. C. The first session dealt with fields and solid particles in the solar system and the second session with the several aspects of space exploration. Brief comments on two papers and three round table discussions are given. The papers were: 1) Solid particles in the solar system (F. L. Whipple). 2) Plasma and magnetic fields in the solar system (T. Gold). 3)Extension of the solar - corona into interplanetary space (E. Parker). 4. The geomagnetically trapped corpuscular radiation (J. A. v. Allen). 5) Capabilities for space research (H. E. Newell). 6) The Moon (G. P. Kuiper). 7) Primary and secondary objects (H. C. Urey). 8) Remarks on Mars and Venus (G. de Vaucouleurs). 9) Rocket astronomy (H. Friedman). 10) Astronomy from satellites and space vehicles (L. Goldberg). 11) Experimental research program on the space sciences, and 12) Outer atmospheres of the earth and planets. --G. T.

A-637 Jean, A. Glenn, Jr.; Lange, L. Jerome and Wait, James R., Ionospheric reflection coefficients at VLF from sferics measurements. Geofisica Pura e Applicata, Rome, 38:147-153, 1957. 7 figs., 4 refs., 4 eqs. English summary. DLC-- A method for calculating the complex ionospheric reflection coefficients at VLF using sferic wave forms is presented. The mathematical analysis was carried out for a number of different wave forms to illustrate the method. Reflection coefficients determined from sferics observations were compared with those calculated, using an ionospheric model. In most cases, the agreement with theory is fairly good, although in some cases, reflection coefficients exceeding unity were obtained. The discrepancies are believed to result from horizontally polarized flashes rather than limitations in the ionospheric model. --Authors' abstract.

A-638 Jeffrey, Z. R., Hourly measurements of ionospheric characteristics, Macquarie Island, 1951. Australian National Antarctic Research Expedition, 1947-1949, Interim Reports, No. 6, 1953. p. 82-220. Mostly tables. DLC (QC973.J4)-- Graphs and tables for every month of 1951 for Macquarie Island. --M. R.

A-639 Jenkins, J. B. and Ratcliff, The investigation of ionospheric absorption by a new automatic method, Pt. 1: Measurements on vertical incidence pulse signals. Electronic Engineering, 25:140, 1953. --Equipment is described which automatically measures echo pulse amplitude and produces records, at minute intervals, of the integral of all echo pulse amplitudes received during each minute. The output of a modified communications receiver, blanked so as not to respond to the transmitter pulse, is fed to two gated amplifiers, one of which selects the echo signal and associated noise, while the other deals with noise only. After integration for 1 min, the difference of the output voltages of the integrators is applied to a pen recorder, the integrators at the same time being reset to zero. Under good conditions, with little rapid fading, the results obtained are in good agreement with results noted by a skilled observer from a CRO display of the transmitted and echo pulses. Wide differences are found under poor conditions, with rapid fading, and the results furnished by the automatic equipment, are considered the more reliable.

A-640 Johler, J. R.; Walters, L. C. and Lilley, C. M., Transfer characteristics of radio waves propagated between the D-region and the E-region of the ionosphere and the earth based on the quasi-longitudinal theory. U. S. National Bureau of Standard, Boulder Laboratories Report 6002, Sept. 15, 1958. 197 p. 24 figs., 123 tables, 15 refs.

A-641 Johnson, Charles Y. and Heppner, James P., Daytime measurement of positive and negative ion composition to 131 km by rocket-borne spectrometer. Journal of Geophysical Research, Wash., D.C., 61(3):575, Sept. 1956. foot-ref. DLC --The positive and negative ion composition from 5 to 60 atomic mass units was measured between 93 and 131 km by spectrometers in an aerobee rocket at 10:16 MST, Nov. 1955. No positive ions were detected during this daytime flight. Negative ions were detected as follows:

Atomic Mass No.	46	32	29	22	16
Relative abundance	96	1.6	0.2	1.0	0.7
Probable identification	NO_2^-	O_2^-	?	?	O^-

Positive ions would have been detected if their concentration had been as much as the negative ions of masses 16 and 29. --S. F.

A-642 Johnson, Francis S., The ion distribution above the F2 maximum. Journal of Geophysical Research, 65(2):577-584, Feb. 1960. 3 figs., 24 refs., 8 eqs. DLC.

A-643 Johnson, R. and Strandberg, M. W. P., Broadening of microwave absorption lines by collisions with the cell walls. Physical Review, 86(5):811-812, June 1, 1952.

A-644 Joint Technical Advisory Committee (IRE-RTMA), Radio spectrum conservation: program of conservation based on present uses and future needs. A report of the Joint Committee of the Institute of Radio Engineers and the Radio-Television Manufacturers' Association. N.Y., McGraw-Hill, 1952. 221 p. figs., bibliog. p. 199-208. DLC (HE8667.J65)--This survey gives an evaluation of the radio spectrum related to industrial scientific and medical use. Allocations of different frequency bands are suggested, and some general characteristics of propagation at different frequencies are discussed.in relation to meteorological conditions in the ionosphere and troposphere. --W. N.

A-645 Joint Technical Advisory Committee (IRE-RTMA), Radio transmission by ionospheric and tropospheric scatter, Pt. 1, Ionospheric scatter transmission. Institute of Radio Engineers, Proceedings, 48(1):4-29, Jan. 1960. 23 figs., tables, 83 refs. Pt. 2, Long-range tropospheric transmission, Ibid., p. 30-44. 10 figs., tables, 43 refs. DLC "This is a supplement to the earlier comprehensive report issued by the Joint Committee of the Institute of Radio Engineers and the Radio-Television Manufacturers Association. Radio spectrum conservations, published N.Y., McGraw-Hill, 1952". --The ionospheric and tropospheric scatter communication techniques are summarized individually. The present knowledge on ionospheric propagation theories, instrumentation, practice, etc. including frequency allocation is treated in the first part. Second part deals with the same as applied to troposphere. --W. N.

A-646 Jones, I. L.; Landmark, B. and Setty, C. S. G. K., Movements of ionospheric irregularities observed simultaneously by different methods. Journal of Atmospheric and Terrestrial Physics, 10(5):296-301, 1957. 4 figs., 2 tables, 11 refs., eq. DWB--Velocities of irregularities in ionospheric layers were determined by 4 different methods, one using 3 receivers about one wave-length apart, the others at 3 points about 15 km apart near Cambridge, Eng. Results agree well, showing that large irregularities had the same movements as those which produced ordinary fading. --C. E. P. B.

A-647 Jones, I. L. (Cavendish Lab., Cambridge), The height variation of horizontal drift velocities in the E-region. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957 (Proceedings of the Polar Atmosphere Symposium, Oslo, 1956, Pt. 2), issued 1958. p. 20-22. fig., 3 refs. DLC--Observations of ionospheric drift velocities have been made simultaneously on two neighboring frequencies. The frequencies used were 2 Mc/s and about 2.5 Mc/s, so that during the daytime, reflections were obtained from the E-region. The heights of reflection on the two frequencies differed by about 5 km, thus information about the drift at heights separated by this amount could be obtained. During the winter months it was found that the phase of the semi-diurnal component of velocity, varied with height, the phase being advanced with height. The fact that the results from the neighboring reflection heights are different, suggests that they are representative of the conditions near those heights. The phase change with height is consistent with the observations made on drifting meteor trails. --Author's abstract.

A-648 Jones, I. L. (Cavendish Lab., Cambridge, Eng.), Theoretical views on drift measurements. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957 (Proceedings of the Polar Atmosphere Symposium, Oslo, 1956, Pt. 2), issued 1958. p. 3-11. 9 figs., 6 refs., eq. DLC--Measurements of ionospheric drifts by observing the fading of a singly reflected wave at three closely spaced points on the ground are discussed. The magnitudes and directions of drift velocities observed from time delays between maxima and minima of the fading records are subject to large variations. These can be explained partly in terms of the variable orientation of a line of maximum amplitude and partly by changes in the amplitude pattern as it moves. The drift observed when the pattern on the ground is anisometric may be markedly different from the true drift, and tends to lie in a direction perpendicular to the direction of stretching. The effect on the average drift due to random orientation of the stretching and due to stretching in a preferred direction is discussed. When the amplitude variations at three stations are available, the auto-correlation and cross-correlation functions can be determined. From these, it is possible to determine the true magnitude and direction of the drift, the size and shape of the amplitude pattern on the ground and also a quantity related to the random changes of the pattern. --Author's abstract.

A-649 Jones, Robert E., Millman, G.H. and Nertney, R.J., Scientific report on the heights of ionospheric winds as measured at long radio wavelengths. Pennsylvania. State College, Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report No. 36, April 30, 1952. 18 p. 12 figs., 22 refs., 14 eqs. DWB--The existence of winds in the ionosphere can be shown using the results obtained from spaced receivers. The height of these winds must occur at or below the reflection level of the frequency used (in this case 150 kc sec^{-1} pulses). A method for obtaining this additional information is developed and a frequency distribution of apparent wind heights is given. The daytime winds, measured at 150 kc sec^{-1} probably occur around the 75 km height, the night-time winds between 83 to 100 km. --A. A.

A-650 Jones, Robert E., Millman, George H. and Nertney, R.J., The heights of ionospheric winds as measured at long radio wavelengths. Journal of Atmospheric and Terrestrial Physics, London, 3(2):79-91, Feb. 1953. 7 figs., 13 refs. MH-BH--Use of delta phase height equipment for obtaining heights at which ionospheric winds occur show daytime winds at about 75 km level and night-time winds at between 83-100 km. --G. J. E.

A-651 Jones, Robert E., Physical characteristics of the lower E-region as deduced from the measurement of changes in phase path of long radio waves. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 48, Aug. 25, 1953. 88 p. 32 figs., 3 tables, 38 refs., 42 eqs. DWB--The diurnal and seasonal variations in phase height of the main E region reflection level at 150 kc at State College, Pa., are reported for a period of 15 months. An electron density model, moderately "sharp" on the lower side, is evolved by modification of the Chapman theory to include the effects of variable scale height, dissociation of molecular oxygen, and variable recombination. This model is checked, primarily, against 150 kc phase height data, but also against 2.4 mc phase heights, height of maximum ionization, and critical frequency results. The comparison of periods of oscillation in phase with fading periods is shown to bear out the theoretical work on the ionospheric diffracting screen. --Author's abstract.

A-652 Jones, Robert E., The development of an E-region model consistent with long wave phase path measurements. Journal of Atmospheric and Terrestrial Physics, 6(1):1-17, Jan. 1955. 10 figs., 2 tables, 32 refs., 9 eqs. DWB--Diurnal changes in phase height of 150 kc radio signals reflected from lower E region, observed in Pennsylvania, are plotted. Mean range is 15 km in summer, 15.5 at equinoxes and 11.5 in winter. Several new ionosphere models are discussed, starting with CHAPMAN's (1931) and incorporating effects of variable scale height, dissociation of O_2 and variable recombination. That finally chosen (fig. 6, moderately sharp on the lower side) is the best compromise but is not entirely satisfactory because of the uncertainties involved.--C.E.P.B.

A-653 Jones, Robert E., Ionosphere research. Pennsylvania. State College, Ionosphere Research Laboratory, Contract AF 19 (122)-44, Final Report, March 25, 1949-Jan. 31, 1955. Jan. 31, 1955. 105 p. bibliog. Mimeo. DWB--Over 200 reports and scientific papers, which have emanated from this project in 5-1/2 years, are listed and abstracts given on all of the scientific reports. Personnel and history of the project are also outlined. The investigations cover a wide range of studies on the ionosphere, especially the lower ionosphere. These are listed and discussed under the following heads: 1) Low frequency (long wave) studies, 2) Electromagnetic studies (wave solutions, coupling theory and total polarization), 3) Ionospheric physics (solar and high atmospheric physics, D-region viscosity, dynamics of ionized media, effect of vertical ion transport), 4) Ionospheric properties (coupling phenomena, E layer characteristics, ionospheric winds and wave interaction), 5) Applied propagation investigations (oblique incidence studies), 6) Extra terrestrial studies (ring current and electrodynamics of very high atmosphere) and 7) Long wave equipment developed. --M. R.

A-654 Jouaust, Raymond, Influence of wind on the frequency of radio waves. Academie des Sciences, Paris, Comptes Rendus, 226(4):329-330, Jan. 26, 1948. --It is suggested that the results obtained by Decaux may be due to ionospheric winds which give rise to Doppler effect. --Wireless Eng. Abstr. 1726.

A-655 Jouaust, Raymond, L'etat de nos connaissances sur l'ionosphere et ses relations avec le magnetisme terrestre. (The status of our knowledge of the ionosphere and of its relations to terrestrial magnetism.) (In: Problemes de Geomagnetisme, J.P. Rothe, et al. Paris, Revue d'Optique Theorique et Instrumentale, 1950. p. 65-76.) Biographical note on Jouaust, p. 76. DLC--Textbook type treatment. --M. R.

A-656 Jowett, J.K.S. and Evans, G.O., A study of commercial time lost on transatlantic radio circuits due to disturbed ionospheric conditions. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102(4):505-512, July 1955. 6 figs., 11 refs. DLC--An analysis has been made of the time lost on certain radio circuits incoming to the United Kingdom from Montreal and New York during the period 1942-1952. The results have been examined in relation to the variations in solar and magnetic activity with a view to estimating the degree of interruption likely to be experienced on transatlantic circuits during the next few years. It is concluded that the maximum values of lost time occur during the winter months as the minimum of the sunspot cycle is approached, and that these high values are associated with periods of high magnetic activity arising from the occurrence of M-region storms. It is considered that the adverse propagation conditions encountered since the winter of 1950-51 will be slightly less severe during the winter of 1954-55 and that by the winter of 1955-56 there should be a marked reduction in the amount of commercial time lost on transatlantic circuits. --Authors' abstract.

A-657 Junakovic, F., Nevto o radio vezi u meteoroloskoj sluzbi. (Radio communication in the meteorological service.) Yugoslavia. Hidrometeoroloska Sluzba, Vesnik, 1(3/4):63-68, July/Oct. 1952; 1(5):100-104, Nov./Dec. 1952. 5 figs. DWB --Current knowledge on ionospheric short-wave radio propagation is summed up. The effect of solar activity, of ionized clouds, of magnetic disturbances, etc. is discussed. The two-wave-length broadcasting technique of the Yugoslav Federal Broadcasting Center, which is destined to cover both short and long distance, is explained. --G. T.

A-658 Kalinovskii, Aleksandr Boleslavovich and Pinus, N.Z., Aerologiia; metody aerologicheskikh nabliudenii. (Aerology; methods of aerological observations.) Leningrad, Gidromet. Oizdat., 1951. 452 p. 245 figs. (incl. photos), tables, footrefs., eqs., 164 refs., p. 423-428. DLC--A unique textbook for students intending to pursue practical hydrometeorological or aerological work. The various chapters consist of I. History and development, especially in U.S.S.R.; II. Pilot balloon observations; III. Meteorograph and its calibration, accuracy and corrections; IV. Kite, captive and manned balloon observations; VI. Airplane soundings; VII. Computations of meteorograph records; VIII. Radiosondes (various types described in detail and compared); IX. Radio-location applied to soundings; X. Measurement of vertical currents; XI. Cloud and cloud physics measurements; XII. Rocket research; XIII. Publication of aerological "yearbooks" or summaries and machine methods of computation (80 column IBM-type cards and punchers, sorters and tabulator illustrated). The detailed theory that enters into each method of observation or instrument use; calculation of data, etc., and actual comparative values, accuracy of instrument elements, design and construction of instruments and photographs of equipment are included. The bibliography of 164 references arranged by chapters consists mainly of Russian sources, but a dozen or more German, U. S. or British references are cited. Material as recent as 1950 is included. Chapter on rockets gives comparative data for V-2 and Wac-Corporal Rocket flights and standard atmospheric data to 100 km height. Chapter on radio location includes brief mention of radar storm detection methods. --M. R.

A-659 Kallmann, H. Korf, A study of the structure of the ionosphere. Rand Corporation, Santa Monica, Calif., (Papers), P.-638, Feb. 1955. 164 p. 14 figs. (some fold.), 18 tables (some fold.), 162 refs., 53 eqs. Thesis (Ph. D.), Univ. of Calif. at L. A. (1953?) DWB--An attempt at a realistic model of the upper atmosphere and ionosphere, based on the latest observational and theoretical results, especially with rockets, radio and acoustical soundings, meteor trail studies and auroral-airglow spectroscopy. Chapters include history, technique, physical properties up to 80, and from 80-220 km; the solar atmosphere, theory of ionization and recombination plus extensive numerical tables and diagrams giving coefficients, spectroscopic data, constants, observational data and models of the various elements. --M. R.

A-660 Kallmann, H. K., Electron distribution in a new model of the ionosphere. California. Univ. Institute of Geophysics. Contract AF 19(604)-111, Scientific Report, No. 4, Jan. 1956. 8 p. 4 figs. --A new model of the ionosphere, based on rocket data for electron densities rather than radio echo data, shows a more homogeneous ionosphere with the E, F1 and F2 regions merging gradually into each other rather than being widely separated or stratified. It indicates a heavy ionization in the 100-200 km region, and low electron density gradients at very low altitudes. The maximum of the F1 region would occur about 165 km. The discrepancy lies in the concept of virtual heights which may prove to be 50 to 100% too high owing to slight gradient variations in a supposedly thick ionosphere. --M. R.

A-661 Kallmann, H.K.; White, W.B. and Newell, H.E., Jr., Physical properties of the atmosphere from 90 to 300 kilometers: proposed "Speculative Atmosphere" submitted to the Working Group on Extension to the U.S. Standard Atmosphere Tables. Journal of Geophysical Research., Wash., D.C., 61(3):513-524, Sept. 1956. 3 figs., 2 tables, 19 refs., 22 eqs. Erratum Ibid., 62(1):168, March 1957. fig. DLC--Based on recent experimental and theoretical studies of the physical properties of the atmosphere at high altitudes, an average model atmosphere is presented for the region between 90 and 300 km. This model is consistent with the following assumptions: Molecular oxygen begins to dissociate appreciably only above 90 km; at around 130 km, about 30% of O_2 is still in the undissociated state; molecular nitrogen begins to dissociate above 220 km; the concentrations of molecular oxygen and nitrogen decrease with altitude exponentially; the temperature becomes isothermal in the region of the exosphere, approximately above 360 km. All physical quantities have been calculated from self-consistent equations as continuous functions of altitude, without assuming any particular form of the temperature gradient. The results show lower temperatures and densities throughout the region of the ionosphere than have been deduced previously. --Authors' abstract.

A-662 Kallmann, H. Korf (Univ. of California, Los Ang.), Un nouveau modèle d'ionosphère. (New model of the ionosphere.) La Météorologie, Paris, Ser. 4, No. 52:235-243, Oct./Dec. 1958. 7 figs., English and Spanish summaries p. 236. DWB --After showing the reason for the considerable differences between the constitution of the ionosphere as given by experiments of radio wave reflection at different frequencies and as given by recordings made with rockets fired to a high altitude; the author explains that the Chapman theory, used up to the present under a simplified form, must not be blamed. In fact, thanks to the recent data supplied by rockets, it can account for the structure of the ionosphere. Results thus given are so satisfactory that although numerous uncertainties subsist, it offers a new image of the ionosphere; it is not composed of ionized layers but rather of a strongly ionized region of large thickness with weak variations of electron densities. --Author's abstract.

A-663 Kallmann, H.K., A preliminary model atmosphere based on rocket and satellite data. Journal of Geophysical Research, 64(6):615-623, June 1959. 5 figs., 3 tables, 32 refs.

A-664 Kalra, S.N., Frequency measurement of standard frequency transmissions. Canadian Journal of Physics, 38(3):513, March 1960.

A-665 Kamada, Tetsuo and Nakajima, Jun, The measurement of the intensity of atmospherics, Pt. 1. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 2:31-39, Jan. 1954. 13 figs., table, 6 refs. DWB--An apparatus for recording intensities of sferics and its methods of operation are described. Results obtained with the instrument at the Research Institute of Atmospherics at Toyokawa, Japan, are reported. Data on diurnal, monthly and seasonal intensity variations, on sferics intensity as a function of the frequency used and on phenomena connected with sunrise, sunset and solar flares are presented and interpreted.-- G. T.

A-666 Kamada, Tetsuo and Nakajima, Jun, On the direction of arrival of atmospherics at Toyokawa, Pt. 1. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 2:95-101, Jan. 1954. 22 figs., 3 refs. DWB--As a result of continuous recordings of direction of atmospherics made at the Research Institute of Atmospherics in Japan (137°E, 35°N), monthly and seasonal average directional frequency distribution diagrams are presented for the period July 1952-Dec. 1953.--G. T.

A-667 Kamiyama, Hiroshi, Seasonal variation of the minimum frequency in h'-f curve for the "E" ionospheric region. Tohoku University, Science Reports, 5th Ser., Geophysics, 2(2):79-85, Aug. 1950. 5 figs., 4 tables, 10 refs., 17 eqs. In English. MH-BH--The minimum critical frequency in the E layer at noon is found to be proportional to $\cos^{3/4}$ (zenith distance of sun at noon). This supports the existence of an ionized D layer about 55 km. and variations from the cos-law may give information about temperature in the middle stratosphere. --C. E. P. B.

A-668 Kamiyama, Hiroshi (Geophysical Institute, Tohoku Univ.), Ionospheric changes associated with geomagnetic bays. Tohoku Univ., Science Reports, 5th Ser., Geophysics, 7(3): 125-135, March 1956. 4 figs., 3 tables, 18 refs., 14 eqs. DWB, DLC--It is assumed that the ionospheric currents corresponding to geomagnetic bay disturbances in the temperate latitude are produced by the electro-statical field developed by the current system in the auroral zone. Taking account of the ionization drift due to this electric field and the earth's magnetic field, the deviation in the electron density from its normal condition is examined. The depression of the electron density in the ascending ionospheric region and the ionic concentration in the descending region, which we often notice during magnetic disturbances, are explainable by assuming a height gradient of temperature in the upper atmosphere. --Author's abstract.

A-669 Kamiyama, Hiroshi and Sato, Teruyuki (both, Geophysical Inst. Tohoku Univ.), The latitudinal effect on the disturbance daily variation in F2 layer of the ionosphere. Tohoku Univ., Science Reports, 5th Series, Geophysics, 8(1):41-51, Nov. 1956. 3 figs., 2 tables, 7 refs., eq. DWB, DLC--The so-called $S_D(N_m)$ in the F2 region of the ionosphere are expressed by Fourier series; it is found that the amplitudes are controlled by the geomagnetic latitude and the phases are depending on the geographic latitude. The latitudinal distributions of the harmonic coefficients show marked seasonal changes. In equinoctial months the distributions are almost symmetrical about the equator, but in solstitial months, the axes of symmetry are removed towards the winter hemisphere. Equal deviation charts for different seasons are given. --Authors' abstract.

A-670 Kamiyama, Hiroshi and Sato, Teruyuki (both, Geophysical Inst., Tohoku Univ.), The distribution of the electrical conductivity in the ionosphere and its variations. Tohoku University, Science Reports, Fifth Series, Geophysics, 9(2):55-80, Oct. 1957. 19 figs., 2 tables, 27 refs., 43 eqs. DWB, DLC --The ionospheric conductivity is estimated on the basis of the atmospheric model derived from rocket data. The collisional frequency with which the conductivity is closely related depends not only on the density and the temperature of the atmosphere but also on the concentrations of the electrons and ions. The dependency is examined at various altitudes. Consequently, the conductivities longitudinal and transverse to the earth's magnetic field, and the Hall conductivity are evaluated for various values of electron concentrations. These results are applied to the vertical and geographical distributions of the conductivities and their daily, seasonal and sunspot-cycle variations. The conductivity is almost proportional to the electron concentration except in the lower E region, and in the F region. In the F region, it is more sensitive to the electron concentration than in the lower region. --Authors' abstract.

A-671 Kamiyama, Hiroshi, A study on the formation of the ionospheric layers. Tohoku Univ., Science Reports, Fifth Series, Geophysics, 11(2):98-112, Sept. 1959. 8 figs., 2 tables, 35 refs., 31 eqs.

A-672 Kamiyama, Hiroshi, Remarks on the electrical conductivity of the ionosphere. Tohoku Univ., Science Reports, Fifth Series, Geophysics, 11(2):73-83, Sept. 1959. 10 figs., 4 refs., 2 eqs.

A-673 Kamiyama, Hiroshi, Vertical distribution of molecular oxygen. Tohoku Univ., Science Reports, Fifth Series, Geophysics, 11(2):84-97, Sept. 1959. 3 figs., 5 tables, 23 refs., 53 eqs.

A-674 Kane, J. A. (U. S. Naval Res. Lab., Wash., D. C.), Arctic measurements of electron collision frequencies in the D-region of the ionosphere. Journal of Geophysical Research, Wash., D. C., 64(2):133-139, Feb. 1959. 4 figs., table, 12 refs., 14 eqs. DLC--Electron collision frequencies in the D-region were measured with the aid of rockets launched during polar blackouts at Fort Churchill, Canada (58°N). During the blackouts the ionization content of the D-region was large enough to cause a strong altitude-dependent absorption of a 7.75 Mc/s CW signal, radiated from the rocket. The refractive indices and the difference absorption of the two magnetic-ionic components of this signal were simultaneously measured versus altitude. The electron collision frequency profile was then determined from these measurements. The results from two midday rocket flights, one made in July 1957, and the other in Nov. 1956, indicates that the electron collision frequencies in the Arctic D-region are lower by a factor of three than the standard values calculated by Nicolet (1957). At 70 km the measured value of the collision frequency is $(1.0 \pm 0.3) \times 10^7$ sec^{-1}. --Author's abstract.

A-675 Kay, I., On the measurement of virtual height. N. Y. Univ. Institute of Mathematical Sciences. Div. of Electromagnetic Research, Contract DA-49-170-Sc-2253, Research Report MME-5, July 1957. 11 p. 3 refs., eqs. DWB (538 N532r)--A time dependent definition of virtual height of a reflected wave train is given so that its accuracy increases as the width of the incident pulse increases. An example is given of a reflected wave whose virtual height cannot be determined by inspection, but which can be determined correctly from the given expression. --From author's abstract.

A-676 Kazantsev, A. N., O pervykh nabliudeniiakh nochnogo ionizirovannogo sloiia, lezhashchego vyshe sloia F2. (First observations of the nocturnal ionized layer above F2 layer.) Akademiia Nauk SSSR, Doklady, 59(3):479-482, Jan. 21, 1948. 4 figs., 2 refs. DLC--In connection with N. A. MEDNIKOVA's discovery in Feb. 1947 , the author presents a series of extracts (with graphs) of reports (some previously published) on the measurement of effective heights of ionized layers between sunset and sunrise carried out by him near Moscow during the period 1933-1937 in which the F2 layer was recorded. Author points out that: 1) the critical frequency of the layer is smaller than the one of the F2; 2) it can be observed by disturbed condition of the atmosphere and its probably produced by corpuscular radiation of the sun and 3) as a rule, it is a night phenomenon appearing around sunset and vanishing at sunrise. --A. M. P.

A-677 Kazantsev, A. N., Absorption and electron distribution in the F2 layer determined from measurements of transmitted radio signals from earth satellites. Planetary and Space Science, 1(2):130-135, April 1959. 6 figs., 3 refs., 7 eqs. DLC.

A-678 Keitel, G. H., The Program of a two-dimensional scattering problem for an automatic sequenced digital computer. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-1031, Scientific Report No. 6, Aug. 1955.

A-679 Keitel, G. H., An extension of Milne's three point method. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-1031, Report No. 6, Dec. 1956.

A-680 Keitel, G. H., On the dipole resonant mode of an ionized gas column. Australian Journal of Physics, 9(1):144-147, March 1956.

A-681 Keller, Herbert B., Ionospheric propagation of plane waves. N. Y. Univ. Washington Square College, Mathematics Research Group, Contract AF 19(122)-42, Research Report, EM 56, Aug. 1953. 41 p. fig., 13 refs., numerous eqs. DWB--The propagation of plane waves in a stratified ionosphere is considered. It is shown that the construction of "true" characteristic waves depends upon the diagonalization of a matrix by a Loewy transformation. For a homogeneous ionosphere this construction can always be carried out explicitly. For the general case we obtain the wave solution in terms of characteristic waves which have the properties usually attributed to characteristic waves in magneto-ionic theory. In addition, the interaction between these waves is made clear by the introduction of continuous reflection and transition coefficients. Ordinary and extraordinary wave reflection levels are shown to be points at which the elementary divisors of a certain matrix become non-simple. Complicated expressions are obtained from which ionospheric reflection and transmission coefficients may be obtained explicitly. Explicit solutions are obtained for normally incident waves with an oblique earth's magnetic field and for oblique incident waves with a vertical earth's magnetic field. --Author's abstract.

A-682 Keller, Herbert B., On the electromagnetic field equations in the ionosphere. N. Y. Univ. Washington Square College, Mathematics Research Group, Contract AF 19(122)-42, Research Report, EM-57, Sept. 1953. 17 p. fig., 5 refs., eqs. DWB--This paper consists of two notes on the equations governing the propagation of electromagnetic waves in the ionosphere. In Part I, the tensor properties of the ionosphere are derived by a method due to VAN DER WYCK. While we introduce only minor improvements on his method, it was felt worthwhile to make these results generally more available. Part II shows the equivalence of various forms of the propagation equations. A general scheme is indicated for finding simplifying transformations of the equations in their first-order form. In particular, we obtain that transformation which yields Rydbeck's coupled equations and give an interpretation. --Author's abstract.

A-683 Kelley, Luther C., Forecast of ionospheric storms and radio communications, 1959-1962. U.S. Army Signal Radio Propagation Agency, Ft. Monmouth, N.J., June 1958. (Project 636).

A-684 Kelso, John M., The maximum height of reflection of a radio wave in a curved ionosphere layer. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Technical Report, No. 1, May 1, 1949. 4 p. graph, 3 refs., 7 eqs. DWB--There is an upper limit to the possible height of reflection in a curved ionosphere (below the level of maximum ionization) where the signal will travel through the layer. This is presented theoretically by an expression derived from the double parabola approximation to the Chapman distribution of ionization as a function of height. --W.N.

A-685 Kelso, John M., Approximate solutions of some problems in the theory of ionospheric radio wave propagation. Pennsylvania. State College. Radio Propagation Laboratory, Contract, AF 19(122)-44, Technical Report, No. 2, June 1, 1949. 146 p. 46 figs., 31 refs., 127 eqs. DWB--A dissertation for the Ph.D. degree at Penna. State College. The double parabola approximation to the Chapman distribution of electron density as a function of height is applied to propagation via the E layer. Analytical expressions are given for: (1) the true and group heights of reflection, (2) ray paths, (3) reflection coefficient, (4) ionospheric range, (5) ground range, (6) MUF for the Sellmeyer dispersion theory, plane ionosphere and earth geometry. Graphical results are given for MUF. The results are compared with the dispersion theories of LORENTZ and of SELLMEYER, the scale heights and height of bottom layer of which are discussed. A method for determining the collision frequency at maximum ionization level is suggested. Another method that will determine whether the Sellmeyer or the Lorentz dispersion should be used in ionospheric calculation is outlined. --W.N.

A-686 Kelso, John M., Elliptical polarization and its application to the polarization of ionospherically reflected long radio waves. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 11, June 1, 1950. 37 p. 22 figs., tables, 10 refs., eqs. DWB--The problem of polarization of ionospherically reflected radio waves is discussed in detail. Author demonstrates that the statement of TAYLOR and MARTIN "that the polarization ellipses of the two magneto-ionic are always oriented so that their major axes are perpendicular" is not generally true. --W.N.

A-687 Kelso, John M., The effect of the Lorentz polarization term on the vertical incidence absorption in a deviating ionosphere layer. Institute of Radio Engineers, Proceedings, 39(4):412-419, April 1951. 4 figs., 15 refs., 34 eqs. MH-BH--The topic computed and discussed leads to the conclusion "that with sufficient sensitivity in the measurement of the reflection coefficient, it may be possible to use this material in deciding whether the Lorentz or Sellmeyer theory of dispersion should be used in ionospheric calculations."--From author's abstract.

A-688 Kelso, J.M.; Nearhoof, H.J.; Nertney, R.J. and Waynick, A.J. (Ionos. Res. Lab., Penna. State Col.), The polarization of vertically incident long radio waves. Annales de Geophysique, Paris, 7(4):215-244, 1951. 2 figs., 20 refs., eqs. English and French summaries p. 215. MH-BH--The polarization of long electromagnetic waves in the ionosphere is considered. The analytical expressions relating N - v distributions of the ionosphere to the characteristic polarizations are developed. The polarization of the electromagnetic waves leaving the ionosphere is treated in two ways. In Part I the wave is treated as a single magneto-ionic component. It is shown that under certain conditions the wave does behave as a single component which attains a "limiting polarization" at some N value, N/0. It is shown, however, that this analysis "breaks down" under certain conditions and, in fact, wave polarizations occur which are not characteristic polarizations associated with any N - v value. It is shown in Part II that a model consisting of electron D and E regions is capable of giving polarization results which are in good agreement with experiment. --Authors' abstract.

A-689 Kelso, John M. (Penna. State Col., Ionosphere Res. Lab.), A procedure for the determination of the vertical distribution of the electron density in the ionosphere. Journal of Geophysical Research, 57(3):357-367, Sept. 1952. 3 figs., 11 refs., 26 eqs. DWB. Comments by L.A. Manning, Ibid., 58(1):117-118, March 1953. And Comments by D.H. Shinn, Ibid. 58(3): 416-418, Sept. 1953. --

A procedure is given for the determination of the "true height of reflection" of a radio wave incident vertically on the ionosphere. Since – for a given operating frequency – the electron density required for reflection is easily found, the present procedure allows the electron density to be determined as a function of height. To find the "true height" at some particular frequency, f_v, it is only necessary to take the average of the values of group height measured at a set of predetermined frequencies. These frequencies depend on f_v and the accuracy desired in the results. In scaling standard experimental curves for this work, it was sufficient to use five values except near cusps or steps where double that number was found desirable. The present method is based on the use of the Gauss-Christoffel quadrature formula, which is used for the numerical integration of the well-known integral for "true height" as a function of group height. The restrictions on this integral apply to all of the work contained here and are: (1) the earth's magnetic field is neglected; (2) The effects of collisions are neglected; (3) It is assumed that ray theory may be used; (4) It is assumed that the curve of electron density as a function of height has no maxima or minima in the region considered. MANNING points out that Kelso's method of computing the electron density in the ionosphere by a numerical integration of vertical height and frequency data gives results no different from those which would be obtained by simple averaging of equally weighted, evenly spaced ordinates. SHINN further shows that although KELSO's method gives good results for integrating such empirically derived data, it is not as accurate as KELSO claims, and shows special cases where the error sould be larger. --M. R., W.N.

A-690 Kelso, John M. (Penna. St. Coll., Ionos. Res. Lab.), On the coupled wave equations of magneto-ionic theory. Journal of Geophysical Research, 58(4):431-436, Dec. 1953. table, 8 refs., 8 eqs. DLC--The propagation of a plane radio wave incident vertically on an inhomogeneous ionosphere varying in the vertical direction in the presence of the terrestrial magnetic field is characterized by a pair of coupled wave equations. These equations can be changed in appearance by choosing various different forms for the time factor, coordinate system, particle charge, and wave functions. In the recent literature, this has led to some unfortunate confusion, which the present work is intended to clarify. The wave equations and the basic defining relations are presented in such a way as to show explicitly the effects of some of the possible arbitrary choices noted above. A table comparing the present notation with that used by various other authors is given. --Author's abstract.

A-691 Kennelly, A. E., On the elevation of the electrically conducting strata of the earth's atmosphere. Electrical World and Engineer, N.Y., 39(11):473, March 15, 1902. DLC--Author states that waves that are transmitted to distances that are large by comparison with 50 miles, may find an upper reflecting surface in the conducting rarefied strata of the air. If this is correct, the curvature of the earth plays no significant part in the phenomena. --M. L. R.

A-692 Kessler, Edwin, III (M.I.T., Cambridge, Mass.), Curvature corrections for radiowind reports. American Meteorological Society, Bulletin, 35(7):328-330, Sept. 1954. 2 figs., table, 2 refs., 5 eqs. MH-BH--The errors arising from the neglect of the curvature of the earth in the reduction of wind data from modern radio direction finding equipment are discussed briefly. Data are presented which enable significant corrections to be made to certain wind reports of interest to the synoptic meteorologist and flight forecaster. --From author's abstract.

A-693 Khakhalin, Viktor Stepanovich, Radiotekhnika v aerologii. (Radio engineering in aerology.) Leningrad, Gidrometizdat, 1957. 263 p. 100 figs., 13 tables, eqs. DWB (M08 K45ra) --A technical book (3800 copies) with detailed diagrams and charts for use in teaching and practice in the hydrometeorological service. The basic physical and technological principles of the equipment and propagation are first covered in detail. Ionospheric propagation and modulation are taken up in Ch. 3, electronic and ionic equipment of all types in Ch. 4, amplifiers in Ch. 5, radio transmitters of radiosondes and other aerological equipment in Ch. 6, and other aspects in the succeeding 7 chapters (power sources, radio location, thunderstorm cloud and shower location and observations of other meteorological elements). Radar and cm wave propagation are considered. --M. R.

A-694 Khastgir, S. R. and Das, P. M., Periodic fading of short-wave radio signals. Physical Society of London, Proceedings, 63-(11):924-930, 371B, Nov. 1950. 5 figs., 7 refs., 2 eqs. DLC --Periodic fading patterns recorded photographically on Calcutta signals (4840 kc/s) at 240 km show 3 types: sinuous fading of quick period, slow periodic fading and the latter with superposed ripples. Physical explanation given. --C. E. P. B.

A-695 Khastgir, S. R. (Wireless Lab., Dept. of Physics, Banaras Hindu Univ.), Abnormal polarization of the atmospheric pulses reflected successively from the ionosphere. Nature, London, 181(4606):404-405, Feb. 8, 1958. fig., 3 refs. DWB--During the determination of the direction of arrival of atmospherics by the conventional cathode ray tube direction finder the author observed that "on occasions, for atmospherics of comparatively distant origin, there were elliptic patterns of gradually decreasing eccentricity and tilt-angle along with one or more linear responses, although when tested with the audio-frequency oscillations from a single generator fed into the aerial system of the cathode-ray tube direction finder, the fluorescent screen exhibited only the usual linear responses." These elliptic patterns are considered to be "evidences of polarization of the atmospheric pulses reflected successively from the ionosphere, the linear responses being due to the direct (or ground wave) atmospheric pulses." More than forty oscillograms with elliptic patterns were recorded during the monsoon months of 1955. "A typical record of the processing ellipses with five or six straight lines bunched within a small angle along with the record of the wave form of the atmospheric pulses simultaneously taken with the automatic atmospheric recorder" is presented and analyzed. --I. L. D.

A-696 Khastgir, S. R. and Murth, Y. S. N. (both, Dept. of Pure Physics, Univ. College of Science, Calcutta), Left-handed ionospheric echo from an equivalent height of (E + F). Journal of Scientific and Industrial Research, Sec. B, New Delhi, 18(7): 304-305, July 1959. 3 refs. DWB, DLC--This report reviews the investigations made by Satyanarayana, Bakhru and Khestgir on the left-hand M echoes as reported in this journal 15B (1956), 331. It also reviews briefly the right-handed extraordinary M echoes observed by Ratcliffe and White as reported in the Philo. Mag. 16(1933), 125. It presents an explanation to the basic fundamentals about these echoes observed from equivalent heights, with or without the Es echo, and describes conditions under which the partial reflection and transmission of such echoes may occur. The rare occurrence of these echoes is due to the off-chance of ion clouds or patches of increased ionization coming in the path of the upgoing wave reflected from the ground after one reflection from the F-region. --N. N.

A-697 Kilpatrick, E. L. (Natl. Bureau of Standards, Wash., D. C.), Polarization measurements of low frequency echoes. Journal of Geophysical Research, 57(2):221-226, June 1952. 3 figs., 3 refs. MH-BH--Polarization of a 160 kc plane polarized signal propagated upwards and reflected by the ionosphere at Sterling, Virginia, October 15-November 30, was characterized by a stable elliptical pattern oriented 60-70°E of magnetic north, ratio of axes 1/3 to 1/5 and left hand rotation of polar vector. Short periods of unstable polarization occurred at sunrise, sunset and irregular times. --C. E. P. B.

A-698 Kimpara, Atsushi, The waveform of atmospherics at night. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 2:1-8, Jan. 1954. 3 figs., 25 plates, 6 refs. DWB--With a view of investigating the change of wave forms of sferics with distance, the author discusses the wave forms observed simultaneously at Toyokawa, Kumamoto and Akita stations, Japan, in 1952. They are classified into 5 groups according to the distance: A) more than 4000 km, B) 3-4000 km, C) 2-3000 km, D) 1-2000 km and E) less than 1000 km. The investigation reveals that in A and B the wave forms depend mainly upon the characteristics of trajectories, in D and E upon activities in meteorological phenomena and in C upon both meteorological and propagation conditions. --From author's abstract.

A-699 Kimpara, Atsushi, The sudden ionospheric disturbances on 22 November 1952. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 2:40-52, Jan. 1954. 11 figs., 5 tables. Append. p. 48. DWB--Despite the period of lower solar activity, a striking S.I.D. phenomenon was observed on Nov. 22, 1952, which revealed the close correlation of solar flare with outbursts of solar radio waves, Dellinger fadeout in short-wave communication, characteristic crochets in three components of magnetograms, fadeout of echoes in ionospheric measurements, and an abnormal increase of the intensity of atmospherics at very low frequencies. The author made a detailed study of these relations and found an advance increase of the intensity of atmospherics about an hour before the solar flare. He appends similar results obtained in a more active period (April, May 1952) as a reference, and discusses their characteristics and correlations. --Author's abstract.

A-700 Kimpara, Atsushi and Kimura, Yasuko, On field intensity recording of atmospherics at 27 kc/s in accordance with the recommendation of WMO. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 5:21-29, March 1958. 3 figs., 3 tables, 5 refs. DWB--In order to see if Recommendation 40 of working group of WMO in 1957 can be applied satisfactorily to the results obtained in Japan, the authors examined the records of intensity meters of atmospherics at 27 kc/s observed continuously in 1957 at Toyokawa station. They found fairly regular behaviors of sferics which can be reasonably explained by the distribution of sources with seasonal variations as well as by the principle of wave propagation. "A" (Sunrise effect) is found generally 20 min before sunrise, except in winter where it is found about 2 hrs before sunrise. "B" (First minimum) and "C" (Recovery effect) are often found more than once, and also found frequently in the evening. "D" (Morning minimum) is found about 2 hrs after sunrise, but sometimes not clearly.

"E" (Afternoon maximum) is found about 2 hrs before sunset and sometimes indicates flat maximum. "F" (late minimum) is found within a half-hour of sunset. "G" (Night maximum) is not found in Toyokawa. After sunset the field intensity of sferics increases gradually and reaches night levels about 2½ hrs after sunset, and keeps its level nearly constant till dawn when "A" is found. "G" should be called "sunset effect" in Japan. It is due to the difference of distribution of sources between Europe and Asia. --Authors' abstract.

A-701 Kimpara, A., Diurnal and seasonal variations in whistler records in Japan. Nagoya Univ. Research Inst. of Atmospherics, Proceedings, 6, 38, (Jan. 1959).

A-702 Kimpara, Atsushi (Nagoya Univ., Japan), Perturbations ionosphériques à début brusque causées par une explosion atomique. (Sudden ionospheric disturbances caused by atomic explosions. Académie des Sciences, Paris, Comptes rendus, 248:2117-2119, April 6, 1959, 1 fig, 2 refs. DWB, DLC--At the time of a nuclear explosion at high altitude, meteorological conditions permitted to observe a strengthening of sferics due to a sudden ionospheric disturbance. The recording of the sferics was done on 10, 21 and 27 kc/s. Comments on the observations. --A. V.

A-703 King, G. A. M. (Geophysical Observatory, Christchurch, New Zealand), Relation between virtual and actual heights in the ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 11(3/4):209-222, 1957. 4 figs., 2 tables, 37 refs., 29 eqs. DLC--There are two general methods of deducing the "true" heights from the virtual height-frequency curve. Aspects of the comparison method treated are choice of model, effect of the earth's magnetic field, the meaning of total electron content, and the use of hp and M3000 as height indicators. The integral method is discussed from the viewpoints of the derived curve and the step-by-step procedure. There is a brief treatment of the nominal accuracy of reduction, sections on the importance of the earth's magnetic field and on "valleys" between layers, and a discussion of factors affecting the actual accuracy of analysis. There are five current research projects at Christchurch based on true height analysis. The bibliography is divided up according to subject, and there are notes on the references. --Author's abstract.

A-704 King, J. W. (Cavendish Lab., Cambridge), The fading of radio waves reflected at oblique incidence. Journal of Atmospheric and Terrestrial Physics, London, 12(1):26-33, 1958. 4 figs., 5 tables, 18 refs. DLC--

Previous experimental results on the reflection of radio waves from the ionosphere at near-vertical incidence have been extended to include the case of waves incident obliquely. It is shown that the radio diffraction pattern formed at the ground by a medium frequency wave reflected at oblique incidence is very much larger than expected and is, on the average, roughly circular. It is concluded that the ionospheric irregularities responsible for the fading have much greater extent in the horizontal than in the vertical plane. It is found, in general, that the speed of fading of a wave of frequency f is proportional to $f \cos i$, where i is the angle of incidence on the ionosphere, and that the probability distribution of amplitude tends to be log normal rather than of the type discussed by RICE (1947). --Author's abstract.

A-705 King, J. W. (Cavendish Lab., Free School Lane, Cambridge), Ionospheric self-demodulation and self-distortion of radio waves. Journal of Atmospheric and Terrestrial Physics, London, 14(1/2):41-49, April 1959. 2 figs., 2 tables, 15 refs., 9 eqs. DLC--Experiments in which the phenomenon of ionospheric self-demodulation was investigated are described. Demodulation is observed to occur only at the lower modulation frequencies, and it is concluded that the occurrences of the phenomenon can be satisfactorily explained by an extension of Bailey's theory of ionospheric cross-modulation as presented by Huxley and Ratcliffe (1949). The magnitude of the observed demodulation effect agrees with the value predicted by theoretical considerations and is what would be expected in view of results obtained in cross-modulation experiments. Complications due to selective fading were not present in the experiments performed. It is found that self-demodulation decreases as does ordinary cross-modulation, near dawn; this is explained by the fact that the absorption of the radio wave occurs at a level where the collision frequency is of the same order of magnitude as the equivalent angular frequency of the wave. --Author's abstract.

A-706 Kirby, Richard C. (Natl. Bur. of Standards, Boulder, Colo.), Extreme useful range of VHF transmission by scattering from the lower ionosphere. Institute of Radio Engineers, N. Y., IRE Convention Record, Pt. 1, 1958. p. 112-120. 10 figs., 15 refs. DLC (IK6541.15) DWB--Results are given from an experimental study of VHF propagation in the extreme distance range for scattering from the lower ionosphere. Signal intensity at 36.0 Mc/s was measured continuously for a year over the 1411 mile path from St. Johns, Newfoundland, to Terceira Island, the Azores, using high transmitting and receiving sites. The median transmission loss is approximately 13 decibels greater than for the same system operated over the 773 mile path Cedar Rapids, Iowa, to Sterling, Virginia; this ratio is interpreted in terms of the geometrical restriction of the effective scattering volume. Less pronounced diurnal and seasonal variation is related to occluding by earth curvature of scattering from heights below about 80 km. Continuous "height gain" observations give evidence of variation of scattering height diurnally and seasonally. Results are given on the nature of the signal fading, space-correlation, realizable gain from arrays having extensive vertical aperture, and polarization effects. --Author's abstract.

A-707 Kirby, Richard C., 1958 critique of VHF ionospheric scatter communication. U. S. National Bureau of Standards, NBS Report, 6020, Nov. 10, 1958. 8 p. 11 figs., 19 refs. DWB (621.384 U585ni)--Work at the National Bureau of Standards reported herein was carried out on behalf of the U. S. Air Force, Andrews Air Force Base, Washington, D.C. A review is given of principal research reported in 1957-58, as well as of several years of operational communication experience using VHF ionospheric scattering for point-to-point radio service. The developing defined role of ionospheric scattering in military and international communication is discussed, in relation to other techniques. A survey is given of antenna and modulation developments as well as contributions to basic knowledge of the propagation mechanism, including new information on geographical dependence. Frequency requirements are discussed in relation to type of service. --Author's abstract.

A-708 Kitchen, F. A. and Tremellen, K. W., Ionospheric influence in television reception. Institution of Electrical Engineers, Proceedings, Pt. A, 99(18):290, 1952.

A-709 Kitchen, F. A.; Pressey, B. G. and Tremellen, K. W., A review of present knowledge of the ionospheric propagation of very low, low and medium frequency waves, Institution of Electrical Engineers, Proceedings, Vol. 100, Pt. 3, No. 64: 100- 1953.

A-710 Kitchen, F. A. and Joy, W. R. R. (both, Royal Naval Scientific Service), Some effects of the fine structure of the ionosphere on transmissions received from the Russian earth satellite 1958β. Nature, London, 181(4626):1759-1761, June 28, 1958. 3 figs., table, 7 refs. DWB--After some simultaneous direction-finding and Doppler frequency-shift measurements had been made on the radio transmissions from the Russian satellite 1958β, on a frequency of 20.005 Mc/s with the initial object of obtaining the parameters of local tracks and those of the orbit, the authors set up a table for Portsdown, Eng. during the period May 16-22, 1958. Interesting anomalies observed then are listed. --N.N.

A-711 Kitchen, F. A., Direction finding observations on the 20 Mc/s transmissions from the artificial earth satellites. Royal Society of London, Proceedings, Vol. 248A, No. 1252:63-68, Oct. 28, 1958. 4 figs., table, 6 refs. --Several bearing transists given are discussed relative to ionospheric propagation. Irregularities in bearings, strength and Doppler may supplement ionospheric knowledge if and when detailed orbit data become available. --W.N.

A-712 Kitchen, F. A. and Johnson, M. A. (both, Royal Naval Scientific Service, London), Role of turbulent scattering in long-distance radio propagation at metre wave-lengths. Nature, London, 182(4631):302-304, Aug. 2, 1958. fig., 7 refs. DWB.

A-713 Kitchen, F. A. and Millington, G., Survey of the Gibraltar to U. K. ionospheric scatter experiment. Institution of Electrical Engineers, Proceedings, Vol. 105B, Supplement No. 8:2, 1958.

A-714 Knecht, R. W. (Nat'l. Bur. Standards, Boulder, Colo.), Observations of the ionosphere over the south geographic pole. Journal of Geophysical Research, Wash., D. C., 64(9):1243-1250, Sept. 1959. 5 figs., 3 tables, 4 refs. DLC--Monthly median values of penetration frequencies of the ionosphere over the south geographic pole have been examined. Twenty months of data (June 1957 through January 1959) are included in the study of foF2, while foE and foF1 median values are shown for 6 summer months (November and December, 1957; January, November, and December 1958; January 1959). It is found that F region ionization persists throughout the 6 month winter night. Marked diurnal variations are observed in the monthly medians of foF2 even though the usual daily variation in solar elevation is absent at this unique location. A small but significant diurnal variation is also found in foF1. In contrast, foE exhibits no regular daily fluctuation, but seems to depend to a great extent on the level of solar activity. --Author's abstract.

A-715 Kobayashi, Tsuneto (Central Radio Wave Obs.), Comparison between the measured and calculated values of the field intensities of HF waves in long distance propagation. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 5(4):198-201, 1951. 5 figs. DWB --Data from observations on Dec. 1950 and during the solar eclipse of Sept. 12, 1950 were used for this comparison. The agreement was fairly good for most cases. --A. A.

A-716 Koch, J. W., Reception of transmitter space diversity signals via England to Boulder, Colorado path. U. S. National Bureau of Standards, NBS Report, No. 6026, Nov. 26, 1958. 6 p. 4 figs., table, ref., 2 eqs. DWB.

A-717 Koch, J. W., Factors affecting modulation techniques for VHF scatter systems. IRE Trans. on Comm. Systems CS-7, No. 2, 77, (June 1959), Institute of Radio Engineers, Transactions, CS-7(2):77-92, June 1959. 24 figs., 11 refs., eqs.

A-718 Koch, J. W.; Harding, W. B.; and Jansen, R. J., Fading rate for propagation research. Electronics, 32(51):78, Dec. 18, 1959.

A-719 Koch, J. W., Preliminary study of ionospheric cross-modulation at standard broadcast frequencies. U. S. National Bureau of Standards, NBS Report, No. 6072, Sept. 25, 1959. 12 p. 2 figs., 6 refs., 21 eqs. DWB.

A-720 Koch, J. W., Reduction of Doppler shift errors in ionospheric scatter PSK communications. U. S. National Bureau of Standards, NBS Report, No. 6053, May 1, 1959. 8 p. 5 figs., 7 refs. DWB (621.384 U585red)--Meteoric Doppler frequency shifts of signals propagated via ionospheric scattering cause errors in narrow-band PSK communications. A simple method of reducing the Doppler-shift errors has been tried. The principle of operation consists of locking out the mark channel when a space signal is present. The experimental results show a useful reduction in error rate when the Doppler lock-out circuitry is used. --Author's abstract.

A-721 Koch, J. W., Study of phase stability for phase-keying applications in VHF ionospheric-scatter communications. U. S. National Bureau of Standards, NBS Report, No. 6051, April 30, 1959. 8 p. 7 figs., 2 refs. DWB (621.384 U585stud)--A study of phase stability of the ionospheric-scatter propagation medium has been carried out, with the objective of determining the usefulness of phase-shift keying systems for communication by this mode. Observations of 20 millisecond integrated phase perturbations and instantaneous phase perturbations were made at frequencies of 30 and 50 megacycles per second. Results of the measurements program indicated that integrated phase variations over 20 millisecond periods were quite large for an appreciable percentage of the time, and that the ionospheric scatter mode is not suitable for systems requiring phase stability for such periods. Data for the instantaneous phase variations were analyzed by determining the phase perturbations between 5 millisecond sampling points. These data were not of sufficient quantity to draw any definite conclusions, but did point up the need for more instantaneous phase measurements that can be resolved for sampling points separated by 2 milliseconds or less. The instantaneous phase perturbation data did tend to indicate that a system requiring phase stability for somewhat less than 5 milliseconds might be useful. --Author's abstract.

A-722 Kodaira, N. and Inaba, M., On the inherent errors of the rawin set. Tateno, Japan. Aerological Observatory, Journal, 5(1):1-5, March 1951. figs., eqs. English summary p. 1. DWB--Short discussion of the angular errors due to the rawin set itself, due to wave propagation and due to the misreading of the indicator in the case of very strong fading. --A. A.

A-723 Koenig, H., Atmospherics geringster Frequenzen. (Spherics at the lowest frequencies.) Zeitschrift fur Angewandte Physik, 11(7):264-274, July 1959. 11 figs., 25 refs.

A-724 Kojan, J. S. and Isted, G. A., The first ionospheric storm warning service. Marconi's Review, 13(97):53-71, 1950. 14 figs. DBS--Purpose of this article is to state the reasons why ionospheric storm warning system was necessary during the war. After briefly describing the ionosphere authors analyze the effects produced on high frequency communication and direction finding system. Improvements made after establishing the Inter-Services Ionosphere Bureau in 1941 as well as efficiency of storm warning issued from Barrow and the new development are discussed. --W. N.

A-725 Komesaroff, M. M. and Shain, C. A., Refraction of extraterrestrial radio waves in the ionosphere. Nature, London, 183(4675):1584-1585, June 6, 1959. fig., 5 refs., 3 eqs. DLC--New expressions derived for refraction, taking into account the effects of horizontal gradients in electron density and considering the magnitude of the uncertainties involved in the necessary approximations are demonstrated. The analysis is restricted to the case of a transit radio telescope. The astronomical value of the ionospheric refraction corrections, the observed and corrected positions are indicated graphically. --From authors' text.

A-726 Koster, J. R. and Storey, L. R. O., An attempt to observe whistling atmospherics near the magnetic equator. Nature, London, 175(4444):36-37, Jan. 1, 1955. 5 refs. DWB--According to the theory of T. H. BARKHAUSEN and T. L. ECKERSLEY, whistlers are due to dispersion in the ionosphere of "clicks" radiated by lightning strokes, and should not occur near geomagnetic equator. At Achimota, Gold Coast, no whistlers were detected in 3 years (about 16 hours observation) though they occurred 1-3 times a minute during the same period in England. --C. E. P. B.

A-727 Kotadia, K. M., Sporadic echoes from the E region over Ahmedabad (23°02'N, 72°38'E). Journal of Atmospheric and Terrestrial Physics, London, 8(6):331-337, June 1956. 9 figs., 2 tables, 8 refs. DWB--In this paper, a study is made of the sporadic E echoes observed in the ionospheric h'-f records of Ahmedabad (Φ = 13.6°N). From the analysis of the data for 1953-1954, a sunspot minimum period, it was found that three types of sporadic, namely: 1) Esc at 95-100 km, 2) Esn at 105-125 km, and 3) Ess at 115-125 km, occur in the E region. The overall bahavior of Es has been shown as being due to the combination of the characteristics of these three types. The sporadic ionization of type Esc has a maximum frequency of occurrence in the late evening hours, and has a thin structure. It is apparently evolved out of a downward drift of the residual ionization of the normal E layer. No correlation could be established with meteor activity. Esn shows a minimum in the afternoon and maximum in late night hours before dawn. Ess is developed by the vertical downward movement of the E 2 layer. --Author's abstract.

A-728 Krasovskii, V. I., Sovetskie issledovaniia ionosfery pri pomoshchi raket i iskusstvennykh sputnikov Zemli. (Soviet exploration of the ionosphere by rockets and artificial earth satellites.) Iskusstvennye Sputniki Zemli, Moscow, No. 2:36-49, 1958. 15 figs., 16 refs., 4 eqs. DLC--A review of the principle studies in the ionosphere by means of rockets and artificial earth satellites carried out in the U.S.S.R. The methods for making these studies involved the use of the disperse interferometer which measured the radio waves radiated from the rocket and the satellite, and the direct measurement of the concentration of charged particles in the ionosphere, and the transmission of the reading by telemetric systems. The apparatus are described with the aid of diagrams and photographs and the results of individual rocket and satellite ascents are presented in graphs. The ionization above the maximum of the F 2 layer declines very slowly with height so that the altitude scale for ionizing particles is very large; at 475 km an ionization of about 10^6 electrons mets/cm^3 was recorded on Feb. 21, 1958; at 795 km the concentration of positive ions reached 1.9 x 10^5 ion/cm^3 on May 15, 1958. The effective temperature of electrons in the F region and above was higher than the temperature of the environment. The ionosphere below the maximum of the F region, in contrast to its model, constructed on the basis of ionospheric probing from the earth, does not have sharply demarcated layers but is characterized by a small maxima with nonatomic increase in electron density up to the maximum of the F2 layer. The maximum of the F2 layer, and in general the ionization below this region, is 50 - 150 km below the values of the usual ionospheric probing from the earth. The equations for computing the mean electron density at a given elevation, the current of the collector in the direct determination of ion concentration, and the deceleration potential are presented in appendices. --I.L.D.

A-729 Krassovskii, V. I., Exploration of the upper atmosphere with the help of the third Soviet sputnik. Institute of Radio Engineers, Proceedings, 47(2):289-296, Feb. 1959. 10 figs.

A-730 Kraus, Lester and Watson, Kenneth, M., Plasma motions induced by satellites in the ionosphere. Physics of Fluids, N. Y., 1(6):480-488, Nov./Dec. 1958. DWB--The electrohydrodynamic phenomena associated with the high velocity motion of a charged body in a plasma are investigated with a view to applications to satellite motion in the ionosphere. It is shown that the effect of the electric field due to the charge on the body in inducing collective motion leads to similar results both for high- and low-density gases. By using a linearized theory, formulas are obtained for the electrohydrodynamic drag and for the increased ionization in the Mach cone behind the body. --Author's abstract.

A-731 Krautkrämer, Josef (Köln University, Institute of Theoretical Physics), Über Wanderungserscheinungen rascher Feldstärke-Schwankungen von Ionosphären-Echos. (Drift phenomena for rapid fluctuations of field strength of ionosphere echoes.) Archiv der Elektrischen Übertragung, 4:133-138, April 1950. 19 figs., 3 tables, 14 refs. DLC--Three receivers placed in a right angled pattern made possible measurements of magnitude and direction of the travelling speed along the earth's surface of the field strength variation of ionospheric echoes. The observed interference line system can be interpreted as some inhomogeneity in the ionospheric layers that travel about 100 m/s with a frequency maximum between 80 - 100 m/sec. West direction is characteristic for the E layer; uncertain for the F-layer. The temporary results are given in table and graphs and are briefly discussed. --W.N.

A-732 Krishnamurthi, M.; Sastry, G. Sivarama and Rao, T. Seshagiri (all, Physical Laboratories, Osmania Univ. Hyderabad), Abnormal ionospheric behaviour at 10 metres wavelength. Current Science, Bangalore, 27(9):332-333, Sept. 1958. fig., table, ref. DLC--The radiation intensity of 10 m cosmic radio waves fell to zero on Jan. 28, -Feb. 21, and March 2, 1958 at the Physical Laboratories, Osmania University, Hyderabad, India (17°26'N, 78°27'E). The gradual fall of intensity occured about sunrise time, and the rise of intensity toward end of the phenomenon was uniformly rapid in the three cases, but differed in duration of minimum noise level. Small scale irregularity in the upper ionospheric layers is offered as a plausible cause of this disturbance which is knowingly unrelated to any solar flare. --W.N.

A-733 Kundu, M. R., Velocity of movement of sporadic E clouds. Calcutta. Univ. Institute of Radio Physics, Research Report, 7:23-25, 1954/1955, pub. 1955. fig., 2 refs. DWB. Also in Science and Culture, Calcutta, 20(6):303, Dec. 1954. --The height distribution of ionization in the composite F region is calculated on the assumptions that the scale height (i.e., the temperature) increases and the recombination coefficient decreases with height in this region. The recombination coefficient is assumed to vary in terms of the reduced height, that is, the height (above $F1_{max}$) measured in terms of the scale height and not in terms of the actual height as had been done earlier by A. P. Nitra in making similar calculations. The present assumption automatically takes into account the effect of rising temperature on the value of the recombination coefficient. Height distribution curves for high and low latitude stations are drawn for typical summer and winter conditions in the high atmosphere in the F region. It is found that when the possible effects of ionospheric tidal drifts are taken into account, the forms of the distribution curves, as also the separation between the F1 and F2 layers, agree with those deduced from observational data. The investigation lends support to the hypothesis that the ionospheric regions F1 and F2 belong to a common bank of ionization produced by a common ionizing radiation from the sun. --Author's abstract.

A-734 Deleted.

A-735 Laby, T. H.; Nicholls, F. G.; Nickson, A. F. B. et al., Reflection of atmospherics at an ionized layer. Nature, London, 139(3524):837-838, May 15, 1937. figs., table, 6 refs., eqs. DLC--Hundreds of sferic wave forms were analyzed. More than twenty showed pulses seemingly reflected from 78-82 km above the earth. Intervals of time, distance of flash and height of layer were calculated. The fundamental frequency of the sferic pulse was 10^4 cycles/sec in which case reflection occurs when ionization reaches 1 electron per cm^3. --W.N.

A-736 Laby, T.H., McNeill, J.J., Nicholls, F.G. and Nickson, A.F.B., Wave form, energy and reflexion by the ionosphere of atmospherics. Royal Society of London, Proceedings, Ser. A, 174(957):145-163, Feb. 1, 1940. DLC--Work was begun in the study of the wave form of sferics by physicists of the Radio Research Board of Australia in 1935. Evidence that atmospherics are reflected by the ionosphere was obtained in 1937. This article summarizes systematically the work done and reported in earlier papers, including a description and illustration of equipment, ray theory of reflection at the ionosphere, calculation of oscillograms, relation between field strength and distance of source, energy and speed. Atmospherics were recorded from sources 70 to 1500 km distant and paths both direct and reflected from ionosphere were calculated. From the time interval (distance on photographic record) between direct and reflected impulse, the height of reflecting layer and distance of source can be calculated. Heights lie between 53 and 82 km. Relation between distance and field strength is linear. --M.R.

A-737 Landmark, Bjørn, Polarization of radio waves reflected from the ionosphere. Journal of Atmospheric and Terrestrial Physics, 2(4):254-255, 1952. 3 figs. MH-BH, DWB--The z-component of radio waves at Tromsø was found to be polarized in the same way as the ordinary component. Positive correlation was found between axis ratio of polarization ellipse and absorption index. Axis ratio varied markedly during polar magnetic storms and discontinuities. --C.E.P.B.

A-738 Landmark, Björn, A study of the limiting polarization of high frequency radio waves reflected vertically from the ionosphere. Geofysiske Publikasjoner, Oslo, 19(7), 1955. 46 p. figs., 33 refs., eqs. Price: Kr. 10.00. DWB, DLC--Polarization measurements made both at Kjeller and at Tromsø are reported and the experimental equipment is described. Twenty observations of the sense of polarization (sense of rotation of the field vectors) of the magneto-ionic third component, the z-component, all show that this component is polarized in the same way as the ordinary magneto-ionic component. This is in accordance with present theories which explain the z-component by a coupling mechanism. During quiet conditions the reflected waves both at Kjeller and at Tromsø, were found to be in general nearly circularly polarized as should be expected according to a full wave theory. However, departures from circularity were observed; these are explained by a statistical theory of limiting polarization developed in this paper, in which the reflected wave is treated as a sum of rays reflected within a cone about the vertical direction, the phases of the individual rays being distributed at random. On the basis of this theory effects on the limiting polarization of horizontal gradients and irregularities may be accounted for. Conditions under which departures from circularity were most frequently observed are described. --From author's abstract.

A-739 Landmark, Bjørn, Measurements of limiting polarization of radio waves reflected from the F-layer. Journal of Atmospheric and Terrestrial Physics, 6(5):284-286, May 1955. 2 figs., table, 5 refs. DWB--The radius vector, vector angle and axis ratio of F-echoes were recorded at Kjeller, Oslo, to test MORGAN's observation that echoes become nearly linearly polarized when the critical frequency is approached. No correlation was found between magnitude of group retardation and state of polarization. The axis ratio was 0.8 to 1.0 compared with MORGAN's 0.1 - 0.2. --C. E. P. B.

A-740 Landmark, B. and Lied, F., Note on a "QL-QT" transition level in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 10(2):114-116, Feb. 1957. 3 figs., 2 refs. DWB--Referring to article by D. LEPECHINSKY (Ibid., 8(6): 297-304, June 1956; see 7.11-161, Nov. 1956, MAB), authors point out that at Tromsö there is no transition level associated with an abrupt change of refractive index. A method is outlined by which information may be obtained of electron density between E and F layers. At Tromsö there was no marked decrease in electron density. --C. E. P. B.

A-741 Landmark, B., The fading of radio waves reflected from the E-layer. Journal of Atmospheric and Terrestrial Physics, 10(5/6): 288-295, 1957. 10 figs., 7 refs., 5 eqs. DWB--The amplitude and phase of waves of frequency 2 Mc/s reflected vertically from the E layer were studied. It was found that there were regions in the wave pattern, of extent D, at the centre of which the phase-path exceeded that at the edges by ΔP. When $\Delta P/D$ 0.025 approximately, the variations of amplitude and phase were associated as they would be if the phase variation was caused by a concavity in the reflecting layer. There resulted a "burst" of amplitude caused by focusing, inside which there was comparatively rapid fading. When P/D $>$ 0.025, the conditions became more complicated, but on one occasion could still be analyzed in terms of a moving concavity in the layer. Observations made at night on waves of frequency 200 kc/s reflected at an angle of incidence of about 40° were explicable in terms of the same model. --Author's abstract.

A-742 Landmark, B. (ed.), Papers presented at the Ionospheric Research Meeting AGARD Avionics Panel, Cambridge, England. AGARDograph, Paris, No. 34, Sept. 1958. 204 p. figs., photos, tables, refs., eqs. throughout. Pertinent articles abstracted separately. At head of t-p.: North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development (AGARD). DWB (629.1323 N864a)--A collection of 16 papers dealing with different aspects of sporadic E ionization presented at the meeting and the introductory and final remarks by J. A. Ratcliffe of Cavendish Laboratory, Cambridge, England. The papers are arranged here in six parts with a summary discussion at the end of each part. In his initial remarks J. A. RATCLIFFE emphasized the general need for clarity in the discussions. For this purpose he expressly suggested to use classification only to simplify, to discuss theories which can be tested experimentally, and not to pay too much attention to the precise shape of the E-layer. In his final remarks he highlighted the main points which arose during discussions. --I. S.

A-743 Lange-Hesse, Günther, Analyse beobachteter Absorptions schwankungen elektromagnetischer Wellen in der Ionosphäre. (Analysis of observed variations of absorption of electromagnetic waves in the ionosphere.) Naturwissenschaften, 39(13): 297-298, July 1952. 5 refs. DWB--A calculation of the absorption factor for short waves (10-200 m or 30-1.5 MHz) shows that transmission is possible throughout the year near the equator, but in middle latitudes only in summer, when it can be forecast from sunspot number and 27-day cycle. In the auroral zone it is correlated with magnetic disturbances. --C. E. P. B.

A-744 Lange-Hesse, Günther (Göttingen), Vergleich der Doppelbrechung im Kristall und in der Ionosphäre. (Comparison of the double refraction in crystals and in the ionosphere.) Archiv der Elektrischen Übertragung, Wiesbaden, 6(4):149-158, April 1952. 8 figs., 14 refs., 44 eqs. DLC--The double refraction of light by crystals and of electromagnetic waves in the ionosphere show analogous features from a formal point of view. The geomagnetic field produces electrical anisotropy in the ionosphere. The dielectric constants of the ionosphere are derived. The causes for the difference between double refraction phenomena in both media are discussed in detail. The formal mathematical discussion is compared with observation results. Polarization is briefly discussed. --A. A.

A-745 Larenz, R. W., Zur Doppelbrechung der Ionosphäre. (On double refraction in the ionosphere.) Naturwissenschaften, 40(20):527, Oct. 1953. 5 figs., 3 refs., eq. DWB--The two refraction indexes n of electromagnetic waves for an electron plasma in a magnetic field are calculated for magnetic field parallel to wave propagation and at an angle with infinite and finite conductivity and for different electron pressures. The mathematical difficulties are discussed. --C. E. P. B.

A-746 LaTourette, P. M., Reduction and processing of F-layer propagation data. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-1830, Report No. 4, Dec. 1958.

A-747 Laursen, Veggo (comp.), Bibliography for the Second International Polar Year, 1932-33. Copenhagen, I, M. O. Temporary Committee on the Liquidation of the Polar Year, 1932-33, 1951. 253 p. DWB--The references are arranged according to countries and according to main subjects. In the section on Radioelectricity (p. 236-241) will be found 80 references, many dealing with the subject of ionospheric propagation. --M. L. R.

A-748 Lauter, Ernst August, Zur Statistik der nachtlichen abnormalen E-Schicht. (On statistics of the abnormal nocturnal E-layer.) Zeitschrift fur Meteorologie, 4(7-8):234-240, July-Aug. 1950. 4 figs., 8 refs. MH-BH--Sudden increases of ionization in E-layer were investigated through the ratio B_E (space wave/-ground wave) for 1250 m. Potsdam transmission. Daily values of magnetic disturbance K and B_E are plotted in 27-day periods Nov. 1947 - May 1950. Minimum B_E follows 3 days after maximum K. In 14/73 cases no marked absorption followed maximum K but there was a secondary maximum K instead. Five cases are examined specially, including high level radiation. Observations show that ionization must be due to solar corpuscular charged radiation of 200-300 km/sec., penetrating below 100 km. --C. E. P. B.

A-749 Lauter, Ernst August and Sprenger, K., Nachtliche Ionisationsstörungen der tiefen Ionosphäre. (Nocturnal ionization disturbances of the lower ionosphere.) Zeitschrift für Meteorologie, 6(6):161-173, June 1952. 19 figs., 20 refs. MH-BH --On the basis of almost 4 years of continuous record of nocturnal space radiation at 245 kHz registered with a frame antenna at approximately 55°N lat (54° geomagnetic lat.) four types of ionization disturbances in the E layer are described. These are the P-type (very rapid polarization variations without noticeable decline of reflection coefficient), S-type (storm type), A-type absorption nocturnal E reflections begin after sunset) and B-type (Bay disturbances). The relationships between these disturbances and terrestrial magnetic disturbances are analyzed statistically but cannot be explained by the accepted model of the ionospheric and terrestrial magnetic corpuscular disturbances. The possibility of ionospheric observations in the long wave region providing an explanation of the disturbances in the E layer and also an explanation of the relationship between atmospheric winds and these disturbances is suggested. --I. L. D.

A-750 Lauter, E. A., Variationen der D-Schichtdampfung auf 245 kHz. (Variations of D layer damping on 245 kHz.) Zeitschrift für Meteorologie, 7(11):321-330, Nov. 1953. 18 figs., 19 refs. MH-BH--Results of the measurement of reflection coefficient on 245 kHz during midday and in the evening are communicated. The diurnal and auroral course of the damping is shown, and the data with other frequencies compared. The damping values of the D layer have a close relationship to atmospherics and a weak one to geomagnetic activity. A 24-day recurrence tendency is clearly indicated. The midday values of the damping are 2 nepers in the winter and almost 7 nepers in the summer. --A. A.

A-751 Lauter, E. A., Der atmosphärische Störpegel im Längstwellenbereich und seine tages- und jahreszeitlichen Variationen. (The atmospheric noise level in the longest wave region and its diurnal and annual variations.) Zeitschrift für Meteorologie, Berlin, 10(4):110-121, April 1956. 12 figs., 11 refs. DLC--Problems of the definition and measurement of the noise level are discussed from measurements of dependence on frequency, and statistics, of atmospherics. The dependence of the noise level on ionospheric conditions and on the frequency and position of centers of disturbance is shown from 3-year mean monthly diurnal variations on 14, 27 and 48 kHz. This shows that in winter the distribution conditions depend especially on the diurnal variation, but in summer on the approach of disturbance centers. Some remarks are added on geophysical peculiarities in the recording of atmospheric disturbances, such as interdiurnal variability, twilight effect and solar flare effect. --Trans. of author's abstract.

A-752 Lawrence, Robert S. (Nat'l. Bureau of Standards, Boulder, Colo.), An investigation of the perturbations imposed upon radio waves penetrating the ionosphere. Institute of Radio Engineers, N. Y., Proceedings, 46(1):315-320, Jan. 1958. 4 figs., 38 refs. DLC--A new method has been devised to measure continuously the phase deviations introduced by the ionosphere into the signals from discrete sources. Sample recordings of measurements at frequencies of 53, 108, and 470 mc are given. An experiment combining this phase measuring technique and standard ionospheric soundings at the point of penetration of the line of sight is in progress and is expected to shed light upon the height of origin of ionospheric scintillations. --Author's abstract.

A-753 Leadabrand, R. L.; Dolphin, L. and Peterson, A. M., Upper atmosphere clutter research: Part I: Experimental Radars for Radio Propagation Studies. Part II: Preliminary results of 400 mc radar investigations of auroral echoes at College, Alaska. Part III: Preliminary results of radar investigations of meteor echoes at 100 and 400 mc. Stanford University, Electronics Research Laboratories, Contract AF 30(602)-1462, Technical Report Pt. I, II, III, Oct.

A-754 Leithaser, G. and Beckmann, B., Über Beziehungen der Ionosphärenschichten zu meteorologischen Einflüssen. (Correlation between the ionospheric layers and meteorological influences.) Zeitschrift für Technische Physik, Leipzig, 18:59-61, 1937. DLC--The nocturnal elevation of the ionospheric layers is discussed in relation to upper air winds. Steepness of the layers as influenced by intensity of the E-W winds are shown in curves for Jan.-Aug. and Oct. 1936. The radio echo curve is mentioned briefly.--W. N.

A-755 Lejay, Pierre and Durand, J., Sur une explication probable de certain échos ionosphériques fortement retardés. (A probable explanation of certain markedly delayed ionospheric echoes.) Académie des Sciences, Paris, Comptes Rendus, 230(6):493-495, Feb. 6, 1950. DLC--An attempt to explain these echoes by oblique reflection.--W. N.

A-756 Lejay, Pierre, Méthodes modernes de recherches sur la haute atmosphère. (Modern methods of research on the upper atmosphere.) Conference at the Palais de La Découverte, Jan. 16, 1954. Paris, 1954. 25 p. 5 figs. Conférences de la Decouverte, Ser. A., no. 192. DLC--Spectroscopic rocket (direct measurement) and radio echo methods of upper atmospheric research are described, and results in terms of temperature (to 150 km), density, winds, ionization, chemical composition, oscillations and radio propagation conditions discussed in this pamphlet.--M. R.

A-757 Lejay, Pierre; Pillet, Genevieve and Chezlemas, Rene, Mesure de l'absorption non déviative des ondes radioélectriques dans l'ionosphère. (Measurement of non deviative absorption of radio-electric waves in the ionosphere.) Académie des Sciences, Paris, Comptes Rendus, 240(18):1745-1748, May 2, 1955. 3 figs., 2 refs. DLC--A method of ionospheric recording is described which eliminates errors affecting methods involving double echoes. Median values of absorption obtained at Demont (France) in Dec. 1954 and Jan. 1955 for every hour of the day are graphically presented. If the exponential law $(\cos \chi)^n$ is assumed for the variation of absorption (χ = zenith angle of the sun, 0.3 is obtained as the approximate value of n, which is close to the value found by Davies and Hagg (1955) for the same period at a higher latitude. --G. T.

A-758 Lejay, P., La mesure des vents ionosphériques. (Measurement of ionospheric winds.) Académie des Sciences, Paris, Comptes Rendus, 245(3):253-257, July 17, 1957. 4 refs. DLC--Measurement of ionospheric winds based on the method of three receivers (Demont) is given. Three antennae have been erected at the summits of a right angled triangle, the small sides of which develop a length of about 200 m and are oriented nearly North-South and East-West. The three receivers magnify the echoes, received after reflection on the ionosphere, of the signals of an impulse emitter (1 KW crest, settled on 3, 4 MHz adjoining the receivers. The recorded electronic displacements could possibly be explained to be in relationship with the electrical streams susceptible to clear the diurnal changes of the earth's magnetic field. It seems, however, that a wave dephasing of 2 to 3 hours should exist in the way of an advance of the registered directions on the directions forecast by the magneticians. The author points out that seasonal change of ionospheric wind directions does not exist. --A. V.

A-759 Lepechinsky, Dimitri, L'influence sur les enregistrements de sondages ionosphériques de la couche E, du niveau de separation des régions de propagation quasi longitudinale (Q. L.) et quasi transversale (Q. T.). (Effect of the height of the boundary surface between regions of quasi-longitudinal and quasi-transversal propagation on records of ionospheric soundings for the E-layer.) Académie des Sciences, Paris, Comptes Rendus, 241(4):897-900, Oct. 3, 1955. 3 figs., ref., 3 eqs. DLC--Sample records show the characteristic discontinuties, and the underlying theory and assumptions are discussed.--A. A.

A-760 Lepechinsky, D., Ionosphère. (Commission III, XII^ème^ Assemblée Générale de l'Union Radio Scientifique Internationale. (Ionosphere (Report of Commission III, XIIth General Assembly of the International Scientific Radio Union.) L'onde Electrique. Paris, 38(376):514-526, July 1958. 3 figs., 67 refs. DLC--Report of work done by members of Commission III at the XIIth general assembly of the International Scientific Radio Union. Regarding the lower ionosphere, the author examines the main ideas of the complete statement of results of Prof. Waynick's researches in this field (experimental data - probable constitution of the layer, lower E region. The important question of ionospheric diffusion which was the object of a special meeting, was submitted by G. H. Booker. A certain number of experimental results were mentioned by various speakers on meteoric and auroral reflections and on the turbulence in the ionosphere. The results of available observations, relating to solar and geophysical phenomena of Feb. 23, 1956 (chromospheric eruption) were set forth by various speakers.

A-761 Lepechinsky, D. (Lab. Nat'l. Radioélectricité, Paris), De l'origine des echoes E sporadique: quelques données experimentales recueillies en France. (On the origin of sporadic E echoes; some experimental data obtained in France.) AGARDograph, Paris, No. 34:97-107, Sept. 1958. fig., table, 10 refs. French summary p. 97, English summary p. 108-109. DWB (629.1323 N864a)--Some experimental data gathered in France are cited as confirming Gallet's "Synamic" theory of the sporadic echo phenomenon. The correlation observed between the variability of ionospheric winds and the occurrence of transparent Es echoes as well as the obvious lack of correlation between the Es recorded simultaneously at Bagneux and Poitiers during the 12 months of 1957 support the hypothesis of purely dynamic origin of Es echoes. Accordingly, the Es echoes arise from the turbulence of ionization at high altitudes rather than from a particular ionizing agent. The most frequently observed types of Es in the 10 ionospheric sounding stations attached to the C.N.E.T. are also tabulated. --I. S.

A-762 Lepechinsky, Dimitri and Davoust, Claude, Quelques effets d'explosions nucleaires sur les sondages ionosphériques verticaux. (Some effects of nuclear explosions on vertical ionospheric soundings.) Académie des Sciences, Paris, Comptes Rendus, 248(8):1203-1206, Feb. 23, 1959. 2 tables, ref. DWB, DLC--Study of ionograms recorded at Tahiti on Aug. 1, 1958 and of those recorded at Maui (Hawaiian Islands) and at Rarotonga (Pacific) on Aug. 12, 1958 when explosions of atom bombs were scheduled in the Pacific Ocean. This study gives evidence of a very abnormal absorption. This ionospheric effect due to atomic explosions can be explained through the intense warming up of the lower ionosphere, causing an increased absorption going as far as "black-out" in the regions at less than 1000 km from Johnston Island. The radius of "ionospheric influence" of the atomic explosions seems to have reached about 3500 kms for the bomb of Aug. 1 and about 5000 kms for the bomb of Aug. 12. --A. V.

A-763 Liakhov, B. (Res. Inst. of Geomagnetism, Ionos. and Radio Propagation, USSR), Work done according to IGY programme. Indian Journal of Meteorology and Geophysics, New Delhi, 10(1):67-68, Jan. 1959. DWB, DLC--During the I.G.Y., the Research Institute of Geomagnetism, Ionosphere and Radio Propagation of the USSR Ministry of Communications, the

Radio Engineering and Electronics Institute of the USSR Academy of Sciences and other research bodies have studied the structure of the ionosphere, made significant calculations by large electronic computing machines, analyzed the moments of the appearance and disappearance of the radio signals from the outer ionosphere, as well as that of the concentrated electrons at altitudes of 600-700 km. It is concluded that the limit of the atmosphere is at 2000-3000 km. There has been an abundant exchange of scientific materials on solar activity, the ionosphere and the condition of earth's magnetic field which has proven of value for short-range magnetic and ionospheric forecasting. The Soviet also established a magnetoionospheric station at the pole of homogeneous magnetization at station Vostok in the Antarctica (lat. 78.5°S; long. 111°E) at an altitude of over 3800 m, nearly 1500 km from the coast.--N.N.

A-764 Lien, J. R.; Marcou, R. J.; Ulwick, J. C.; Aarons, J. and McMorrow, D. R., Ionosphere research with rocket-borne instruments. (In: Boyd, R.L.F.; Seaton, M.J. and Massey, H.S.W. (eds), Rocket exploration of the upper atmosphere. London, Pergamon, 1954. p. 223-239. 17 figs., table, 14 refs., 6 eqs.) DWB--Measurements of effective electron density, collisional frequency, and propagation modes over a long path have been made by a series of U.S.A.F. rocket flights at White Sands Proving Ground and Holloman Air Development Center, New Mexico. Data on effective electron density have been obtained by measuring the retardation time of a radio signal a megacycle or so above the critical frequency for the E-region. The retardation times were found by comparing the time of arrival in the rocket of two synchronized signals sent from the ground, one of which is the probing signal and the other an ultra-high frequency reference signal that suffers negligible retardation. On several occasions a profile curve relating the effective electron density vs. altitude has been obtained for the regions between 90 and 130 km. These data show the E region to be bifurcated with a separation between layers of about 15 km. This gives support to the view that at least two ionization processes exist within the E region. Some knowledge has been gained of the possible modes of propagation over a long path. Pulsed signals sent from the National Bureau of Standards transmitter at Sterling, Virginia, are received both on the ground and in the rocket near the White Sands region, New Mexico. The signals received in the rocket are retransmitted to the ground, where they are recorded together with the ground received signals. It has been possible to follow the variations in propagation modes as the rocket makes its ascent. In order to obtain a more precise determination of the collisional frequency in the lower E region, a rocket experiment is proposed using the "Luxembourg" or cross modulation phenomenon. The experiment yields the product with respect to altitude. When combined with the "retardation" experiment, it is possible, in principle, to obtain the factor G itself. --Authors' abstract.

A-765 Lindquist, Rune, The panoramic ionospheric recorder. Tellus, 1(4):37-43, Nov. 1949. 12 figs., 8 refs. Abstract p. 35. DWB--A new type ionospheric recorder was installed at the Askim Observatory near Gothenburg, Sweden in July 1948. The recorder, oscillator, transmitter, antenna system, receiver, relay, time-base indicator and records are described and illustrated. Five sample records are reproduced, showing varying degrees of disturbances. Very good records are obtained in polar regions which are subject to great fluctuations in height and stability of ionospheric layers, because of short sweep time.--M. R.

A-766 Lindquist, Rune A., A survey of recent ionospheric measurements at the Ionospheric and Radio Wave Propagation Observatory at Kiruna. Arkiv for Geofysik, Stockholm, 1(2-4):247-266, 1951. 28 figs., 10 refs. MH-BH--Ionospheric research started at the Ionospheric and Radio Wave Propagation Observatory at Kiruna on Oct. 1, 1948. This report gives some preliminary results obtained from the recordings during the period October 1948-August 1949. Different types of sporadic E echoes are classified and the diurnal and seasonal behaviour of Es is shown and discussed. The relation between E's and magnetic disturbances is further discussed. A few typical polar blackouts are described and studied. The diurnal and seasonal behaviour of the ordinary layers is also shown as a final bi-product. --Author's abstract.

A-767 Lindquist, Rune (Pa. St. Coll. Ionosphere Res. Lab.), Interpretation of vertical incidence equivalent height versus time recordings on 150 Kc/s. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionospheric Research, Scientific Report, No. 33, June 10, 1952. 115 p. 27 figs., tables, 20 refs. DWB--Results of measurements during (disturbed and undisturbed days) Jan. 1950-March 1952 are tabulated, monthly median heights computed and presented in graphs that are discussed. The normal behavior of the bottom of the E layer is discussed and some conclusions as to the conditions within the layer and immediately above are given. The coupling echo does exist. One echo form, regular during magnetic disturbed nights, is due to one type of sporadic E. Group and phase heights are compared and the difference checked against theoretical predictions. Results of the effect of solar flares are given. --W. N.

A-768 Linford, Leon B., Physical properties of the upper atmosphere. Utah, University, Progress Report No. 3, Nov. 24, 1950. 22 p. 7 figs. (Contract AMC No. W19-122 ac 15.) DWB--Most of the report is concerned with the design of circuits and modifiers for wide-deviation reaction-tube modulator equipment for use in studying transmission constants of electro-magnetic waves in the optical, 10-cm., 500-Mc, 18-Mc and 4.5-Mc bands; and dispersion curves with band widths of 2-Mc centered at 18-Mc and 4.5-Mc. Previously the maximum deviation at 2-Mc was 7.5% swing. On this project swings as high as 71% were obtained. --M.R.

A-769 Little, A. S., Hourly measurements of ionospheric characteristics, Macquarie Island, 1953. Australian National Antarctic Research Expeditions, Interim Reports, No. 10, Jan. 1956. unpaged. 6 + 11 figs., 132 tables, No. 316-446, 6 refs. Also: Firmstone, T. F., Hourly measurements of ionospheric characteristics, Macquarie Island, 1954. Ibid., No. 12, Dec. 1955. unpaged. 8 figs., almost entirely tables, 3 refs. Also: Callow, D. R. L., Hourly measurements of ionospheric characteristics, Macquarie Island, 1955. Ibid., No. 13, Aug. 1956. unpaged. 11 figs., almost entirely tables. DWB--Extremely detailed tabular and graphical presentation of the hourly data obtained at Macquarie Island (54°29'S, 158°58'E., Geomagnetic 61°S, 283°E). Hourly values of f^oF2, f^oF1, f^oE, fE, H'F2, h'F1, h'E, $h'E_s$, hpF2, (M3000) F2 and M(3000)F1. Data for Sept. 1953 are missing. Records began in June 1950. --M.R.

A-770 Little, C. G., High latitude ionospheric observations using extraterrestrial radio waves. Institute of Radio Engineers, Proceedings, 42:1700---, 1954.--A preliminary account is given of observations made at College, Alaska, over a two-month period in the spring of 1954, of the effect of the ionosphere on the reception of cosmic radiation at 65 mc. Strong absorption of the diffuse rf background is most common at midday and least common during late evening; it is correlated with no-echo conditions and with variations of the geomagnetic field. Observations on localized radio sources indicate that scintillations are commoner in Alaska than in England. Scintillations were observed whenever marked 65-mc absorption occurred during transit of the localized source through the antenna beam; this indicates that the lateral distribution of ionization during periods of absorption is nonuniform. Study of the scintillations should provide information about irregularities in the ionosphere.

A-771 Little, C. G.; Rayton, W. M. and Roof, R. G., Review of ionospheric effects at VHF and UHF. Institute of Radio Engineers, N. Y., Proceedings, 44(8):992-1018, Aug. 1956. 2 tables, 182 refs. 3 + eqs. DLC--This paper summarizes the present-day knowledge of ionospheric effects at VHF and UHF, with the exception of forward scattering of VHF radio waves by the ionosphere. The seven effects covered in the paper are: Radar echoes from aurora, Radar echoes from meteors, The Faraday effect and Radar echoes from the moon, Radio noise of auroral origin, Absorption of radio waves by the ionosphere, Refraction of radio waves by the ionosphere, and the Scintillation of the radio stars. Each ionospheric effect has in turn been divided into separate subtopics, and the main results are given in these subsections, with particular emphasis upon providing references to the original papers. In this way the reader wishing to know the answer to a specific problem will speedily be able to find a summary of the main published results in the field, and also be able to learn which papers deal with the particular topic of interest. --Authors' abstract.

A-772 Little, C. G. and Leinbach, H., The riometer – a device for the continuous measurement of ionospheric absorption. Institute of Radio Engineers, N. Y., Proceedings, 47(2):315-320, Feb. 1959. 4 figs., 6 refs. DLC--A sensitive, self-balancing, noise-measuring equipment, known as the riometer, is described. This instrument has been designed for routine measurement of ionospheric absorption during the IGY, using the cosmic noise method. Application of this technique in the auroral zone has resulted in quantitative measurements of ionospheric absorption, even during polar blackouts. The riometer has the advantages over a simple total-power cosmic noise receiving system of 1) linear response to changes of imput noise power, 2) high accuracy in the presence of narrowband RF interference, and 3) good long-term stability. --Authors' summary.

A-773 Lorentz, Hendrick Antoon, The theory of electrons and its application to the phenomena of light and radiant heat. Leipzig, B. G. Teubner, 1909. 332 p. refs., numerous eqs. DLC --A large theoretical text which takes up in successive parts: I. General theory of free electrons which stems from theories of FARADAY and MAXWELL; p. 1-68; II. Emission and absorption of heat radiation after KIRCHOFF, BOLTZMANN, WIEN and JEANS, p. 68-97; III. Theory of Zeeman effect, p. 98-131; IV. Propagation of light in a body composed of molecules. Inverse Zeeman effect, p. 132-167; V. Optical effect in moving bodies, p. 168-230. The newly accepted theory of relativity of EINSTEIN is considered in the last chapter. All of the known effects, phenomena and theory which enter into wave propagation in the ionosphere are treated in this classical treatise on the electron, originally presented in a series of lectures at Columbia University in 1906. --M. R.

A-774 Lovell, A. C. B., A note on the interpretation of transient echoes from the ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 8(4/5):293-294, May 1956. fig., 6 refs. DWB--The midday maximum occurrence of transient echoes from meteor trails is attributed to a maximum of meteoric activity at midday in summer, as shown by surveys. --C.E.P.B.

A-775 Low, Ward C. and Knight, Raymond M., Rocket reception of radio pulses over long distances. Boston University. Upper Atmosphere Research Laboratory, Contract AF 19(122)-36, Investigation of the ionosphere utilizing sounding rockets, Final Report, June 30, 1953. 65 p. tables, numerous figs. MH-BH--This is the final report on Contract AF 19(122)-36 between the Department of Defense and the Trustees of Boston University. It also marks the conclusion of the project usually termed the "Oblique Incidence Ionosphere Experiment," here called briefly the "Ionosphere Experiment." The principal goal of this project has been to obtain general information concerning characteristics of long distance radio pulse reception in high altitude rockets, more specifically, whether significant deviations from results of simple propagation theory result from the receiving stations being in, or very near, the E-layer. To the limited extent to which the recovered data have been examined, no such anomalies have been recognized. A description of the equipment employed on this experiment in three high altitude missiles: V-2 No. 51, and AFCRC Aerobee Rounds No. 20 and No. 24 is presented. A display of data obtained during the flights of those missiles is given, with a discussion of the methods of measurement used. --Authors' abstract.

A-776 Low, Ward C., An instrument for investigation of non-linear effects of the ionosphere. Boston Univ. Upper Atmosphere Research Laboratory, Contract AF 19(604)-757, Final Report, Oct. 31, 1954. 25 p. figs. (incl. photos), refs., eqs. DWB--The design and construction of two CW rocket transmitters are described. Specifications were supplied by Air Force Cambridge Research Center. The transmitters are to provide the wanted wave in an ionospheric cross-modulation experiment. A review and extension of applicable cross-modulation theory is given, including suggestions for detailed analysis methods of experimental data which may be obtained. It is suggested that the specified wanted wave frequency may be higher than desirable. The effective altitude ranges in which useful data may be expected are found to be narrow. Additional study is recommended before performance of the experiment as presently designed. --Author's abstract.

A-777 Luscombe, G. W., Delayed signals in ionospheric forward-scatter communication. Nature, London, 180(4577):138, July 20, 1957. fig., 3 refs. DWB--VHF signals received in the United Kingdom from Gibraltar with a delay of 140 m sec are attributed to round the world propagation.--C. E. P. B.

A-778 Lutz, S. G.; Losee, F. A. and Ladd, A. W., Pulse phase-change signaling in the presence of ionospheric multipath distortion. Institute of Radio Engineers, Transactions, CS-7(2): 102, June 1959.

A-779 Lyon, A. J. and Moorat, A. J. G., Accurate height measurements using an ionospheric recorder. Journal of Atmospheric and Terrestrial Physics, London, 8(6):309-317, June 1956. 8 figs., 6 refs., 3 eqs. DWB--The errors of the D. S. I. R. (Slough) ionospheric height recorder are discussed. Checking of the calibration procedure is described, and a method is given for correcting errors in height measurement due to distortion of the echo-pulse in the receiver. With a calibrated receiver and expanded time-base, E region equivalent heights can be measured to ± 2 km. Without such correction systematic errors of + 5 to 15 km are present in height and MUF measurements at ionospheric stations all over the world. --C. E. P. B.

A-780 Lyons, J. F., Analyzing multipath delay in communications studies. Electronics, 32(36):52-55, Sept. 4, 1959. 7 figs., ref.

A-781 McCue, C. G., Concerning Green's reinterpretation of the magneto-ionic theory. Journal of Atmospheric and Terrestrial Physics, 3(5):239-244, June 1953. fig., 12 refs., 19 eqs. MH-BH--A. L. GREEN (1949-50) justified his empirical maximum usable frequency (M. U. F.) formula by a new analysis of the magneto-ionic theory of radio transmission. Author considers that this modification of E. V. APPLETON's interpretation (1932) is incorrect. --C. E. P. B.

A-782 McKenzie, A. A., Reliable VHF signals up to 1,250 miles distance. Electronics, N. Y., 25(6):102-103, June 1952. 2 figs., 4 refs. DLC--Signals which can regularly be heard at great distances, with an optimum at noon and poorest reception between 20 and 22 h (E. S. T.), are attributed to a phenomenon similar to the sporadic E layer (Es) but not sporadic. The signal is enhanced during magnetic storms and SID's when other high frequency signals fade out. It must come from the part of the E layer below the level of maximum ionization or even below the absorbing region of the D layer. (See Physical Review, p. 141, April 1952.)--M. R.

A-783 McKerrow, C. A. (Defence Research Board, Ottawa), Some recent measurements of atmospheric noises in Canada. Institute of Radio Engineers, N. Y., Proceedings, 45(6):782-786, June 1957. 5 figs., 2 tables, 6 foot-refs. DLC--Some recent atmospheric noise measurements in the vlf range have been made in Canada by the Defence Research Telecommunications Establishment of the Defence Research Board. The amplitude of the mean logarithmic power (mlp) of atmospheric noise on a frequency of 10 kilocycles has been measured at Ottawa, Ontario (lat. 45.4°N, long. 75.9°W), over a period of one year, beginning in Oct. 1955. The mlp atmospheric noise amplitude has also been measured in the sub-Arctic regions of Canada at Churchill, Manitoba (lat. 58.8°N, long. 94.2°W), on a frequency of 107 kc for the period Dec. 1955 to Aug. 1956. A brief description of the equipment used to obtain these measurements is described. The results of the measurements are presented in the form of a graphical analysis showing the hourly median variations. These measurements are compared with previous measurements made in Canada, and with the estimated values of the National Bureau of Standards, and CCIR predictions of July 1956. --Author's abstract.

A-784 Macmillan, R. S.; Rusch, W. V. T. et al., Very-low-frequency antenna for investigating the ionosphere with horizontally polarized radio waves. U. S. National Bureau of Standards, Journal of Research, Sec. D, 64(1):27-35, Jan./Feb. 1960. 13 figs., 12 refs., 16 eqs. DWB, DLC--The advantages of a horizontal half-wave resonant antenna for very-low-frequency propagation experiments lie in its relatively simple and inexpensive construction and in its radiation pattern which is maximum in the vertical direction. The radiation fields of this type of antenna located at the surface of a conducting earth consist of: 1, a horizontally polarized space-wave radiated in the perpendicular bisector plane of the antenna; and 2, a vertically polarized ground-wave field radiated along the axis of the antenna. This vertically polarized field is zero at right angles to the antenna. These fields have been experimentally verified. The use of a 50-kilocycle horizontal half-wave antenna for vertical incidence ionospheric sounding experiments is described. The radiation pattern of this antenna is well suited for ionospheric soundings since a receiver located in the ground-wave null receives only the reflected skywave signal. Ground-resistivity measurements made at a number of locations in Central and Southern California were correlated with the geology of the terrain. This correlation showed that the ground resistivity is highest (a condition necessary for optimum antenna efficiency) in areas where the underlying rock formations are relatively unfractured. The amount of annual rainfall and other climatic conditions have little or no effect on the resistivity. Finally, a unique antenna system is presented which employs resonant loading circuits to convert a section of an existing power line into a horizontal half-wave very-low-frequency transmitting antenna. --Authors' abstract.

A-785 Macmillan, R. S.; Rusch, W. V. T. and Golden, R. M., A new antenna to eliminate ground wave interference in ionospheric sounding experiments. Journal of Atmospheric and Terrestrial Physics, 13(1/2):183-186, Dec. 1958. 5 figs.

A-786 McNicol, R. W. E. and Gipps, G. de V., Characteristics of the Es region at Brisbane. Journal of Geophysical Research, 56(1):17-31, March 1951. 10 figs., 10 refs. DWB--A study based on routine h'f records of the Es layer taken at Brisbane, Australia, between June 1943 and Dec. 1949 shows at all seasons the critical frequency is lowest at dawn. In summer it reaches a maximum at 10 hr and declines gradually. In winter the rise is slower and the maximum occurs around 14 hr, dropping markedly by sunset. The observations suggest that there are 2 distinct types of Es at Brisbane - one found at great heights and descending to its final position, the other formed in situ. The first is predominant in summer and the second in winter. No evidence of correlation could be found with sunspot numbers, ionospheric storms or meteor occurrence frequency, and the conclusion is reached that the Brisbane Es is not predominantly of meteoric origin. There is some slight evidence of correlation between the constant height type of Es and F region diffuseness. --From authors' abstract.

A-787 McNicol, R. W. E.; Webster, H. C. and Bowman, G. G., A study of "Spread-F" ionospheric echoes at night at Brisbane, Pt. 1, range spreading (experimental). Australian Journal of Physics, Melbourne, 9(2):247-271, June 1956. 26 figs., 5 photos, 3 tables, 11 refs. DLC. Also: McNicol, R. W. E. and Webster, H. C., Pt. 2, Interpretation of range spreading. Ibid., p. 272-285. 8 figs., 15 refs., eqs. DLC--Examination of ionospheric records on 2.28 Mc/s at Brisbane, Buderim (95 km N) and Toowoombe (95 km W) shows satellite echoes accompanying the nighttime F2 echo. The characteristics of these multiplets (points of juncture, intensities, multiple hop satellites, spatial correlation, duration of multiplets and individual satellites, diurnal and seasonal distribution, relation to F and Es, etc.) are described and shown in graphs and photos of records. Movements approximately 240 $\pm$ 140 km/hr with a direction of $290^{\circ} \pm 60^{\circ}$, duration averages 50 min, occurrence is more frequent in winter than in summer, etc.

Theories of origin are given in Part II. Motions are considered to be wave motions rather than a drift of ionosphere. Only a few of the multiplets are thought to be due to Es scatter with return path via F2.--M. R.

A-788 Maeda, K.; Aono, Y.; and Kobayashi, T., A tentative method of calculation of h. f. radio sky wave field intensity by use of transmission curve. Japan. Science Council. Ionosphere Research Committee, Reports on Ionosphere Research in Japan, 4(2):61-70, 1950.--Gives the principle underlying the proposed graphical method of calculation of h. f. radio field intensity. A E_V/f curve (field intensity v. frequency at vertical incidence) and an ordinary h'/f curve are needed. Smith's transmission-curve method (1939) is applied and by a deduction of analytical relationships, between attenuations at oblique and vertical incidences, it is shown that ambiguity or speculation in the estimation of mean collision frequency and of its distribution can be removed. Some examples and curves are given.

A-789 Maeda, Ken-ichi (El. Comm. Lab., Ministry of Telecom., Japan), Dynamo-theoretical conductivity and current in the ionosphere. Journal of Geomagnetism and Geoelectricity, Kyoto, 4(2):63-82, July 1952. DLC--Tensor expressions of anisotropic velocity and conductivity of a simple ionized gas in magnetic field is applied to the ionosphere as a heterogeneous ionized medium. It is shown that the vertical electric current in the ionosphere is suppressed down to a negligible magnitude, and under this condition the specific conductivities of the ionosphere are derived. With these conductivities the dynamo-theoretical equation is constructed and solved for some special models of the ionospheres. The directional conductivities of the ionosphere are introduced and explained. The vertical motion of electrons and ions in the ionosphere is considered and its importance is briefly noted from the viewpoint of the ionospheric distribution. --Author's abstract.

A-790 Mæhlum, Bernt (Norwegian Def. Res. Establ. Kjeller, Lilleström, Norway), Anisometry in the fading pattern of sporadic E as observed near the auroral zone. AGARDograph, Paris, No. 34:163-168, Sept. 1958. 3 figs., 4 refs. DWB (629.1323 N864a)--The diffraction pattern formed over the ground from the sporadic E-layer has been studied at Tromsö (67° geom. lat.). The irregularities in the diffraction pattern are found to be elongated in an east-west direction, and velocities of drift up to 1600 m/s of the irregularities have been observed. --Author's abstract.

A-791 Maenhout, A., Distribution en azimut des parasites atmospheriques recus a Dourbes sur ondes kilometriques. (Azimuth distribution of sferics received at Dourbes on kilometer waves.) Ciel et Terre, Brussels, 73(11/12):499-505, Nov./Dec. 1957. 5 figs. DLC--The azimuth distribution of sferics received with a Lugeon-Nobile type radiogoniograph tuned on the frequency of 27 Kc/s is given for a typical winter month (Dec. 1956) and for a typical summer month (June 1957). The measurements were made at the Geophysical Center at Dourbes, Belgium.--A. V.

A-792 Maire, J., Note sur les relations entre l'agitation du champ magnetique terrestre et l'agitation ionospherique observee dans les radiocommunications transcontinentales par ondes decametriques. (Note on the relation between the disturbance in the terrestrical magnetic field and ionospheric disturbance observed in transcontinental radio communication by 10 m waves.) Annales de Géophysique, 5(3):216-220, July-Sept. 1949. 3 figs., table, 6 refs. MH-BH--The author describes a method of recording daily ionospheric disturbances over a given distance as reflected in radio communication and discusses that variation of the amplitude of the ionospheric disturbances as a function of distance, the 27-28 day cycle of ionospheric disturbances and the concomitant disturbances of the earth's magnetic field.--I. L. D.

A-793 Maire, J., Reception of transatlantic signals of frequencies near 30 Mc/s. Annales de Radioéléctricité, 6( ):197---, 1951.--Results of systematic reception tests made near Paris from 1937 to 1940 and from 1948 onwards are shown diagrammatically and discussed. The transmissions are from WWV and amateur stations. Regularity of reception throughout the above two periods is related to the sunspot cycle, the time of sunset at the mid-point of the path, and the predicted muf. Reception of Buenos Aires transmissions on about 27.5 mc was, with minor exceptions, consistently good during much of the daytime from 1946 to 1950, and was almost completely free from echo disturbances.

A-794 Major, G., D-layer ionospheric echoes at Macquarie Island. Nature, London, 175(4463):862-863, May 14, 1955. 2 refs. DWB--Echoes at a minimum virtual height of 40 km were observed on most days of the year on 2-7.5 Mc/s at Macquarie Island., occasionally persisting through the night. They may be peculiar to islands.--C. E. P. B.

A-795 Major, G., Hourly measurements of ionospheric characteristics, Macquarie Island, 1952. Australian National Antarctic Research Expeditions, 1947-1949, Interim Reports, No. 9, Jan. 1956. p. 220-315. Mostly tables. DLC (QC973. M25) --Graphs and tabulation of hourly ionospheric characteristics for Jan., Feb., March, August, Sept., Oct., Nov. and Dec. 1952 in same form as for 1950, for Macquarie Island. --M. R.

A-796 Malinovski, Al., Radiolokatsionna uredba za opredeliana posoka i skorost na visokiia viatur. (Radar set for determining the direction and speed of upper air winds.) Khidrologiia i Meteorologiia, Sofia, No. 4:46-53, 1956. 9 figs. Russian and English summaries p. 53. DLC--The radar set described in this paper is located at the Aerological Dept. of the Bulgarian Weather Service. It is designed to replace the conventional pibal theodolite in conditions of low visibility. The radar triode transmitter operates in the 50 cm band. Great accuracy of elevation and azimuth (1/10 deg) is achieved through conical scanning. Range is measured directly on the Type A indicator with a circular base with an accuracy of $\pm$ 100 m. More accurate reading ($\pm$ 20 m) is possible when using a special device "stretching" the base. The set has a peak power of 20 kw, pulse duration 2 sec, antenna beam width of 5°. --Author's abstract.

A-797 Mallinckrodt, A. J., The boundary problem in ionospheric wave propagation. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-795, Technical Report No. 2, May 1954.

A-798 Mallinckrodt, A. J.; Snyder, W. and Helliwell, R. A., Characteristic waves. Institute of Radio Engineers, Transactions, PGAP-3:53-62, Aug. 1952.

A-799 Manning, Laurence A. (Comp.), A survey of the literature of the ionosphere. Stanford University. Dept. of Engineering, Final Report No. 1-FI (on high altitude radio frequency propagation) Aug. 30, 1947. (Contract W 33-038 ac-14737. 278 leaves. numerous figs., tables and eqs. DWB--This valuable bibliography contains the major part of the important papers on radio propagation in the upper atmosphere and on ionospheric physics. Aspects likely to be of significance to the problems of missile communication on VHF are included. The 888 entries are abstracted and arranged alphabetically under the authors, and will also be found in the classified subject index and through a provided code system. The last 76 leaves consist of a digest section comprising the more important knowledge on certain branches of the ionosphere.--W. N.

A-800 Manning, Laurence A., Windmessungen in der oberen Atmosphäre. (Wind measurements in the upper atmosphere.) Umschau, Frankfurt a. M., 51(8):245-246, April 1951. 2 figs. DLC--Popular report on measurement of wind velocity at heights of 50 to 70 miles, by radar echoes from ionization trails persisting after the passage of meteors, as carried out at Stanford University, California. An explanatory schematic drawing and data on wind velocity recorded during the summer 1949 are presented. --G. T.

A-801 Manning, Laurence A. (Stanford Univ., Calif.), Recent advances in the study of ionospheric winds. American Meteorological Society, Bulletin, 34(9):401-405, Nov. 1953. 6 figs., 4 refs. MH-BH--Two radio methods of ionospheric wind observation and the meteoric method are described in detail and illustrated. --M. R.

A-802 Manning, L. A., Ionospheric layer heights. IRE-URSI Meeting, Washington, D. C., May 1955. --One of the simplest methods for finding true height is that of Booker and Seaton. By assuming the layer of parabolic form, they showed that the true height of the layer maximum is equal to the virtual height at 83.4 percent of the critical frequency. An extension of their analysis is given to include the effect of the earth's magnetic field. For geomagnetic latitudes north of 45°, the longitudinal approximation of the magneto-ionic equations applies with very slight error. It then is possible to get analytic expressions for the virtual height of reflection from a parabolic layer. It is found that at these latitudes use of the Booker-Seaton analysis yields less error if applied to the extraordinary rather than the ordinary trace. Curves are produced showing the error in neglecting the magnetic field, and also the scaling frequency that gives the true height without error. The method may be of especial usefulness in the International Geophysical Year.

A-803 Manning, Laurence A., Survey of the literature of the ionosphere. Stanford Univ. Radio Propagation Laboratory, Contract AF 19(604)-686, Final Report, July 31, 1955. 650 p. illus., tables, eqs. About 1400 abstracts arranged alphabetically by author. ASTIA photostat, No. AD-75 477. "In essence a second edition of the Survey of 1947 which was prepared for the Air Materiel Command". --The 1000 abstracts in the 1947 edition have been increased to over 1400, and the annotated bibliography (p. 19-463) is supplemented by lists of journals, subjects and institutions and their code abbreviations, a subject index (p. 464-511), and a summary of knowledge of various aspects of ionospheric physics and propagation (p. 512-650). The subjects discussed are: structure, recombination, disturbances, propagation, methods of investigation, wave paths, height analysis and meteors. The latest abstracts included are 1954, the earliest about 1928. --M. R.

A-804 Manning, L. A. (Stanford Univ., Calif.), Report on URSI Commission III, Ionospheric Radio Propagation. Institute of Radio Engineers, Proceedings, 46(7):1362-1366, July 1958. Also issued as National Research Council, Wash., D. C. Publication No. 581:51-101, 1958. DWB, DLC--The technical program was divided into 8 parts: 1) lower ionosphere, 2) geomagnetic influences on ionosphere, 3) whistlers, 4) geomagnetic storms, 5) horizontal movements in ionosphere, 6) scattering in ionosphere, 7) solar flare of Feb. 23, 1956, 8) rocket exploration of ionosphere. A fairly complete summary is given of progress reported at the meeting on each of these subjects. --M. R.

A-805 Marasigan, V. (Manila Obs., Philippines), Height-gradient of electron-loss in the F-region. Journal of Atmospheric and Terrestrial Physics, London, 13(1/2):107-112, Dec. 1958. 4 figs., 14 refs., 6 eqs. DLC--A theoretical expression is derived for the exponential height-gradient of the coefficient of electron-loss in the F region, on the assumption that this gradient completely accounts for the initial process of bifurcation. Five models are proposed:parabolic, linear, second-power, cosine and quasi-parabolic. --Author's abstract.

A-806 Marasigan, V. (Manila Obs., Philippines), Bifurcations in the F-region at Baguio, 1952-1957. Journal of Atmospheric and Terrestrial Physics, London, 13(1/2):26-31, Dec. 1958. 5 figs., 13 refs., eqs. DLC--A 5-year statistical survey of bifurcations in the F region at Baguio is presented and analyzed in the light of a parametric mechanism of the v-R relations of the F1 and F2 layers. The conclusion is reached that two of the features of bifurcation statistics are mainly due to variations in layer heights and thicknesses with season and solar activity respectively. --Author's abstract.

A-807 Marcou, R. J. (Boston College, Newton, Mass.); Pfister, W. (A. F. Cambridge Res. Center, Bedford, Mass.) and Ulwick, J. C. (A. F. Cambridge Res. Center, Bedford, Mass.), Ray-tracing techniques in a horizontally stratified ionosphere using vector representations. Journal of Geophysical Research, Wash., D. C., 63(2):301-313, June 1958. 2 figs., 9 refs., 54 eqs. DLC--Vector expressions are derived for tracing oblique ray paths, taking into account the full effect of the earth's magnetic field. The method is an extended analytical treatment of POEVERLEIN's two dimensional case based upon crystal optics. In particular, the unit vector S in the direction of the ray and the vector expressions for the equivalent path of the wave packet and the group refractive index are derived. A method for high speed computers is described for ray tracing in a horizontally stratified ionosphere, for determining, by an iteration process, the index of refraction and wave normal direction, and for determining electron-density distributions from rocket data. --Authors' abstract.

A-808 Mariani, F., Densita elettroica in una ionosfera non isoterma. (Electronic density in a non-isothermal ionosphere.) Annali di Geofisica, Rome, 9(1):43-62, Jan. 1956. 10 figs., 4 refs., 33 eqs. English summary p. 61, DLC--This paper theoretically deals with the effects of the terrestrial curvature on the ionization intensity and on the electron density in a non-isothermal atmosphere, for the two cases in which (1) the temperature gradient has a constant value at every height or (2) assumes the value 0 above a given height. A general relation is found between temperature, electron density, generalized recombination coefficient, matter density and absorption coefficient of the ionizing radiation, valid, in stationary conditions, for a monochromatic radiation. --From author's abstract.

A-809 Mariani, F., Variazioni stagionali e non stagionali della densita elettronica ionosferica. (Seasonal and non-seasonal variations of the ionospheric electronic density.) Annali di Geofisica, Rome, 10(1/2):165-181, 1957. 10 figs., 3 tables, 13 refs., 7 eqs. Italian and English summaries, p. 180-181. DLC --A comparative study of the component N_{12} of twelve months period, present in the series of the median monthly values of the maximum electron densities in the F2-layer, for about 20 observatories located between the geographical latitude 52°N and 43°S, during the years 1949-1954, shows that its behaviour at noon exhibits a substantial phase-agreement between the geomagnetic latitudes 53°N and 35°S; at midnight, instead, the component N_{12} exhibits a phase shift of 180° at the two sides of the equator. With regard to the F1 and E layers one sees that they exhibit only seasonal characteristics. At first sight, the behaviour of N_{12} in the F2 layer could be attributed to a non-seasonal component having a twelve months period but the same phase in the two hemispheres superposed to the normal seasonal component; however the detailed analysis of the noon and midnight behaviours of N_{12} in the F2 layer leads to the conclusion that the eventual non-seasonal component cannot be attributed neither to a radiation source external to the solar system nor to the annual variations of the Sun-Earth distance, greater during summer and smaller during winter. At this stage of our knowledges, one could accept the view of a connection of the features of N_{12} in the two hemispheres with the phenomena of general circulation in the high atmosphere. --Author's abstract.

A-810 Mariani, F., Densita elettronica nell'alta atmosfera e interpretazione delle curve h' (f) dell'altezza virtuale della ionosfera. Parte 1. (Electron density in the upper atmosphere and the interpretation of the curve h' (f) of the virtual height of the ionosphere.) Annali di Geofisica, 6(1):21-45, Jan. 1953. Pt. 2, Ibid., 6(4):533-553, Oct. 1953. 18 figs., 5 tables, 23 refs., numerous eqs. English summaries p. 44-45, 553. DWB --1) The group refractive index applicable to the vertical propagation of an electromagnetic wave in the ionosphere is calculated for the latitude of Rome by means of Appleton's formula. The optical path of a wave of given frequency penetrating a parabolic layer is calculated for three different heights of maximum electron density and for various values of critical frequency. The geometrical parameter of electron distribution in the ionospheric layers is determined by a theoretical revision of an experimental curve of virtual height, thus obtaining the thickness of every layer and its height above ground, considering both the cases of totally separated and of partially superimposed layers. 2) The optical path is calculated for an electromagnetic wave which penetrates and is reflected by a Chapman layer having a "semithickness" 2.5 H (H = scale height). Results are compared with those obtained in Pt. I for those ionograms in which the F1 and the "true" F2 layers are partially superposed. The electron density distribution in the superposition region is studied considering the recombination of the electrons and the ions and it is ascertained that the model of linear superposition used in Pt. I must be replaced by a more complicated model in which the electronic density is $\underline{N} = \left[N_1^2 + N_2^2\right]^{1/2}$ (N_1 and N_2 are the densities of the F1 and the "true" F2 layers if they are independent). A preliminary comparison of the theoretical and experimental results seems to give a better interpretation of the ionograms. --Author's abstract.

A-811 Mariani, F. (Inst. di Fisica dell'Universite, Roma), A new theoretical model of the composite F-layer. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2):160-173, Oct. 1959. 8 figs., 2 tables, 23 refs., 8 eqs. DWB, DLC--A model of a composite F layer is developed to explain both the regular behaviour of the F1 layer and the anomalies of the F2 layer. The bifurcation in the F1 and F2 layers arises as an effect of a discontinuity in the physical conditions of the upper atmosphere, namely a fairly rapid variation of the temperature vertical gradient. The assumed height variation of the generalized recombination coefficient is $\alpha = \alpha_0 \eta \xi N^{-1} T^{-1}$. Tidal movements have a smaller importance, because they cause only secondary perturbative effects. --Author's abstract.

A-812 Mariani, F. (Ist. Naz. Geofisica, Rome & Ist. Fisica Univ. Rome), The worldwide distribution of the F2 layer electron density: seasonal and non-seasonal variations and correlations with solar activity. Nuovo Cimento, Bologna, Ser. 10, 12(3):218-250, May 1, 1959. 8 figs., 4 tables, 19 refs., 9 eqs. English summary p. 218; Italian summary p. 240. DLC --The worldwide behaviour of the twelve-month period (seasonal and nonseasonal) variation of the maximum electron density N in the F2 layer appears noticeably different at noon and at midnight. In each case, it is controlled by the geomagnetic field and by the solar activity but, while it shows large asymmetric features at noon in the two hemispheres, it is fairly symmetrical at midnight. It is not possible to account for the experimental results by assuming some external source of radiation producing nonseasonal effects. One is led to assume some terrestrial cause of asymmetry: for example, some effect of general circulation in the upper atmosphere. With respect to the correlation of electron density with solar activity, there appears again some noticeable asymmetry in the two hemispheres; in particular, the northern hemisphere appears more influenced by the solar hydrogen filaments, especially for increasing latitude. The explanation of these asymmetries, in terms of some direct influence of the sun, is also puzzling, so that, in this case, one is led to think of some more or less unknown effect of solar corpuscular (or electromagnetic) radiation on the upper atmosphere, for example on its movements or its conductivity. At the present stage of our knowledge, we cannot exclude the possibility of a similar cause for both the asymmetries of the twelve-month period variation and of the correlations with solar activity. Further observational evidence is required. --Author's abstract.

A-813 Martyn, D. F. (Commonwealth Sc. and Ind. Res. Org., Canberra, Australia), Travelling disturbances in the ionosphere. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 11:195-198, 1952. 8 refs. DWB--Brief note on the problems of the apparently unrelated phenomena in the F2 region are discussed such as: 1) The anomalies in intensities of multiple reflections, 2) the apparently vertically travelling clouds of ionization, 3) the small disturbances of virtual height and critical frequency, and 4) the systematic errors in direction finding. These may all be due to 100-200 km long waves of speed about 10^4 cm/sec that travel horizontally. --W. N.

A-814 Martyn, D. F. (Radio Res. Lab., C.S.I.R.O., Camden, N. S. W.), Processes controlling ionization distribution in the F2 region of the ionosphere. Australian Journal of Physics, Melbourne, 9(1):161-165, March 1956. 5 refs., 5 eqs. DLC--

All indications point to the reliability of established atmospheric densities (10^{10} particles per cc) at 300 km level, rather than to the values (about 30 times less) obtained by recent rocket soundings. If the latter were correct, the F2 region would lower shortly after sunset to well below 300 km, which is not the case. Hence there must be a systematic error in density measurements by rockets at great heights. The results of a thorough investigation into the effects of diffusion processes in F2 layer is presented under the headings of: 1) speed of diffusion of ionization under gravity and partial pressure gradient, 2) formation of stable Chapman regions by diffusion, and 3) formation of stable Chapman region by combined action of diffusion and attachment gradient, and 4) interpretation of equatorial anomalies and parabolic shape of F2 region. --M. R.

A-815 Martyn, D. F., The normal F region of the ionosphere. Institute of Radio Engineers, N. Y., Proceedings, 47(2):147-155, Feb. 1959. 6 figs., 37 refs., 13 eqs. DLC--The global morphologies of the F1 and F2 regions at magnetically quiet times are reviewed, and attention also is given to the sunspot-cycle variations. The physical conditions, temperature, pressure, recombination coefficients, and collision frequencies are reassessed in the light of recent studies of rocket and satellite results and of diffusion. The theory of the F region is reviewed with special attention to Bradbury's hypothesis and to the effects of transport of ionization. Also considered are the morphology of "spread-F" and radio star scintillation phenomena. A theory of the latter is outlined, and it is shown that the undersurface of the F region is unstable at times of upward drift, which appear to be the times when such phenomena are prominent. --Author's summary.

A-816 Martyn, D. F. (C.S.I.R.O., Camden New South Wales, Australia), Large-scale movements of ionization in the ionosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2178-2179, Dec. 1959. ref. DLC--The complexity of the causes of variations in the motions of ionization in the ionosphere is noted, as is the difficulty of differentiating real and virtual motions. An instability mechanism for deviations in ionization density is suggested, for which the predicted temporal and spatial morphologies appear to be consistent with those of the occurrence of sporadic E, spread F, and radio-star scintillations. --Author's abstract.

A-817 Mason, Ruth F. (Geophysical Obs., Christchurch, New Zealand), Some observations on night-time ionospheric storms at Christchurch. New Zealand Journal of Geology Geophysics, Wellington, 1(3):519-529, Aug. 1958. 6 figs., 6 tables, 4 refs. Abstracted from reprint. DWB (M:538.7 M411so)--

Data from ionograms are discussed in relation to the description of night-time storms at Christchurch. A consideration of seasonal variation shows that in winter, storms have features not noticeable in other seasons. Electron distributions are calculated for the early hours of both severe and moderate storms; all show an initial increase in the number of electrons up to maximum density level prior to the storm decrease normal for this latitude. --Author's abstract.

A-818 Massey, N. S. W. (Univ. Coll., London), The formation of the ionosphere. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 9-31. 33 refs., eqs. DWB--Prevailing theories are reviewed and a model ionosphere comprising all of the characteristics (Physical and chemical) presented. Points which must be cleared up by future research are elaborated on. Discussion by APPLETON, VEGARD, MASSEY, BERKNER, MAEDA and others are given in extenso. --M. R.

A-819 Matsushita, Sadami (High Alt. Observ. Univ. Colorado), On the artificial geomagnetic and ionospheric storms associated with high-altitude explosions. Journal of Geophysical Research, Wash., D. C., 64(9):1149-1161, Sept. 1959. 10 figs., table, 14 refs. DLC--Geophysical effects of nuclear explosions at Johnston Island on Aug. 1 and 12, 1958, were studied by means of IGY geomagnetic and ionospheric data collected at various stations in the Pacific area and the American continent. The explosion heights are estimated at 70 to 80 km and about 40 km, respectively. Immediately after each explosion, three phenomena occurred. (1) Strong counterclockwise circular electric currents were formed in the vicinity of Johnston Island at 80- to 100-km height. They caused the immediate occurrence of artificial magnetic storms in the central Pacific. (2) High-energy particles moving along the magnetic lines of force caused auroras seen from Apia, and also caused the main parts of the magnetic storms observed at Apia. (3) X-rays due to the explosion caused the increase of the D-region absorption observed at Maui. Irregularities of the electron density in the F layer at Maui and the maximum geomagnetic change at Honolulu were caused by a shock wave from the explosion. The degree of ionization in a wide area in the central Pacific increased to about 10 times normal within 35 min after the first explosion and within about 6 hrs after the second. Then a strong radio absorption continued for many hours.

A-820 Maurain, Charles Honore, L'étude physique de la terre; interieur, couche superficielle, atmosphère. (Physical study of the earth; interior, surface layer and atmosphere.) Paris, Presses Universitaires de France, 1949. 127 p. DWB--Most of this pocket size book is concerned with the study of the interior of the earth and application of geophysical methods of prospecting or of investigating the structure of the earth's crust. Chap. IV consists of a non-technical discussion of the methods of exploring the atmosphere, including manned and sounding balloons (for temperature and pressure), pilot balloons (for wind) and indirect methods such as by studying meteor trails, clouds, the aurora, light of the night sky, twilight phenomena, solar radiation, absorption by ozone and water vapor, explosive waves and radio waves or sferics. Lastly, the ionosphere and solar relations (variations in the solar constant and weather) are discussed. --M. R.

A-821 Maxwell, A., Turbulence in the upper ionosphere. Philosophical Magazine, 45(371):1247-1254, Dec. 1954.--From the experimental data at present available it is shown that the Reynolds number in the upper F-region (300-400 km level) is of the order of 300. The region may therefore be turbulent. It is suggested that the high level diffracting screens which give rise to spread F-echoes and to radio star fading are caused by non-laminar flow, and that their non-appearance during the daylight hours may be due to the inhibition of turbulence by large temperature gradients, by lower drift velocities or by an increase in the kinematic viscosity.

A-822 Meadows, R. W., The attenuation of radio waves reflected from the E-region of the ionosphere. Institution of Electrical Engineers, Pt. B, 105(1):22, Jan. 1958.

A-823 Meek, J. H. (Radio Physics Lab., Ottawa), Prediction techniques at high latitudes. (In: Polar Atmosphere Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionospheric Section. N. Y. Pergamon Press, 1958. p. 101-107. 8 figs.) Also issued in Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, Pt. 2, 1957, pub. 1958. p. 101-107. DWB, DLC--The method of HF predictions developed in Canada is designed for application to high latitude and polar communication circuits. Objections to the present system of group predictions are raised. The Canadian system is based on the linear relationship between the critical frequency and the sunspot number, $F = A + BS$ where F is the critical frequency; S the sunspot number and A and B, constants. The relation between the critical frequency and the sunspot number and the variations between zero intercept and the time of day at one particular station for different seasons of the year, are shown in the illustrative figures. An example of an oblique incidence record is given from which the separation between ordinary and extraordinary traces is visible. Five results of some previous experiments are cited. This method of predictions has reduced the work involved in making the prediction charts.

A-824 Mende, H.; Rawer, K. and Vassy, E., Absorption radioélectrique par la basse ionosphère, mesurée a bord d'une fusée. (Radioelectric absorption in the lower ionosphere, measured from a rocket.) Annales de Géophysique, Paris, 13(3):231-233, 1957. table. DLC.

A-825 Menzel, W., Das "Wetter" in der Ionosphäre. (The weather in the ionosphere.) Meteorologische Rundschau, 3(7-8):176-177, July-Aug. 1950. DWB--Briefly discusses ionization at different levels, daily and seasonal changes, measurement by wireless waves, effect of sunspots. --C. E. P. B.

A-826 Merrill, R. G., Radiation patterns in the lower ionosphere and Fresnel zones for elevated antennas over spherical earth. U. S. National Bureau of Standards, NBS Report, 5599, Sept. 10, 1958. 68 p. 20 figs., 9 tables, 21 refs., eqs. DWB (621.384 U585rad)--Patterns of elevated antennas produced by reflection from spherical earth have been computed incorporating parallax, refraction, tropospheric defocusing, spherical divergence, and near-horizon diffraction. Antenna siting data are given for standard refracting at VHF for a scattering height of 85 km: 1. Antenna height and elevation angle for placing the maximum of the first lobe at the path midpoint; 2. Distance from the antenna which define the first Fresnel zone. 3. Data Data for determining obstacle effects and the elevation of the zero phase surface in the Fresnel zone: this concept is introduced as a new basis for obstacle criteria. These patterns and those for a temperate over-water refraction, and siting data for the latter case, will be published as appendices. A preliminary computation of optimum antenna height is given which indicates that a considerable range of heights lower than those given in (1) will have a greater or equal gain. --Author's abstract.

A-827 Merrill, R. G., Optimum antenna height for ionospheric scatter propagation. U. S. National Bur. of Standards, NBS Report, 6047, March 18, 1959. 13 p. 8 figs., 10 refs., 2 eqs. DWB--Radiation patterns of elevated antennas over spherical earth for scatter propagation in the lower ionosphere incorporation refraction, parallax, spherical divergence, and tropospheric defocusing have been used to compute the height gain function resulting from raising and lowering symmetric transmitting and receiving antennas for a fixed path length. This height gain function shows that a broad range of lower antenna height has a gain over that antenna height computed with the same model which places the maximum of the first lobe at the path mid-point. The maximum of this function is defined as the optimum antenna height. --Author's abstract.

A-828 Merritt, Ernest and Bostwick, William E., A visual method of observing the influence of atmospheric conditions on radio reception. National Academy of Sciences, Wash., D. C., Proceedings, 14(11):884-888, Nov. 1928. DLC--The experiment described is that of a partial separation of the ground waves and the sky wave in radio communication. Two balanced coils were used (A and B). The A coil mounted with its plane vertical and directed toward the sending station, the B coil in vertical plane at right angles to this direction. The latter coil responds only to that component of the sky wave which is polarized with its electric vector horizontal and is not affected by the ground wave. Suitable amplification to one pair of plates of a cathode ray oscilloscope featuring respectively horizontal and vertical movements, combination of which results in a Lissajous figure on the screen. An example of the method as used during the presence of aurora is described. Further studies especially during sunset are contemplated. --W. N.

A-829 Mihran, T. G., A note on a new ionospheric-meteorological correlation. Institute of Radio Engineers, Proceedings, 36(9): 1093-1095, Sept. 1948. fig., 16 refs. DLC--A correlation between time-of-occurrence of maximum F2 critical frequency and average pressure was found on some days in Nov., Dec. 1945 and in Feb. - March 1946. --W. N.

A-830 Mikhnevich, V. V., Nekotorye rezul'taty issledovanii verkhnei atmosfery. (Some results of investigations of the upper atmosphere.) Priroda, No. 5:71-72, 1958. DWB, DLC--The data obtained by a rocket flight, up to a height of 473 km and with a payload of 1520 kg, which took place on Feb. 21, 1958 in the U. S. S. R. is summarized. Measurements of electron concentration in the upper ionosphere showed that there is no sharply marked ionospheric layer at 110-120 km. The electron concentration above 110-120 km diminished slightly and increased gradually up to 250-300 km. Above this level at about 300 km the concentration of electrons diminishes slowly so that at 470 km the electron concentration is equal to one million of electrons per cubic centimeter. The existence of a large concentration of electrons at 400-500 km, where the concentration of neutral particles is greater than that of electrons, may be explained by the intense diffusion electrons from lower lying regions of the ionosphere. Also it was established that at 100 km there is separation due to diffusion. Collisions between particles at heights up to 300 km were recorded. The greatest height up to which pressure was measured - 260 km - was attained during rocket investigation in the U. S. S. R.

A-831 Millington, G., Propagation at great heights in the atmosphere. Marconi Review, 21(131):143-160, 1958. 9 figs., table, 10 refs.

A-832 Millington, G., Ray-path characteristics in the ionosphere. Institution of Electrical Engineers, Proceedings, Pt. IV, 101 (7):235-249, Aug. 1954. 14 figs., table, 12 refs., 73 eqs. DLC--The paper is based on an earlier one by the author and presents an improved method of making magneto-ionic calculations that is both quicker and more accurate than the graphical construction previously given. By means of a new parameter the symmetrical cases can be studied in a simple manner and the asymmetry in the general case can be more readily examined. Propagation in the magnetic meridian plane is discussed in detail, including the phenomenon described by POEVERLEIN of a cusp at the apex to the ray path within a certain critical angle of incidence. The problem of direction-finding errors at short distances due to the lateral deviation caused by the earth's magnetic field is treated as a perturbation of the vertical incidence case, and it is shown that the effect is likely to be large only under critical conditions that it would be difficult to obtain in practice. The paper ends with a short discussion of absorption, with special reference to the effect of the earth's magnetic field on non-deviative absorption. --Author's abstract.

A-833 Millman, George H. (Pa. S. Coll. Ionosphere Res. Lab.), Initial ionosphere wind measurements at 150 Kc/s. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 17, Dec. 25, 1950. 30 p. + 35 figs., 21 refs., eqs. DWB--Four experimental tests were carried out during the first part of 1950 to measure winds in the E layer at 150 kc/s at vertical incidence. Direction and magnitude of winds observed April 3 between 2000 to 2400 LMST and June 29 between 1900 to 2330 LMST are calculated and tabulated. Double and triple spaced receivers were used. The amplitude of the first hop echo as a function of time was recorded four times. Fading records obtained (1) during an ionospheric storm, (2) during less disturbed period of an ionospheric storm and (3) under normal conditions are statistically analyzed for a Rayleigh and a Gaussian distribution of the amplitude of the reflected signal and change in amplitude respectively. --W. N.

A-834 Millman, George H. (Ionosphere Res. Lab., Pennsylvania State Col.), A note on ionospheric wind measurements at 150 Kc/s. Annales de Geophysique, Paris, 7(4):272-274, 1951. 3 figs., 6 refs. MH-BH--The method used in ionospheric wind measurements, currently conducted at the Ionosphere Research Laboratory, Pennsylvania State College, is briefly described. The magnitude and direction of wind is calculated from the amplitude of hop-echoes reflected from the lower edge of the E layer, as recorded by 3 receivers placed at the corners of a right triangle. The high-power impulse transmitter operates at about 5 km from the receivers at a frequency of 150 Kc/sec. Data on ionospheric wind directions and magnitudes for July and Aug. 1951 are presented and commented on. --G. T.

A-835 Millman, George H., A study of ionospheric winds and turbulence utilizing long radio waves. Pennsylvania State College. Ionosphere Research Lab., Contract AF 19(122)-44, Scientific Report No. 37, May 30, 1952. 124 p. 55 figs., 3 tables, eqs. Also issued in Annales de Geophysique, 8(4):365-384, Oct./Dec. 1952. DWB--Author discusses briefly the dynamo theory, the tidal oscillation theory, a model of the upper circulation and the theory of wind measurements — including general equations derived for calculating ionospheric wind speeds and directions (utilizing three spaced-receivers). A method for determining the height of these winds is presented and evidence indicating diurnal and seasonal variations of the movement of upper atmospheric winds is given. Data from July 1951 through March 1952 are statistically analyzed and compared with theoretical postulates. A survey of the problem of fading is included. The 150 Kc/s equipment used is described in detail. Suggestions are made as to further data analysis to study the existence of lunar and solar tidal effects on ionospheric wind movements. Simultaneous short and long wave measurements of winds should be made.-- W. N.

A-836 Millman, George H., Analysis of tropospheric, ionospheric and extraterrestrial effects on V.H.F. and U.H.F. propagation. General Electric Co. Electronics Div., Technical Information Series, R56EMH31, Oct. 6, 1956. 138 p. 68 figs., tables, 50 refs., numerous eqs. Photostat copy. DWB (M94.7 M655an)--Effects of the atmosphere and extraterrestrial noise sources on the propagation of VHF and UHF radio waves are discussed. Relationships are derived for calculating refraction effects, time delays, Doppler errors, polarization changes and attenuation of radio waves traversing the atmosphere. These conclusions were reached. Refraction and time delay effects in the troposphere are independent of frequency and are a direct function of relative humidity in the air. In the ionosphere refraction and time delay errors, polarization shift and attenuation are inversely proportional to the square of frequency. The Doppler frequency error in the troposphere is directly proportional to frequency while in the ionosphere is inversely proportional to frequency. The theoretical total radiation from the quiet sun, in the radio frequency spectrum, is directly proportional to frequency raised to about the 0. 755 power. The total flux density emanating from radio stars, Cassiopea and Cygnus, is inversely proportional to the frequency raised to the 0. 81 power. --S. P.

A-837 Millman, George H. (General Electric Co, Syracuse, N. Y.), Atmospheric effects on VHF and UHF propagation. Institute of Radio Engineers, Proceedings, 46(8):1492-1501, Aug. 1958. 16 figs., 4 refs., 53 eqs. DLC, DWB--This report discusses the effects of the troposphere and ionosphere on the propagation of VHF and UHF radio waves. In order to accurately calculate the refraction effects, time delays, Doppler errors, polarization changes and the attenuation experienced by radio waves traversing the entire atmosphere, the author has derived some mathematical relationships. Tropospheric refractive index profiles and ionospheric electron density models representative of average atmospheric conditions are also presented in this paper. --N. N.

A-838 Millman, George H. (G. E., Syracuse, N. Y.), The geometry of the earth's magnetic field at ionospheric heights. Journal of Geophysical Research, Wash., D. C., 64(7):717-726, July 1959. 5 figs., 7 refs., 20 eqs. DLC--

A-839 Mimno, Harry Rowe, The physics of the ionosphere. Reviews of Modern Physics, 9(1):1-43, Jan. 1937. 16 figs., 309 refs., 24 eqs. DLC--This important paper opens with a brief historical survey followed by a simple analysis of the more prominent features that distinguish the components of the radio spectrum. A more detailed discussion includes following topics among others: thunderstorms and barometric effects, local ionospheric clouds, scattering and interaction of radio waves, etc. It is concluded that the complex physical system requires study by statistical methods. The classical magneto-ionic theory, or rather the anomalies, is considered. The molecular atomic ionization and recombination processes await a generally accepted theory explaining the stratification of the ionosphere. --W. N.

A-840 Minnis, C. M. and Bazzard, G. H. (both, D.S.I.R. Radio Res. Station, Slough), Some indices of solar activity based on ionospheric and radio noise measurements. Journal of Atmospheric and Terrestrial Physics, New York, 14(3/4):213-228, June 1959. 5 figs., 4 tables (in appendix), 10 refs., 17 eqs., 4 eqs. (in appendix). DWB, DLC.

A-841 Minozuma, F. and Enomoto, H., The mechanism and distribution of short period fading under conditions of ionospheric turbulence. Physical Society of London, Proceedings, Ser. B, 67(3):211-216, March 1, 1954. 6 figs., 7 refs., 12 eqs. DWB --Relations between distribution and rate of change of field intensity, and the turbulence which produces them are discussed and compared with transmissions from JJY Tokyo (4 and 8 Mc/s). The turbulence model in the ionosphere gives a turbulent diffusion coefficient $\lambda^2(Z) = \lambda^2 g e^{-2Z/m}$. The mean square perturbation of atmospheric density derived from this expression predicts the fading speeds found in practice and may be a useful index for determining the safety fading factor. --C.E.P.B.

A-842 Mirick, C. B. and Hentschel, E. R., A new method of determining height of the Kennelly-Heaviside layer. Institute of Radio Engineers, Proceedings, 17(6):1034-1041, June 1929. 13 figs., table, 4 refs., 2 eqs. DLC--Radio signals, transmitted by airplanes in flight, are recorded graphically on a moving chart to show periodic variations of frequency over considerable time intervals. By connecting this frequency with the distance of transmission, the ground speed of the aeroplane and the effective height of the K-H layer, a theory is evolved by which the height of the K-H layer is computed.

A-843 Mitra, A. P. (Univ. of Calcutta), The D-layer of the ionosphere. Journal of Geophysical Research, 56(3):373-402, Sept. 1951. 10 figs., 5 tables, 35 refs., 15 eqs. MH-BH--Normal (75-90 km) and sporadic (60 km in tropics) D layers are described on the basis of present knowledge, and effects on long and short wave radio propagation and reflection discussed. Theories of origin include that of MITRA, BHAR and GHOSH (UV ionization of O_2), JOUAST and VASSEY (photo-ionization of atomic sodium) and NICOLET (O_2, Na and NO ionization); theories of the D layer structure include models by Bremmer, Rydbeck, Booker, Wilkes, Stanley and Pfister, which are used in calculations. In spite of widely differing theories of above workers, the temperature profile up to 100 km is fairly well-established and the composition of the atmosphere uniform, so a detailed picture of the ion or electron density distribution, its variation with time, place and height, and the variation of the effective height of reflection with solar zenith angle can be presented. The conclusions drawn from the elaborate statistical and graphical models presented here, are: 1) the electron distribution in no way follows the Chapman law since the electron distribution increases continuously with height up to the E layer, the ion distribution does show a similarity to the Chapman distribution; 2) the variation of reflecting height with zenith angle for long waves can be explained on the basis of the ionization distribution; 3) the theoretical reflection coefficient at low frequency ranges agree with experimental results, and 4) quantitative results based on observation confirm that the D region is produced by ionization of the O_2 at the first ionization potential. --M. R.

A-844 Mitra, A. P., Some relationships between the F1 and the F2 regions of the ionosphere. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 79, Nov. 30, 1955. 26 p. 12 figs., table, 10 refs., 9 eqs. --In this report analysis of the fluctuations in the height and electron density of the F1 and the F2 regions of the ionosphere, initiated in an earlier work (Scientific Report No. 53; also Indian J. Phys., 28, 269, 1954), is continued. Although the work was originally undertaken to assess the merit of the hypothesis of the common origin of the F layers, it became obvious at a later stage of the analysis that the close relationship that undoubtedly exists between the two regions is predominantly of dynamical origin. If fluctuations of solar origin exist, they must be small. A remarkable feature of the fluctuations at Washington is that, both for electron density and height, the percentage variations in the F2 region are, on the average, about four times as large as those in F1. The same relationship is maintained for variations associated with geomagnetic disturbances. For both regions the daily variations of height and electron density are closely related, but an increase in height is associated with a decrease in electron density and vice versa. For 3-day running averages of the indices, the relationships between the heights and electron density in the two regions are given by:

$$P(NmF2) = -1.3P(h'F2) - 0.6P^2(h'F2)$$

$$P(NmF1) = -P(h'F1)$$

--Author's abstract.

A-845 Mitra, A. P., The Indian programme for the International Geophysical Year, Pt. I, Some results of the programme on ionosphere. Journal of Scientific and Industrial Research, Ser. A, 17(10):395-401, Oct. 1958. 7 figs., 2 tables, 4 refs.

A-846 Mitra, A. P. (Ionosphere Res. Lab., Penn. State Univ.), Time and height variations in the daytime processes in the ionosphere. Pt. 1: A noontime model of the ionosphere loss coefficient from 60 to 600 km over middle latitudes. Journal of Geophysical Research, Wash., D. C., 64(7):733-743, July 1959. 4 figs., 6 tables, 29 refs., 31 eqs. DLC--This work deals with the height variations of the various dissipative processes occurring in the ionosphere over a height range of 50 to 600 km, and is an extension of the earlier work by Mitra and Jones (1954). An expression is given for the calculation of the loss coefficient over the entire ionosphere. For noon conditions, defined by the hours 1030 to 1330 LMST, and for stations in the northern middle latitude zone, the equation for the loss coefficients for heights in the range of 50 to 600 km is

$$\alpha = 5 \times 10^{-21}\, n(0_2) + 3 \times 10^{-20}\, n(0) + \frac{2 \times 10^{-19} n(0_2)}{2 \times 10^{-11} n(0_2) + 1 \times 10^{-8}\, No} + 1 \times 10^{-12}\ cm^3/s$$

--Author's abstract.

A-847 Mitra, A. P., Relaxation time of the ionosphere. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19 (604)-3875, Scientific Report, No. 119, April 1, 1959. 35 p. 13 figs., 4 tables, 17 refs., 33 eqs. DWB (M10.535.P415i No. 119)--A generalized study of relaxation time phenomenon comprises the subject of interest of this report. A new model based on extensive experimental data, is deduced and is related to the physical considerations involved. Temporal and latitudinal variations are included in this study to the extent possible. The report is concluded with a discussion concerning several related phenomena. --Author's abstract.

A-848 Mitra, S. K. (Univ. of Calcutta), General aspects of upper atmospheric physics. (In: Compendium of meteorology. Boston, American Meteorological Society, 1951. p, 245-261. 7 figs., 3 tables, 108 refs.) MH-BH--Effect of radiation and turbulence on structure of the atmosphere is first considered. Then the outer limit of the atmosphere, the escape of gases (cone of escape), problem of deficiency of helium in atmosphere, the exosphere or fringe region (similar to corona of sun), the solar control of upper atmosphere, effect of solar UV radiation on various atmospheric gases, geometry of illumination of upper atmosphere by sun, etc. accompanied by models and tables, are discussed. Methods of investigation or exploration are next considered. Direct methods (balloon, smoke shell, V-2 rocket, sound and radio), and indirect (meteors, auroras, night sky light, magnetic variations, barometric oscillation, noctilucent clouds and scattering of UV light) are considered systematically.—M. R.

A-849 Mitra, Sisir Kumar (Univ. of Calcutta, India), General aspects of upper atmospheric physics. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 11:19-54, 1952. 6 figs., 3 tables, 22 refs. DWB--As an introductory speech for the Conference on Ionospheric Physics, PROF. MITRA outlined in detail our knowledge of the upper atmosphere in all of its ramifications, and presented a number of problems for future study. The escape of gases in the fringe region, illumination, meteor trails, auroras, radio wave soundings, solar and cosmic radiation effects, ionization, luminescence, winds, effect on weather conditions in the troposphere (and vice versa), extent of the atmosphere, normal state of pressure and temperature, etc. are discussed and many aspects illustrated. --M. R.

A-850 Mitra, Sisir Kumar, (Symposium on) the physical characteristics of the upper atmosphere. U. S. Air Force. Cambridge Research Center. Geophysical Research Papers, No. 12:21-39, 1952. 2 refs. DWB--The discussion dealt with some unsolved problems, such as: 1) the height of the atmosphere where the diffuse separation begins, 2) the temperature in and above the E layer regions, 3) the distribution of atomic nitrogen, 4) origin of the F2 layer, 5) the nature of the ionized regions responsible for the sporadic E, Es, 6) origin of the winds at the E and F layer heights, 7) origin of the sodium in the upper atmosphere and 8) the correlation between weather and the ionosphere. Although the topics were but briefly discussed, many theoretical considerations and suggestions were given by the contributors. --W. N.

A-851 Mitra, Sisir K., The upper atmosphere. 2nd ed. Calcutta, The Asiatic Society, (Preface 1952.) 713 p. figs., tables, bibliog. p. 644-668, eqs. DLC, MH-BH--The purpose of the book, as stated in the first edition issued 1947, is to give, "in a connected form, an account of the present state of our knowledge of the upper atmosphere as has been obtained so far by direct and indirect observations." The 2nd edition contains 13 chapters and an appendix and the bibliography of 887 items is arranged in that order. Author, source and imprint are given but no titles. Ch. VI, The ionosphere (p. 176-353), is a comprehensive survey covering history, propagation of electromagnetic waves, radio sounding of the ionosphere, absorption, application of ionospheric data to radio transmission, origin and stratification, variations, irregularities and disturbances and, finally, weather and the ionosphere. There are 294 references for Ch. VI (p. 649-656). Imprints cover the period 1902-1951. --M.L. R.

A-852 Mitra, S. K., The story of radio-electronics. Journal of Scientific and Industrial Research, Sec. A, New Delhi, 14(1): 3-13, Jan. 1955. 6 foot-notes (incl. 3 foot-refs.). DWB--This presidential address to the 42nd Session of the Indian Science Congress, Baroda, Jan. 4, 1955 opens with a brief summary of radio electronics from fundamental research to practical applications in radio climatology, radio astronomy and defense. Next part takes up India's position in radio research, facilities and future. It ends with an appeal to the younger generation to take advantage of study facilities in the nationally important field of radio electronics. --W. N.

A-853 Mitra, S. N., A radio method of measuring winds in the ionosphere. Institution of Electrical Engineers, Proceedings, Pt. 3, 96(43):441-446, Sept. 1949. 10 figs., 14 refs., 8 eqs. DLC--An important article describing apparatus, theory, methods of observation and comparing results with those of others. By using a 4 Mc pulse transmitter and 3 receivers about 100 m apart, 82 determinations of winds in the ionosphere were made. Frequency of speeds ranging from 20 to 120 m/sec, shown on histograms. Greatest frequency at about 50 m/sec, and from the SE (shown in polar histogram as toward NW). Diurnal variation also shown graphically (evidence of semidiurnal period). As results indicate no winds of this magnitude in F-region, these observations are assigned to the sporadic E-region (70-115 km). Results agree with those obtained from luminous phenomena (meteors and luminous clouds) by other workers but not in agreement with theory. --M. R.

A-854 Mitra, S. N. (New Delhi), Effect of ionospheric irregularities on the variations of phase-path and amplitude of a downcoming wireless wave. Journal of Scientific and Industrial Research, India, 11(11):453-454, Nov. 1952. fig., 2 refs.--Brief discussion of the results of simultaneous record change of the phase-path and the variation of the amplitude of the same downcoming wave. A pulsed transmitter of about 2 Mc/s was used. A typical example of the reflection from the normal E-layer is presented on a 35 mm film strip. According to the author's conclusion amplitude variations and phase discontinuities are due to the motion of an "irregular ionosphere". --W. N.

A-855 Mitra, S. N. and Mazumdar, S. C., Some measurements of ionospheric absorption at Delhi. Journal of Atmospheric and Terrestrial Physics, 10(1):32-43, Jan. 1957. 7 figs., 2 tables, 18 refs., 12 eqs. DWB--Measurements of ionospheric absorption on 5 and 2.5 Mc/s in June 1954-Dec. 1955 are described. Experimental set-up is shown; it gave log P where P = (electric field of reflected polarized wave)/(electric field of corresponding incident wave). Diurnal variation gave /log P $/\propto$ (cos X)^{n} where n varied from 0.33-1.13, mean 0.62. Relaxation time averaged 45 min. Difference from theoretical values n = 1.5 and 8 min. is attributed to the main absorption taking place in the D region. Results of observations after sunset are not clear, but the high residual absorption at night may be due in part to ionization by corpuscular solar emissions. --C. E. P. B.

A-856 Miya, Ken-ichi (Central Radio Wave Observat. R. R. C.), Consideration on the measurement of vertical incidence ionosphere attenuation in high frequency. Japan. Science Council. Ionospheric Research Committee, Report of Ionosphere in Japan, 5(4):201-202, 1951. 7 eqs. DWB--A short note about the calculation of the ionosphere attenuation using the difference between field intensities of the "one hop and two hop" reflection waves observed simultaneously. The result coincides with the result obtained by means of the conventional method, using the field intensity of the "one hop" reflection wave. --A. A.

A-857 Miya, Ken-ichi and Kanaya, Sumio (both, Kokusai Denshin Denwa Co., Ltd.), Radio propagation prediction considering scattering wave on the earth's surface. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 9(1):1-15, March 1953. 12 figs., 2 tables, 15 refs. DWB, DLC--Control-point method is usually employed in the prediction of the behavior of radiowave propagation in long-distance radio communication channels. For a particular channel, however, this method often gives results considerably discrepant with observation. With the intention of improving the percentage of successful prediction, this paper deals with the investigation of the method of applying the scattering waves on the earth's surface to the prediction of radio-wave propagation conditions. A new method called "control-line method" is proposed to determine the MUF with regard to the scattering waves from the land and from the earth's surface. The new and the old methods are applied to various radio communication channels and the theoretical and observed results are compared. It is found that for commercial shortwave bands below 20 Mc/s, only normal and land-scattered propagations can be taken into account for satisfactory prediction. Next, the method of calculating the LUF is investigated. Numerous examples show that the new MUF and LUF give prediction that hits fairly good to radio circuits between Europe and Japan. Finally, the method of the I. P. S. of Australia, which is aimed at correcting the errors of the prediction of propagation conditions, is discussed from the authors' point of view. --Authors' abstract.

A-858 Miya, Ken-ichi and Kanaya, Sumio (both, Kokusai Denshin Denwa Co., Ltd.), On the lateral deviation of radio waves coming from Europe. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 10(1):1-8, 1956. 8 figs., table, 3 refs., 3 eqs. DWB--The gain of receiving rhombic antennae pointing in various directions was measured in Tokyo on waves coming from Europe. Lateral deviation was observed often followed by comparatively strong field intensity in the untransmissible period of the normal F2 propagation. From the results, the following two propagation modes are suggested for interpreting the propagation of the wave of frequency above F2-4000-MUF. One of them is the forward continental scatter by the F2 propagation off the great circle and the other is the forward ground scatter reflected by sporadic E clouds near the great circle covering the region of low MUF. --Authors' abstract.

A-859 Miya, Ken-ichi; Ishikawa, Masaru and Kanaya, Sumio (Tokyo), On the bearing of ionospheric radio waves. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 11(3):130-144, Sept. 1957. 11 figs., 13 refs., 5 eqs. DWB--This paper describes fluctuation and remarkable lateral deviation of bearing of the ionospheric HF waves, measured by using a new visual and recording type direction finder. As regards fluctuation of bearing, the relation between propagation mode and distance is explained. Three cases of lateral deviation are pointed out according to propagation modes of ground back scattering, continental forward scattering and antipodal propagation, and characteristics thereof are clarified. It is shown, in particular, that lateral deviation of the continental forward scatter is observed on a radio circuit in which the propagation mode is predominant and at times when the MUF on the great circle is lower than the frequency used. --Authors' abstract.

A-860 Moeller, H. G., Further results of sweep frequency oblique incidence experiments. Journal of Atmospheric and Terrestrial Physics, 13(1-2):173-, Dec. 1958. ref.

A-861 Mook, Conrad P., A preliminary meteorological study of the origin of whistlers. Journal of Geophysical Research, 64(7): 745-748, July 1959. fig., 11 refs.

A-862 Morgan, M. G., A review of VHF ionospheric propagation. Institute of Radio Engineers, New York, Proceedings, 41(5): 582-587, May 1953. numerous foot-refs. DWB--Five phenomena which make it possible for very high frequency signals (30-300 mc) to be propagated between two points on the earth by passing through the ionosphere are discussed. These are: 1) regular F2 ionization, 2) sporadic E ionization, 3) scattering from the regular ionization, 4) auroral ionization and 5) meteoric ionization. The paper is based mainly on information available in the U. S. and Canada. --G. T.

A-863 Morgan, M. G. (Dartmouth College), A review of VHF ionospheric propagation. Institute of Radio Engineers, N. Y., Proceedings, 43(6):752, June 1955. DLC--Note about reception at Whyalla, S. Australia, of 39 Mc police transmissions from N. America in Oct.-Dec. 1947 and 1948 between 0800 and 1200 local time, and for 2 or 3 days at 27-day intervals. The signals were sometimes strong enough to drown out the FM radio telephone circuit from Crystal Brook, 45 mi away. It was finally verified that the signals came from S. Dakota State Police or from nearby states or provinces of Canada, and the police in S. Dakota reported hearing Australian stations during the same period (reports not verified). Period came at sunspot maxima and at 11:30 to 15:30 at mainpoint of S. Dakota-S. Australia path (Fanning Island). --M. R.

A-864 Morgan, M. G., Whistlers and dawn chorus. International Geophysical Year, 1957/1958, Annals, 3:315-336, 1957. 8 figs., refs. DWB--A detailed account of the available information on methods of measuring whistling atmospherics is given as supplementary material to the article by F. HORNER . After a general description of the phenomena involved, the following topics are covered with a view toward standardization of measurement observations, equipment, etc. 1) IGY objectives; 2) Equipment and observing techniques (general, antennae, cathode input, dynamic range, filters, antenna siting-hum, oscillation, calibration, and recording technique); 3) Data reading and presentation (general, spectrographs, wave form analysis); and 4) A minimum station. A series of appendices includes an analysis of tweeks, notes on the earth's magnetic field and on multiple whistlers, and sample tables of subjective data which were recorded as the result of various observations. --R. P.

A-865 Morris, D. W. and Hughes, C. J., Phase characteristics of radio signals received via the ionosphere. Nature (London), 183(4657):310-311, Jan. 31, 1959. 2 figs., 6 refs.

A-866 Motzo, M. (Radiopropagation Studies' Center, Inst. of Techn. Physics, Univ. of Naples), Curve teoriche di risonanza nell, interazione tra onde elettromagnetiche, per incidenza verticale nella ionosfera. (Theoretical curves for gyrointeraction between electromagnetic waves crossing the ionosphere at a vertical incidence.) Il Nuovo Cimento, Ser. 9, 9(3):213-219, March 1, 1952. 3 figs., 2 tables. English summary p. 219. DLC--It is pointed out that V. A. BAILEY developed a theory for calculating the gyrointeraction between two electromagnetic waves crossing the same ionospheric region, one of them having an oblique incidence. The theoretical curve representing this phenomenon is presented. The author offers a similar curve for gyrointeraction between successive waves crossing the ionospheric E-layer at a vertical incidence. This method is claimed to be more practical for experiments. Values for intensity of the electromagnetic field of the disturbing wave and for the index of interaction are tabulated. --G. T.

A-867 Müller, Hans Gerhard, Ein neues elektrisches Höhenwindmessverfahren. (A new electrical wind aloft measuring device.) Germany, Reichsamt fur Wetterdienst, Forschungs- und Erfahrungsberichte, Ser. B, No. 20, 1944. 16 p. 15 figs., 4 tables, 7 refs. Photostat. (Formerly Germany secret.) DWB--An ultra short wave station on the ground sends out an impulse which is reflected from the balloon apparatus, giving the elevation and azimuth angle on the receiver. The principle of the device, evaluation of records, calibration, errors and results are described and compared with other types of equipment in common use. --M. R.

A-868 Mullaly, R. F., Graphical constructions for ray-tracing in the ionosphere. (In: Physical Society, London, Physics of the Ionosphere, Pt. 4, The mathematics of wave propagation through the ionosphere. London, Physical Society, 1955. p. 384-393.)

A-869 Mullaly, R. F., The calculation of group velocity in magneto-ionic theory. Journal of Atmospheric and Terrestrial Physics, 9(5/6):322-325, Nov. 1956. 10 refs., 15 eqs. DWB--It is shown how the magneto-ionic group refractive index μ may be calculated as a function of the direction of propagation θ by expressing both these quantities in simple form in terms of a parameter λ, which is given a series of values. A similar method gives μ' as a function of the electron density for a fixed value of θ. Whereas most computations of μ' made up to the present have required electronic calculating machines, the simplified formulae given here are suitable for use with a desk calculator. Throughout, the effect of collisions in the medium is neglected. --Author's abstract.

A-870 Munro, G. H., Short-period changes in the F region of the ionosphere. Nature, London, 162( ):886, 1948. --Continuous ionospheric observations at 3 sites at distances 13, 27 and 30 miles apart, indicate horizontal motions in region F2 with velocities between 3 and 5 miles/min. The effects observed may be due either to horizontal drifts in the ionosphere, with superimposed local variations in ionization gradient, or to a progression of a wave motion (e.g. a pressure wave). The evidence presented is considered to favour the latter explanation.

A-871 Munro, G. H. (Elec. Engi. Dept., Sydney Univ.), Travelling ionospheric disturbances in the F region. Australian Journal of Physics, Melbourne, 11(1):91-112, March 1958. 21 figs., 8 refs. DLC--Observations of the horizontal movements of travelling ionospheric disturbances recorded on a single radio frequency from April 1948 to March 1957 are analyzed for seasonal and diurnal variations of occurrence and of direction and speed of travel. Recording was mainly in daylight hours but some limited night results are included. The average number of disturbances recorded was six per day over the period. Observing accuracy and significance of the deduced data are discussed. The frequency of occurrence has a diurnal variation with a marked midday maximum and a seasonal variation with minima at the equinoxes. The monthly means of direction of travel show a consistent seasonal change from 30° in winter to 120° in summer with a small corresponding change in mean speed from 8 km/min in winter to 7 km /min in summer. The monthly mean diurnal variation of directions was consistent from 1950 to 1954 but has shown a marked change in the last two summers. Winter directions by day are mainly in the north-east quadrant and have a mean day-time drift towards the north but at night they are predominantly in the north-west quadrant. Summer day-time directions were mainly in the south-east quadrant until Dec. 1956; since then they have tended to the south-west after noon, reverting to the south-east about midnight. Diurnal variation of speed is of the same order as the seasonal change. --Author's abstract.

A-872 Munro, G. H., Reflexions from irregularities in the ionosphere. Royal Society of London, Proceedings, Ser. A, 219(1139): 447-463, Oct. 7, 1953. 12 figs., 6 refs. DLC--Gives results of a 4-year study at Sydney, Australia, of small daytime changes in virtual height of F region reflections with periods of 10 min-1 hr on 5.8 Mc/s, using 3 pulse transmitters 50 km apart. Disturbances are classed as X (loop), Y (branch) and Z types. The complexities are special cases of reflection from curved surfaces, associated with travelling disturbances, and occur frequently. The differences of type result from different group retardations along different paths. --C. E. P. B.

A-873 Munro, G. H. and Heisler, L. H. (both, Electrical Eng. Dept., Univ. of Sydney), Divergence of radio rays in the ionosphere. Australian Journal of Physics, Melbourne, 9(3): 359-372, Sept. 1956. 10 figs., table, 9 refs., eqs. DLC--Travelling disturbance manifestations on ionosonde records usually occur at different times on the "o" and "x" traces. It is shown that this is due to the divergence of the ordinary and the extraordinary rays in the earth's magnetic meridian plane and that the sense of this time difference, therefore, gives a direct indication of the sense of the north-south component of movement of the disturbance. Furthermore, where the direction and speed of travel of a disturbance can also be determined from spaced station observations, the actual separation of reflection points of the o- and the x-rays can be deduced. At Sydney, N.S.W. (33°52'S, 151°11'E) this is of the order of 30 km at the height of maximum ionization of the F2 region. On h't records the corresponding time difference observed includes a component due to the vertical separation of reflection points if the front of the disturbance is not vertical. From records of this type taken at three spaced stations the horizontal component may be determined directly. Examination of some 430 such observations taken over a period of 4 years confirms the variation of the time difference with direction of travel predicted by theory, and also indicates the consistent presence of a forward tilt in the front of disturbances. The theoretical relation between the horizontal and vertical separation is then used to determine the slope of front of disturbances. It is found to have a mean value varying from 65° to the horizontal for disturbances travelling northward to a minimum of 51° for those travelling 120°E of N. --Authors' abstract.

A-874 Murty, T. V. S. (Banaras Hindu Univ., Banaras, India), Design and development of a simple ionospheric equipment. Journal of Scientific and Industrial Research, Sec. A, New Delhi, 15(2):70-74, Feb. 1956. 9 figs., 12 refs. DWB, DLC --A compact and simple manually operated medium power ionospheric sounding transmitter and receiver was constructed in the Banaras Univ. laboratories. The design and circuits, records and sensitivity and selectivity curves are illustrated. A cathode-ray oscillograph is used for reproducing the pulses. Scattering of radio waves can be studied by means of the pulses. --M. R.

A-875 Nagata, T. and Abe, S. (Geoph. Inst., Tokyo Univ.), Notes on the distribution of SC* in high latitudes. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 9(1):39-44, March 1955. 4 figs., 7 refs. DWB, DLC--

Distribution of the preliminary reverse impulse (Δ Hk) of SC* of magnetic storms in the Northern Hemisphere is examined. The result shows that the equivalent overhead currents for Δ Hk are represented by current flows from 10 h to 22 h in the Polar Cap and the resulting two vortices extending to lower latitudes; a clockwise vortex in the afternoon and a weaker counter-clockwise one in the forenoon. --Authors' abstract.

A-876 Naismith, R., Improved chart for ionospheric forecasting in the British Zone. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102(4):503-504, July 1955. 2 figs., table. DLC--An improved form of chart for use in ionospheric forecasting is described. In the international 3-zone system of presenting forecasts of radio-wave transmission conditions, the necessity to provide average values over a range of longitudes introduces errors. These errors can be eliminated for the region of the United Kingdom by the use of a British Zone Chart (B. Z. C.), which presents the predictions directly for all 2, 000 km control points around London. A comparison by various user organizations show that, over a test period of six months, the standard deviation between the predicted and observed conditions was approximately halved when the B. Z. C. was used. --Author's abstract.

A-877 Nakai, Taketosi, The distance of the source and the height of reflection deduced from the waveforms of ionospheric reflection type. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 4:20-28, Dec. 1956. 6 figs., table, 2 refs. DWB --The effective height of reflection (h) in the ionosphere and the distance of the source (d) were estimated by the reflection theory in the use of the waveforms of the regular peaked type observed in Toyokawa in June, 1950; h is found to be about 85 $\pm$ 5 km and d is estimated to the accuracy which is approximately proportional to the reciprocal of the distance of propagation. The derived values for d were compared with good quality C. R. D. F. Fixes and the results showed fair agreement. These results are described in this paper, but particular emphasis is given to a possible range of solutions for h and d deduced by a graphical method of analysis or deduced from the reflection theory and it is discussed that practicability of estimating h or d to a useful accuracy from the waveforms reflected in the ionosphere depends on the distance itself or the number of recorded echoes and the discrepancies which occur between the recorded and ideal sequence of echoes. --Author's abstract.

A-878 Nakai, Taketoshi, Atmospheric noise study by measurement of the amplitude probability distribution. Nagoya Univ. Research Institute of Atmospherics, Proceedings, 5:30-49, March 1958. 21 figs., 3 refs., 10 eqs. DWB--The cumulative probability of amplitude in the envelope of atmospheric noise was measured at the output of a narrow-band receiver at 50 kc/s. The level of integrated atmospherics was recorded at the output of the receiver at the same frequency. The band width of the receiver was about 1,000 c/s. The departure from a single logarithmic-normal distribution was investigated. Type of the amplitude distribution is described. A description is given of a calculation which was made to determine the effect that the departure from a single logarithmic-normal distribution has on the total noise power. The curves derived from this calculation may provide a useful means in estimating the R. M. S. value of the noise amplitude. The description is given of a calculation which was made to investigate the behavior of short-time fluctuations of the probability measured. The results may provide a means of estimating a pulse spacing of the larger amplitude. Various parameters have been derived from the amplitude distributions. These parameters are described and the diurnal change of each parameter is shown, and the level of integrated atmospherics is compared with the R. M. S. value derived from the amplitude distribution. --Author's abstract.

A-879 Nakai, Taketoshi and Suzuki, Y., Atmospherics noise study at 50 kc. Nagoya Univ. Research Institute of Atmospherics, Proceedings, 6:22, Jan. 1959.

A-880 Nakata, Yoshiaki; Kan, Miyao and Uyeda, Moroyuki, Simultaneous measurement of sweep frequency h't and fct of the ionosphere. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan, 7(4):129-135, Dec. 1953. 6 figs., 3 refs., eq. DWB--This paper deals with simultaneous continuous recording of virtual height and critical frequency of the ionosphere, by changing the frequency in the band from 4.9 to 9.0 Mc/s. The adopted equipment is briefly described. Sample records are presented. --Author's abstract.

A-881 Napoletano, Aldo, Richerche di correlazioni ionosferico-meteorologiche. (Research on ionospheric-meteorological correlations.) Rivista di Meteorologia Aeronautica, 10(3):18-22, July-Sept. 1950. 3 figs., Italian, French, English and German summaries p. 18. MH-BH--A survey of research on correlation between ionospheric and meteorological conditions since 1932 is followed by a series of graphs, showing relation between mean pressure and hours of maximum ionization of the F2 layer (according to Mihran) and of E layer variations and Wolf number as obtained at the Central Radiopropagation and Radionavigation Laboratory in Naples. Research now in process there is outlined.--M. R.

A-882 National Research Council. United States National Committee on International Scientific Radio Union (ISRU), Report on the 12th General Assembly, Aug. 22-Sept. 5, 1957, Boulder, Colorado. National Research Council, Publication, No. 581, 1958. 195 p. figs. Mimeo. DWB (621.384 N277re), DLC (TK5700.I834). This report on General Assembly also issued in Institute of Radio Engineers, Proceedings, 46(7):1350-1383, July 1958. --The 7 reports cover: 1) Radio measurements and standards by Ernst Weber; 2) Tropospheric propagation by John B. Smyth; 3) Ionospheric propagation by L. A. Manning; 4) Radio noise of terrestrial origin (sferics and whistlers) by Harold E. Dinger; 5) Radio astronomy by F. T. Haddock; 6) Radio waves and circuits by E. C. Jordan; 7) Radio electronics by W. G. Shepherd. Reports of Commissions 2, 3, 4 and 5 will be abstracted separately. The 12th General Assembly of U. R. S. I. at Boulder was attended by over 500 radio scientists from 26 countries. The reports provide an excellent summary of work going on all over the world in each field. The agenda for the 7 sessions is given on p. 1350-1 by Frederic H. Dickson and U. R. S. I. and its officers and chairman is discussed on p. 1351-2 by H. W. Wells. The address of welcome by Detlev W. Bronk, President of the National Academy of Sciences, appears on p. 1352-4. The extensive report to the Academy of Science contains notes on attendance, program, detailed transactions of the assembly, symposia and business sessions, documents, discussions, resolutions, etc.--M. R.

A-883 Nawrocki, P. J., Investigation of atmospheric radio noise. Florida. Univ., Gainesville. Engineering and Industrial Experiment Station, Contract AF 19(604)-876, Scientific Report, No. 13, Nov. 1, 1956. 35 p. 13 figs., 8 refs., 22 eqs. DWB (M94.6 F636i)--Investigation of the electromagnetic field components (E_2 and H_2) of the ground wave from individual sferic pulses exceeds the theoretical value obtained from SOMMERFELD's theory, and that H_2 and E_2 probably have a common functional dependence upon the distance of propagation.--Author's abstract.

A-884 Nearhoof, H. J. (Penna. St. Coll. Ionos. Res. Lab.), Tabulation of 150 Kc/s polarization data obtained at vertical incidence including their interpretation from the single magnetoionic component viewpoint. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report No. 25, Aug. 20, 1951. 418 p. 23 figs., tables, 14 eqs. DWB--

Theoretical methods are discussed which allow the determination of the electron density and the collisional frequency from the measurable polarization quantities as defined by the Appleton-Hartree equation. These methods are general in that they can be applied to any geographical location and to any operating frequency. Experimental results on 150 Kc/s are then interpreted using the above mentioned theoretical procedure by treating the downcoming echo as a single magneto-ionic component. The results are then applied to an assumed ionospheric model of Chapman shape and with an exponential V curve fixed in space and independent of time. --Author's abstract.

A-885 Nertney, R. J. (Penna. St. College. Ionos. Res. Lab.), Characteristics of the lower ionosphere as deduced from long wave measurements: preliminary. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 28, Sept. 20, 1951. 46 + p. 29 figs., 16 refs., eqs. DWB--The theory of obtaining wave solutions of ionospherically reflected waves (see Report No. 20 (1), and 27 (2),) and 150 Kc/s experimental data were used to determine diurnal and seasonal characteristics of the lower E and D region. The existence of certain "splits" may be explained without recourse to a very sharp strata layer. --W. N.

A-886 Nertney, R. J., Method for obtaining the wave solutions of ionospherically reflected long radio waves including all variables and their height variations with preliminary applica tions. Pennsylvania. State College. Ionosphere Research Laboratory. Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 20, March 15, 1951. 65 + 12 + 8 p. 27 figs., 2 tables, 15 refs., eqs. DWB--Applies the "wave theory" specifically to the problem of obtaining the wave solutions of the uncoupled wave equation for 150 kc at vertical incidence over State College, Pa., whereby solutions were obtained for the "ordinary" component under some specified conditions. Wave functions for E layer fc = 0. 55, 1. 1, 2. 2, 3. 0 and 4. 4 Mc and from which the calculations of the reflection coefficients are made. Extended dispersion calculations (see Report No. 10(1)) in graphical representations of μ and X, ordinary and extraordinary waves for fc 3. 0 Mc and the X values on the extraordinary wave for all fc values above are presented. Other calculations are made and the comparison made between theoretical and experimental results. Postulating a D layer accountable for discrepancies, author presents two D-layer models. --W. N.

A-887 Nertney, R. J., The lower E and D region of the ionosphere as deduced from long radio wave measurements. Journal of Atmospheric and Terrestrial Physics, 3(2):92-107, Feb. 1953. 31 figs., table, 13 refs. Also issued as: Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report, No. 39, June 20, 1952. 78 p. 35 figs., table, 27 refs., eqs. DWB--Model electron distributions for E and D layers are set up, based on experiment and theory, for noon (summer) and for night. Conclusions from models are compared with observed heights of critical layers. --C. E. P. B.

A-888 Netherlands. Meteorologisch Instituut, Het Internationaal Geophysisch jaar, 1957-1958. (International Geophysical Year, 1957/1958.) Its Verspreide Opstellen, No. 4, 1957. 79 p. figs., photos. Contents: VENING MEINESZ, F. A.: Algemene inleiding (Introduction), p. 7-16; BLEEKER, W.: Het budget van de dampkring, (Atmospheric budget), p. 17-23; GROEN, P.: Het onderzoek van de wereldzee, (Oceanographic research), p. 25-31; VELDKAMP, J.: De hoogste luchtlagen, (The upper layers of the atmosphere), p. 33-41; MINNAERT, M. G. J.: De waarneming van de zon, (Solar observations), p. 43-48; JONGEN, H. F.: De kosmische straling, (Cosmic rays), p. 49-55; DE VOOGT, A. H.: Het radioverkeer in het International Geophysisch Jaar, (Radio propagation), p. 57-63; ROELOFS, R.: Aarde, Maan en sterren, (The earth, moon and stars), p. 65-70; OORT, J. H.: Kunstmatige satellieten, (Artificial satellites), p. 71-79. DWB--This attractive brochure consists of 9 articles on different phases of the IGY, with frequent reference to participation by the Netherlands. The preface is by C. J. WARNERS, director of the KNMI (Netherlands Meteorological Service). The illustrations vividly depict various IGY activities. --M. R.

A-889 New York Univ. Institute of Mathematical Sciences. Div. of Electromagnetic Research, Theory of dissociation and recombination processes in the ionosphere. Contract AF 19(122)-463, Final Report, June 1956. 10 p. Research reports and publications on the contract, p. 8-10. --Between March 1950 and June 1956, 25 reports were issued under this contract and 80% of these were published in scientific journals. Work done is summarized under several headings: I. Properties of the ionosphere; II. Many particle scattering problems; III. General scattering theory; IV. Molecular scattering problems; V. The inverse scattering problems. --M. R.

A-890 Newell, Homer E., Jr., A review of upper atmosphere research from rockets. American Geophysical Union, Transactions, 31 (1):25-34, Feb. 1950. 6 figs., 34 refs. Abstract p. 25. MH-BH--Research on the upper atmosphere with the V-2 and Aerobee rockets is reviewed; including progress in control of flight, tracking and recovery of instruments and data, and future research program of Naval Research Laboratory working together with the Signal Corps, Air Force and Applied Physics Laboratory. Relation of altitude to pressure and temperature up to 120 km as determined from flights in New Mexico, shown graphically. Solar spectrum, ozone concentration, cosmic radiation, ionospheric and photographic data on cloud formations are discussed and illustrated. --M. R.

A-891 Newell, Homer E., Jr. (Naval Res. Lab., Wash., D. C.), International Geophysical Year earth satellite program. Franklin Institute, Phila., Journal of the Franklin Institute Monographs, No. 2:2-13, June 1956. DWB--Details of Project Vanguard, including instrumentation of vehicle by Navy Research Lab., and the 11 ton launching vehicle being constructed by Glenn L. Martin Co.; orbit, 3 stage performance, optical and radio observing program, computational centers and geophysical or astrophysical problems which may be solved by the earth satellite program are discussed in this article. --M. R.

A-892 Newman, M. M.; Stahmann, J. R. and Anderson, J. R. (all, Lightning & Transients Res. Inst., Minneapolis), Recording and classification of thunderstorm atmospherics by counter techniques. (In: Conference on Radio Meteorology, Nov. 9-12, 1953, Univ. of Texas, Supplement to the Proceedings, V-3, pub. 1954. 9 p. 5 figs., table, ref.) DWB (M94.7 C748p. Sup.)--Noises from whatever source or wave length can be measured by counter analyzers. The rate of rise, amplitude, average level and pulse repetition rate are characteristics which can be measured with some modifications for sferics over other types of noise. Models of counter analyzers are described and illustrated. Methods of measurement outlined, correlation with actual reduction in intelligibility discussed and equipment, records, and results illustrated in photographs and graphic forms. It covers a wide range of frequency and the results are easy to read and analyze. --M. R.

A-893 Nicolet, Marcel, Effects of the atmospheric scale height gradient on the variation of ionization and short wave absorption. Journal of Atmospheric and Terrestrial Physics, 1(3):141-146, 1051. 2 tables, 3 refs., 35 eqs. MH-BH. Also in U. S. Air Force. Cambridge Research Center, Geophysical Papers, No. 11:263-272, 1952. 2 tables, 6 refs., 35 eqs. DWB--Author demonstrates that material progress can be made in the explanation of the ionosphere by extending CHAPMAN's theory to allow for: 1) increase of the scale height from the D layer and upwards, 2) that the recombination coefficient varies with height and 3) that the ionizable constituents may have a different scale height from that of the main constituent. --W. N.

A-894 Nicolet, Marcel (C.S.A.G.I., Uccle, Belgium), Constitution of the atmosphere at ionospheric levels. Journal of Geophysical Research, Wash., D. C., 64(12):2092-2101, Dec. 1959. 8 tables, 37 eqs. DLC.

A-895 Noonkester, V. R., Proposed investigation of ionospheric electron density profile and geomagnetic fluctuations as a function of stratospheric winds. U. S. Navy Electronics Lab., San Diego, Calif., Research and Development Report NEL/Report 908, June 5, 1959. 16 p. 2 figs., 72 refs., 16 eqs. DWB (M(055) U585r No. 908)--More detailed studies are needed to determine the relationship between ionospheric and lower atmospheric circulation. According to the dynamic theory of ionospheric electrical currents the electron density profile and magnetic variations at the surface of the earth are functions of the E layer wind and conductivity distribution. This is illustrated mathematically in this report. It is concluded that if significant relationships between ionospheric conditions and lower atmospheric circulation can be found its applications to low-frequency radio propagation problems will be of great value. --Author's summary & N. N.

A-896 North Atlantic Treaty Organization. Advisory Group for Aeronautical Research and Development, Abstracts of lectures at AGARD Symposium on Polar Atmosphere, Oslo, July 2-8, 1956 (Ionospheric part). issued 1956. Each abstract repaged. footrefs. Tipped in: (Program) of the Symposium. DWB (M10.535 N864s)--A mimeographed collection of abstracts or summaries of 21 papers on ionosphere and related problems as presented at the (Oslo) AGARD symposium on the Polar atmosphere. --M. R.

A-897 Northover, F. H. (Dept. of Math., Carleton Univ., Ottawa, Canada), The propagation of electromagnetic waves in ionized gases (with special reference to "whistlers"), Pt. 1. Journal of Atmospheric and Terrestrial Physics, N. Y., 17(1/2):158-169, Dec. 1959. 3 refs., 46 eqs. Pt. 2, Ibid., p. 170-178. 35 eqs. DWB, DLC--Recent studies lend support to the theory that whistling atmospherics are caused by lightning flashes, the electromagnetic energy radiated by these being guided along discrete columnar ionic irregularities which follow approximately the lines of force of the earth's magnetic field. In Part I the theoretical problems arising are set forth and a general wave theory developed which is first applied to the problem of propagation through homogeneous compound streaming media. In Part II the simplest case of "standard type" propagation along stationary columns is carefully examined, both for columns with a central ionic surplus and for columns with a central ionic deficiency. Although both types of column, when sufficiently well developed, can guide electromagnetic energy it appears that the former type is a much more likely mechanism for the whistler propagation than the latter. It is hoped in subsequent papers to deal with the propagation of general type disturbances along stationary columns and also through columns where appreciable axial streaming is taking place. --Author's abstract.

A-898 Norton, K. A. and Omberg, A., The maximum range of a radar set. Institute of Radio Engineers, N. Y., Proceedings, 35(1):4-24, Jan. 1947. 11 figs., 2 tables, 36 refs., 70 eqs. DLC--Formulas to calculate the maximum range of a radar set are demonstrated here along with several of the factors analyzed on which a given radar set depends for maximum range. In addition to electronics, etc., the meteorological elements involved in radio wave propagation are discussed. --W. N.

A-899 Norton, K. A.; Rice, P. L.; Janes, H. B. and Barsis, A. P. (all, Central Radio Propagation Lab., National Bureau of Standards, Boulder, Colo.), Rate of fading in propagation through a turbulent atmosphere. Institute of Radio Engineers, N. Y., Proceedings, 43(10):1341-1353, Oct. 1955. 13 figs., table, 22 refs., numerous eqs. DLC--Fading rate is defined to be the number of times per minute that the envelope of the received field crosses its median level with a positive slope. This definition of fading rate is equally useful for ionospheric or tropospheric propagation studies. Furthermore, it may be used with equal facility on short transmission paths where the ground wave component of the received field predominates and on the longer transmission paths where the scattered component of the received field predominates.--From authors' abstract.

A-900 Norton, Kenneth A., System loss in radio wave propagation. U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(1):53-73, July/Aug. 1959. 14 figs., 6 tables, 33 refs., 79 eqs. DLC, DWB--A summary is presented of the ways in which the concept of system loss and the closely related concepts of transmission loss, basic transmission loss, propagation loss, and path antenna gain may be used for precise, yet simple, descriptions of some of the characteristics of radio wave propagation which are important in the design of radio systems. Definitions of various terms associated with the concept of system loss are given which introduce a greater flexibility into its use without any loss in precision. It is shown that the use of these added terms and concepts makes feasible the extension of the use of this method of description to any portion of the radio spectrum. A more general formula for the system loss is given which may be used for antennas with an arbitrarily small separation. Using this formula it is shown that the system loss between small electric or magnetic dipoles separated by a distance $d \ll \lambda$ can be made arbitrarily small even though the individual antennas have large circuit losses. Formulas are developed for the percentage of time that a desired signal is free of interference, and these are used to demonstrate methods for the efficient use of the spectrum. In particular, contrary to general belief, it is shown that efficiency is promoted by the use of high power and high antennas and, in the case of a broadcast service, sufficiently small separations so that there is appreciable mutual interference. An analysis is made of the variance of the path antenna gain in ionospheric scatter propagation. Methods are given for the calculation of the transmission loss for the ground wave and tropospheric scatter modes of propagation through a turbulent model atmosphere with an exponential gradient. Examples of such calculations are given which cover a wide range of frequencies and antenna heights. Finally, examples are given of the expected range of various tropospheric point-to-point scatter systems such as an FM multichannel teletype system, a television relay or an FM broadcast relay. --Author's abstract.

A-901 Obayashi, Tatsuzo, On the world-wide disturbance on F2 - region. Journal of Geomagnetism and Geoelectricity, Kyoto, 6(2):57-67, June 1954. 20 figs., 2 tables, 11 refs. DLC--World-wide patterns of F2 region disturbance and their development with geomagnetic storm-time are examined with the help of comprehensive world-wide data on the F2 layer. Charts showing average disturbance in the F2 region during the main phases of associated magnetic storms are presented (separately for the Dst (f^oF2) and Ds (f^oF2) components). A detailed analysis is made of the development of individual disturbances in the Northern Hemisphere associated with some typical severe magnetic storms. --From author's abstract.

A-902 Obayashi, Tatsuzo, Movements of irregularities in the E - region. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 9(2):105-113, 1955. 9 figs., 8 refs., 3 eqs. DWB--Movements of large scale irregularities in the E region have been deduced from the observations of fading patterns of medium radio waves transmitted from the three broadcasting stations spaced about 150 km at the vortices of a right triangle, as received at Hiraiso situated 350-400 km apart. The speeds and directions of movement are determined by the time difference of each record, which can be observed as the transit of some characteristics on fading patterns caused by the travelling of large scale irregularities from one propagation path to another. Observations were carried on every day from July to December 1954. The movements appear to have flowed predominantly towards the west during the night and the east during the morning with velocities ranging 5-150 m/sec. The examination of the results for NS and EW components for the winter suggests the presence of the diurnal variation of direction. The average vector of movements during the night is also found to exhibit some seasonal change. By comparing the simultaneous records of ionospheric observation (vertical incidence) with the fading records of three separated points of reflection, we have found as an example that the moving cloud, which is observed as very rapid faded fading with the duration of a few hours has some correlation with the sporadic ionization cloud, and its turbulent velocities are of the order of 10-15 m/sec. --Author's abstract.

A-903 Obayashi, T., Geomagnetic pulsations and the earth's outer atmosphere. Annales de Geophysique, 14(4):464-474, Oct./Dec. 1958. 6 figs., table, 16 refs.

A-904 Obayashi, T.; Fujii, S. and Kidokoro, T. (all, Hiraiso Radio Wave Observ. Radio Res. Labs.), An experimental proof of the mode theory of VLF ionospheric propagation. Journal of Geomagnetism and Geoelectricity, Kyoto, 10(2):47-55, 1959. 7 figs., 10 refs. DWB--A new spectoscope recording continuously the amplitude-frequency spectrum of VLF atmospherics has been developed. The receiver sweeps the frequency giving complete coverage of the band of 5 - 7 kc/s repeatedly and the output is displayed on an intensity modulated cathode-ray tube, which is photographed on a slowly moving film. Observations have been carried out and it appears that the result provides an excellent experimental base for the mode theory of VLF ionospheric propagation. It is found that the frequency-spectrum of distant atmospherics shows a broad intensity maximum around 10 kc/s and decreases its intensity towards higher frequencies with undulating peaks. Marked selective absorption bands appeared in the spectrum are variable according to the time of day, and they might be associated with cutoff frequencies of the waveguide bounded by the earth and the ionosphere. The solar flare effect on VLF atmospherics propagation is also revealed, which indicates a sudden shift of the spectrum to higher frequencies owing to the increase of ionization and the lowering of a reflecting height of the ionosphere. --Authors' abstract.

A-905 Obayashi, Tatsuzo, Measured frequency spectra of very-low-frequency atmospherics. U. S. National Bureau of Standards, Journal of Research, Sec. D, 64(1):41-48, Jan./Feb. 1960. 12 figs., 11 refs., eqs. DWB, DLC--New spectroscopes recording continuously the amplitude-frequency spectra of vlf atmospherics have been developed. Two receivers cover the frequency ranges 1 to 10 kc and 5 to 70 kc sweeping the respective bands repeatedly, and their outputs are displayed on intensity modulated cathode-ray tubes which are photographed on slowly moving film. Observations have been carried out since June 1958, and it appears that the results provide an excellent experimental basis for comparisons with the mode theory of vlf ionospheric propagation. It is found that the frequency spectrum of distant atmospherics indicates a pronounced absorption near 3 to 5 kc, a broad intensity maximum around 10 to 20 kc, and a general decrease towards higher frequencies with undulating peaks. The selective absorption bands appearing in the spectrum are variable according to the time of day and seasons. These changes may be interpreted loosely as an ionospheric effect which is associated with the cutoff frequency of the waveguide bounded by the earth and the ionosphere. The solar flare effect on vlf atmospherics propagation is also revealed, which indicates a sudden shift of the spectrum to higher frequencies owing to the increase of ionization and the lowering of a reflecting height of the ionosphere. --Author's abstract.

A-906 Obayashi, Tatsuzo (Hiraiso Radio Wave Obs. Radio Res. Lab. Nakaminato-shi, Ibaragi-ken), Very low-frequency spectra of atmospherics propagated through the ionosphere. Nature, London, 184(4679):34-36, July 4, 1959. 3 figs., 7 refs. DWB--A more complete experimental proof of the mode theory on very low frequency ionospheric propagations and on the characteristics of the atmospherics is given. Descriptive and experimental facts are presented from the observations of atmospherics at Ibaragiken, Japan. Typical records are examined. Among the facts that lend support to the mode theory is one on the relation between the sudden enhancement of atmospherics, and the sudden ionospheric disturbances. --N. N.

A-907 Obolenskii, V. N., Meteorologiia. (Meteorology.) Leningrad. Gidrometizdat., 1938/1939. 2 vols. v. 1, 639 p. 273 figs., 53 tables, refs. (at end of each ch.), 145 eqs. v. 2, 443 p. 207 figs., 81 tables, 631 refs., numerous eqs. DWB--Vol. I comprises a thorough theoretical and practical text on physical and synoptic meteorology. Vol. II takes up in more detail the advanced aspects of atmospheric optics, acoustics and electrical phenomena such as thunderstorm electricity, radioactivity and its effect on atmospheric ionization, atmospherics, ionosphere, solar radiation and magnetic effects. The chapter on ionosphere (p. 297-309) summarizes existing knowledge on methods of investigation (radio wave), results, theory, normal and abnormal investigations, diurnal and seasonal variations, clouds of electrons and ions, causes of variations in ionization of different layers, Dellinger effect, etc. --M. R.

A-908 Obukhov, A. M., (Inst. of the Physics of the Atmosphere Academy of Sciences, Moscow), Scattering of waves and microstructure of turbulence in the atmosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2180-2187, Dec. 1959. 7 figs., 20 refs., 4 eqs. DLC--The paper deals with a brief survey of the theory of scattering of waves by turbulent inhomogeneities. Experiments on the study of scattering phenomena of sound by turbulence in the surface layer of the atmosphere are discussed. These experiments were carried out to obtain some information on the turbulent spectrum;their results are compared with the data of meteorological measurements in the surface layer. Applying the method of scattered radio waves to the study of turbulence in the ionosphere is discussed. --Author's abstract.

A-909 Ogata, Yoshiharu (Akita Radio Wave Obs., Radio Res. Labs.) Observation at Akita of ionospheric drift. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 10(2):91-92, 1956. fig. DWB--An observation was made to determine the velocity of ionospheric drift by a joint team of scientists from Akita Radio Wave Observatory and those from the Radio Research Laboratories. Transmitters were at Tazawa and Akita, both in Japan. Results show that the E layer nighttime observations yields sufficient data of median value 50 m/s and a most frequent velocity of 40 m/s, whereas the F layer observation during the day gave a median of 120 m/s in each group and a most frequent velocity of 80 m/s. --N. N.

A-910 Oguti, T. and Nagata, T. (both, Geoph. Inst., Tokyo Univ.), Model experiments of the screening effect of the ionosphere. Tokyo Univ. Geographical Institute, Geophysical Notes, 8(1), Contribution No. 3, June 1955. 7 figs., 8 refs., 13 eqs. DLC Reprinted from: Japan. Science Council. Ionospheric Research Committee, Report of Ionosphere Research in Japan, 8(4):171-184, 1954. --Electromagnetic induction within a thin copper shell caused by a rapid change in external magnetic field is measured in order to find the screening effect of the ionosphere. In this report, some experimental results for several cases of idealized simple distribution of electric conductivity are dealt with, and the result of the simplest case is compared with that of theoretical calculation. The agreement of the experiment with the theory is satisfactory. It seems therefore that this model experiment is promising for estimating the screening effect of the ionosphere having a more complex distribution of electric conductivity. --Authors' abstract.

A-911 Ohio. State Univ. Dept. of Electrical Engineering, Antenna Laboratory, Antennas for ionospheric scatter propagation. Contract AF 19(604)-1531, Final Engineering Report, Nov. 1, 1955. (AD-88950).

A-912 Ohio. State Univ. Dept. of Electrical Engineering, Antenna Laboratory, Antennas for ionospheric forward scatter propagation, Pt. II. Contract AF 19(604)-1531, Final Engineering Report, Dec. 31, 1955. (AD-88950).

A-913 Okamoto, Hironobu; Ose, Masami and Aida, Kazuo (all, Radio Res. Labs., Kokubunji, Tokyo), New type of scattering echo observed by the shipborne ionospheric sounder over the sea. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 11(2):50-54, June 1957. 4 figs. DWB--On the first Japanese Antarctic research expedition (1956-7) from Japan to Singapore to Cape Town to Syowa Base and return, a new type of ionospheric sounding echo scattering was observed (as shown on recorder records) in a region up to 120 km above the surface for h'f records. No internal or instrumental failure could be found and, as shown on an hourly graph, a diurnal cycle was predominant (scatter mostly in daytime). Over-sea, land or ice propagation showed differences in type of scatter, being weaker over land or ice than over sea. It apparently is due to tropospheric conditions. --M. R.

A-914 Oklahoma Agricultural and Mechanical College. Research Foundation, Operation and evaluation of the beacon triangulation system and the ionosphere beacon system. Contract W28-099 ac-376, Final Report (pub. after May 1952). 16 p. DWB --This final report of a project started in Sept. 1947 is a summary of difficulties developed during the tracing of V-2 rockets and aerobees for upper air research. Lack of personnel, inadquate direction antennas, and poor synchronization of the clocks at the triangulation stations were the main problems. The best solution would be to replace all four indicators with automatic synchronization and photograph the records at one interrogator station. --A. A.

A-915 Olesen, Jens Kirstein (Danish Nat'l. Comm. U. R. S. I.) and Rybner, Jørgen (Royal Danish Tech. Univ.), Slant Es disturbance at Godhavn and its correlation with magnetic disturbance. AGARDograph, Paris, No. 34:37-57, Sept. 1958. 17 figs., foot notes, 11 refs. DWB (629.1323 N864a)--This paper describes the characteristics of slant Es as observed at Godhavn, Greenland. Statistical material is presented which shows that 'slant Es condition' in the ionosphere normally occurs only during sunlit hours and only associated with a certain type of magnetic disturbance, the so-called J-disturbance. There is a close correlation between the occurrence of the two phenomena, both diurnally and seasonally. The daytime occurrence of slant Es at Godhavn is distinct from conditions at places like College, Alaska, where slant Es is a night-time phenomenon accompanied by the occurrence of aurorae. During slant Es conditions at Godhavn, reflections from the upper part of the E layer and from the F layers are always disturbed, while the D region absorption is comparatively low. Slant Es waves are usually so weak that the recorder gain setting greatly influences the distinctness with which the corresponding trace appears on the records. Certain phenomena have been found which indicate slant Es conditions in the ionosphere although no slant Es trace is visible. --Authors' abstract.

A-916 Omori, T. and Okumura, Y. (Electrical Communication Lab.), Results of vertical arrival angle measurement for radio waves from San Francisco. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 7(1):29, 1953. DWB--Data for seasonal vertical angle measurement for radio waves from San Francisco for June 1951 to April 1952 are presented and analyzed according to the frequency of the waves received. The vertical arrival angle at Oi Observatory was found to be proportional to FoE/f and FoF2/f where FoE and FoF2 are measured at the receiving station and f is the working frequency of the waves received (13.78, 7.715, 18.0 and 9.49 Mc/s, respectively). --M. R.

A-917 Oriol Cardus, J., Sondeos ionosfericos. (Ionospheric soundings.) Revista de Geofisica, Madrid, 14(56):285-312, Oct./Dec. 1955. 8 figs., 19 refs., eqs. DWB, DLC--An ionospheric recording station was established at Ebro Observatory on March 26, 1955. The history of ionospheric soundings and propagation of electromagnetic waves from Balfour-Stewart (1878) and Heaviside (1902), Appleton (1927) and others is outlined, and the basic equations presented and one explained. Application of theory to ionospheric sounding (determination of height, electron density, magnetic field, etc.) is next reviewed. Notes on the equipment installed at Tortosa, photographs of installations and records made in 1955, and analysis of records made at Tortosa from May to Sept. 1955, showing mean hourly variations in E, F1 and F2 layers for each month together with conclusions as to diurnal, seasonal, and regional variations in height, etc. of the various layers, are presented. --M. R.

A-918 Ortner, Johannes and Egeland, Alv, Aussergewöhnliche Ausbreitungsbedingungen für ultrakurze Wellen. (Unusual propagation conditions for very high frequencies radio waves.) Archiv der Elektrischen Übertragung, Stuttgart, 13(10):420-428, Oct. 1959. 7 figs., 6 tables, 16 refs. DLC--At the Kiruna Geophysical Observatory in Kiruna, Sweden (67.8°N, 20.4°E) radio waves of Central European VHF transmitters could be received within the period Feb. 1958 to Aug. 1959. These quite unusual conditions for frequencies of 90 Mc/s occurred only five times, and this during the summer months. It is difficult to find a close relation between geophysical or solar events and these unusual conditions of propagation, which occurred during geomagnetically undisturbed and disturbed days. Different processes of propagation are discussed: forward scatter, meteor trails ionization, auroral E layer. A quite specific sporadic Es layer gives the best explanation for these unusual receiving conditions. Critical frequencies observed near the reflexion point of the received radio waves are of the order of the values computed with Appleton-Hartree formula, assuming an Es propagation. --A. V.

A-919 Ortusi, J., The propagation of metre and centimetre waves (Wavelengths between 6 m and 3 cm). Annales de Radioelectricite, 9(2):227, 1954.--Propagation over both direct-visibility and long-distance paths is considered. Characteristics studied include received power, and the measurements of turbulence fields are considered in appendixes. The results are summarized for convenient use in a series of ten nomograms, covering received power, transmission equivalent, attenuation, maximum range and effective antenna height.

A-920 Osborne, B. W., Horizontal movements of ionization in the equatorial F region. Journal of Atmospheric and Terrestrial Physics, 6(2/3):117-123, March 1955. 3 figs., 14 refs. DWB --Spaced-aerial observations of horizontal velocity of ionized particles during day in F region at Singapore gave in Sept.-Oct. 1953 a regular semidiurnal variation from about 52 m/s towards E at 9 - 12 h LMT to nearly 50 m/s towards W at 15 - 17 h. A doubtful tendency was found for movement to S at 9 - 15 h. In Nov. 1953 - Feb. 1954 movements were less regular and mostly towards W from 10 - 18 h. In March - April 1954 variation was from 40 - 50 m/s towards E at 9 h and 23 h to over 50 m/s towards W at 17 h. --C. E. P. B.

A-921 Osborne, C. B., Magnetic and radio disturbance. North Atlantic Ocean. Marine Observer, 22(156):66-68, 1952. DWB--June 17, 1951, magnetic compass varied several degrees from gyro compass, during passage of a large sunspot. No radio signals could be received. Reports on disturbances from Admiralty Compass Observatory, Overseas Telecommunications Dept. of G.P.O. and Central Forecasting Office, Dunstable, are included. --C.E.P.B.

A-922 Outsu, Jinsuke and Iwai, A., Investigation of the presence of ionized hydrogen in the outer atmosphere using whistler dispersions. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 6:44-55, Jan. 1959. 7 figs., 7 refs., 4 eqs.

A-923 Paetzold, H. K., Die ersten kunstlichen Erdsatelliten. (Das Internationale Geophysikalische Jahr, XIII). (The first artificial earth satellites (The International Geophysical Year, Pt. 13).) Die Umschau, Frankfurt a. M., No. 1:2-7, 1958. 7 figs. DWB, DLC--Details of the first two Soviet satellites, their trajectories, tracking and variations are discussed, along with the first preliminary scientific results. It appears that atmospheric density at 200-250 km is about double the value assumed in the past. Radio signals are being received from satellites far below the horizon which would indicate that waves are channeled along the ionosphere for some time before penetrating into the lower atmosphere. --G.T.

A-924 Paetzold, H. K. and Zschorner, H. (both, Max-Planck-Inst. für Stratosphärenphysik, Weissenau), Radiobeobachtungen auf 20 MHz der ersten russischen Erdeatelliten. (Radio observations at 20 Mc/s of the first Russian satellites.) Telefunken - Zeitung, Berlin, 31(120):99-104, June 1958. 8 figs., 5 refs. French summary, p. 99; English summary p. 104. --Analysis of the Doppler effects of the 20 Mc/s radio signals from the Sputniks I and II yielded the horizontal structure of the ionosphere discussed here. The radio observations were conducted at the Institute of Stratospheric Physics, Weisenau, Germany and the optical observations at the Telefunken Triangulation Laboratory, Ulm. The 2-3 min fadings discussed in terms of the Cotton-Mouton effect and the Faraday effect indicate extension of ionospheric irregularities to 1,000 - 2,000 km. The existence of focussing elements, also horizontally orientated over 100 - 200 km is plausible. A form of "guidance" due to ionospheric refraction, rather than scattering, may further the 6,000 km wave path. Excellent graphs and reproductions of the original film recordings are given. --W.N.

A-925 Paetzold, H. K. (Max-Planck-Institut für Aeronomie, Institut für Stratosphären-Physik, Weissenau and T. H. Munchen), Die höchste Atmosphäre und der Weltenraum. (The highest atmosphere and the cosmos.) Umschau, Frankfurt a. M., 59(1): 3-6, Jan. 1, 1959. 5 figs., table. DLC DK629. 19:550. 3-- The audibility of the Sputnik radio signals of 20 MHz and 40 MHz indicated that the radio waves were refracted in the ionosphere; this is possible only when the electron density does not fall below a value of $1. 10^6$ electrons/cm^3 in the maximum of the ionosphere at a height of 300 km. At greater altitudes the electron density diminishes much more gradually than the atmospheric density. The relative ionization gradually increases with altitude from 0. 05% at 300 km to 7% at 1000 km. From the Faraday frequency perceptible in the satellite signals it was possible to compute an electron density of $5. 10^5$ electrons/cm^3 at 500 km. The temporary and irregular fading indicates the existence of ionospheric inhomogeneities. Duration of fading of several minutes to several seconds indicated horizontal variations of electron density extending from 2000 km to 100 km. The satellite became inaudible over higher latitudes at relative close distance while from the south it was audible at great distances; this indicates the influence of the polar ionosphere which is more disturbed by incursion of corpusite clouds than in lower latitudes. The shorter life of the satellites as a result of deceleration indicates that atmospheric densities above 200 km are higher than hitherto expected. These higher densities signify higher temperatures in the upper atmosphere. At 200 - 350 and 1000 km the corresponding temperatures were 800, 2000 and 2500°K. The composition of the atmosphere comprises a density of 100 nitrogen molecules/cm^3 and 1×10^6 oxygen atoms/cm^3, and 0. 1% atomic hydrogen at about 80 km. At 1000 km there are still 10^5 H-atoms/cm^3 and at 3000 km 1000 H-atoms/cm^3 may be present. At the high temperatures of the exosphere H-atoms are no longer stable but evaporate into the cosmos. Atmosphere density is greater by day than at night; variations in density amounting to a factor of 10 result from a warming up of the high atmosphere. The frequency of meteorites impinging upon the satellite was 1 meteorite/$100n^2$ sec for meteorites 4 μ in diameter; with increasing size the frequency diminished by a factor of 10. The cosmic radiation was extraordinarily high; at 1000 km it was 1000 times greater than the normal cosmic radiation. The radiation particles were protons. The maximum of radiation is apparently at 10, 000 km and above this height it diminishes. The origin of the radiation belt is discussed.--I. L. D.

A-926 Panofsky, H. A. (Penn. State Univ.), On the structure of turbulence in electrically neutral, hydrostatically stable layers, (summary only). Journal of Geophysical Research, Wash., D.C. 64(12):2195, Dec. 1959. DLC.

A-927 Parkinson, R. W., Second-order wave solutions for critical and near-critical coupling conditions. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionosphere Research, Scientific Report, No. 70, Oct. 1, 1954. 61 p. 34 figs., table, 9 eqs. MH-BH--Explicit expressions for second-order wave solutions of the general equations of propagation are obtained. Numerical results are included for six ionospheric models chosen to provide critical and near critical coupling conditions. It is concluded that the theoretical results show excellent promise of explaining experimentally observed coupling phenomena; correlation of theory with experiment, now under way, is deferred to a future report. --Author's abstract.

A-928 Parkinson, R. W., The night-time lower ionosphere as deduced from a theoretical and experimental investigation of coupling phenomena at 150 kc/sec. Journal of Atmospheric and Terrestrial Physics, London, 7(4/5):203-234, Oct. 1955. 28 figs., table, 27 refs., 3 eqs. DWB--Final results of an experimental programme for the investigation of coupling phenomena at 150 kc/sec, which covered a period of some ten months in all, are presented. Conclusions are obtained, from a comparison of the theoretical results presented in the preceding paper and the experimental data, regarding the shape of the night-time D-layer in the coupling region and its seasonal and diurnal variations. Sunset D-E region models for July and Nov. 1953 are proposed. A theoretical recombination coefficient model suggested by MITRA (1954a) is then applied in the usual manner to determine the variation of these models with time of night. Finally, comparison is made both with the conclusions obtained from the data on coupling phenomena and with all other available low frequency data; very good agreement is obtained in all cases. It is concluded that the theoretical analysis satisfactorily explains the experimental observations. --Author's abstract.

A-929 Parkinson, R. W., The fading periods of the E-region coupling echo at 150 kc/s. Journal of Atmospheric and Terrestrial Physics, London, 8(3):158-162, March 1956. 3 figs., 11 refs. DWB--Fading periods of coupling echoes are discussed. Short period fades (period about 1-2 min) are superposed on long-period fades (5-10 min upward). The long fades are attributed to a diffracting screen at 90 km and the short fades to a screen below this level, but an alternative explanation is a single screen at coupling level. --C.E.P.B.

A-930 Parthasarathy, R. and Reid, G. C., Signal strength recordings of the satellite 1958 δ 2 (Sputnik III) at College, Alaska. Institute of Radio Engineers, Proceedings, 47(1):78-79, Jan. 1959. table, 2 refs.

A-931 Pawsey, J. L.; McCready, L. L. and Gardner, F. F., Ionospheric thermal radiation at radio frequencies. Journal of Atmospheric and Terrestrial Physics, 1(5/6):261-277, 1951. 9 figs., 2 tables, 6 refs. MH-BH--Minimizing man-made radio noises and atmospherics, the thermal radiation from the ionosphere has been identified and measured. The electron temperature at 70-80 km was found to be 240-290°K. This paper describes the equipment used and shows how to distinguish between different noises. --A. A.

A-932 Pedersen, P. O., Wireless echoes of long delay. Institute of Radio Engineers, Proceedings, 17(10):1750-1785, Oct. 1929. 12 figs., 4 tables, numerous refs. and eqs. DLC--Short radio waves, λ = about 31 m., of which the echoes were delayed by 3 min. 15 sec. and 4 min. 20 sec., have been observed by JØRGEN HALS, STØRMER, VAN DER POL and others. Author is of the opinion that these long delayed echoes are reflections from ionization bands outside the influence of the earth's magnetic field.

A-933 Penndorf, R. and Coroniti, S. C. (both, AVCO Manuf. Co., Boston, Mass.), Polar Es. Journal of Geophysical Research, Wash., D. C., 63(4, Pt. 1):789-802, Dec. 1958. 10 figs., table, 10 refs. DWB, DLC--Data obtained by ionosondes and published by CRPL are used to investigate Es over the Polar region. Three distinct types of polar Es exist, labeled Thule, Auroral Belt, and Mixed type. The Thule type, which is restricted to the area close to the geomagnetic pole (north of 73° geomag. lat.), shows a summer maximum occurring around geomagnetic noon. It follows Universal time. The auroral Belt type occurs along the Auroral Belt and appears only at night. It follows local time. No appreciable change with season or sunspot activity is found. The mixed type is found along the demarcation line of these two types, for example, at Baker Lake; that is, during some months the Thule type prevails, whereas in other months the Auroral Belt type prevails. Another mixed type occurs at the southern limits of the Auroral Belt type, around 60° geomagnetic latitude. The geographic extent of each type is shown on a polar map. The strong correlation of Es and magnetic activity point to a direct or indirect influence of corpuscular radiation on the occurrence of Es in the polar region.

A-934 Pennsylvania. State College. Ionosphere Research Laboratory, Survey of the literature of the ionosphere pertaining to long waves. Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 23, July 10, 1951. 268 p. DWB--This bibliography is comprised of abstracts and references to the literature of the ionosphere and a portion of the upper atmosphere. Attention has been largely confined to the published work concerning long waves and the levels in height where the upper atmospheric physical characteristics affect the passage of such waves. While, as mentioned above, the emphasis has been placed on long wave and associated literature, many survey papers and some of historical interest are included. Similarly, relevant work in physics and mathematics are considered. --From author's abstract.

A-935 Pennsylvania. State College. Ionosphere Research Lab., Basic ionospheric research. Contract AF 19(122)-44, Quarterly Report, Nos. 2-10, June 16/Sept. 8, 1949 to May 24/Aut. 24, 1951. 9 pieces, figs., refs. DWB--The quarterly reports No. 2-10 deal with the work and progress on: 1A, Procurement and interpretation of 150 kc/s equivalent height versus time recording; 2A, Procurement and interpretation of 150 kc/s vertical incidence ionospheric absorption data; 3A, Equipment development for oblique incidence measurements in the frequency range from 100 kc/s to 500 kc/s; 5A, Long wave literature survey abstracting and bibliography; 6A, Long wave theoretical development; 7A, Long wave exploratory work; 8B, h' - f recordings; 9B, WWV field strength recordings; 12B, Theoretical development based on the double parabola theory; 13B, Short wave exploratory work; 16A, Oblique incidence measurement at 150 kc/s; 18A, Long wave ionospheric absorption; 19A, Long wave equipment development; 21A, 150 kc/s sky-wave polarization; 23B, Oblique incidence P'-f experiment; 24B, E layer characteristics under quiet and disturbed conditions; 28A, Lunar tide study. Reprints of papers by the project personnel are included in some of reports. Conferences, visits, papers published and reports issued in the course of the periods are listed. Rosters of personnel are included. --W. N.

A-936 Perlman, S.; Kelley, L. C.; Russell, W. J. and Stuart, W. D., Concerning optimum frequencies for space vehicle communication. Institute of Radio Engineers, Transactions, CS-7, No. 3:167-173, Sept. 1959. 9 figs., 11 refs. DLC--A condensed portion of the U. S. Army Signal Radio Propagation Agency's "Tentative evaluation of the transmission factors for space vehicle communication." The factors related to communication between space vehicles and earth stations are examined including noise temperature rather than noise figure, since the former is the better basis for evaluation. --W. N.

A-937 Peterson, Allen M. (Stanford Univ.), The interpretation of long scatter echo patterns. U. S. Air Force. Cambridge Research Laboratories, Geophysical Research Papers, No. 7: 58-71, Dec. 1950. 8 figs., 7 refs., 11 eqs. DWB--

The theory of echo delay and of focusing effects is given. Experimental observations are compared with theory. --A. A.

A-938 Peterson, Allen M., The mechanism of F-layer propagated back-scatter echoes. Journal of Geophysical Research, 56(2): 221-237, June 1951. 8 figs., 10 refs., 15 eqs. MH-BH--Observed back scatter from the F layer (2 F) is difficult to explain on the basis of its origin in the E layer, but agrees with theory if it is assumed that the scattering occurs at the earth's surface. This type of scattering is not unusual or sporadic but occurs nearly 100% of the time. The leading edge of the pattern is sharply defined. The time delay as a function of frequency and transmitter power or pulse width is investigated and the results shown graphically and explained. --M. R.

A-939 Peterson, A. M.; Villard, O. G., Jr.; Leadabrand, R. L. and Gallagher, P. B., Regularly observable aspect-sensitive radio reflections from ionization aligned with the earth's magnetic field and located within the ionospheric layers at middle latitudes. Journal of Geophysical Research, 60(4):497-512, Dec. 1955. --The phenomenon discussed was observed regularly in the 6-30 Mc frequency range at the geomagnetic latitudes 43.75° and at 55°. The echoes and the reflection geometry, etc. suggest that the phenomenon is caused by the general type of particle bombardment assumed to cause aurora. --W. N.

A-940 Peterson, A. M. et al. (all, Stanford Research Inst., Menlo Park, Calif.), Radio and radar tracking of the Russian earth satellite. Institute of Radio Engineers, N. Y., Proceedings, 45(11):1553-1555, Nov. 1957. 5 figs., table. DLC--Brief account of techniques employed and results obtained at the Stanford Research Institute. Experimental measurements with hastily assembled equipment -- now improved -- appear to yield valuable scientific data on the upper atmosphere. --W. N.

A-941 Peterson, Allen M. (Stanford U., Res. Inst., Stanford, Calif.), Optical, electromagnetic, and satellite observations of high-altitude nuclear detonations, Pt. 2. Journal of Geophysical Research, Wash., D. C., 64(8):933-938, Aug. 1959. 5 figs., table, 10 refs. "These remarks, and other papers at symposium to be published in Aug. 1959 issue of Proceedings of the National Academy of Sciences."

A-942 Peterson, Allen M.; Egan, R. D. and Pratt, D. S., The IGY three-frequency backscatter sounder. Institute of Radio Engineers, N. Y., Proceedings, 47(2):300-314, Feb. 1959. 16 figs. (incl. photos), 13 refs.

A-943 Pfister, W., Effect of the D-ionospheric layer on very low frequency radio waves. Journal of Geophysical Research, 54(4):315-337, Dec. 1949. 14 figs., 16 refs., 12 eqs. Summary p. 315. MH-BH--The D layer is defined as a layer below E layer, at about 60 km, affecting propagation of long waves. Its probable electron and ion distribution is discussed, ion production is about $10/cm^3/sec$. Reflection and transmission coefficients are calculated. --C. E. P. B.

A-944 Pfister, Wolfgang (Geo. Res. Dir. Cambridge Field Sta.), Effect of the D-ionospheric layer on very low frequency radio waves. U. S. Air Force Cambridge Research Laboratories, Geophysical Research Papers, No. 7:107-135, Dec. 1950. 15 figs., 16 refs., 12 eqs. DWB--The normal D layer exists at a level of about 60 km. The rate of ion production is of the order of $10\ cm^{-3}\ sec^{-1}$. Values for the reflection have been calculated for different ionization and for different angles of incidence. Also transmission values have been obtained. Instructive diagrams are given. The final assumed model of the D layer is summarized. --A. A.

A-945 Pfister, Wolfgang, Magneto-ionic multiple splitting determined with the method of phase integration. Journal of Geophysical Research, 58(1):29-40, March 1953. 9 figs., 6 refs. DWB--The method used is a first-order W. K. B. approximation with an integration path in the complex height plane. The refractive index versus height is represented on a Riemann surface with four sheets corresponding to upgoing and downcoming waves and ordinary and extraordinary types of polarization. The branch points connecting the sheets are characterized as reflection points or as coupling points. Suitable paths of integration in the Riemann surface determine the reflection coefficient for the various magneto-ionic components. Five possible fundamental components have been found, and an infinite number of additional components due mainly to multiple reflections between the different reflection points. Numerical computations have been carried out for one ionospheric model with a Chapman distribution of electrons and an exponential decrease of collision frequency located in a moderate magnetic latitude. The results are represented in a sweep frequency picture of virtual height and absorption for five fundamental modes of propagation. --Author's abstract.

A-946 Pfister, Wolfgang (Ionospheric Physics Lab., Geophysics Res. Directorate, A. F. Cambridge Res. Center), Study of fine structure and irregularities of the ionosphere with rockets and satellites. (In: Van Allen, James A. (ed.), Scientific uses of earth satellites. Ann Arbor, Univ. of Michigan Press, 1956. p. 283-291. 2 figs.) DWB, DLC--

Almost all experiments using the ionosphere as a propagation medium reveal the presence of irregular or blobby structure in the electron distribution, and, consequently, a variety of methods is in use to determine something about the blobby structure, either by propagation through the ionosphere as in the radioastronomic technique or by reflection within the layers. Only limited information is available from rocket experiments, but due to the fact that a rocket or satellite travels in the midst of the ionosphere, experiments using transmissions between the vehicle and the ground will be able to add a new and very valuable type of information. Up to now, the contribution of the irregularities has been looked at more as a nasty by-product which must be smoothed out in the data analysis. However, from the data available, an analysis in terms of irregular structure appears to be quite promising. Based on experience with known techniques, a set of experiments for a satellite is being proposed. It is a combination of the pulse-delay experiment similar to the Air Force electron-density rocket experiment with a kind of drift-type experiment measuring the signal amplitude fluctuations at three closely spaced receivers. The real advantage of the fine-structure experiment with satellites or rockets will be that the changing aspect allows us to gain a three-dimensional picture of the configuration of the blob, while so far we are used to looking only at the two-dimensional diffraction pattern at the ground. --Author's abstract.

A-947 Pfister, W. and Keneshea, T. J., Ionospheric effects on positioning of vehicles at high altitudes. U. S. Air Force. Cambridge Research Center. Air Force Surveys in Geophysics, No. 83, March 1956. 27 p. numerous figs., table, 7 refs., numerous eqs. DWB, DLC--When a radio wave penetrates the ionospheric region, the presence of free electrons there causes it to deviate from its straight line path. The predictable part of this effect has been computed in terms of error in the initial angle of propagation and the error in the range of points in the ionized region. The results are contained in a series of graphs. The maximum error for a frequency of 1000 Mc/s is of the order of 0.1 mil and 45 meters respectively; these values being inversely proportional to the frequency. The unpredictable part of the effects of the ionosphere is randomly varying and unknown in its details, especially the dependence on frequency. From known facts of the ionospheric irregularities and from theoretical considerations a justifiable estimate of the effects can be obtained. This estimate is based on the angular spread and other quantities derived from ionospheric drift measurements and on an experimentally confirmed frequency dependence law.--Authors' abstract.

A-948 Pfister, Wolfgang; Keneshea, T. J. et al., The ionosphere. (In: Handbook of Geophysics for Air Force designers, ed. by C. F. Campen, Jr., et al. 1st ed. Wash., D. C., 1957. Ch. 15 (29 p.) 64 figs., table, 7 refs., 4 eqs.) DWB--A condensed review of the available data on ionospheric ionization, auroras and airglow as related to radio propagation, with extensive graphical (charts, maps, records, diagrams) illustrative material on the E, F2, Sporadic E and auroral distributions in space and time and their interrelationship and relationships with sunspot activity, magnetic activity, altitude, critical frequency, etc. Recently compiled world-wide charts are presented for many of these elements. --M. R.

A-949 Pfister, W. (U. S. A. F., Cambridge, Res. Center, Bedford, Mass.), Measurement of ionospheric fine structure by high altitude rockets. AGARDograph, Paris, No. 34:183-192, Sept. 1958. 5 figs., 2 refs. DWB (629.1323 N864a)--In the United States, two methods are being used for the determination of electron density distribution from rocket experiments: the pulse delay method and the phase delay method. The results derived from both of these methods is different in one respect. The stratifications appear considerably more pronounced in the pulse delay method. The indications are that a basic difference exists in the way both methods respond to the existence of horizontal irregularities in the ionosphere. In the pulse delay experiment two features have been included which permit an estimate of the structure size of the irregularities. It is a variation of the frequency in seven steps between 4 and 5 Mc/s and it is the reception of the signal with three closely-spaced antennas. A preliminary analysis of some of the rocket data gave 1.8 km and 0.3 km respectively for the structure size. The predominant feature of the results from pulse delay experiments is a pronounced stratification of the electron density as representing mean electron density with preferred levels at 94, 100, 106, 112, 118 and 128 km. The results cannot be interpreted as representing mean electron densities for the height levels concerned. However, the apparent stratification is thought to be produced by an alignment of blobs of ionization at those preferred levels. --Author's abstract.

A-950 Phelps, A. V. and Pack, J. L. (both, Westinghouse Res. Lab. Pittsburgh, Pa.), Electron collision frequencies in nitrogen and in the lower ionosphere. Physical Review Letters, N. Y., 3(7):340-342, Oct. 1, 1959. 3 figs., 10 refs., eqs. DLC.

A-951 Phillips, G. J., An apparatus for recording time-delays between radio fading characteristics. Journal of Atmospheric and Terrestrial Physics, 6(2/3):124-128, March 1955. 4 figs., ref. DWB--

When amplitudes from two aerials pass in succession through minimum values a condenser is given a charge proportional to the time between occurrences of the 2 minima. It is discharged through a center-pen recorder, polarity depending on the sense of the time delay and length of spike on the interval. Circuits are shown and practical details noted. --C. E. P. B.

A-952 Physical Society of London, Physics of the ionosphere: report of the Physical Society Conference on the physics of the ionosphere, held at Cavendish Laboratory, Cambridge, Sept. 1954. London, Physical Society, 1955. 406 p. numerous figs., tables, refs., eqs. DWB--For long review by James Paton see Royal Meteorological Society, Quarterly Journal, 81:645, Oct. 1955. DWB--The results of the conference on the physics of the ionosphere held Sept. 6 to 9 in Cambridge are published in a sizeable volume. The 50 articles are grouped under the following main headings: 1) the lowest ionosphere, p. 1-87; 2) irregularities and movements in the ionosphere, p. 88-211; 3) the F2 layer, p. 212-275; and 4) the mathematics of wave propagation through the ionosphere, p. 276-406. Ionospheric physicists from many countries contributed. The first paper in each section comprises a review and bibliography of works in the field. Nearly every aspect of ionospheric research or application is covered in an orderly manner by the variety of articles and the excellent grouping. This compendium, therefore, represents a survey of progress in ionospheric physics up to 1954. --M. R.

A-953 Piddington, J. H., The modes of formation of the ionospheric layers. Journal of Geophysical Research, 56(3):409, Sept. 1951. --Critically examines the eclipse data on recombination coefficients in the E- and F-layers. Concludes that the coefficient in the E layer may be somewhat higher than the value of 10^{-8} commonly assumed, and that no simple analysis of F layer data can be considered to give a reliable value of the coefficient. If the recombination coefficient is large, an additional source of ionization is required; suggests electric current flow in the regions concerned as the most likely source. Discusses solar regions responsible for ionization production. Then considers possible ionization processes and wavelengths for the F, E, and D layers. No new experimental data is described. --L. A. M.

A-954 Piddington, J. H., The four possible waves in a magneto-ionic medium. Philosophical magazine, London, 7 Ser., 46 (381):1037-1050, Oct. 1955. 2 figs., 14 refs., 16 eqs. DWB. Also: The four possible waves in ionized gas in a magnetic field. Nature, London, 176(4488):875-876, Nov. 5, 1955. fig., 10 refs. DWB--

Discussion of the properties of radio waves propagated through gas permeated by a magnetic field. Besides the ordinary and extraordinary waves (identical with radio O and E waves) there is a 'magnetic-sound' wave at low frequencies and an analogous wave at high frequencies termed the 'magnetic-plasma' wave, which may be important in the origin of intense non-thermal solar radio emission. The relation between these four waves is studied. "The magneto-ionic medium is quadruply refracting, transmitting 4 different waves". --C. E. P. B.

A-955 Pierce, J. A., Pulse transmission over long distances. U. S. Air Force. Cambridge Research Center, Geophysical Research Papers, No. 7:56-57, Dec. 1950. DWB--The author used a stable oscillator with manual adjustment of frequency and phase and also either a stable or relatively unstable oscillator with a servo-mechanism. A few results are discussed, showing the variation in behavior and the general importance in communication of the Pedersen rays. --A. A.

A-956 Pierce, J. R. and Kompfner, R., Transoceanic communication by means of satellites. Institute of radio Engineers, Proceedings, 47(3):372-380, March 1959. 3 figs., 5 tables, 6 refs.

A-957 Piggott, W. R., The abnormalities in the ionosphere at high latitudes. Nature, London, 171( ):124, 1953. --Study of the variations, with respect to time and location, of the frequency of occurrence of storm types E and D shows that the polar regions may be divided into three zones, the polar zone, the storm belt and the polar quiet zone. Within the storm belt, the most dense forms of storm E ionization are practically confined to an area centered near Canada, while the existence can be demonstrated of two centers of activity in the D region, spaced 180° apart, which rotate once around the earth every 48 hours.

A-958 Piggott, W. R., The reflection and absorption of radio waves in the ionosphere. Institution of Electrical Engineers, Proceedings, Pt. 3, 100( ):61-72, March 1953. --A brief historical review is given of the investigations on the absorption of radio waves made in the United Kingdom since 1935 together with a detailed discussion of the factors which must be considered when making accurate measurements of this phenomenon. An outline of the theory of ionospheric absorption and its application to practical absorption measurements is included. The effects of double refraction, polarization, spatial attenuation dispersion, ionospheric inhomogeneities and partial reflection, which modify the apparent attenuation of radio waves reflected in the ionosphere, are discussed. The methods used to minimize errors due to these factors are presented in detail. The experimental techniques used in the routine absorption measurements are described fully. The detailed results of the measurements of the absorption of radio waves in the ionosphere, are included.

A-959 Piggott, W. R., D. S. I. R. ionospheric absorption measuring equipment. Wireless Engineer, London, 32(6):164-169, June 1955. 4 figs., 4 refs. DLC--The principles of ionospheric absorption apparatus, first designed by Sir E. Appleton in 1935, are described with wiring diagrams. It employs a very stable linear r-f pulse. --C. E. P. B.

A-960 Piggott, W. R., On the variation of ionospheric absorption at different stations. Journal of Atmospheric and Terrestrial Physics, 7(4/5):244-246, Oct. 1955. 6 refs. DWB--Correlation of day-to-day variations of absorption at 2 Mc/s at Swansea and Slough is about 0.92 both in winter and summer. Freiburg-Slough correlation is not directly possible, probably owing to discrepancies in deducing the absorption. "After allowing for known sources of error, it is considered that the residual differences in summer are too small to be significant, but it is probable that real differences occur in winter."--C. E. P. B.

A-961 Piggott, W. R.; Beynon, W. J. G.; Brown, G. M. and Little, C. G. (comps.), Measurement of ionospheric absorption. International Geophysical Year, 1957/1958, Annals, 3(IGY Instruction Manual):173-226, 1957. figs., tables, refs., eqs. Contents: General theory of ionospheric absorption, p. 177-178. Piggott, W. R.; Beynon, W. J. G. and Brown, G. M.: The pulse reflection method of measuring ionospheric absorption, p. 179-203. Ionospheric absorption and f-min, p. 204-206. Little, C. G.: The measurement of ionospheric absorption using extra-terrestrial radio waves, p. 207-217. Brief report on some absorption intercomparison experiments, p. 218-226. DWB--A systematic and thorough treatment of theory and practice in measurement of ionospheric absorption in general and for IGY in particular. The methods involve study of variations in amplitudes of signals, in minimum frequency of echoes from the ionosphere and variations in amplitudes of signals from outside the atmosphere. During IGY the geographical variations, solar relations, winter anomalies, corpuscular effects, etc. will be studied. Appendices give symbols, abbreviations and terminology used in absorption measurements, and detailed program for pulse reflection absorption measurements during IGY (frequencies, sampling, noon and night observations, diurnal variations, measurement of constant solar zenith angle and high latitude measurements). --M. R.

A-962 Piggott, W. R. (DSIR Radio Research Station, Slough), The gyro-frequency in the E layer above Slough, England. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(1/2):197-198, Oct. 1959. 6 refs., 2 eqs. DWB, DLC--Measurements of the gyro-frequency, f_H, in the E layer from the separation of f_oE and f_xE at Slough give $f_H = 1.236 \pm 0.015$ Mc/s. The calculated value is $f_H = 1.27$ Mc/s. The difference is consistent with that found by Scott using $f_oE - f_zE$ measured at high latitudes. --Author's abstract.

A-963 Piggott, W. R. and Bhattacharyya, J., On the mode of propagation in the E layer. Journal of Atmospheric and Terrestrial Physics, N. Y., 17(1/2):150-157, Dec. 1959. fig., 2 tables, 17 refs., 2 eqs. DWB, DLC--Lepechinsky and Durant's suggestion -- that f_oE is incorrectly interpreted at stations where the dip exceeds about 60° -- is critically tested using observed f_oE data. All the tests agree in showing that this hypothesis is wrong, the critical frequency being reduced correctly for stations with dips up to 89°. The common type of Es trace extending approximately $f_H/2$ above f_oE interpreted by Lepechinsky as a magneto-ionic effect above f_zE, is shown to be due to sporadic E and not magneto-ionic effect. It follows that the collisional frequency near the maximum of the E layer is of the order 10^4 sec^{-1} and not 10^6 sec^{-1} as required by Lepechinsky. --Authors' abstract.

A-964 Piggott, W. R., A rapid method of obtaining accurate virtual heights from an ionogram. Journal of Atmospheric and Terrestrial Physics, 14(1-2):175-177, April 1959. 2 figs., ref.

A-965 Piggott, W. R., The calculation of the median sky wave field strength in tropical regions. Dept. of Scientific and Industrial Research. Her Majesty's Stationery Service, London. Radio Research Spec. Report, No. 27, 1959. 38 p. 28 figs., 3 tables, 13 refs.

A-966 Pikel'ner, S. B. (Crimean Astrophysical Obs.) and Lehnert, B. (Royal Inst. of Tech., Stockholm), (Comments on Lehnert's) Magneto-hydrodynamic waves in the ionosphere and their application to giant pulsations. Tellus, Stockholm, 9(1):138-139, Feb. 1957. eqs. DLC--PIKEL'NER, in a criticism of LEHNERT's paper on magneto hydrodynamic waves in the ionosphere attempts to show that the coupling between the ions of a neutral gas is too poor for the total mass of the gas to oscillate as a whole in the normal E, F, and F2 layers. LEHNERT, in his reply, states that this is true outside the auroral zone, but that inside the auroral zone the periods of oscillation of ordinary hydromagnetic waves are consistent with the giant pulsations of 60 to 300 sec if the ionization is high within this region of the giant pulsation. More data are needed. --M. R.

A-967 Pineo, V. C. (M.I.T., Lincoln Lab., Lexington, Mass.), Off-path propagation at VHF. Institute of Radio Engineers, Proceedings, 46(5), Pt. 1:922, May 1958. 2 figs., 4 refs. DLC--A propagation experiment involving simultaneous measurement at Sterling, Va. and two off-path stations of signals beamed from Cedar Rapids, Iowa toward Sterling, is described and found to indicate that ionospheric scatter propagation consists of two modes, one due to solar influence, the other to meteoric ionization.--G.T.

A-968 Pitteway, M. L. V., Reflexion levels coupling regions in a horizontally stratified ionosphere. Royal Society of London, Philosophical Transactions, Ser. A, 252(1004):53-68, Oct. 1959. 12 figs., 12 refs.

A-969 Plendl, Hans, Über Ziele und Ergebnisse mehrjahriger Ionosphärenforschung. (The aim and results of long period ionospheric research.) Deutsche Akademie der Luftfahrtforschung, Munich, Schriften, No. 6:29-91, 1938/1939, pub. 1939. 34 + 13 figs., (incl. photos). Discussion, p. 68-91. DLC--Continuous ionospheric records, made at Munich, Potsdam and Rechlin with 80 m impulse equipment, during 13 solar rotations from Dec. 1937 to Dec. 1938, are presented, analyzed and discussed separately. The period was one of most extreme sunspot and auroral-magnetic storm activity. Records show that ionospheric structure is more variable than tropospheric weather. The need for records over a period of 50 years or more, in order to establish diurnal seasonal and solar-period variations in the different layers and time and intensity relations for irregular as well as regular phenomena, is emphasized in discussion. Reflections from auroral forms show on a number of the records. It was found that disturbances in the geomagnetic field begin a few hours before ionospheric disturbances — an important point for forecasting disturbances in radio propagation. It was also found that vertical reflections approximate conditions for long distance propagation, which gives a convenient method of sounding for radio-ionospheric forecasts. This does not apply to the abnormal E layer which is of local character. The detailed discussion by BARTELS, GOUBAU, ZENNECK, MOGEL, DIEMINGER, LANGE and O. V. SCHMIDT give additional illustrations of ionospheric records and comments on recent discoveries. The last comment, by Schmidt (p. 79-91), shows by means of models and excellent photographs the results of seismic wave propagation experiments in various media and at boundaries of media of different density, with theory of analogy to ionospheric propagation developed in some detail.--M.R.

A-970 Poeverlein, Hermann, Strahlwege von Radiowellen in der Ionosphäre. (Radiation paths of radio waves in the ionosphere.) Bayerischen Akademie der Wissenschaften, Sitzungsberichte, 1948. Also Ibid., Zeitschrift für angewandte Physik, 1(10):517-525, Oct. 1949. Also Ibid., 2(4):152-160, 1950.

A-971 Poeverlein, H., Ionosphären-Grenzfrequenz bei schiefem Einfall. (Ionosphere critical frequency at oblique incidence.) Zeitschrift fur angewandte Physik, 5(1):15-19, 1953. 4 figs., 25 refs., 12 eqs. DLC--A method of constructing paths of radio waves in the ionosphere which takes account of the earth's magnetic field is applied to calculate the critical frequency for any angle of incidence. Graphs show for waves of 3. 75 MHz the ratios of critical frequency for vertical incidence to incidence at any angle, ratio for waves in E-W plane to those in magnetic meridian, and effect of wave length (7. 5-0. 75 MHz). --C. E. P. B.

A-972 Poeverlein, Hermann (U. S. Air Res. & Dev. Comm., Bedford, Mass.), Low-frequency reflection in the ionosphere, Pt. 1. Journal of Atmospheric and Terrestrial Physics, London, 12-(2/3):126-139, 1958. 14 refs., 44 eqs. DLC--A theory of low frequency reflection in the ionosphere is developed. At wavelengths long compared to the layer thickness, the ionospheric layer is considered as a thin, conductive sheet, that leads to a discontinuity of the electromagnetic field. A thicker layer is subdivided into many thin (or differential) sublayers. The field is then thought of as a superposition of many partial waves, each of which is reflected by an individual sublayer. An additional penetrating wave must be assumed. At the lowest frequencies – that is, in the case of thin-sheet reflection – the currents in the layer are horizontal and the reflection is of the metallic type, always showing reversal of the horizontal E-component. Dielectric-type reflection with sign or phase transition at the Brewster angle is obtained at somewhat higher frequencies, if vertical and horizontal current density components are of comparable magnitude. The present first part of the paper deals with the thin-sheet reflection theory and the fundamentals of the general theory. Specialized cases of the general theory and some consequences will be discussed in the second part. The frequencies under consideration are roughly 1-100 kc/s. --Author's abstract.

A-973 Poeverlein, Hermann (A. F. Cambridge Research Center), Low-frequency reflection in the ionosphere, Pt. 2. Journal of Atmospheric and Terrestrial Physics, N. Y., 12(4):236-247, 1958. fig., 24 refs., 9 eqs. DLC--The first part of the paper dealt with a theory for ionospheric reflection of low frequencies, i.e. of wavelengths comparable to or great compared to the layer thickness. In the present second part various ranges of data are specified and their reflection characteristics are investigated. Metallic-type reflection is found at high electron concentration and dielectric-type reflection at medium electron concentration above a certain frequency limit. In this latter case, the currents in the ionospheric layer have the direction of the terrestrial magnetic field and the propagation in the layer is very peculiar. Some consequences of the theory are discussed with references to observations where possible. Among them there are statements about phase, sign, and Brewster case and possibilities of transmission through a layer. The final section brings some remarks on the theory, mainly on the field-strength quantities introduced. These quantities allow an interpretation which points at a close relationship to Budden's theory. --Author's abstract.

A-974 Poincelot, Paul, Reflexion d'une onde éléctromagnétique plane sur un milieu ionisé. (Reflection of a plane electromagnetic wave from an ionized medium.) Académie des Sciences, Paris, Comptes Rendus, 241(2):186-188, July 11, 1955. 2 refs., 15 eqs. Also his: Réflexion d'une onde éléctromagnétique plane sur un gaz ionisé suivant une certaine loi. (Reflection of a plane electromagnetic wave from an ionized gas according to a given law.) Ibid., 241(3):290-292, July 18, 1955. 14 eqs. Also his: Réflexion d'une onde éléctromagnétique plane sur un gas ionisé. (Reflection of a plane electromagnetic wave from an ionized gas.) Ibid., 241(9):649-651, Aug. 29, 1955. ref., eqs. DLC--Reflection of plane electromagnetic waves is treated mathematically, considering pulse frequency and structure of the reflecting ionized medium (electronic density, height, etc.). The analysis involves Hankel functions and their asymptotic developments. --G. T.

A-975 Poincelot, Paul, Influence de l'absorption sur le coéfficient de réflexion de l'ionosphère. (Influence of absorption on the reflective index of the ionosphere.) Annales des Télécommunications, Paris, 14(3/4):54-58, March/April 1959. 15 refs., eqs. DLC--Study on the influence of the absorption by ionosphere on its reflective index under normal incidence. Author investigates the propagation of a plane electromagnetic wave through a stratified medium, admitting that the electronic concentration varies linearly with respect to altitude. Generalezing the hypotheses made in several former publications, author introduces a viscous resistance and computes under these conditions the reflective index of the considered ionosphere layer. The value of the reflective index is expressed as follows: $[\rho] = e^{-4\beta} w^2/3 \alpha c$, where w = pulsation of the wave; c = speed of light in the vacuum. β is determined by means of the ratio β = r/m (m being an electron, possessing a speed v and subject, on the part of the medium, to a force $\vec{j} = - \vec{r}\, v$); α intervenes in the law of the index n fluctuation with respect to the height z above the basis of the ionospheric layer: $n^2 = 1 - \alpha z/w^2$. The adopted hypotheses correspond to reflection upon the lower layers of the ionosphere. Numerous experimental checkings have been made. -- A. V.

A-976 Polar Atmosphere Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionospheric Section. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957, issued 1958. 212 p. figs. (incl. photos), tables, refs., eqs. DLC --Twenty-one papers on the polar ionosphere arranged according to the 3 sections of the symposia, each section with an extensive discussion: I. Drifts in the ionosphere; II. Prognostic techniques of the ionosphere with special reference to Arctic regions; and III. Absorption. The opening speech by FRANK L. WATTENDORF, director of AGARD of NATO gives the history of the Advisory Group for Aeronautical Research and Development – conceived by TH. VON KARMAN – and of the symposium in Oslo on July 2-8, 1956, where polar-ionospheric and meteorological research would be discussed; followed by an introduction speech by the late H. U. SVERDRUP, who mentions his early interest in Arctic research, dating back to 1918 when he departed on the "Maud," and on the great changes in Arctic observation techniques since 1918-25 and, finally, on the difference in emphasis between Arctic and tropical meteorology – in one case radiation processes and inversions are foremost; in the other, the convective processes and condensation are more prominent. --M. R.

A-977 Pope, Joseph H., Diurnal variation in the occurrence of "Dawn chorus". Nature, London, 180( ):433, Aug. 31, 1957. figs., table, refs. DLC--Brief report on observations Jan. 1-July 2, 1956 using equipment sensitive to 1 - 10 kc/s. Dawn chorus was present in 224 of the 2,784 one min hourly observing periods, diurnal variation of which are shown in a histogram, featured graphically in local time occurrence as a function of geomagnetic latitude and compared with other localities in a table given. --W. N.

A-978 Power, Thomas S (U. S. A. F.), Air Force research and development in space technology. Aeronautical Engineering Review, N. Y., 16(9):36-39, Sept. 1957. port. DLC--Since airplanes (i. e., the Bell X-2) have now flown as high as 126,000 ft, they are effectively if not actually operating in "space," for 99% of the atmosphere lies below that level and many of the problems encountered are the same as if there were no atmosphere at all. Thus in any aviation system, knowledge of the environment (the atmosphere) at high altitudes is of vital concern. Solar radiation, air masses, the jet stream, ionosphere, cosmic rays, meteoric debris and their effects on planes, on rockets and communications and on each other are among the phenomena to be investigated intensively. Weather observation and forecasting, and human (biological) factors are no less important. --M. R.

A-979 Prenatt, Raymond E. (Aberdeen Proving Ground, Md.), Faraday rotation measurements at Fort Churchill. Journal of Geophysical Research, Wash., D. C., 64(9):1340-1341, Sept. 1959. 2 figs., eq. DLC.

A-980 Price, R. E., Travelling disturbances in the ionosphere. Nature, London, 172(4368):115-116, July 18, 1953. 2 figs., 2 refs. DWB--Observations at 3 points at Nedlands, Western Australia, on 5.8 Mc/s recorded motion of disturbances in reflecting layer. Direction of motion 90-180°E of N in summer and 0-60°E of N in winter with rapid change over at equinoxes. Speed 5-20 km/min with maximum at 10. No correlation with auroras or weather. --C. E. P. B.

A-981 Price, R. E. and Green, P. E., Jr., Measurement of ionospheric path-phase for oblique incidence. Nature, London, 179(4555):372-373, Feb. 16, 1957. 4 figs., 4 refs. DWB--Three techniques are described for direct measurement of changes of path-phase, involving transmission of short radiofrequency pulses having a highly stable carrier frequency. --C. E. P. B.

A-982 Probst, S. E. and Krause, George E., IBM 704 Program to determine maximum usable frequency (MUF) and lowest usable frequency (LUF) for HF propagation. U. S. Army Signal Radio Propagation Agency, Ft. Monmouth, N. J., Oct. 1959. Project 625.

A-983 Quinn, T. P., Coherent detection system for a rocket-borne ionospheric sounder. Pennsylvania. State Univ. Ionosphere Research Lab., Contract DA-35-061-ORD-577, Scientific Report, No. 113, Dec. 15, 1956. 63 p. 20 figs., 9 refs., eqs. DWB (M10. 536 P415i)--An experiment proposed by the Ionosphere Research Laboratory is discussed. The experiment is designed to measure electron densities in the ionosphere by means of rocket-borne instruments. The preliminary design for two rocket-borne coherent detection systems is presented. The detection system for a daytime experiment is capable of detecting an ionosphere probe signal when the signal to noise ratio is much less than unity. --Author's abstract.

A-984 Rangarajan, S. (Kodaikanal Obs., Kodaikanal, India), The sporadic E layer at Kodaikanal. Journal of Geophysical Research, 59(2):239-246, June 1954. 3 figs., 2 tables, 9 refs. MH-BH--An examination of the ionospheric records at Kodaikanal, which is located almost on the geomagnetic equator, reveals that the sporadic E layer here has some regular features not observed at other latitudes. It occurs in nearly 93% of the half-hourly records during the daytime. Two main types of Es are observed; namely, (1) the patchy type with a well-marked diurnal variation and (2) which occurs mostly during afternoons. It is found that neither meteoric activity nor thunderstorm activity has any appreciable influence on the formation of either of the two types of Es. No correlation is observed between Es and the geomagnetic field. --Author's abstract.

A-985 Rao, B. Ramachandra and Rao, E. Bhagiratha (Ionosphere Lab., Andhra Univ., Waltair), A continuous radio wave method of studying travelling disturbances in the ionosphere. Journal of Scientific and Industrial Research, New Delhi, Sec. A, 13(10):462-466, Oct. 1954. 2 figs., 2 tables, 7 refs. DLC --Different methods of determining ionospheric drift are reviewed, and the new method, which involves measurement of the time difference between passage of peculiar peaks on continuous ionospheric records, between one station and another nearby station with nearly the same frequency, described in detail and numerical examples cited and records presented by way of illustration. The stations cited are Calcutta, and Dacca, in 41 m band. Data for May and June 1953 show movements ranging from 7 to 21 km/min, over a distance of 120 km. Reasons for assuming the drift to lie in the F rather than the E layer are given. Movements are usually toward the south (N-wind) but one case shows opposite drift. --M. R.

A-986 Rao, B. Ramachandra and Murty, D. Satyanarayana (both, Andhra Univ., Waltair), A simple method of studying winds in the ionosphere by using continuous-wave radio. Nature, London, 177(4522):1222-1223, June 30, 1956. fig., 2 refs. DWB--Transmissions from Madras on 31 m reflected once from F2 region and received on 3 vertical aerials at Waltair were recorded on the same roll of paper. A typical record shows a displacement of 40-90 m/s from 150-230°E of N. --C. E. P. B.

A-987 Rao, B. Ramachandra; Rao, M. Srirama and Murty, D. Santyanarayana (all, Ionosphere Lab., Andhra Univ., Waltair), Investigation of winds in the ionosphere by spaced receiver method. Journal of Scientific and Industrial Research, Sec. A, New Delhi, 15(2):75-81, Feb. 1956. 4 figs., 13 refs., 6 eqs. DWB, DLC--

Details of equipment and results of soundings presented in text and illustrations (recorder records), polar diagrams showing seasonal variation of wind movements in the E and F region in winter from NE and summer (W in E layer, indefinite in F); wiring diagrams, etc. based on spaced receiver observations (MITRA, 1949), made at the Ionospheric Laboratory at Andhra Univ., Waltair, India, in 1954 using 3 receiving antennas and one pulse sender operating in the 2-6 Mc/sec range with a pulse width of 200 microseconds. --M. R.

A-988 Rao, B. Ramachandra and Rao E., Bhagiratha (both, Ionospheric Research Labs., Andhra Univ., Waltair, India), Horizontal ionospheric drifts in the F2 region at equatorial latitudes. Nature, London, 181(4623):1612-1613, June 7, 1958. fig., table, 5 refs. DWB--This review discusses the various ionospheric F2 region drifts which had been studied in detail at a number of high-altitude stations. Reference is made to Briggs and Spencer, Rep. Prog. Phys. 17, 245(1954); Martyn, D. F., Physics of the Ionosphere, 163 (1955); Purslow, B. W., Nature, 181, 35(1958); Mitra, S. N., Proc. Inst. Elect. Eng., Pt. 3, 96, 441 (1949); Rao, B. R., Rao, N. S., and Murty, D. S., J. Sci. Indust. Res., 15A 75(1956). A detailed account of the same investigation will be published in the near future. --N. N.

A-989 Rao, B. Ramachandra and Murty, D. Satyanarayana (both, Ionospheric Res. Lab., Andhra Univ., Visakhapatnam), A new continuous wave radio method for the study of ionospheric drifts. Journal of Scientific and Industrial Research, New Delhi, Sec. A, 17(12), Special Supplement, Dec. 1958. p. 63-67. 2 figs., 2 tables, 3 refs. DWB, DLC--A simplified method is described involving transmission from a distant sender received by three simple vertical aerials at the corners of a right angled triangle, signal strength being recorded side by side on a photographic paper. Sectional view is given. Comparison with other methods show that this method yields consistent reliable results. Another advantage is that choice of proper frequencies enables drift measurements at different ionospheric locations from the very same receiving center.

A-990 Rao, B. Ramachandra and Ramana, K. V. V. (both, Ionospheric Res. Lab., Andhra Univ., Visakhapatnam), Diurnal variation of ionospheric absorption on 5.65 Mc/s at Waltair during the IGY. Journal of Scientific and Industrial Research, New Delhi, Sec. A, 17(12), Special Supplement, Dec. 1958. p. 56-58. table, 9 refs., 6 eqs. DWB, DLC--The equations used to obtain the ionospheric absorption by calculating comparatively the amplitude of the echo received with the amplitude if the ionosphere were a perfect reflector are given. Procedure and equipment used during the period March - Aug. 1958 are described. Tabulated n values (cos x index) vary from 0.88 to 1.75, average 1.25 as against the theoretical 1.5. --W. N.

A-991 Rao, B. Ramachandra; Rao, E. Bhagiratha and Ramana Murthy, B. V. (all, Ionospheric Res. Lab. Andhra Univ., Waltair), Effect of magnetic activity on drifts of the F2 region. Nature, London, 183(4662):667-668, March 7, 1959. fig., 4 refs. DWB--Ionospheric drift observations made at Waltair (mag. lat. 9°30'N) over a period of 16 months during Feb. 1956 and May 1958, are analyzed. This preliminary report uses 466 observations in plotting a graph of the variations of the speed of drifts of the F2 region with geomagnetic index and obtains a mean straight line which indicates that there is a decrease of mean drift speed of the F2 region with increase of magnetic activity in the range of 0-6. --N. N.

A-992 Rao, B. Ramachandra and Rao, E. Bhagiratha (both, Ionospheric Lab. Andhra Univ., Waltair), Study of horizontal drifts in the F1 and F2 regions of the ionosphere at Waltair (17°43'N, 83°18'E, mag. lat. 9°30'N). Journal of Atmospheric and Terrestrial Physics, London, 14(1/2):94-106, April 1959. 5 figs., 4 tables, 11 refs. DLC--Results of the analysis of drift measurements made at Waltair for the F1 and F2 regions over a period of 2 years are presented in this paper. The main features of the diurnal and seasonal variation of drifts in F2 region are given in detail. The general pattern of drift movements for this low latitude station is found to be in phase opposition to those observed at high latitudes, thus confirming F2 region drift theory given by Martyn (1955). --Authors' abstract.

A-993 Rao, B. V. T. and Rao, M. K., Ionospheric absorption over Delhi. Institution of Telecommunication Engineers, Journal (India), 4(4):205-208, Sept. 1958. 5 figs., 5 refs.

A-994 Rao, M. Srirama and Rao, B. Ramachandra, Long-period fading in medium-wave radio signals. Nature, London, 176(4479): 459-460, Sept. 3, 1955. fig., table, 8 refs. DWB--Fading of transmissions on 1.42 Mc/s from Madras received at Waltair, 600 km distant, in May 1954 showed a period of 7 min, decreasing with time (7 h to 8 h). This agrees with calculations based on magneto-ionic theory. --C. E. P. B.

A-995 Rao, M. Srirama and Rao, B. Ramachandra, Analysis of fading records from four spaced receivers for ionospheric wind measurements. Journal of Atmospheric and Terrestrial Physics, 10(5/6):307-317, 1957. 4 figs., 4 tables, 6 refs., 3 eqs. DWB--This paper deals with the analysis of fading records from four spaced receivers of pulsed radio waves reflected at vertical incidence from the ionosphere, with a view to finding out the shape of lines of maxima and evolve a better method of calculating wind data. The usual three-station method of measurement of ionospheric winds using average displacements is found to give inaccurate results. It is shown that the method of calculating wind data using median values of displacements gives reliable results. A new and improved method of analyzing wind records for evaluation of true velocities and direction is also presented. --Authors' abstract.

A-996 Rao, M. N. and Mitra, A. P. (Radio Propagation Unit, New Delhi), Effect of vertical drifts on the nocturnal ionization of the lower ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 13(3/4):271-290, Feb. 1959. 14 figs., 2 tables, 18 refs., 12 eqs. DLC--Effect of vertical ionic drift velocities on the night-time ionization density in the lower ionosphere for heights ranging between 80 km to 130 km is studied by a method of successive approximation. Values are also given of the effective recombination coefficient as a function of height and time for these drift velocities. Velocities ranging from 1 to 20 km/hr are used. The resultant ionization profiles for velocities 1-5 km/hr represent magnetically quiet conditions, while those for higher velocities would represent disturbed conditions of increasing severity. It will be noted that the ionization density decreases for upward drift and increases for downward drift. The present work provides a quantitative explanation of the sudden cessation of night-time echoes of low-frequency radio waves at times of magnetic disturbances, such as those observed at the Pennsylvania State University (Lindquist, 1953). --Authors' abstract.

A-997 Rao, M. Srirama and Rao, B. Ramachandra (both, Ionospheric Res. Lab. Physics, Dept. Andhra Univ.), Investigation of magnetic-ionic fading in oblique incidence medium-wave transmissions. Journal of Atmospheric and Terrestrial Physics, N. Y., 12(4):293-305, 1958. 4 figs., 6 tables, 8 refs., 13 eqs. --Periodic fading of magneto-ionic origin observed in oblique incidence medium wave records is interpreted theoretically by calculating the phase paths by a graphical integration method assuming Chapman and parabolic ion distribution. Analytical expressions have also been derived for phase paths of both magneto-ionic components by an approximate method involving the use of an empirical formula for q-x curves. The theoretical values of fading periods compared very well with the experimental data, the agreement being particularly good for the case of Chapman distribution. --Authors' abstract.

A-998 Rastogi, R. G. (Nat'l. Res. Council, Ottawa, Canada), The diurnal development of the anomalous equatorial belt in the F2 region of the ionosphere. Journal of Geophysical Research, Wash., D. C., 64(7):727-732, July 1959. 4 figs., 26 refs. DLC--The latitudinal variation in the critical frequency of the F2 layer was studied for each hour of the day during the equinoctial months of a year at sunspot minimum. The middle latitude maxima first develop at low latitude and shift poleward with the progress of the day, the course being reversed in the evening hours. The double maxima in the diurnal variation of foF2 are less separated with increasing latitude and finally converge to a single maximum at a dip of about 25°. These two anomalies in foF2 are suggested as being due to the vertical drift of ionization, together with its motion towards the poles in the morning and towards the equator in the afternoon. Other anomalies of F2 can be also explained by a meridional transport of ionization. --Author's abstract.

A-999 Rastogi, R. G. (Nat'l. Res. Coun. Postdoctorate Fellow), Magnetic control on the variations of the critical frequency of the F2 layer of the ionosphere. Canadian Journal of Physics, Ottawa, 37(7):874-879, July 1959. 3 figs., 16 refs. DWB, DLC--The paper discusses the comparative influence of the true magnetic and smooth geomagnetic latitudes on the diurnal and latitudinal variations of the critical frequency of the F2 layer (foF2) at low latitudes. The diurnal variations of foF2 are shown to differ considerably at stations having the same geomagnetic latitude, but the discrepancies disappear when the true magnetic latitude is taken into consideration. The latitudinal variation of noon values of foF2 is also shown to present discrepancies for low latitude stations in the geomagnetic latitudes plot, but on true magnetic latitude plots the points fall regularly along a smooth curve. --Author's abstract.

A-1000 Ratcliffe, J. A., Diffraction from the ionosphere and the fading of radio waves. Nature, London, 162(4105):9-11. --A theory of fading is outlined which regards a "single" reflected wave as the sum of contributions from a large number of scattering centers in the reflecting region, moving with velocities distributed according to a Gaussian law. The resultant signal is found to be analogous to that produced when random noise is passed through a filter with a specified band-pass characteristic and the results of an analysis of this case are applied to the present problem. It is shown that the observed fading characteristics of radio waves on various frequencies from 4 Mc to 16 kc are in accord with the theory, the rms values of the scattering center velocity being of the same order of magnitude in each case. The theory accounts for the observed fact that the rate of fading is roughly proportional to the frequency of the wave and the distance of the transmitter.

A-1001 Ratcliffe, J. A. (Cavendish Lab., Cambridge, Univ.), A review of the research work being conducted at the Pennsylvania State College on the propagation of radio waves through the ionosphere. Pennsylvania. State College. Radio Propagation Laboratory. Contract AF 19(122)-44, Technical Report, No. 4, July 15, 1949. 7 p. DWB.

A-1002 Ratcliffe, J. A., The production of fading by an irregular ionosphere. U. S. Air Force Cambridge Research Center, Geophysical Research Papers, No. 7:166, Dec. 1950. DWB--Short abstract of a report on the conference of June 1949. Radio fading is produced by diffractive reflection from the ionosphere acting as a rough surface. --A. A.

A-1003 Ratcliffe, J. A. (Cambridge, Eng., Cavendish Lab.), The propagation of long and very-long waves. U. S. Air Force Cambridge Research Laboratories, Geophysical Research Papers, No. 7:17, Dec. 1950. DWB--A short abstract of the paper presented on the Conference on Ionospheric Research in June 1949. The daytime downcoming wave on 16 kpc is strong (summer reflection coefficient r = 0. 15) but on 100 kpc it is weak (r = 0. 01). --A. A.

A-1004 Ratcliffe, J. A., The analysis of fading records from spaced receivers. Journal of Atmospheric and Terrestrial Physics, 5(3):173-181, July 1954. 8 figs., 8 refs., 10 eqs. Also: Newstead, Gordon, The determination of the velocity of winds from spaced fading experiments. Ibid., 182-185. fig., 3 refs., 7 eqs. DWB--RATCLIFFE analyzes a record of travel of pulses, reflected at vertical incidence, along two arms of a rightangled triangle. The record shows considerable variability, the cause of which is discussed. It is shown that some but not all records of this type could be explained in terms of a constant wind and isotropically random amplitude pattern. NEWSTEAD further analyzes records of fading at 3 points and shows that under certain conditions it should be possible to deduce statistics of wind variation. --C. E. P. B.

A-1005 Ratcliffe, J. A. (Cavendish Lab., Cambridge), Microscopic mechanism for the absorption of radio waves in the ionosphere. (In: Beer, Arthur (ed.), Vistas in Astronomy. pub. London, 1955-1956. Vol. 2:791-798. 5 figs., 2 refs., 30 eqs.) DWB, DLC--The paper deals with the absorption which occurs when a radio wave passes through a medium containing free electrons which make collisions with heavy particles. It is shown that the absorption can be accounted for in terms of the impulses which the electrons radiate at each collision under the influence of the imposed wave. Although these impulses are randomly timed they correspond to a coherent wave of the required amplitude and phase. --Author's abstract.

A-1006 Ratcliffe, J. A., The formation of the ionospheric layers F-1 and F-2. Journal of Atmospheric and Terrestrial Physics, London, 8(4/5):260-269, May 1956. 4 figs., 2 tables, 6 refs., 22 eqs. DWB--Detailed investigations of the electron distribution in the F2 region have recently shown (RATCLIFFE et al., 1956) that the F2 layer could be formed by the ionizing agency which has its peak of electron production in the F1 layer, if the loss-coefficient varies with height in a certain way, explained in the paper referred to. The implications of a loss-coefficient varying in this way are examined in detail in the present paper, and it is shown that it would explain the known facts about the splitting of the F layer into separate F1 and F2 layers. The question of what determines the height of the F2 electron peak is also discussed. --Author's abstract.

A-1007 Ratcliffe, J. A., Movements in the ionosphere. Nature, London, 177(4503):307-308, Feb. 18, 1956. 3 refs. DWB--Account of Royal Astronomical Society discussion on Nov. 25, 1955. Drifts of electron irregularities show that phase of 12-hr rotating component in E region advances by 5°/km from 85-130 km and changes with seasons. Speed increases with height. Fading movements agree with meteor trail movements which are due to air motion. The cause of this is discussed. In F region large scale ripples and small scale irregularities travel with the same speed. Elongated (3 or 4:1) irregularities at 400 km which produce scintillation are discussed; their true drift is towards SW. Some suggestions as to cause were made. --C. E. P. B.

A-1008 Ratcliffe, J. A., The ionosphere. Nature, London, 179(4555): 339-340, Feb. 16, 1957. DWB--Radio exploration of the ionosphere is described. Critical frequencies of E and F1 layers agree with simple theory of production and recombination of electrons, but in F2 layer diffusion of electrons by large scale vertical movements is important. Changing patterns of reflected wave are attributed to moving irregularities caused by air movements in E layer, but not in F region. Variations of ionizing radiation from the sun, 'sudden ionospheric disturbances" and ionospheric storms are discussed. Part played by ionospheric scatter in short wave communication is described. --C. E. P. B.

A-1009 Ratcliffe, J. A. (Cavendish Lab., Univ. of Cambridge), The ionosphere. (In: Bates, D. R. (ed.), The Earth and its atmosphere. N. Y., Basic Books, 1957. p. 204-222. fig.) DLC--Discovery of the ionosphere, production of ionized layers, propagation of radio waves through ionized air, proof of existence of the ionosphere, ionospheric soundings, ionospheric observatories, h'(f) curves and critical frequencies, the E and F1 layers, the peculiar F2 layer, electric currents in the high atmosphere, horizontal movements of the ionosphere, solar effects (ionospheric storms and SID's), and world-wide ionospheric studies during IGY are discussed at some length in a popular style. --M. R.

A-1010 Ratcliffe, J. A. (Cavendish Lab., Cambridge Univ.), Information by radio from the satellites. Institution of Electrical Engineers, London, Journal, 4(47):603-608, Nov. 1959. 7 figs., table, 2 refs. DLC--This article is a condensed form of a lecture dealing with some exploratory results of ionospheric research as obtained by way of radio signals from orbitting satellites, especially the Sputnik 1. The propagation characteristics of the 20 and 40 Mc/s radio waves used permit deductions to be drawn with regard to orbital features, ionospheric electron content, density and distribution, influence of earth's magnetic field, etc. Results deduced from the Doppler effect and the Faraday effect are discussed and shown in graphs. --W. N.

A-1011 Ratcliffe, J. A.; Robbins, Audrey R, et al., Movements in the quiet E layer over Slough. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):21-26, Sept. 1959. 2 figs., 4 refs., 4 eqs. DLC--Electron density profiles have been deduced from h'(f) curves recorded at Slough once per hour on every day of each of six representative months. Allowance was made for the effects of the earth's magnetic field and the ionization below the F layer. The average behavior on magnetically quiet days is described and discussed, with particular reference to the possible magnitude and phase of vertical movements in the F region. --Authors' abstract.

A-1012 Ratcliffe, J. A. (Cavendish Lab., Cambridge), The highest parts of the ionosphere. Royal Meteorological Society, Quarterly Journal, 85(366):321-331, Oct. 1959. 12 figs. DWB, DLC --A paper describing the present ideas about the highest parts of the ionosphere, above about 150 km, and how views about these parts have developed in the past five years. Formerly, it was thought that the formation process of F2 layers was the same as that of E and F1 layers; a series of 'anomalies' and 'unknowns' connected with F2 layer has made the old explanation entirely unsatisfactory. Although no adequate explanation has yet been set forth, recently, the determinations of atmospheric and electronic densities by rockets and artificial satellites, and the calculations of electron density distributions from the h(f) curves indicate that a first order solution of the problem may not be long delayed. The way then also will be clear for a consideration of the anomalies in the F2 region, and of the fundamental changes noticeable in it during ionospheric storms. The discussion is extensively illustrated by graphical representations. --I. S.

A-1013 Ratcliffe, J. A. (Univ. of Cambridge), The magneto-ionic theory and its application to the ionosphere. London, Cambridge Univ. Press, 1959. 206 p. figs., tables, eqs., bibliog. p. 193-201. Price: 40 Sh. DLC (QC661.R33). Review in Royal Meteorological Society, Quarterly Journal, 85(365): 320, July 1959. Review by A. Scibor-Rylaki in Science Progress, London, 47(188):776-777, Oct. 1959. Review by G.H. Munro in Australian Journal of Science, Sydney, 22(4):176, Oct. 1959.--Account of the theories of radio wave propagation through the earth's ionosphere and through the ionized envelopes of radio stars, being concerned with the propagation of electromagnetic waves through a partially ionized gas in the presence of a magnetic field. The author is not content to follow a simple mathematical approach but searches for physical reasons for the behavior of the waves. Two approaches have been adopted: a macroscopic one in which the properties of the medium are averaged out and a microscopic one based on the motion of individual electrons. Ch. I treats the derivation of the equations, the microscopic approach, the physical reason for the characteristic waves and their dispersion, the absorption or the "macroscopic" theory and the microscopic picture of absorption. In Pt. II, the results are summarized in graphical form and simple rules demonstrated for computing curves of refractive index and absorption index as functions of electron density. Pt. III treats applications of the theory to the earth's ionosphere and mentions a wide range of phenomena capable of explanation in terms of the magneto-ionic theory of a homogeneous medium. Finally, the author discusses a number of relevant miscellaneous topics, including the relationship between the anisotropic behavior of the atmosphere and that of transparent crystals. A complete bibliography and an alphabetical index of subjects are included in this excellent work. --A. V.

A-1014 Ratcliffe, J. A. (Cavendish Lab., Cambridge Univ., England), Ionizations and drifts in the ionosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2102-2111, Dec. 1959. 9 figs., 7 refs., 15 eqs. DLC--Our knowledge of the vertical distribution, and the horizontal irregularities and movements, of electrons in the ionosphere is summarized. The mechanism by which electrons can be moved either by the movement of the surrounding air or by electric fields arising from charges elsewhere in the ionosphere is discussed. The statistical description of a randomly moving distribution function which is commonly used by investigators of the ionosphere is described. --Author's abstract.

A-1015 Rawer, Karl, Ausbreitungsvorhersage fur Kurzwellen mit Hilfe von Ionosphärenbeobachtungen. (Forecast of short wave propagation conditions through ionospheric observation.) Archiv der Elektrischen Übertragung, 5(4):154-167, April 1951. 14 figs., 40 refs., 18 eqs. DLC--Following a brief review of empirical methods for calculation of field intensity with respect to M.U.F., the development of the so-called "German method" is discussed. Geographic location, time of day and year, and sunspot cycle are factors treated separately. --W.N.

A-1016 Rawer, Karl; Bibl, Klaus and Argence, Emile, Sur la détermination des nombres de chocs des régions E et F de l'ionosphère. (On the determination of collision frequencies in the E and F regions of the ionosphere.) Académie de Sciences, Paris, Comptes-Rendus, 233(12):667-668, Sept. 17, 1951. refs., eqs. DWB--During Nov. 1949 - April 1950, and Feb. 1951, 32 nighttime observations were made of the F region at 4 frequencies. The number of echoes have been analyzed and coefficients established according to usual methods. The decrease in absorption and the effect of focalization have been considered in the calculations. A similar series has been obtained from noon data for five frequencies in the E region. The variation of absorption and the influence of absorption is calculated. --M.R.

A-1017 Rawer, Karl, Calculation of sky-wave field strength. Wireless Engineer, London, 29(350):287-301, Nov. 1952. 17 figs., 30 refs., 25 eqs. DLC--A method for the calculation of the field of the skywave, based upon the contributions of the different transmission paths, has been applied since 1940. It takes account of the effects of the lower ionospheric layers, such as absorption and cut-off, and of the geometrical optics of the reflecting layer. The trend of actual development in this field seems to be that former integral formulas are replaced by such differential methods. --Author's abstract.

A-1018 Rawer, Karl, Die Ionosphäre: ihre Bedeutung für Geophysik und Radioverkehr. (The ionosphere: its importance in geophysics and radio communication.) Groningen, P. Noordhoff, 1953. 179 p. 67 figs., 143 refs., 68 eqs. DLC--A complete text on the use of radio in ionospheric research. Ch. I takes up methods of observation by echoes, spectroscopic methods for aurora and airglow, magnetic, meteor and luminous night clouds, and soundings; Ch. II gives results of observations by echo methods, magnetic data, composition, pressure, density and temperature. Ch. III discusses theories of ionospheric stratification (origin and disappearance of ionization and explanation of different layers. Ch IV takes up normal and irregular changes of the ionosphere (D, E, F2, F, E2, G and Es and influence of magnetic storms, eclipses, polar summer and night, commencements). Ch. V discusses influence of ionosphere on propagation of radiowaves and forecasting propagation. --M. R.

A-1019 Rawer, Karl, L'effet de l'équateur magnétique sur l'ionisation de la couche Es. (Effect of the magnetic equator on the ionization of the sporadic E region.) Académie des Sciences, Paris, Comptes Rendus, 237(18):1102-1104, Nov. 2, 1953. 4 refs. DWB--The frequency of sporadic ionization at the magnetic equator only occurs with respect to the centers of "ionization clouds" and not for minimum ceiling. The effect only takes place during daytime. --Author's abstract (trans.).

A-1020 Rawer, Karl and Argence, Emile, Sur les phénomènes de focalisation dus à la houle ionosphérique et la détermination du nombre de chocs. (Focalization phenomena caused by ionospheric tides, and determination of the number of collisions.) Académie des Sciences, Paris, Comptes Rendus, 239(17):1066-1067, Oct. 27, 1954. 6 refs. DWB--Certain ionospheric phenomena (like a secondary echo having larger amplitude than the primary one) cannot be explained by the customary hypothesis of a plane stratified ionosphere. Such phenomena may be accounted for by the assumption of a wave motion of the reflecting surface. The author presents an equation for deriving ionospheric curvature from amplitudes of triple echoes. The new approach considerably affects various values deduced from ionospheric measurements. --G. T.

A-1021 Rawer, K. (Ionospheric Stat., of S. P. I. M., France, Neuershausen, Freiburg, Ger.), Some remarks concerning ionospheric absorption work. Journal of Geophysical Research, Wash., D. C., 60(4):534-535, Dec. 1955. fig. DLC--Monthly mean absorption decrements in E layer and daily values also, do not support assumption of a horizontally stratified plane ionosphere whose total absorption is characterized by an effective reflection coefficient. Focusing effects arising from curvature in the reflecting layer produce an apparent reflection coefficient greater than 1. Effect is only important in vicinity of focusing areas. Night F2 observations showed negative absorption decrement in 30% of cases. Even in daytime, 2 or 3 daily observations show important focusing. These areas are illustrated as being in the form of inverted ripples. --M. R.

A-1022 Rawer, Karl, L'intensité du rayon dit de Pedersen. (Intensity of the Pedersen beam.) Académie des Sciences, Paris, - Comptes Rendus, 243(11):797-798, Sept. 10, 1956. table. DLC--Ionospheric communication between two points may be established by two different beams, the one with the steeper angle of emission being called Pedersen beam. It is shown in this paper that (as generally known) the Pedersen beam usually has lower intensity than the regular beam. At certain frequencies, however (for example f $\lesssim$ 8.2 MHz) this intensity relation can be reversed, which is attributed to a selective absorption effect. --G.T.

A-1023 Rawer, K., Focusing on a "rippled" ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 8(4/5):296, May 1956. 4 refs., eq. DWB--Gives revised formulas for spherical "ripples" showing values of H/r for which focusing exists. --C.E.P.B.

A-1024 Rawer, K. and Suchy, K., Äquivalenztheoreme bei der Wellenabsorption im Plasma. (Equivalence theorem in wave absorption by plasma.) Annalen der Physik, Ser. 7, 1(4/5):255-260, 1958. 7 refs., 23 eqs. --Two calculations, one based on wave theory and one on radiation theory, show that (disregarding the geomagnetic field) Martyn's theory of ionospheric absorption is valid only if the attenuation is mostly due to collision and proportional to collision frequency. --Trans. of Authors' abstract.

A-1025 Rawer, K. (Ionosphere Inst. Rhein, Germany), Correlation of Es characteristics in time and space. AGARDograph, Paris, No. 34:67-80, Sept. 1958. 11 figs., 10 refs. DWB (629.1323 N864a)--The main parameters used to characterize an Es layer are now precisely enough defined as foEs and fbEs. Nevertheless the values of these parameters are not representative, since heavy fluctuations appear quite often. A better description can be given when the correlation functions in space and time are determined. This has been done provisionally; a correlation distance of about 200 km, and a correlation time of about 1 h for foEs and ½ h for fbEs has been found. --Author's abstract.

A-1026 Rawer, Karl, The ionosphere: its significance for geophysics and radio communications. Trans. by Ludwig Katz. N. Y., Frederick Ungar, 1957. 202 p. 72 figs., bibliog. p. 191-198, 68 eqs. DWB (M10.535 R257io). Review by E. V. Appleton in Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):223, 1958. Review in Institution of Electrical Engineers, Journal, 4(44):463, Aug. 1958. Review by T. W. Bennington in Nature, 182(4643):1116, Oct. 25, 1958.

A translation of the 1953 German text covering methods of observation of the ionosphere (radio, spectroscopic, geomagnetic, meteor and noctilucent clouds); results of echo soundings and geomagnetic observations, (composition of air, excitation, pressure and density, temp., ionization); theory of layer formation, de-ionization, etc.), regular and irregular changes and the influence of the ionosphere on propagation and prediction of propagation conditions.

A-1027 Rawer, K., Hauteur et épaissaur de la couche ionosphérique E. (Height and thickness of the ionospheric E layer.) Annales de Géophysique, Paris, 15(4):547-550, Oct./Dec. 1959. 3 figs., 5 refs. DLC--A method is presented concerning the transformation of the "virtual heights" of ionograms into true heights for the E region, by resolving the integral equation which determines the electron density distribution as a function of height. This transformation makes it possible to study the height variations of the ionosphere. It is shown that the vertical motions in the F region may be continued in the E region. The daily variation of the maximum ionization appears clearly. The thickness of the layer decreases with the decrease of the solar zenith distance. The minimum virtual height increases in the morning and evening; on the contrary the true height of the lower boundary of the E layer seems to be rather little variable during the day. The author concludes that the variations of ionization may not be expressed by means of a simple continuity equation if the exchange effects in the E region are not taken into account.--A. V.

A-1028 Reber, Grote (Wailuku, Maui, Territory of Hawaii), Spread F over Hawaii. Journal of Geophysical Research, 59(2):257-265, June 1954. 5 figs. MH-BH--The random variations of intensity of signals from point sources caused by the ionosphere greatly affect studies of cosmic static. One cause of these fluctuations is the condition known as spread F, which indicates the presence of diffuse and irregular echoes from the F region of the ionosphere. Analyses of spread F over Hawaii were completed for the period 1944-1953. The diurnal and seasonal properties are discussed, and a conclusion is reached regarding latitude and longitude effects. Some properties of scintillations at decameter waves are described. --Author's abstract.

A-1029 Reddy, C. A.; Rao, B. Ramachandra and Rao, M. S., Magneto-ionic fading in pulsed radio waves reflected at vertical incidence from the ionosphere. Institution of Radio Engineers, Journal, 18(11):669-675, Nov. 1958. 2 figs., 4 tables, 5 refs.

A-1030 Rees, M. H. (Univ. Alaska, College, Alaska) and Rense, Wm. A. (Univ. Colo., Boulder, Colo.), Note on the cause of ionization in the F region. Journal of Geophysical Research, Wash., D. C., 64(9):1251-1255, Sept. 1959. 2 tables, 15 refs., 7 eqs. DLC--Recent rocket data on the intensity of the solar 303.8 A HeII line at the 140 km and 212 km level of the upper atmosphere are utilized to investigate the possibility that this radiation may be largely responsible for the heating and ionization effects in the F region. Electron densities at 140 km and at 212 km are computed on the basis that the 303.8 A photons ionize oxygen atoms. The computed results compare favorably with observed values of electron densities measured at these heights on ionograms taken at the same time as the rocket flight which yielded the 303.8 A intensity data. --Authors' abstract.

A-1031 Reid, G. C. and Collins, C. (both, Defence Res. Board, Ottawa, Canada), Observations of abnormal VHF radio wave absorption at medium high latitudes. Journal of Atmospheric and Terrestrial Physics, London, 14(1/2):63-81, April 1959. 7 figs., table, 23 refs., eq. DLC--A study of cosmic noise absorption at a frequency of 30 Mc/s at Ottawa and Churchill has revealed the existence of two apparently distinct types of abnormal absorption event. One of these is predominantly a night-time phenomenon and is closely associated with auroral and geomagnetic disturbance. It is suggested that this absorption may be caused by an increase in electron collisional frequency at E region heights rather than by a large increase in electron density at lower levels. The second type of absorption is confined to the auroral zone and is predominantly a daytime phenomenon, recurring for several days after a large solar flare. Evidence is presented to show that this absorption is due to an increase in ionization at very low levels in the ionosphere. The cosmic noise measurements are supported by evidence from a number of VHF forward-scatter circuits in Canada, and this is used to obtain information about the geographical extent and frequency of occurrence of these abnormal absorption events. --Authors' abstract.

A-1032 Renau, J. (Cornell Univ., Ithaca, New York), A theory of spread F based on a scattering-screen model. Journal of Geophysical Research, Wash., D. C., 64(8):971-977, Aug. 1959. 8 figs., 10 refs., 4 eqs. DLC--To shed some light on the phenomenon of spread F, a thin scattering screen is postulated above the E region. The virtual height which is associated with a pulse radiated from the sounder, forward scattered by the screen and then reflected back to the sounder via the F region, is calculated. For frequencies appreciably larger than the penetration frequency, the minimum virtual height versus the operating frequency, on a linear scale, is a straight line, the slope of which depends on the height of the screen. As the height of the screen increases, the slope decreases. When the scattering screen is assumed at the level of reflection, the slope of the line coincides with the tangent from the origin to the regular vertical-incidence trace. Experimental ionograms are presented that fit with the suggested mechanism. --Author's abstract.

A-1033 Revellio, Karl, Die atmosphärischen Störungen und ihre Anwendung zur Untersuchung der unteren Ionosphäre. (Atmospheric disturbances and their application in the study of the lower ionosphere.) Weissenau, Germany, Max Planck-Institut fur Physik der Stratosphare, Mitteilungen, No. 6, 1956. 54 p. 82 figs., 46 refs., eqs. German summary p. 1. DWB (10.53 W433m)--Atmospheric disturbances (atmospherics) may provide information on the state of the lower ionosphere in different ways. Their form makes it possible to determine the height of reflection and distance of the center by considering the multiple reflections from the ionosphere and the ground. The decrease in pulse amplitude with the number of reflections is an indication of reflection coefficients and electron densities. The variety of pulse forms makes it difficult to interpret such forms, but all wave forms can be reduced to a reflection model. The rate of occurrence of disturbances is strongly dependent on frequency, time of day and season. Phenomena at sunrise were clarified by comparison with field strengths of signals received from a sender. They give indications of the UV-absorbing region at the upper limit of the ozone layer. During the solar eclipse of June 30, 1954 an increase in the number of atmospherics was observed and from this fact a decrease of attenuation in the lower ionosphere was deduced. --Transl. of author's abstract.

A-1034 Revirieux, P. and Lejay, P., On the localization of the sporadic E-ionized region of the upper atmosphere. Academie de Sciences, Paris, Comptes Rendus, 227, 79, 1948. --In June, 1948, good 2-way low-power communication at frequencies near 60 Mc was maintained for several hours between amateur stations near Paris and others in (a) Czechoslovakia (June 27), (b) South Norway (June 28), (c) South Sweden (June 29). Such long distance communication could not be established with any other stations during the periods concerned. On June 7 long-distance communication in the 60 Mc band could only be established with Algeria. These results indicate the existence of sharply localized ionization zones which move slowly and are situated roughly midway between Paris and the places with which radio contact on these frequencies is possible. Movement of such an ionization zone was noted on June 4 between

1630 and 2000 G.M.T., when communication was carried out successively between Paris and (a) northern countries, particularly Sweden, (b) Denmark, (c) Czechoslovakia, (d) Switzerland and Italy, (e) French stations near the Mediterranean, (f) Algeria. Lejay stated that particularly strong sporadic E was recorded at Bagneux in two periods which coincide precisely with those noted above. The sporadic E upper frequency limits, on the afternoon of June 4 and the morning of June 5, exceeded the highest frequency (13 Mc) available for the Bagneux transmitter. Between June 24 and 29, the upper limits were not so high, but many multiple echoes were noted, particularly on June 26 and 27. The amateur observations supply valuable information as to the situation and extent of a phenomenon whose cause is at present uncertain; such information is not given by vertical soundings of the ionosphere.

A-1035 Rice, P. L. and Daniel, F. T., Radio transmission loss versus distance and antenna height at 100 Mc. U. S. National Bureau of Standards, NBS Report, No. 3520, Jan. 1, 1955. Supplement 8. 25 p. 11 figs., tables, 7 refs., 4 eqs. DWB --This report describes curves of transmission loss versus distance and antenna height derived from an analysis of approximately 159,000 hourly median field strength observations between 90 and 110 Mc. These observations extend over a period of several years and are distributed geographically over the whole U. S. The curves contained in this report are believed to be more precise for engineering use than the FCC Ad Hoc Committee curves published in 1949, the only curves of this character generally available up to now. --Authors' abstract.

A-1036 Richter, K. H., Ergebnisse aus Radar-Höhenwindmessungen in Hannover-Langenhagen. (Results of radar upper wind measurements in Hanover-Langenhagen.) Germany. Deutscher Wetterdienst in der US-Zone, Berichte, No. 42:331-338, 1952. 7 figs., 4 tables, 7 refs. DWB--Mean scalar and vector wind velocities at levels ground to 80 mb tabulated monthly June 1948-May 1949 are discussed in detail. Steadiness computed. Diurnal variation of scalar velocity (winter, summer, year) shown by isopleths (maximum around 300 mb, 2 h in winter, 10 h in summer and year.)--C. E. P. B.

A-1037 Riggs, L. P. and Bean, B. R., Radio meteorological data available as of April 1, 1958. U. S. National Bureau of Standards, NBS Report, 5565, April 7, 1958. 18 p. tables. DWB (621.384 U585ra)--The past few years have seen a rapid increase in the amount of research on the utilization of standard weather observations for radio propagation studies, with occasional unnecessary duplication of effort or noncompatibility of basic parameters. An effort was made to remedy this situation at the First Meeting on Radio Climatology held at the Central Radio Propagation Laboratory on Jan. 15, 1958. One of the important conclusions of this meeting was that CRPL should act as a clearing house and maintain a listing of data obtainable from various laboratories. The present report is the first such listing of these data. --Authors' abstract.

A-1038 Rastogi, R. G. (Physical Res. Lab., Ahmedabad, India), A study of the noon critical frequencies of the E and F1 layers of the ionosphere. Geofisica Pura e Applicata, Milan, 40:145-156, 1958. 15 figs., table, refs. DWB--The mean monthly noon critical frequencies of the E and F1 layers of the ionosphere at a number of stations in different latitudes and their variation with sunspot number have been studied. It was found that while the E layer approximates a Chapman region, the F1 layer is markedly affected by other agencies, somewhat similar to F2. In high sunspot years, foF1 shows two maxima at middle latitudes with a minimum at the equator. --Author's summary.

A-1039 Rivault, R. (Faculte des Sci., Poitiers), Caractéristiques des sifflements observés au cours d'une année. (Characteristics of whistlers observed in the course of one year.) L'Onde Electrique, Paris, 37(362):539-540, May 1957. fig. DLC--Frequency and wave-form characteristics of whistlers were recorded at Poitiers, France. Two types were identified: those of short duration (connected with thunderstorm activity in the Southern Hemisphere) and those of longer duration (preceded by an atmospheric of a particular type associated with lightning in the Northern Hemisphere). Wave forms of long whistlers would indicate that they are closely connected with the mechanism of formation of the sferics which precede them. --G. T.

A-1040 Rivault, R., Perturbations radioélectriques d'origine terrestre (Commission IV, XII^ème^ Assemblée Générale de l'Union Radio Scientifique Internationale). (Radioelectric disturbances of terrestrial origin: (Report of) Commission IV, XIIth General Assembly of the International Scientific Radio Union.) L'Onde Electrique, Paris, 38(376):527-532, July 1958. 62 refs. DLC--Report on the results and researches presented by mem bers of Commission IV at the XIIth General Assembly of the International Scientific-radio Union. The development mentioned three years ago is now confirmed by the abundance of new results in connection with whistlers and natural low-frequency emissions. Thanks to these phenomena, one can already explore the exosphere which will, in the near future, be sounded as one now sounds the ionosphere. The author summarizes the results obtained in research on parameters modifying the shapes of atmospherics, when studying lightning and whistlers and low-frequency transmissions. He finally explains the researches made in connection with statistical and goniometrical recording of atmospherics, and also those regarding the meteorological aspects of atmospheric observations. --A. V.

A-1041 Roberts, C. R.; Kirchner, P. H. and Bray, D. W., Radio reflections from satellite-produced ionization. Institute of Radio Engineers, Proceedings, 47(6):1156-1157, June 1959.

A-1042 Robbins, Audrey R. and Thomas, J. O. (both, Cavendish Lab., Cambridge), The disturbed F layer over Slough. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):102-107, Sept. 1959. 6 figs., 8 refs. DLC--Electron density profiles for magnetically disturbed days have been compared with those for quiet days. The effect of disturbance on the height of the peak of the F2 layer (h_mF2), on the maximum electron density (N_m) and the total electron content below the F2 layer peak (n_T) is discussed. It is emphasized that the quantity h'F2 frequently used in the past in describing the effect of disturbance is without physical significance, and can be seriously misleading. Evidence is presented to show that appreciable changes sometimes occur in the ionosphere near the time of a magnetic sudden impulse. --Authors' abstract.

A-1043 Rogers, G. L., A new method of analysing ionospheric movement records. Nature, London, 177(4509):613-614, March 31, 1956. 2 figs., 10 refs., 2 eqs. DWB--A process is described for scaling down a radio wave pattern for optical examination. It is suitable for investigating a smooth reflecting ionosphere with small imperfections moving across or below it. The method was tested in Wellington, N. Z. It shows that objects far below the ionosphere can make significant contributions to ionospheric movement records. --C. E. P. B.

A-1044 Rogers, G. L., Diffraction microscopy and the ionosphere. Journal of Atmospheric and Terrestrial Physics, 10(5/6):332-337, 1957. fig., table, 11 refs. DWB--The application of diffraction microscopy to Mitra records is considered. It is shown that its application to existing records might result in some slight improvement, probably scarcely justifying the effort. If, however, tests should show that the combination would work with aerial spacings of 3-10 λ, the advantages of the combined method would be substantial. An important practical limitation on any type of Mitra method is the complexity of the record normally obtained, and it may prove impossible to analyze adequately any but the simplest of them by any technique. The question of future development is briefly touched on. --Author's abstract.

A-1045 Romell, Dag, Influence du déplacement vertical des couches ionisées sur la fréquence des ondes radioélectriques. (Influence of vertical displacement of the ionized layers on the frequency of radio-electric waves.) Académie des Sciences, Paris, Comptes Rendus, 226(12):1007, March 22, 1948. DLC, DWB--Theory that the ionized layers themselves, not the ionized gas, moves rapidly in a vertical sense. Possible effect of winds in the high atmosphere. (Doppler effect).

A-1046 Ross, W. and Bramley, E. H., Tilts in the ionosphere. Nature, London, 164(4165):355, 1949. --Simultaneous observations were made with two direction finders 10 km apart, on signals from a transmitter 700 km further north. Bearings taken during the day on hf signals reflected from the F region show fluctuations of a few degrees from the true great-circle bearing. These fluctuations have a period of 10 to 30 min, and are attributed to a tilting or wrinkling of the reflecting layer. The fluctuations were similar at both receiving stations, showing that a tilt of about 4° from the horizontal was substantially uniform over a distance of 5 km.

A-1047 Ross, W. J., Ionospheric investigation from satellite radio observations, Pt. 1, Doppler effect recording instrumentation. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 120, June 30, 1959. 81 p. 24 figs., eqs., 14 refs. DWB (M10. 535 P415i) --A brief survey is made of the main features of satellite transmitters and of the ionospheric propagation effects produced in the radio waves from them. From these considerations the desirable properties of the transmitter are summarized and the necessary properties of the receiving apparatus are inferred. Detailed descriptions of the various units of the receiving instrumentation are then given, followed by the presentation of a sample record analyzed to yield electron content of the ionosphere. --Author's abstract.

A-1048 Row, Ann L., Upper winds over Auckland. New Zealand. Meteorological Service, Circular Note, No. 78, 1952. 1 p + 5 tables. GB-MO--Seven years of radar wind observations at Auckland are used to derive monthly means, resultant winds and the seasonal frequency distribution for 10, 000, 18, 000, 30, 000 and 40, 000 ft levels. --G. J. E.

A-1049 Roy, R. and Verma, J. K. D. (Inst. of Nuclear Physics, Calcutta), Irregularities in the ionosphere. Journal of Geophysical Research, 58(4):473-485, Dec. 1953. fig., 12 plates, refs. DLC--Electron clouds, both in the E and F regions of the ionosphere have been detected at vertical incidence by means of a high-precision ionosphere sounding equipment. The clouds give rise to scattered echoes, which are delineated on an expanded sweep as individual pips, resolved out from the normal echoes. An estimate of the received power by back-scattering, made on the basis of the theory of tropospheric radio scattering by BOOKER and GORDON, shows that it is far in excess of the receiver noise power. Some of the records indicate that sometimes at night the normal layer structure of the ionosphere ceases to hold; the ionospheric regions then contain only electron clouds at different heights. The scattered echoes generally appear for a very short duration. The short persistence (1 to 2 minutes) of these echoes has been explained by considering the drift of the clouds by the upper air winds. --Authors' abstract.

A-1050 Roy, R. and Verma, J. K. D. (Inst. Nuclear Physics, Calcutta, India), Polarization of electromagnetic waves for vertical propagation in the ionosphere. Journal of Geophysical Research, Wash., D. C., 60(4):457-482, Dec. 1955. 17 figs., 3 plates (photos), numerous eqs. 19 refs. DLC--A theoretical study of the variation of the state of polarization of a vertically incident electromagnetic wave while in propagation in the ionosphere has been made on the basis of an approximate solution of the wave equations obtained by Saha, Banerjee, and Guha. It has been shown that the major axes of the polarization ellipses of both the ordinary and the extraordinary waves would lie in the N-E quadrant in the Northern Hemisphere and in the N-W quadrant in the Southern Hemisphere. A new method has been outlined for the determination of the electron density and the collision frequency in the ionized layers from the value of the tilt-angle and the ratio of axes of the elliptic patterns. An analysis of the characteristics of the experimentally observed polarization patterns indicates that in E layer the value of $\underline{v}$ is 1.7×10^6 per second. They further show that the polarization of the downcoming waves corresponds to their respective reflection levels, rather than a limiting region below the E layer. --Authors' abstract.

A-1051 Rudloff, D., Ionosphärensturm und Wetterfunkdienst am 4. September 1958. (Ionospheric storm and weather broadcasting Service on September 4, 1958.) Wetterlotse, Hamburg, No. 136:221-223, Sept. 1958. DWB--Ship observations of the phenomena which for hours silenced radio transmission over a large area, is discussed briefly.--W. N.

A-1052 Rumi, G. C. (Geophysical Inst., College, Alaska), VHF radar echoes associated with atmospheric phenomena. Journal of Geophysical Research, Wash., D. C., 62(4):547-564, Dec. 1957. 3 figs., (11 photos), 34 refs., 3 eqs. DLC--VHF radar observations during the summer and the fall of 1955 at Ithaca, N. Y., gave useful information not only about lightning, meteors, and aurora, but also about the possible existence and characteristics of "upward discharges" from the top of the troposphere to the bottom of the ionosphere. A radar operated at 27.85 Mc/sec was used. A feature was the photographing from magnetic tape records that were played back to reproduce the original oscilloscope presentation. This technique proved to be useful in permitting more detailed analysis than had previously been possible. Photographs are presented that show examples of echoes (in an amplitude-vs-time display) that we have attempted to associate with "upward discharges." (Photographs of a simple meteor echo and of a meteor echo embedded in an auroral echo are also included.) Detailed analysis led us to dissociate many of our echoes from meteors. Their rise and decay speeds, their duration, their flatness, their ranges of appearance, and the observed repetitions suggested that "upward discharges" from troposphere to ionosphere could have been responsible for the reflection of radio waves. Nevertheless meteors cannot be ruled out of a complete picture of the phenomenon. Meteors may play a role in the generation of "upward discharges" as triggering agent. --Author's abstract.

A-1053 Rumsey, N. J. (Dominion Physical Lab., Lower Hutt, New Zealand), Curvature-induced error in the analysis of fading records. Journal of Atmospheric and Terrestrial Physics, London, 11(3/4):255-258, 1957. 2 figs., 10 refs., eqs. DLC --Curvature of lines of maximum amplitude in a radio field-strength pattern drifting across an array of three receivers can introduce an error into the estimate of the drift velocity, but the error is expected to be large only infrequently. The mean error is smaller for an array of receivers at the corners of an equilateral triangle than for one at the corners of a right-angled triangle. --Author's abstract.

A-1054 Rydbeck, Olof E. H., A theoretical survey of the possibilities of determining the distribution of the free electrons in the upper atmosphere. Trans. Chalmers Univ. of Technol, Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 3, 1942.

A-1055 Rydbeck, Olof E. H., On the propagation of radio waves. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 34, 1944. 168 p. 47 figs., 5 tables, 26 refs., 274 eqs. DLC--A theoretical study of transmission properties of the parabolic layer (also as seen from the ionosphere) throughout long, medium and short wave ranges. An expansion of wave functions enables accurate investigation of L. T. Eckersburg's phase integral method. --W. N.

A-1056 Rydbeck, Olof E. H., A simple Kerr modulator for ionospheric recording. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 44, 1945.

A-1057 Rydbeck, Olof E. H., On the spherical and spheroidal wave functions. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 43, 1945.

A-1058 Rydbeck, Olof E. H., The theory of the traveling wave tube. Göteborg, Sweden. Chalmers Tekniska Högskola, (Report from the Research Lab. of Electronics) 1947.

A-1059 Rydbeck, Olof E. H., On the propagation of waves in an inhomogeneous medium, I. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 74, 1948.

A-1060 Rydbeck, O. E. H. (Chalmers Univ. of Technology, Gothenburg, Sweden), Magnetic ionic triple splitting. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 182-201. 16 figs., 6 refs., 9 eqs., p. 200-201. DWB--A fundamental paper giving a summary of the theory and results of detailed investigations of the mechanism of excitation of the E and F layer triple splits (third mode or Z-trace) which appear on ionospheric records. The data are taken from records made at the Kiruna Ionospheric and Radio Wave Propagation Observatory at 67°50'N and 20°14'E. Graphs show variation of critical collisional frequency with geomagnetic latitude and illustrative recorder records of triple splits. It is not necessary to assume any sudden change in electron density with height to explain the phenomenon. A more detailed report is given by the author in 1950 paper. --M. R.

A-1061 Rydbeck, Olof E. H., Forsgren, Sven K. H., On the theory of electron wave tubes. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 102, 1951.

A-1062 Rydbeck, Olof E. H., The theory of magneto ionic triple splitting. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 101, 1951.

A-1063 Ryle, M. and Hewish, A., The effects of the terrestrial ionosphere on the radio waves from discrete sources in the galaxy. Royal Astronomical Society, Monthly Notes, 110(4):381-394, 1950. --The existence of irregular refraction processes in the ionosphere causing rapid fluctuations in the intensity of the radiation at the ground have been observed. Using antennas of high resolving power showed that the apparent position of a source may vary irregularly by 2 or 3 minutes of arc. The incidence of these irregularities shows a marked diurnal variation; maximum at about 01 h 00m local time. Accounting for the irregularities in the ionosphere an alternative mechanism based on the interception of interstellar matter moving under the gravitational attraction of the sun, rather than solar emission is suggested and may contribute toward closer information of accretion of matter by the sun. --From authors' abstract.

A-1064 Sacco, L., La distribuzione statistica della intensita dei segnali radio propogati nella troposfera e nella ionosfera. (The statistical distribution of field strength of radio signals propagated in the troposphere and the ionosphere.) Poste e Telecommunicazioni, Rome, 22(2):55-72, Feb. 1954. 4 figs., 21 refs., 56 eqs. DLC--An examination is made of the types of distribution in time which best represent the fluctuations of radio signals traversing the troposphere and the ionosphere. The distributions considered are (a) normal, (b) log normal, (c) fluctuations due to interference (Rayleigh distribution), and (d) fluctuations due to polarization variations. Gamma and phase distribution are discussed and the concept of correlation is introduced. --I. R. E., Proceedings, No. 3020, Nov. 1954.

A-1065 Sachdev, D. K. (Radio Propagation Unit, Natl. Physical Lab., New Delhi), Study of the atmospheric radio noise at 27 and 100 kc/s at Delhi. Journal of Scientific and Industrial Research, Sec. A, 17(7):262-270, July 1958. 12 figs., table, 8 refs., 2 eqs. DLC--A preliminary report of the observations on VLF atmospheric radio noise being carried out by the Radio Propagation Unit, National Physical Laboratory of India, New Delhi (28.5°N, 77°E) is presented. Measurements are currently made at two frequencies, namely 27 kc/s and 100 kc/s. Diurnal and seasonal variations of the radio noise indicate appreciable ionospheric attenuation during day-time, and a summer afternoon maximum, possibly associated with local thunderstorms. Noise intensity falls rapidly during the early morning hours, the 'sunrise time' differing greatly from one day to another. The sunrise fall is sharper at 100 kc/s than at 27 kc/s. Long period (2 hr) fading is observed on certain nights, and is believed to be associated with disturbed conditions in the ionosphere. Particular attention has been given to the study of sudden enhancement of atmospherics (S. E. A.) for which the observations were initially undertaken. It is found that enhancement is observed at both frequencies at the time of a solar flare; the effect at 27 kc/s is normally larger and earlier than at 100 kc/s. However, there is no one-to-one correspondence between the S. E. A. and the solar flare. Further, cases have been observed when the S. E. A. at 100 kc/s is found to be larger than at 27 kc/s. From the present observations it is suggested that transition from enhancement to fadeout occurs somewhat beyond 100 kc/s. --Author's abstract.

A-1066 Saha, A. K. and Ray, S., Some features of the E2 layer observed at the ionosphere field station, Haringhata, Calcutta. Journal of Atmospheric and Terrestrial Physics, 7(1/2):107-108, Aug. 1955. 3 figs., 2 refs. DWB--The automatic ionospheric recorder normally shows a thick extensive E2 layer in daytime. It usually originates at F1 level at or after 13 h LMT and descends to merge with E1 layer. --C. E. P. B.

A-1067 Saha, M. N.; Banerjea, B. K. and Guha, U. C., Vertical propagation of electromagnetic waves in the ionosphere. National Institute of Sciences of India, Proceedings, 17(3): 205-226, May/June 1951. 8 figs., 3 tables, 11 refs., 3 eqs. DWB--A theoretical and detailed discussion of various equations for the vertical propagation of radio waves in the ionosphere, with stress on the nature of the modification at high latitudes. The coupling term Φ and the polarization quantities P_1 and P_2 are discussed in minute detail whereas the two refractive indices q_e and q_o are not discussed as they were previously treated in detail by other workers. It is shown that Φ can be neglected anywhere, except very close to the geomagnetic poles, so far as F layer propagation is concerned, but E layer propagation is more complicated. As an exact treatment of the differential equation is yet to be made, the nature of the modification of propagation as a function of Φ on the triple splitting cannot be definitely stated. --W. N.

A-1068 Sales, G. S., A summarization of turbulence and ionospheric "wind" measurement theories with application of the latter to preliminary data at 75 kc/s. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report No. 88, Aug. 1, 1956. 133 p. 37 figs., 5 tables, 37 refs., numerous eqs. --The initial problem presented in this report is a study of the modern theories of turbulence and their application. Besides the historical introduction, which is the first section, the work is divided into three main parts. The classical and statistical theories of turbulence are discussed in the first two sections and their applications in the third. The application of most interest here is the study of ionospheric "wind" motions. This problem is gone into in some detail with a summary of the experimental and analysis work necessary for obtaining the desired information. The main purpose for studying ionospheric "winds" is to achieve an understanding of the dynamics of the ionosphere and provide information as to the daily variation of "winds". --Author's abstract.

A-1069 Sandoz, O. A.; Stevens, E. E. and Warren, E. S., Development of radio traffic frequency prediction techniques for use at high latitudes. Institute of Radio Engineers, Proceedings, 47(5):681-688, May 1959. 5 figs., 60 refs.

A-1070 Sao, Kazuo and Maeda, Tsuyako, Special daytime waveform and the distance from its origin. Nagoya, Japan. Univ. Research Institute of Atmospherics, Proceedings, 3:110-112, Nov. 1955. 4 figs., table. DWB--Data on some four dozen sferics recorded at the Research Institute of Atmospherics from June 17 to June 22, 1955 are tabulated. The sferics selected consist of a characteristic oscillation with two well-defined peaks. It is assumed that the first pulse corresponds to the ground wave and the second to the doubly reflected sky wave. Supposing the height of the reflecting D layer to be 65 km, the simple reflection theory is found to agree with the observed wave forms. --G. T.

A-1071 Sao, Kazuo and Shiga, Tamenari, Some considerations of the waveform of atmospherics due to ionospheric reflection. Nagoya, Japan. Univ. Research Institute of Atmospherics, Proceedings, 3:47-53, Nov. 1955. 13 figs., 2 tables, eq. DWB --By assuming that the source of atmospherics is a single rectangular pulse, that the reflecting layer is a finite conductor sharply bounded at a height of 80 km, and that the earth is a perfect conductor, the authors show by numerical computation how a pulse is transformed into a rather smooth half-wave, and how the calculated wave form is consistent with that observed in practice. Ground wave and the earth's magnetism are neglected in order to simplify the calculations. --From authors' abstract.

A-1072 Sao, Kazuo, Echo type waveforms which appear to exhibit the effect of reflections from two layers in E region. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 4:86-89, Dec. 1956. 13 figs. DWB--Nice illustrations are presented for a special type of nighttime sferics wave form recorded in June 1955 and March 1956. In each case, 2 distinct series of peaks or pulses are discernible – each representing a reflection between earth and ionosphere by a different mode of 545 wave forms studied, 186 or 16% were of this type. It is concluded that peaks represent reflection from a height of 75 and 80 km (HORNER suggests 77 and 85 km). Distances are also computed. --M. R.

A-1073 Sao, Kazuo, Researches in the frequency analyses of wave-forms of atmospherics, Pt. 1. Nagoya. Univ. Research Institute of Atmospherics, Proceedings, 5:12-30, March 1958. 8 figs., 4 eqs. DWB--In order to illustrate the wave forms of atmospherics with the knowledge of pulses radiated from the origin and theories of propagation of VLF waves, investigations of the frequency spectra obtained with the aid of frequency analyses were proposed. In this field, F. W. CHAPMAN and others observed the responses of a number of narrow-band receivers tuned to various frequencies. The results were based on the smooth daytime type of atmospherics originated at known distances up to about 4000 km. From these results they reduced the frequency characteristics of attenuation factors of very long wave propagation. Smooth and general complicated type wave forms of sferics are analyzed. --From author's abstract.

A-1074 Sato, Teruo (Geoph. Inst., Kyoto Univ.), The reflection coefficient of the long wave. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan, 7(2):69-70, 1953. DWB--In the case where the wave is reflected at the boundary at any height (z) from the base of the ionized region and the wave does not penetrate at all to the height above (Z), the reflection coefficients for the wave of 16 kc/s are about 0.62, 0.36 and 0.24 when the thicknesses of the penetration region are 1, 2 and 3 km, respectively, in the case of an ionic density of 3×10^5 cc. In the case where the wave penetrates to any height without limitation to the reflection point, the reflection coefficients for the wave of 16 kc/s are about 0.24, 0.47 and 0.77 when the gradients of the electron density with height are 10^2 cc, and 3×10^2 cc and 10^3 cc per 1.5 km, respectively. --I. L. D.

A-1075 Satyanarayana, R. and Khastgir, S. R. (Banaras Hindu Univ. Banaras), Polarization of down-coming wireless waves of medium wavelengths. Journal of Scientific and Industrial Research, Ser. B, 11(6):211-215, June 1952. 6 figs., table, 3 refs. DWB--Investigations at selected radio station in India showed that: 1) only ordinary waves were received, 2) the polarization was lefthanded and elliptical, at times turning into a straight line or a circle and 3) the ratio of normal and abnormal component and the phase difference between these components varied randomly with time--W. N.

A-1076 Satyanarayana, R.; Bakhru, K. and Khastgir, S. R. (all, Banaras Hindu Univ., India), Triple-splitting of the F echoes. Journal of Atmospheric and Terrestrial Physics, London, 13(3/4):201-204, Feb. 1959. 2 figs., 16 refs. DLC--An account is given of the polarization studies made on the triple F echoes, obtained by employing pulses of waves of frequency, 3 Mc/s, at vertical incidence. The polarization studies revealed that the first component after the ground pulse was the normal extraordinary component having a right-handed sense of rotation, the second component was the normal ordinary component having a left-handed sense of rotation and the third component was the Z-component having a left-handed sense of rotation. In addition to the coupling process suggested by ECKERSLEY and RYDBECK between the ordinary and extraordinary waves, and operative only in high geomagnetic latitudes, the partial reflection and transmission at the level of ionospheric reflection for the ordinary component have been considered as a plausible process for getting the Z-component. Since the coupling process is not likely to produce a detectable Z-component at low geomagnetic latitudes the occasional presence of the Z-component at low latitudes has been attributed to the partial reflection and transmission process which may take place at all latitudes. The view that the Z-component really corresponds to the left handed ordinary component suffering reflection at the level corresponding to $p_o^2 = p^2 + p \cdot p_H$ has been supported.--Authors' abstract.

A-1077 Saxton, J. A., Ionospheric scattering at V.H.F. Mechanism of propagation: practical application to long-range communication. Wireless World, London, 62(1):36-40, Jan. 1956. 4 figs. DLC--Scattering by irregularities of refractive index is described. Turbulence causes scattering in the troposphere which is chiefly effective in 500-5000 Mc/s. Transmission up to 2000 km on 25-60 Mc/s may be due to forward scattering by ionic clouds in the E region or to reflection from ionized meteor trails or both. The characteristics of such signals and their use in communication are discussed.--C.E.P.B.

A-1078 Saxton, J. A. (D.S.I.R., Slough, Gt. Brit.), La physique de la diffusion ionosphérique sur ondes métriques. (Physics of ionospheric scattering of meter waves.) L'Onde Electrique, Paris, 37(362):450-455, May 1957. 20 refs., 2 eqs. DLC--Possibilities of VHF communication (25-60 MHz) over distances of the order of 1000-2000 km by means of irregularities in the ionospheric E region have been established by recent research. The author reviews theoretical and experimental research work concerning the mode of propagation and concludes that the scatter signals may be due to either turbulence or meteors. While it is not possible, at present, to ascertain the prevalence of either of these factors, it appears probable that night signals are almost entirely due to meteoric scattering. --G. T.

A-1079 Saxton, J. A., Long-distance radio propagation above 30 Mc/s. Nature, London, 181(4617):1184-1187, April 26, 1958. DWB--The London Institution of Electrical Engineers held a symposium on Jan. 28, 1958 at which more than 20 papers dealing with British contributions to the study of long-distance radio wave propagation at frequencies above 30 Mc/s were presented. Two developments so far recognized in Britain are: the possibility of long distance communication between 1, 000 and 2, 000 km on frequencies exceeding the maximum usable frequency and that transmission occurs via the E region of the ionosphere and also through the troposphere. Brief precis of some of the papers presented at the symposium are included. --N. N.

A-1080 Schenk, Karl, Die Funkausbreitung als neues Hilfsmittel in der modernen Wetterforschung. (Radio propagation as a new aid in modern weather observation.) Deutscher Wetterdienst in der US-zone, Berichte, No. 12:215-218, 1950. Discussion by H. Israel and Heinz Meinhold (with 3 figs.) p. 218-220. MH-BH--Argues that broadcast reception offers a means of investigating the relation between the ionosphere and weather and a possibility of constructing charts of levels in ionosphere. Proposes term "Funkmeteorologie" (Radio meteorology). --C. E. P. B.

A-1081 Schilling, G. F. and Sterne, T. E. (both, Astrophysical Obs., Smithsonian Inst.), Preliminary orbit information for USSR satellites Alpha one and Alpha two. Smithsonian Institution. Astrophysical Observatory, IGY Project No. 30. 10, Special Report, No. 1, Oct. 14, 1957; re-issued: Dec. 2, 1957. 20 p. tables. Also issued in "edited form" as Smithsonian Contributions to Astrophysics, Wash., D. C., 2(10):191-198, 1958. DWB, DLC--This is the first report on notification, reception, tracking, bulletins on reception, and predicted tracks of the first Soviet Sputnik launched Oct. 4, 1957. The orbit inclination was 65°, periodicity 95 m; weight 83. 6 kg, diameter 58 cm, output 1 watt, high frequency 40. 002 Mc, low frequency 20. 005 Mc. First reception of radio signals at NRL in Washington, D. C. was at 20. 45 EDT, Oct. 4. --M. R.

A-1082 Schindelhauer, F., Peilung der Ausgleichsvorgänge, die Luftstörungen verursachen. (Bearings of discharge phenomena giving rise to sferics.) Hochfrequenztechnik und Elektroakustik, Berlin, 54(5):109-111, Oct. 1939. DLC--

Observations of sferics at Potsdam Observatory in July to Oct. 1938 are discussed. The results, presented in curves, show long wave sferics of E-W direction in the morning, turning more to N-S at midday. The short wave sferics generally came from N-S, otherwise following the diurnal variation as for long wave sferics. Sferics originate in the ionosphere, the ionospheric currents give rise to the E-W direction. Sferics may also be produced by thunderstorms. --W. N.

A-1083 Schindelhauer, F. and Lauter, E. A., Ein Beitrag zur Erforschung der Vorgänge bei Mögel-Dellinger-Effekten. (A contribution to the observation of the processes in Mögel-Dellinger effects.) Zeitschrift für Meteorologie, 4(7-8):243-245, July-Aug. 1950. 2 figs., 5 refs. MH-BH--On Sept. 13, 1949, 13.02 h, strong short wave fading at many stations coincided with a magnetic eruption effect. This was followed at 3-minute intervals by a weak increase in reception on 1250 m, increased disturbance on 2450 and 11,000 m. The frequency necessary to penetrate D layer at Dakar rose to 15.3 MHz. Other observations were made on June 28, 1949. Causes briefly discussed. --C. E. P. B.

A-1084 Schlapp, D. M. (Cavendish Lab., Cambridge), Some measurements of collision frequency in the E region of the ionosphere. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(3/4):340-343, Nov. 1959. fig., 9 refs., eq. DWB, DLC --Measurements of collision frequency in the E region were made by observing how the deviative absorption of a radio echo varied with its group path as a critical frequency was approached. The collision frequency at heights between 105 km and 120 km was found to vary with a scale height of about 16 km. In 1955, the collision frequency passed through a value of 2×10^4 sec^{-1} at a height of about 112 km. There is some evidence that, when the sunspot number is greater, the collision frequency at a fixed height is greater. --Author's abstract.

A-1085 Schmelovsky, Karl-Heinz, Probleme der Ausbreitung in troposphärischen und ionosphärischen Wellenleitern. (Problems of the propagation of tropospheric and ionospheric wave guides.) Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen, 7(49):1-24, 1958. 14 figs., 2 tables, 23 refs., numerous eqs. DLC--An attempt is made to find a general procedure for determining the propagation characteristic of a wave guide, in particular its propagation damping. In the derivation of these characteristics the author constructs a model which describes the field in the wave conductor as a process of interference of waves which are reflected at the limits. By using this model it is possible to retain the concept of the reflection factors. The problems considered include exclusively wave guides having a propagation constant that is very complex as a result of radiation or reflection losses, thereby the boundary wave length looses its fundamental importance; approximately spherical symmetrical guides are present; the ratio of longitudinal to transverse measurements is usually substantially smaller than in the case of artificial hollow guides. The mathematical treatment of the propagation in the case of homogeneous wave guides, in tropospheric wave guides and in homogeneous wave guides are presented and application and illustrations for the interpretation of sunrise effects in the atmospheric noise level, in the longest wave lengths and propagation constants of tropospheric wave guides are given. --I. L. D.

A-1086 Schmelzer, R. J., Total atmospheric absorption of 60 kmc radiation. Lockeed Missile Systems Division, (Pub.) LMSD-2793, Sept. 19, 1958.

A-1087 Schmerling, E. R. (Ionosphere Res. Lab., Penn. State Univ.), An easily applied method for the reduction of h-f records to N-h profiles including the effects of the earth's magnetic field. Journal of Atmospheric and Terrestrial Physics, London, 12(1): 8-16, 1958. 7 figs., 2 tables, 10 refs., 13 eqs. DLC--A method is presented by means of which experimental h'-f records may be readily reduced to electron density height profiles without the use of computing aids during the final reduction process. No special assumptions are made concerning profile shapes, account is taken of the earth's magnetic field, and collisions are neglected. This method depends on sampling h' at fixed sub-multiples of the frequencies f_o at which true heights are required; true heights being then simply obtained by averaging these values. The sampling frequencies depend on the parameters of the earth's magnetic field, and must be computed for the magnetic coordinates of each station from which records are to be analyzed. This computation, in its entirety, is quite complex; but once performed, the results are available for use on any number of records. The method is, therefore, especially suitable for the rapid routine reduction of large numbers of records. Complete computations are presented for one station, and the results are checked against an analysis of h'f curves for known profiles. --Author's abstract.

A-1088 Schonland, B. F. J.; Elder, J. S. and van Wyk, J. W., Reflection of atmospherics from the ionosphere. Nature, London, 143(3630):893-894, May 27, 1939. fig., 4 refs. DLC--The analysis of thousands of sferics oscillograms that travelled from 50 to 2800 km supports the Australian findings that the structure of the wave form arises from repeated reflections.

Evidence for the existence of a real lowering of the effective height of reflection was found. The sferics discussed were all due to flashes to ground. --W. N.

A-1089 Schrag, R. L. (Penna. St. Coll., Radio Propag. Lab.), An investigation of the 150 Kc/s propagation characteristics of the upper ionosphere. Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionospheric Research, Scientific Report, No. 33, March 15, 1952. 41 p. graphs, 10 refs., 48 eqs. DWB--Extended studies of the 150 Kc/s propagation characteristics into and through the F region indicate that the small amount of the ordinary wave component passing through the E layer, where the total reflection takes place below the maximum of electron density of this layer, will be totally absorbed in the F region. The extraordinary component, however, suffers but moderate absorption and no reflection in the E layer, hence its possible use for radio sounding of the upper ionosphere or Størmer ring is the premise of the detailed investigation. The discussion emphasizes the following topics: 1) a complete wave solution carried through a found "pole" at 939 km with the aid of 2) a new method for solving the uncoupled wave equation, heretofore not obtained. --W. N.

A-1090 Schrag, R. L., Extended range ionospheric observations at 150 Kc/s. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report No. 66, July 15, 1954. 137 p. 49 figs., 7 tables, 16 refs. MH-BH--Results of low frequency pulsed radio sounding experiments employing extended-range receiving instrumentation are discussed. The experiments were conducted with 150 Kc/s vertically incident waves, and involved amplitude and polarization studies of multiple-hop echo systems. Nighttime observations have revealed two phenomena of interest: (1) Multiple-hop amplitude decay patterns for normal E-region echoes during low absorption conditions indicate a nearly continual roughness of the reflecting surface. On occasion these patterns exhibit pronounced focusing, indicating that ionospheric reflections are taking place from concave "surfaces." Effects of such large scale irregularities in the surfaces of constant N are not visible in first-hop echo observations. The focusing results are summarized, and estimates are presented concerning the nature and sizes of the E-region irregularities involved. (2) Occasionally, trains of weak echoes are detected having, principally, extraordinary polarization and very low successive-hop attenuation. Their amplitudes and delays are found to be consistent with a highly efficient M-type reflection mechanism utilizing reflecting boundaries at approximately 130 and 240 km. The lower boundary, being partially transparent, is interpreted as a sporadic E ionization slab; while the upper reflector is believed to result from a deep ionization "well" between Regions E and F. It is concluded that the nighttime electron density at 240 km may, on occasion, fall to a value less than 312 elec/cc. --Author's abstract.

A-1091 Schrott, R., Ein Echolotungsgerat für Ionosphären-und Wetterforschung. (An echo-sounding apparatus for ionosphere and weather investigation.) Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A, 3(1-2):109-112, 1950. 3 figs., 3 refs. German, English and French summaries p. 109. DWB--An impulse transmitter and receiver is described combining low cost, high accuracy and safe working. Wiring diagrams given. It can be used for measuring critical frequencies and the altitude of the ionosphere. --C. E. P. B.

A-1092 Schumann, Winfried Otto, Über die Dampfung der elektromagnetischen Eigenschwingungen des Systems Erde-Luft-Ionosphäre. (On the damping of the natural electromagnetic oscillations of the system earth-air-ionosphere.) Zeitschrift für Naturforschung, 7a(3-4):250-252, March-April 1952. eqs. DLC--A theoretical equation for the damping of the lowest frequencies is developed, which should permit the calculation of the effective height of the atmosphere and the effective conductivity of the ionosphere by emitting short impulses. --C. E. P. B.

A-1093 Schumann, Winfried Otto (Elektrophysikalisches Inst. T. H. Munich), Über die Ausbreitung langer elektrischer Wellen um die Erde und einige Anwendungen auf Senderinterferenzen und Blitzsignale. (Propagation of long electric waves round the earth and some applications to transmitter interferences and lightning signals.) Zeitschrift für Angewandte Physik, Berlin, 6(8):346-352, 1954. figs., 22 refs., eqs. DLC--Interferences of long wave transmitters, atmospheric processes, lightning discharges, sferics and reflected impulses are first discussed. Conditions for long wave propagation are well-known but the problem of propagation of electric waves in the atmosphere is still not well understood. On the one hand, it is necessary to study the very small conductivity of the ionosphere during signals of the "slow tail" type in order to understand the important fading, while signals consisting of a long series of reflected impulses require especially good reflection properties, i. e., high conductivity of the ionosphere and different reflection heights. The kind of wave types which is received meteorologically is to a large extent still unknown and should be analyzed in detail. --A. M. P.

A-1094 Schumann, Winfried Otto, Über die Oberfelder bei der Ausbreitung langer elektrischer Wellen im System Erde-Luft-Ionosphäre und 2 Anwendungen (horizontaler und senkrechter Dipol). (On "modes" in the propagation of long electric waves in the earth-air-ionosphere system and two applications (horizontal and vertical dipole).) Zeitschrift für Angewandte Physik, Berlin, 6(1):35-43, 1954. 2 figs., 14 refs., 39 eqs. DLC--It is shown that the earth's curvature may be disregarded when determining "modes" of electric waves in the kilometer range, thereby replacing radial Bessel functions by exponential distributions. Propagation properties and emission intensities of such modes are determined for the electrical and magnetic vertical dipoles according to the method of singular characteristic functions. The propagation of thunderstorm sferics is also discussed. --Trans. of author's abstract.

A-1095 Schumann, W. O., Über die Beeinflüssung der Ausbreitung sehr langer elektrischer Wellen durch das Magnetfeld der Erde. (Influencing of propagation of very long electric waves by the geomagnetic field.) Naturwissenschaften, 42(4):91-92, Feb. 1955. 2 refs. DWB--Under the influence of a vertical magnetic field the ionosphere becomes an anisotropic conductor and a wave of very low frequency splits into two coupled waves. This effect and its avoidance are discussed. --C. E. P. B.

A-1096 Schwentek, Heinrich, Bestimmung eines Kennwertes für die Absorption der Ionosphäre aus einer automatisch-statistischen Analyse von Feldstärkeregistrierungen. (Determination of ionospheric absorption coefficient by means of automatic statistical analysis of field strength recordings.) Archiv der Elektrischen Übertragung, Stuttgart, 12(7):301-308, July 1958. 11 figs., 15 refs., 14 eqs. DLC--A simple method is described by which the nondeviative absorption of the ionosphere can be determined continuously by field strength measurements at oblique incidence. The conditions of a suitable transmission path are discussed. An analysis of the field strength frequency distribution measured by a statistical counter renders possible the separation of the main transmission paths from each other. Thus absorption values for hourly intervals can be determined immediately. For this purpose the absorption values are reduced to vertical incidence. Furthermore the state of the ionosphere may be derived from the distributions. Thus the mean reflection coefficient of the Es layer at night as well as its frequency are immediately obtained. For the delayed diurnal variation of absorption dependent on the sun's zenith angle a simple formula is suggested. --Author's abstract.

A-1097 Scott, James C. W., Longitudinal and transverse propagation in Canada. Journal of Geophysical Research, 55(1):65-84, March 1950. 13 figs., table, 8 refs., eqs. MH-BH--Multifrequency pulse measurements north of auroral zone in Canada show that the ionosphere is very turbulent and unstable. The echoes are peculiar and longitudinal. The causes are discussed. The apparent magnetic field is calculated; it shows large diurnal and seasonal variation. --C. E. P. B.

A-1098 Scott, James C. W., The gyro-frequency in the Arctic E layer. Journal of Geophysical Research 56(1):1-16, March 1951. 7 figs., 4 tables, 8 refs., 15 eqs. DWB--Calculation of the gyro-frequency in the E layer at Canadian Arctic ionospheric recording stations gives a lower magnetic field than that obtained by extrapolation of the terrestrial field measured at ground level, and at one station (Resolute Bay) a large semi-diurnal variation with maxima at 06 and 18 hr local time. Ray path deflections which can explain similar effects previously reported for the F layer cannot be responsible in the E layer because of the opposite sense of this deviation and because of the small layer-thickness. Moreover, no semi-diurnal variation was found in the F layer. It is shown that these new W layer phenomena may be due to a variable concentration of heavy ions rising to over 4000 times the density of free electrons. --From author's abstract.

A-1099 Scott, James C. W. (Defence Res. Telecom. Establ., Defence Res. Board, Ottawa), Real and complex wave polarization in the ionosphere. Journal of Geophysical Research, 58 (4):437-443, Dec. 1953. 3 figs., table, 4 refs., 13 eqs. DLC--The relation between the polarization ellipse in the wave front and the complex polarization at vertical incidence in a slowly-varying horizontally-stratified ionosphere is reviewed. Charts and a table are given showing the sense, orientation and eccentricity of the polarization ellipse under all conditions of plasma frequency, collisional frequency, wave frequency, and magnetic field intensity and direction. --Author's abstract.

A-1100 Scott, J. R., Wind statistics at Singapore. Royal Meteorological Society, Quarterly Journal, 83(357):381-383, July 1957. table, 4 refs. DWB--Weekly radar ascents at Singapore, increasing to daily, from July 1950 to Dec. 1955 are tabulated by seasons 5000 - 70,000 ft. Up to 30,000 ft σ (standard vector deviation) varies little. From 30,000 - 50,000 ft $\sigma\rho$ = constant. --C. E. P. B.

A-1101 Sechrist, C. F., Jr., Theory and design of a traveling wave antenna system for long wave sweep frequency investigation of the ionosphere at vertical incidence. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 91, March 1, 1957. 49 p. 16 figs., 8 refs., eqs. DWB (M10. 535 P415i)--The analysis, design, and evaluation of the new combination 75 Kc/s folded dipole antenna, 225 kc/s antenna, and long wave sweep frequency transmitting antenna system being erected at the Scotia Field Station are discussed. The system to be used for long wave sweep experiments consists of a 6500' long off-center fed transmission line antenna for frequencies between 50 and 220 kc/s and a 2000' long center fed transmission line antenna for frequencies up to 800 kc/s. Taking into account ionospheric absorption and atmospheric noise levels for summer and winter days and nights, a comparison of required field intensity to overcome atmospheric noise and expected incident field intensity with the transmission line antenna is made for the frequency range 50-1000 kc/s. --Author's abstract.

A-1102 Sechrist, C. F., Jr., Instrumentation for long wave sweep frequency investigation of the ionosphere at vertical incidence. Pennsylvania. State Univ. Ionosphere Research Lab. Contract AF 19(604)-3875, Scientific Report No. 103, June 1, 1958. 96 p. 67 figs., 10 refs. DWB (M10. 535 P415i)--The description and operation of the instrumentation for long wave sweep frequency investigation of the ionosphere is covered in this report. The beat frequency method of generating wide frequency sweeps is used in the 0. 5 megawatt transmitter which covers the frequency range from 50 to 1, 000 kc/s. Transformer coupled, push-pull, wide-band amplifiers are employed in the transmitter providing class B operation with good waveform, and obviating the need for complex tuning arrangements. The transmitting antenna used for sweep operation is a 60 Kc/s folded dipole that is converted to a balanced transmission line antenna by an automatic switching arrangement. An automatic control system is described which permits unattended, alternate operation of the 60 Kc/s and long wave sweep transmitters. A sample h'-f record, obtained with the sweep equipment, appears near the end of the report. Recommendations for future development conclude the report, and the appendices cover the design procedures. --Author's abstract.

A-1103 Sechrist, C. F., Jr., Preliminary theory and interpretation of long wave sweep frequency records. Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-3875, Scientific Report, No. 115, Feb. 1, 1959. 98 p. 44 figs., 35 refs., eqs. DWB (M10. 535 P415i)--This report being the first of several planned on low frequency ionograms as obtained at the laboratory summarizes the NBS work on low frequency results, the theoretical work and results obtained at the laboratory including qualitative interpretation of some low frequency ionograms. The results as obtained for the stable night Aug. 10-11, 1958 are discussed and the disturbed ones June 9-10, 1958 accompanied by samples of h^1 - P records. Results for the stable night showed echoes varying from 100 km at 140 bc/s to 110 km at 1 Mc/s. The approximate 500 kc/s main echo polarization when computed showed up eliptically. Results for the disturbed nights are itemized and in general future existence of different sporadic E layers at differing heights. The normal E layer ionization was decaying. --W. N.

A-1104 Seddon, J. Carl (U.S. Naval Res. Lab., Wash., D. C.), Propagation measurements in the ionosphere with the aid of rockets. Journal of Geophysical Research, Wash., D. C., 58(3):323-335, Sept. 1953. 10 figs., 7 refs., 11 eqs. DWB--Daytime measurements of electron density, ion density, electron collision frequency, and earth's magnetic field in the ionosphere were made during V-2 rocket flights at the White Sands Proving Ground, New Mexico. Two CW harmonically related frequencies were radiated from the rocket to two ground stations to obtain measurements of the ordinary and extraordinary indices of refraction in the region around the rocket. The results for one flight show an ion layer with a maximum of 5×10^8 ions/cc and a small electron layer with a maximum of 7500 el/cc just below the E1 layer. On a Sept. day the F1 layer remained dense up to the E2 layer, while on a Jan. day the density apparently decreased above the F1 layer maximum to much lower values. It is shown that the Lorentz polarization term should not be used in the E layer at 4 Mc. --Author's abstract.

A-1105 Seddon, J. C.; Pickar, A. D. and Jackson, J. E. (U. S. Naval Research Lab., Wash., D. C.), Continuous electron density measurements up to 200 km. Journal of Geophysical Research, 59(4):513-524, Dec. 1954. 9 figs., 11 refs., 6 eqs. MH-BH--Measurements in the ionosphere using the Seddon propagation technique were conducted with the Viking 10 rocket, launched at 10:00 a.m. MST on May 7, 1954, at the White Sands Proving Ground, New Mexico. This rocket reached a record altitude of 219 km, and provided very good data for both upward and downward trajectories. Ordinary and extraordinary indices of refraction at 7.754 Mc were measured in the region surrounding the rocket. From these indices, it was possible to determine accurately the electron distribution from 84 to 200 km. By using the P'-f records taken during the rocket flight, the electron density curve was extrapolated up to the maximum of the F2 region (2.9×10^5 el/cc at 288 km). The measurements showed a rapid increase in density from

1 X 10^4 el/cc at 91 km to 1 X 10^5 el/cc at 101 km. This was followed by additional but less rapid increases up to the peak of the F1 region (2.1 X 10^5 el/cc at 170 km). Densities in the 170- to 200-km region were, in general, five to ten percent lower than the F1 maximum density. Although obtained during a period of low sunspot activity, these latest results agree remarkably well with previous results reported by Seddon and Jackson for periods near the sunspot maximum. In all cases, the daytime ionosphere was seen to remain dense throughout the E region and up to the F1 region, with only occasional minor peaks in density. In all cases, the distribution obtained agreed very closely with the P'-f records. Sporadic echoes are apparently due to partial reflections from high gradient regions. --Author's abstract.

A-1106 Seddon, J. Carl (U.S. Naval Res. Lab., Washington, D.C.), Electron densities in the ionosphere. Journal of Geophysical Research, 59(4):463-466, Dec. 1954. 4 figs. DWB--Recently the author published a curve of electron densities obtained from rocket experiments. The published curve showed a sharp decrease in electron density at 145 km. Another interpretation of the data eliminates this decrease. The new interpretation is based on a breakdown in independence of propagation of the magneto-ionic components of a CW-signal transmitted from the flying rocket. --From author's abstract.

A-1107 Seddon, J. Carl, Rocket investigations of the ionosphere by radio propagation method. U.S. Naval Research Laboratory, Upper Atmosphere Research Report, No. 22; NRL Report 4304, March 1, 1954. 37 p. figs., tables, 9 refs., eqs. DWB--Daytime measurements of electron density, ion density, electron collision frequency, mean molecular cross section, and earth's magnetic field during V-2 rocket flights at the White Sands Proving Ground, New Mexico, were obtained on March 7, 1947, Jan. 22, 1948, and Sept. 29, 1949. In each case a 4.274-Mc signal and its 6th harmonic were radiated from the rocket to receiving stations on the ground to obtain measurements of the ordinary and extraordinary indices of refraction of the region around the rocket. The results of one flight show an ion layer with a maximum of 5 X 10^8 ions/cc and a small electron layer with a maximum of 7500 el/cc just below the E1-layer. On a September day the E1 layer remained dense up to the E2 layer, while on a January day the density apparently decreased above the E1 layer maximum to much lower values. It is shown that the Lorentz polarization term should not be used in E layer computations at 4 Mc. A detailed explanation of the data analysis methods is included in the appendixes. Extensive calculations using the general Appleton-Hartree formula have been made at 4.274 Mc and some of the results are shown for various collision frequencies, using the value of the magnetic field at 100 km above the White Sands Proving Ground, New Mexico. --Author's abstract.

A-1108 Seddon, J. C. and Jackson, J. E. (both, Naval Research Lab., Wash., D. C.), Absence of bifurcation in the E layer. Physical Review, N. Y., 97(4):1182-1183, Feb. 15, 1955. fig., 8 refs. Also: Pfister, W.; Ulwick, J. C. and Marcou, R. J., Further remarks on bifurcation in the E layer. Ibid., p. 1183-1184. 3 refs. DLC--In the first article electron density distribution curves are given covering the altitude range 90-150 km as obtained from three separate New Mexico rocket flights spaced over 5 years. Reasons are given for placing considerable confidence in the results. All fail to show any bifurcation in the day-time E layer, in contradiction of the results of Lien - Marcou et al. The second article, a reply to Seddon and Jackson, points out that the results of both groups of workers are consistent within themselves but depend on different analyses — Seddon's experiments are based on the change in phase delay, while the authors' give the group delay. It is pointed out that the magnetic field has an important effect on the ray paths and adequate allowance for this may affect the results of both experiments.

A-1109 Seddon, J. C. and Jackson, J. E. (both, U. S. Naval Research Lab., Wash., D. C.), L'application des fusées à l'étude de l'ionosphère. (Application of rockets to the study of the ionosphere.) Annales de Géophysique, Paris, 11(2):169-172, April/June 1955. 2 figs., 7 refs., eqs. DLC--Doppler measurements from rockets to determine electron density as a function of altitudes to 160 and 300 km. respectively, are shown graphically in two figures. Density was obtained by direct measurement to 200 km and by extrapolation using ionograms up to 300 km. --M. R.

A-1110 Seddon, J. Carl (Rocket Sonde Branch, U. S. Naval Res. Lab.), High electron density gradients in the ionosphere as observed with rockets. AGARDograph, Paris, No. 34:171-181, Sept. 1958. 5 figs., 2 tables, 7 refs. DWB (629.1323 N864a)--Many daytime measurements of electron density profiles with rockets have been made during the condition known as "sporadic E". In all cases, it was found to be a high electron density gradient region covering in general a radius in excess of 50 km. Gradients as large as 10^6 el/cc per km have been observed. Various characteristics of sporadic E, such as horizontal variability, thickness, and maximum electron densities are briefly discussed. Evidence of many other large electron density gradients between 66 and 200 km is presented. One such gradient is always found to be present near the mesopause. The others are variable in occurrence and altitude, except for a strong tendency for E region gradients to occur at particular altitudes separated by about one scale height. One night flight at Fort Churchill, Manitoba, Canada is discussed where two sporadic E regions existed. One of these, at 98 km, had a characteristic never before observed, of the large gradient being on top side. Evidence is presented that shows that a spread F-condition existed above 190 km and that it probably consisted of many irregular, turbulent high-gradient regions. --Author's abstract.

A-1111 Seddon, J. Carl (U. S. Naval Res. Lab., Wash., D. C.), Differential absorption in the D and lower E regions. Journal of Geophysical Research, Wash., D. C., 63(1):209-216, March 1958. 6 figs., 5 refs., 6 eqs. DLC.

A-1112 Seddon, J. C. and Jackson, J. E. (both, U. S. Naval Res. Lab.), Rocket Arctic ionospheric measurements. International Geophysical Year, 1957/1958. IGY World Data Center A, IGY Rocket Report Series, No. 1:140-148, July 30, 1958. 7 figs., 6 refs., 2 eqs. DWB (M07.362 H237ex).

A-1113 Seddon, J. C. and Jackson, J. E. (both, U. S. Naval Res. Lab.), Ionosphere electron densities and differential absorption. International Geophysical Year, 1957/1958. IGY World Data Center A, IGY Rocket Report Series, No. 1:149-158, July 30, 1958. 11 figs., 8 refs., eq. DWB (M07.362 H237ex).

A-1114 Seddon, J. C. and Jackson, J. E., Rocket studies of the Arctic ionosphere. IGY Bulletin, Wash., D. C., 20:7-9, 1959. American Geophysical Union, Transactions, 40(1):63-65, March 1959. DWB.

A-1115 Seddon, J. C. (Nat. Aeronautics and Space Admin.), Rocket observations of high electron density gradients in the ionosphere. American Geophysical Union, Transactions, 41(1):113-118, March 1960. 4 figs., 2 tables. DWB, DLC.

A-1116 Sethuraman, R. (Physical Res. Lab., Ahmedabad), Rates of fading of reflected pulses of vertically incident electromagnetic waves at Ahmedabad on 2.6 and 4.0 Mc/s. Journal of Scientific and Industrial Research, New Delhi, Sec. A, 17(12); Special Supplement, Dec. 1958. p. 50-53. 4 figs., table, 7 refs. DWB, DLC--Summarized results of the Physical Research Laboratory's observations at Ahmedabad Oct. 1956 - March 1958 show that: (1) rapid fading < 5 sec. period occurs mainly during night hour and is somewhat dependent on magnetic activity; (2) low values of C_p is generally associated with more rapid fading, and the F_2 reflections exhibited a marked correlation with the amount of spread of the p^1 - f records; (3) nighttime F_2 is sensitive to magnetic activities which daytime E layer is not. --W. N.

A-1117 Shain, C. A. and Kerr, F. J., A note on factors affecting the interpretation of observations of transient echoes from the ionosphere. Journal of Atmospheric and Terrestrial Physics, 6 (5):280-281, May 1955. fig., 6 refs. DWB--Observed short-lived echoes on 100 kw 18.3 Mc/s radar direction vertically showed maxima at 5 h and 10 h. The maximum at 5 h is due to sporadic meteors. The maximum at 10 h is attributed to the low cosmic noise at this time; when observations are corrected for this the maximum disappears. --C. E. P. B.

A-1118 Shammatt, F. H., Atmospheric whistlers and the electron density in the ionosphere. Texas. Univ. Electrical Engineering Research Lab., Contract AF 19(604)-5504, Report 6-30, Oct. 21, 1959. 22 p. 6 figs., table, 10 refs., 25 eqs. DWB (M94.7 T355r)--Some of the electromagnetic energy released from lightning strokes travels a path through the ionosphere essentially parallel to the magnetic lines of the earth's magnetic field. It arrives at the ground in the opposite hemisphere as a frequency dispersed wave train with time delay increasing with decreasing frequency. The extent of this dispersion has previously been shown to be a function of the height distribution of electron density in the ionosphere along the path traveled. This report presents a method of computing the dispersion from a knowledge of the electron density and compares observed and computed dispersions based on an assumed exponential electron density height distribution. The correlation between the two sets of curves is sufficiently good to lend credance to the assumed electron distribution. This research was carried out as one phase of a general propagation study designed to investigate various tropospheric and ionospheric refractive index distribution models. --Author's abstract.

A-1119 Shapley, A. H., On forecasting propagation disturbances to radio communications in Alaska. Alaskan Science Conference, 2nd, Mt. McKinley National Park, Sept. 4-8, 1951, Proceedings, p. 281-282, pub. (1953?) DWB--Advance warning of radio communication conditions in the North Pacific and Alaska is being attempted by North Pacific Warning Service by the National Bureau of Standards Field Station at Anchorage, Alaska. Variations in radio propagation are closely associated with abnormal conditions in the ionosphere. Studies of absorption, Es movements, turbulence, fading, etc. are being undertaken. --M. R.

A-1120 Shapley, A. H., Comité des Sondages Ionosphériques. (Committee of Ionospheric Soundings.) International Scientific Radio Union, Bulletin d'Information, No. 112:14-15, Nov./Dec. 1958. DLC--Program of the future activities of the Committee for ionospheric soundings and projects for improvement of the organization. --A. V.

A-1121 Sharma, S. K. (Radio Communication Lab. Eng. Coll. Banaras Hindu Univ.), Effect of thermal expansion of the F2 region of the ionosphere on the absorption of high frequency radio waves. Journal of Scientific & Industrial Research, Sec. A, 18(1):17-20, Jan. 1959. fig., 2 tables, 9 refs., 5 eqs. DWB, DLC--The total absorption of radio waves in the ionosphere has been measured by the pulse technique at vertical incidence at different hours of the day. It has been found that for frequencies below the critical frequency of F1 layer, only one maximum of total absorption is generally observed while at frequencies sufficiently above the critical frequency of the F1 layer, two maxima, one before and the other after the local noon, are observed. The maximum observed before noon has been attributed to the thermal expansion of the F2 region of the ionosphere under adiabatic equilibrium, the effect of which is more pronounced in the lower latitude. --Author's abstract.

A-1122 Shearman, E. D. R., Study of ionospheric propagation by means of ground back-scatter. Institution of Electrical Engineers, London, Proceedings, Pt. B, 103(8):203-209, March 1956. 6 figs., 12 refs. DLC. Also his: The technique of ionospheric investigation using ground back-scatter. Ibid., p. 210-223. 16 figs., 27 refs., 14 eqs. DLC. Also: Laver, F. J. M. and Stanesby, H., Experimental test of reciprocal transmission over two long-distance high-frequency radio circuits. Ibid., p. 227-232. 6 figs., 9 refs., 3 eqs. DLC. Also: Meadows, R. W., Experiment to test the reciprocal radio transmission conditions over an ionospheric path of 740 Km. Ibid., p. 224-226. 6 refs. discussion on all papers, p. 232-235. DLC--This series of papers and the discussion on p. 232-235 covers many phases of a systematic program conducted during 1949-55 in the British Isles to obtain data on the back-scatter, skip distance, ionospheric layers involved and height thereof for one to four hops (up to 11,000 mi) propagation. It was found that better results were obtained in winter than in summer, that the distances were shorter than calculated, and that only about 1% of the cases showed distinctly different reception in one direction than in another. Also the main proportion of energy is scatter back by the ground, rather than by the ionosphere as many authors theorized. In summer the energy is distributed over a considerable time with several peak bands corresponding with reflection from several ionospheric layers. In winter only 1 major band (return time) is noted — that for F layer. The vertical incidence pulses do not give exactly the same calculated height and skip distance as the oblique pulse signals. Perhaps returns come from outside or in the edge of the calculated beam. --M. R.

A-1123 Shearman, E. D. R. and Harwood, J. (both, Radio Res. Stat. Slough, Bucks, England), Sporadic E as observed by backscatter techniques in the United Kingdom. AGARDograph, Paris, No. 34:111-128, Sept. 1958. 10 figs., 4 refs. DWB (629-1323 N864a)--Observation of sporadic E clouds with a rotating-aerial backscatter sounder enables a greater sample of Es clouds to be studied than the use of a vertical incidence sounder, and permits the size, location and movement of clouds to be estimated. Limitations are introduced by finite aerial beam width and skip-distance effect. Multi-frequency operation eliminates the latter defect, and also permits ionization to be measured. Results obtained during the I. G. Y. with a single-frequency rotating-aerial sounder are presented, showing the diurnal, seasonal and geographical characteristics of Es occurrence. On particular occasions, movements have been tracked and, under favorable conditions, the size and ionization of the clouds determined. Earlier results obtained with a fixed-direction aerial and multi-frequency technique show similar diurnal and seasonal trends, and illustrate the possibilities of the variable-frequency facility for simultaneous measurement of cloud size and ionization. --Authors' abstract.

A-1124 Sheppard, P. A. (Imperial College, London), Dynamics of the upper atmosphere. Journal of Geophysical Research, Wash., D. C., 64(12):2116-2121, Dec. 1959. 4 figs., 8 refs. DLC.

A-1125 Shimazaki, Tatsuo, World-wide daily variations in the height of the maximum electron density of the ionospheric F2 layer. Japan. Radio Research Laboratories, Tokyo, Journal, 2(7): 85-97, Jan. 1955. 7 figs., 2 tables, 8 refs., 14 eqs. DWB.

A-1126 Shimazaki, Tatsuo (Radio Research Lab.), The characteristics of the F2 regions as deduced from the daily variations in the ionospheric layer. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 10(3):124-142, 1956. 11 figs., 14 refs., 12 eqs. DWB--Summarized analytical results of the theoretical work involving two models of the ionosphere are presented and discussed. A general method for analysis of the ionospheric daily variations is demonstrated and some of the salient deductions derived are: 1. The F2 layer is produced at a level higher than that of the maximum electron production as a result of height dependent coefficient. 2. A positive temperature (or scale height) gradient is a very important existence in the F2 regions and the thermal expansion during the daytime is larger in sunspot maximum years than in minimum and in summer and/or lower latitudes than in winter and/or higher latitudes. 3. The vertical drift velocity being non-uniform the increase or decrease of amplitude and phase depend on altitude of formation of the F2 regions. Seasonal and latitudinal variations do not depart significantly, from daily variations except near the Equator. --W.N.

A-1127 Shimazaki, Tatsuo, Structure of the F2 layer as deduced from its daily variations. Japan. Radio Research Laboratories, Journal, 3(11):17-43, Jan. 1956. 15 figs., 20 refs., eqs. DWB--The differential equations of motion and of continuity of the ionospheric F2 regions are solved numerically on some probable assumptions of the upper atmosphere. If vertical tidal drift is considered, the calculated daily variations have a strong resemblance to the observed ones in all latitudes except near the equator. The observed daily variations in the maximum electron density in the F2 layer in various latitudes and seasons may well be explained by changes in the height of this critical level and in the phase of semi-diurnal vertical tidal drift velocity. --From author's abstract.

A-1128 Shimazaki, Tatsuo (Radio Res. Labs., Kokubunji, Tokyo), Dynamical structure of the ionospheric F2 layer as deduced from the world-wide daily variations. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):108-115, Sept. 1959. 3 figs., table, 14 refs. DLC--Recourse was made to numerical calculations to find the effects of various nonuniform vertical motions due to diffusion, thermal and/or tidal variations on daily variations in the F2 layer. A method was worked out for detecting 24 hr periodicities in electron density distribution regardless of non-recurrent motions due to several causes. The comparison of calculated and observed variations shows that the Bradbury model is better than the Chapman model in every respect. Special emphasis is placed upon the fact that the effect of non-uniform semi-diurnal vertical drift velocities with height gradient of both amplitude and phase is very important except near the equator. --Author's abstract.

A-1129 Shimazaki, Tatsuo (Radio Res. Labs., Kokubunji, Japan), Effect of the Sq current system on the ionospheric E- and F1-layers. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):77-82, Sept. 1959. 3 figs., 4 refs., 6 eqs. DLC--The discrepancy between the observed foE or foF1 and those predicted by the Chapman theory is examined in detail. The result shows that the F1 layer varies in a manner more regular than the E layer, and that the discrepancy in the E layer may be attributed partly to the effect of scale height gradient, but the principal cause certainly lies in the effect of Sq overhead current system. Discussion is made on the non-uniform motion of vertical drift velocity produced by this effect, as well as on the recombination coefficient and the scale height gradient in these regions. --Author's abstract.

A-1130 Shimazaki, Tatsuo (Radio Research Lab.), World-wide measurements of horizontal ionospheric drifts. Japan. Science Council, Ionosphere Research Committee, Report of Ionosphere and Space Research in Japan, Vol. 13, No. 1:21-47, 1959. 8 figs., 2 tables, 53 refs. DWB, DLC.

A-1131 Shirke, J. S., Measurements of the ionospheric absorption on 2-5 Mc/s at Ahmedabad. (India). Institution of Telecommunication Engineers, Journal, 5(3):115-120, June 1959. 3 figs., 3 tables, 8 refs.

A-1132 Shmoys, J., The reflection coefficient of the exponential layer. Journal of Geophysical Research, 57(1):142-143, March 1952. fig., 8 eqs. MH-BH--Theoretical curves are shown for reflection coefficient as a function of frequency for the absorption coefficients $A - 10^{-20}$, 10^{-21} and 5×10^{-22} cm^2 ($\chi = 0^{\circ}$, $\Theta - 0$), as calculated for the exponential layer, and compared with MITRA's curves calculated by using the parabolic approximation. The use of the exponential approximation makes variation of reflection coefficient more rapid. --M. R.

A-1133 Shmoys, J., Low frequency propagation in an exponential ionospheric layer. N. Y. Univ. Washington Square College of Arts and Science. Mathematics Research Group, Contract AF 19(122)-42, Research Report, No. EM-51, April 1953. 16 p. 3 figs., 6 refs., 67 eqs. DWB--Recently, HEADING and WHIPPLE treated the problem of propagation of long radio waves in an exponential ionospheric layer. They dealt with the case of an obliquely incident plane wave, a vertical magnetic field, and low collision frequency. The case treated here is that of vertical incidence, oblique magnetic field, and both low and high collision frequency. The results obtained do not agree with experimental data. This is probably due to the fact that coupling effects were neglected. An example is given in the Appendix which shows that the omission of coupling terms, however small their coefficients may be, is not always justified. --Author's abstract.

A-1134 Silberstein, Richard, High-frequency scatter sounding experiments at the National Bureau of Standards. Science, 118 (3078):759-763, Dec. 25, 1953. 4 figs., 13 refs. DLC--The four methods of studying backscatter echoes used at NBS since 1946 are reviewed, their basic principles explained, their merits and shortcomings discussed. Sample recordings obtained with each of the methods are presented. The techniques described are: 1) intensity vs range photography at fixed frequency, 2) range-time recording at fixed frequency, 3) plan position indicator representation and 4) the sweep frequency technique. --G. T.

A-1135 Silberstein, R., Sweep frequency backscatter: some observations and deductions. Institute of Radio Engineers, New York, Transactions, vol. AP-2(2):56-63, April 1954. 12 figs., table, 10 refs. DLC--Detailed analysis of records taken during two periods in December 1952 and January 1953. "In one group of observations over a 1150 km path on three undisturbed days, the values of F2 layer maximum usable frequency scaled from midpoint vertical-incidence ionospheric records and those determined by backscatter delay assuming ground scatter agree almost within experimental error. In another three-day group characterized by a low-latitude ionospheric disturbance with low geomagnetic K indexes but considerable sporadic E activity, values of MUF determined from scatter were much too high under the ground-scatter assumption, errors of about 30 percent being not uncommon." The distant scatter in this case appears to originate at the E layer. --Author's abstract.

A-1136 Silberstein, R., The use of sweep-frequency backscatter data for determining vertical and oblique-incidence ionosphere characteristics. IRE - URSI meeting, Washington, D. C., May 1955. --It is possible to use sweep-frequency backscatter data for obtaining monthly median values of x-kilometer maximum usable frequencies at control points in a circle of radius one half this distance. Diurnal graphs are shown for a 2370 km path comparing the classical MUF as deduced from experimental backscatter data with the same MUF as deduced from midpoint vertical-incidence data and from actual oblique-incidence characteristics. For the two cases shown, the median MUF deduced from backscatter was about 2 percent higher than that deduced from oblique-incidence records, while that deduced from vertical incidence data was about 2 percent lower. Possible causes of anomalous echoes are discussed as are characteristics of some unusual records. A strong, sporadic morning-hour echo apparently associated with the E layer is described.

A-1137 Silberstein, Richard (Nat. Bur. of Stands. Boulder, Colo.), A long-distance pulse-propagation experiment on 20.1 megacycles. Journal of Geophysical Research, Wash., D. C., 63(3):445-466, Sept. 1958. 10 figs., 3 tables, 15 refs., 6 eqs. DLC--A pulse-propagation experiment was performed between Sterling, Virginia, and Maui, Territory of Hawaii, with the object of studying the mechanism determining the classical MUF at long distances, and also of obtaining a general idea of the mode structure. Simultaneous oblique-incidence records of the transmitter pulses were made at Boulder, Colorado, which lies along the path. Some backscatter records were obtained at the transmitter site; and vertical-incidence records were made at the midpoint of the Sterling to Boulder portion of the path. Results showed greatly differing mode structures between one day and the next, indicating that the long path is very sensitive to ionospheric conditions, and also that M and N reflection and layer tilts play an important part. Experimental evidence was strong that sporadic E ionization enables the propagation of a wave over the path where F2 ionization at one end of the path is not sufficient for reflection. --Author's abstract.

A-1138 Silberstein, R. (Nat. Bur. of Stands., Boulder, Colo.), The use of sweep frequency backscatter data for determining oblique-incidence ionospheric characteristics. (dif. article). Journal of Geophysical Research, Wash., D. C., 63(2):335-351, June 1958. 12 figs., table, 8 refs. DLC--The paper presents the results of comparisons of backscatter echoes, oblique-incidence pulse reception, and midpoint vertical-incidence echoes fro a 2370 km path, following an earlier study for a 1150 km path. An attempt is made to find distinctive characteristics of those backscatter records that afford accurate values of MUF for the 2370 km path. Some sporadic intermediate-distance echoes are discussed, and some difficult night records are given. It is shown that present power and antennas are inadequate for obtaining F2 propagated echoes continuously, except on winter days. It is concluded that the sweep-frequency backscatter technique is useful for obtaining maximum-usable-frequency data for instantaneous or prediction use over inaccessible areas, but that proper antennas and skilled personnel are very important. --Author's abstract.

A-1139 Silberstein, R. (Nat. Bur. of Stands., Boulder, Colo.), The origin of the current nonenclature for the ionospheric layers. Journal of Atmospheric and Terrestrial Physics, London, 13 (3/4):382, Feb. 1959. DLC.

A-1140 Singer, Fred S.; Maple, E. and Bowen, W. A, Jr., Evidence for ionosphere currents from rocket experiments near the geomagnetic equator. Journal of Geophysical Research, 56(2): 265-281, June 1951. 10 figs., 4 refs. MH-BH--Results obtained from two aerobee rocket soundings made from a seaplane tender (Norton Sound) in March 1949, at 11°S and 89°W, about 1000 miles west of Huancayo, Peru. Instrumentation described and shown diagramatically and in photograph. Calibration, flight history (to 345,000 ft altitude) and method of analysis described. Magnetic field vs. time shown in graph for both soundings, and compared with theoretical curve from inverse cube law. Departures from this law indicate existence of a current layer in the atmosphere between 93 and 105 km. Surface data from world-wide observatories indicate some disturbances on sun or earth, but no unusual disturbances. Authors claim results confirm dynamo theory of daily magnetic variation. --M. R.

A-1141 Singer, S. F. (Physics Dept., Md. Univ.), Rocket exploration of magnetic fields and electric currents in the upper atmosphere. (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), Rocket exploration of the upper atmosphere. London, Pergamon, 1954. p. 256-260, figs., 16 refs.) DWB--Tidal winds in the conducting layers of the earth's atmosphere produce e. m. f. 's, and therefore a current system which is responsible for many of the geomagnetic variations observed at sea level. Rocket measurements at the magnetic equator have now established the existence of this current in the lower E layer of the ionosphere. (1) Because of the insufficient conductivity of even the whole atmosphere in the presence of a transverse magnetic field it has always been difficult to account for the current on the basis of a theory which does not require excessively high wind velocities. The experimental results show that the current is distributed in only a very narrow layer, extending from 93-105 km. (2) This finding forces a reconsideration of the theory of ionospheric conductivity. It leads to the suggestion that by means of Hall polarization, which is set up perpendicular to the electric field and the earth's magnetic field, the conductivity at the equator is restored to the original high value which would exist in the absence of the magnetic field. In this way it is now possible to account for the ionospheric current system without invoking the presence of extremely high winds, i. e. velocities much greater than 100 km/hr. --Author's abstract.

A-1142 Singh, B. N. and Ram, R. L., A peculiar type of periodic fading. Journal of Atmospheric and Terrestrial Physics, 13 (1-2):190-191, Dec. 1958. 3 figs., 2 refs.

A-1143 Singh, B. N. and Ram, R. L. (both, Physics Lab., Patna Univ., Patna), Rhythmic fading of short-wave radio signals. Journal of Atmospheric and Terrestrial Physics, N. Y., 16 (1/2):145-155, Oct. 1959. 5 figs., 9 refs., 16 eqs. DWB, DLC--The problem of periodic fading due to interference of a number of components of a sinusoidal radio signal has been theoretically treated by considering it as equivalent to determining the resultant of a number of simple harmonic vibrations of nearly equal frequencies. The practical bearing of the results so obtained to fading curves of magneto-ionic origin particularly those caused by interference of three and four components has been discussed. A number of typical fading curves for short-wave radio signals transmitted from Delhi and Calcutta have been described. Particular reference may be made of curves which are very likely of magneto-ionic origin and depict the complete sequence of events expected when the value of the m. u. f. for the F2 layer passes across the signal frequency due to the increase or decrease of the ionic density of the layer. Fading curves which have been ascribed to interference between waves singly and doubly reflected from F2 layer and also those which are apparently caused by interference between waves simultaneously reflected from F2 and E layers have also been described and their features discussed. An example has also been given of such fading curves whose origin appear to be obscure. --Authors' abstract.

A-1144 Singh, R. N., Ionosphere and nature of fading patterns of received radio signals. Indian Journal of Physics, Calcutta, 28(3):109-118, March 1954. 12 figs., 8 refs. DLC--Records of reception of sw transmissions from Indian and other stations are analyzed and compared with theoretical curves derived from Rayleigh's probability formula. A study is made of (a) variations of the nature of fading with time of day for a given signal frequency and transmitter distance, and (b) variation of the nature of fading with transmission distance for a given frequency at different times of day. The results indicate that the fading pattern is at least partially determined by the electron density in the region of the ionosphere at which the received waves are reflected. --Author's abstract.

A-1145 Singh, R. N. and Murty, Y. S. N. (both, Wireless Lab., Dept. of Physics, Banaras, Hindu Univ.), Limiting polarization curves for radio wave propagation in the ionosphere. Current Science, Bangalore, 27(5):161-162, May 1958. 2 figs., 6 refs., 5 eqs. DWB, DLC--At Barnabas (dip angle: 36°26'N) a study of the values for θ and χ, the multiples and submultiples of the gyromagnetic wave lengths λ have been made. The conformal method of representing the polarization of a radio wave propagated through the ionosphere in the presence of earth's magnetic field by the above symbols is still retained. A conclusion is reached that the limiting values of $\theta = 45°$ and $\chi = 0$ only when the wavelength is less than 1/3 of the gyromagnetic wavelength. The critical collision frequency was calculated as 4.49 Mc/s, the total magnetic intensity as 0.446 Gans. --N. N.

A-1146 Singh, R. N. (Banaras Hindu Univ., India) and Khastgir, S. R. (Univ. College of Scien., Calcutta, India), Study of "winds" in the F region of the ionosphere during the unusual days in the IGY calendar. Journal of Atmospheric and Terrestrial

Physics, N. Y., 16(3/4):376-383, Nov. 1959. 5 figs., 4 refs., 8 eqs. DWB, DLC--The three-spaced-receiver fading records were taken at Banaras with vertical pulsed transmission at 3.8-4.2 Mc/s during the regular world days, world meteorological intervals following the IGY calendar and also during the SWI's. The records gave information about the movements of the F region of the ionosphere during these unusual days. The velocity and the direction of the "wind" were obtained by the method of similar fades and the cross-correlation method. The experimental arrangements and the methods of measurements have been described. Usually the velocity of the F region "winds" was found to have high values during the world meteorological intervals. The sudden reversal in the direction of the F region "wind" round the midnight hour was confirmed by the observations taken during the regular world days. The sudden reversal in the direction of the "wind" was found to be followed usually by extremely rapid random fading, indicating turbulence in the ionosphere. The fading records on the unusual days in the IGY calendar have been classified and fully discussed with reference to the random and steady movements of the irregularities which exist for a short time in the F region. --Authors' abstract.

A-1147 Singh, Tej Pratap, Fading of radio signal on medium wave from oscillatory motion of lower ionosphere. Science and Culture, Calcutta, 17(11):472-473, May 1952. 2 figs., 15 refs. MH-BH--Brief note on a fading phenomenon observed on 338.6 m and 434.8 m at Delhi. The theory of oscillatory motion of the lower ionosphere is introduced to explain the phenomenon. --W. N.

A-1148 Singleton, D. G. (Physics Dept., Univ. of Queensland, Brisbane), A study of "spread F" ionospheric echoes at night at Brisbane, Pt. 3, Frequency spreading. Australian Journal of Physics, Melbourne, 10(1):60-76, March 1957. 7 figs., table, 21 refs., 9 eqs. DLC--The virtual range versus frequency (P'f) records of the ionosphere made at Brisbane during 1952 and 1953 have been examined. The observations are interpreted in terms of scattering from the clouds of enhanced ionization near the F2 layer maximum which are believed to be responsible for the scintillation of radio stars. It is suggested that there is a seasonal vertical movement of these clouds, the extent of which increases with latitude. --From author's abstract.

A-1149 Sinno, Kenzi (Radio Res. Lab., Tokyo), On the variation of the F2 layer accompanying geomagnetic storms. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 7(1):7-14, 1953. 5 figs., table, 5 refs., 4 eqs. DWB--The separation of the variations in foF2 and h'F2 accompanying geomagnetic storms into two parts depending on the universal and the local time, respectively, has been attempted by the same method as the one employed in the case of geomagnetic force components. The seasonal and latitudinal characteristics of the two parts and the developing process of the local-time part of the variations have been revealed. The deductions from the above are that the variation in the local-time part is excited by the so-called "Sd current" associated with the geomagnetic storm and that any trace of moving disturbance from the auroral zone reported by some workers is not clear enough to be found. --Author's abstract.

A-1150 Sinno, Kenzi (Hiraiso Radio Wave Observatory, Radio Research Laboratories), On radio propagation disturbances. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 10(3):143-147, 1956. 5 figs., 2 refs. DWB--Two types of geomagnetic storms are discussed in relation to forecasting of radio communication conditions. The more severe effect on radio propagation is found to arise from the 27-day recurrence storm period linked to the M region and coinciding frequently with the passage of the calm region of the solar surface of the sun's central meridian. The other nonrecurrent but effective storm type is related to the active region of the sun. Accuracy of forecasting radio communication conditions is conversely proportional to solar activity. --W. N.

A-1151 Skeib, Gunter, Die Peilung atmosphärischer Störungen durch Synchronaufnahme von Richtung und Wellenform. (Determination of atmospheric disturbances by synchronic recording of direction and wave forms.) Germany. Deutscher Wetterdienst, Berichte, No. 4(22):146-147, 1956. 9 refs. DWB, DLC--The author discusses the detection of atmospheric disturbances by means of the synchronous recording of direction and wave forms with particular reference to the work of F. SCHINDELHAUER, on the use of small sector sounding and cathode ray sounding, the Potsdam synchronous recording apparatus, the automatic atmospheric wave form recorder (ADCOCK and CLARKE), etc. --I. L. D.

A-1152 Skeib, Gunter, Über die Genauigkeit der Bestimmung von Reflexionshöhen und Entfernungen atmosphärischer Störungen aus ihrer Wellenform. (Precision of determination of reflection heights and distances of atmospheric disturbances from their wave form.) Zeitschrift für Meteorologie, Berlin, 11(5/6):129-135, May/June 1957. 2 figs., 8 tables, 2 refs., 28 eqs. DWB, DLC--SCHONLAND's formula for determining the height of the reflecting ionospheric layer (H) and the distance (D) of the lightning discharge from the point of observation are subject to errors which are the result of the fact that the precision of the temporal fixation of the echo impulse in the wave form of the disturbance has a finite limit owing to the resolving capacity of the instrumentation and irregularity in the reflection process. Equations are developed for determining the mean error of H and D when the values of p, q, r (impulses, τ, and τ_n (time differences between impulses) and D and H are taken from a wave record. Data on the mean error of D and H for different combinations of p, q and r for the specific wave record are presented. Also equation for computing the mean error of D and H from non-dimension values of p, q, r and $\frac{D}{H}$ are derived and tables with data of N

$$\frac{ct_n}{H} + \frac{D}{H} = N = \sqrt{4_n^2 + \frac{D}{H}^2}$$ and values $\frac{\partial H}{\partial \tau_1}$ $\frac{\partial H}{\partial H_2}$

and ∂H for different combinations of p, q, r and for different values of $\frac{D}{H}$ are presented. Also the errors arising as a result of fast determination of the order number in the wave form are discussed. --I. L. D.

A-1153 Skinner, N. J. and Wright, R. W., Equatorial ionospheric absorption. Journal of Atmospheric and Terrestrial Physics, 9(2/3):103-117, Aug./Sept. 1956. 7 figs., table, 18 refs., 7 eqs. DWB--Measurements of ionospheric absorption were made at Ibadan, Nigeria, mag. lat. 2 1/2°S by apparent reflection coefficient at noon. Total absorption shows a linear relation of -log e_p /F with $1/f^2$F instead of 1/f. Variation with sun's zenith distance was proportional to $(\cos \chi)^{0.7}$ instead of $(\cos \chi)^{1.5}$. These discrepancies with theory are attributed to absorption in a Chapman-type D layer. Results are compared with those from Singapore, Slough, Falkland Islands and Prince Rupert. --C. E. P. B.

A-1154 Skinner, N. J., Hope, J. et al. (both, Univ. College, Ibadan, Nigeria), Horizontal drift measurements in the ionosphere near the Equator. Nature, London, 182(4646):1363-1365, Nov. 15, 1958. 2 figs., (incl. photo), table, 6 refs., eqs. DWB--Horizontal drift in the ionospheric E and F layers have been measured regularly at Ibadan, Nigeria (magnetic latitude 2½° S) ever since 1957. The method used for the measurements and the results at Ibadan are compared with those at Singapore and Waltair. Ibadan has larger drift velocity because of its geographical position. --N. N.

A-1155 Slough, England. Radio Research Station, Electron density and profiles in the ionosphere during the IGY (Official communication from the DSIR Station). Journal of Atmospheric and Terrestrial Physics, 13(1/2):195-197, Dec. 1958. 2 tables, 2 refs.

A-1156 Slusser, E. A., Predicting performance of UHF and SHF systems. Electronics, 24(6):116-121, June 1951. 14 figs., 2 tables, 18 eqs. DWB--Topographic and atmospheric conditions affecting propagation of ultra high frequency waves are discussed and illustrated. Curves illustrate effect of rain and fog on SHF absorption. --M. R.

A-1157 Smith, Ernest Ketcham, Jr., Worldwide occurrence of sporadic E. U. S. National Bureau of Standards, Circular, No. 582, March 15, 1957. 278 p. numerous figs. and tables, 115 refs. DLC (QC100. U555)--This monograph contains a thorough review of the literature and a discussion of the structure, energy sources, physical state and definition of Es; of data obtained by vertical incidence (HF) and oblique incidence (VHF) sounding. The limiting frequency is ($>$) 5 mc. The appearance of various types of Es (Huancayo, auroral, sequential, blanketing, stratified, transparent, etc.), the major Es zones (equatorial, temperate, auroral), the geographical variations, magnetic activity relations, reception at $>$ 400 miles, field strength data, relation of vertical to oblique incidence data and sources of energy for Es (solar corpuscles, meteors, thunderstorms, winds and turbulence) are treated. Meteors provide one, but not a major, source of Es. --M. R.

A-1158 Smith, E. K. and Knecht, R. W. (both, Nat. Bu. of Stands., Boulder, Colo.), Some implications of slant-E. Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957 (Proceedings of the Atmosphere Symposium, Oslo, 1956, Pt. 2), issued 1958? p. 195-204. 14 figs., 12 refs., 4 eqs. DLC--Three examples of slant Es observed at College, Alaska on Feb. 27, 1955, are shown in ionograms. Cases of low latitude Es are also shown for the sake of comparison. Ionograms of slant-Es, the linear representation of measured and computed slant Es curves, the application of caustic focussing to slant Es through analogy to Dieminger's ground scatter case, the possible modes of slant Es, the field strength at frequencies near 2370 MUF, the isotropic case of scattered power referred to backscatter, deviations β from specular conditions and some families of theoretical slant Es curves, are shown graphically. A feature of slant Es reported in a private communication in 1951 is plotted on a linear instead of the semi-logarithmic scale.

A-1159 Smith, Ernest K., Jr. (NBS, Boulder, Colorado), Sporadic E observed on VHF oblique-incidence circuits. AGARDograph, Paris, No. 34:129-146, Sept. 1958. 11 figs., 8 refs. DWB (629. 1323 N864a)--This paper is concerned with sporadic E as observed on VHF circuits operated by the National Bureau of Standards. The only circuit for which extensive analyses are available is the initial ionospheric scatter circuit running from Cedar Rapids, Iowa, to Sterling, Virginia, in the United States, and operating at 27.775 and 49.8 Mc/s with high gain rhombic antennas. During the last year, observations have also been made over three frequency yagi to yagi circuits (30, 50, and 74 Mc/s) and four frequency rhombic circuits (30, 40, 50, 74), all circuits having their transmitters in Long Branch, Illinois, and their receivers on Table Mesa, near Boulder, Colorado. Another series of circuits operating on 50 Mc/s extend from Guantanamo Bay, Cuba, down across the magnetic equator in South America. A companion circuit to this later series runs from the northern part of Luzon in the Philippines to Okinawa in the Ryukyu Islands. Preliminary observations are presented for some of these circuits. A rather crude but simple method is shown by which it is possible to predict VHF field strength levels from vertical incidence data. Simultaneous fading rate measurements made on 30, 50 and 74 Mc/s over the Long Branch to Boulder path indicate that fading during sporadic E normally has a period of a few seconds. However it is not uncommon for fading on 30 Mc/s to be more rapid than on 50 Mc/s; 50 Mc/s to be more rapid than 74 Mc/s. Results such as these seem to point towards a mechanism where intense patches of ionization occur in the E region and reflections take place when plasma densities pertinent to the frequency and obliquity in question occur. When referred to the inverse distance level, signal strengths during periods of sporadic E propagation appear about 10 dB higher on 5 element yagi antennas than on high gain rhombics. --Author's abstract.

A-1160 Smith, Ernest K., Jr., Temporal and world-wide variations of sporadic E. AGARDograph, Paris, No. 34:1-22, Sept. 1958. 15 figs., 4 refs. DWB (629.1323 N864a)--This paper attempts to portray the gross geographical and time variations of sporadic E. As ionosonde data constitute the only reasonably uniform world wide source of information, the definition of sporadic E used here must be the same as that which has been established by international agreement for use in scaling vertical incidence records. The majority of the data used in this analysis is for the period 1947-1954. Some preliminary analyses of IGY ionosonde data, notably from the close-spaced equatorial chain in South America are also included. It is left to other papers in this meeting to distinguish between the different types of Es. Further, an arbitrary choice is made to consider only such cases of sporadic E for which the vertical incidence critical frequency (fEs) is greater than 5 Mc/s. Temporal and geographic variations are represented by contour maps for which the contour parameter is the percentage of time for which fEs exceeds 5Mc/s. Three sporadic E zones, equatorial, temporal and auroral, are established on the basis of the diurnal and seasonal variations of the gross sporadic E. The boundary between the auroral zone and the temperate zone is found to occur near the 15% auroral isochasm. The equatorial zone is taken to be a narrow ribbon centered on the magnetic equator and connected with the equatorial electrojet. The most recent data available indicates that this ribbon is about four hundred miles in width. --Author's abstract.

A-1161 Smith-Rose, R. L. and Barfield, R. H., An investigation of wireless waves arriving from the upper atmosphere. Royal Society of London, Proceedings, Ser. A, 110:580-614, March 1, 1926. 10 figs., 7 tables, 5 refs., 15 eqs. DLC--Instrumentation, methods and experiments by which evidence for the downcoming radio waves are obtained is discussed, including some conclusions and suggestions for future research. --W. N.

A-1162 Smith-Rose, R. L., International Scientific Radio Union: meeting in Sydney. Nature, London, 171(4354):628-631, April 11, 1953. DWB--Report of meeting Aug. 11-21, 1952. Subjects discussed included Measurements and Standards, Troposphere and wave propagation, Ionosphere and wave propagation, International Geophysical Year 1957-58, Terrestrial atmospherics, and Radio-astronomy. --C. E. P. B.

A-1163 Smith-Rose, R. L., Radio research station, Ditton Park, Bucks. Nature, London, 175(4465):921-923, May 28, 1955. 2 figs. DWB--An account of the research program of the Station and its associated observatories (2 in British Isles, 5 overseas). This includes influence of meteorological conditions on transmission of very short waves, continuous study of the ionosphere by vertical sounding, reflection and scattering, and noise background including sferics. The plan is shown of a special building in course of erection to replace temporary huts. --C. E. P. B.

A-1164 Smith-Rose, R. L., The new Radio Research Station, Ditton Park, Slough. Nature, London, 180(4578):163-166, July 27, 1957. DWB--New permanent buildings of Radio Research Station were opened by SIR EDWARD APPLETON on June 20, 1957. Radio research in the past 35 years summarized and present program set out, especially in connection with IGY. --C. E. P. B.

A-1165 Sörensen, E. V., Magneto-ionic Faraday rotation of the radio signals on 40 Mc/s from Satellite 1957 (Sputnik I). (Abstract of article issued by Danish Academy of Technical Sciences, Microwave Laboratory, Copenhagen, as its Report P 1765, June 24, 1959). --

Some of the fadings of the 40 Mc/s signals from Sputnik I during morning transits are assumed to originate in Faraday rotation in the ionosphere. This has been investigated for the transit of Oct. 12, 1957, 5.30 GMT, for which the orbit was known with reasonable accuracy. The fading records show an increasing fading rate during the last part of the transit. This is contrary to the simple theory based on the assumptions of a flat earth and a homogeneous ionosphere, from which a constant fading rate should be expected. The main reason why simple theory did not apply in this case, is that the satellite travels through the twilight zone from night towards day, i.e. from low to high ionization. The Faraday rotation is calculated by means of data for the orbit, magnetic field maps and predictions of the ionosphere conditions. The result is in good agreement with the observation when a high ionization between the altitude of maximum ionization and the satellite is assumed. The effect of refraction is estimated by means of the perturbation theory. It increases the Faraday rotation from 0 to 19 percent during the transit. It is concluded that it is difficult to obtain detailed information on the state of the ionosphere by means of such fading records, especially when the frequency is so low that the refraction becomes significant. --Author's summary.

A-1166 Somayajulu, Y. V. (Wireless Res. Lab., Andhra Univ.), Oblique incidence pulse observation of the ionosphere near the maximum usable frequency. Current Science, 21(6):155-156, June 1952. fig., ref. DWB--Pulse transmission experiments at frequency 21.7 Mc/s over a distance of about 1500 km at Delhi indicate that APPLETON's and BEYNAN's explanation of a parabolic region of the reflecting layer (F2) is correct since the sequence of observation was similar and particularly because a sudden increase in the signal intensity was clearly observed. Detailed account to be published. --W. N.

A-1167 Somayajulu, Y. V.; Rao, B. Ramachandra and Bhagiratha Rao, E., Investigation of travelling disturbances in the ionosphere by continuous-wave radio. Nature, London, 172(4383): 818-820, Oct. 31, 1953. 3 figs., 9 refs. DWB--The first letter describes a simple method using continuous short-wave signals and oblique-incidence pulses from Madras recorded at Waltair, 640 km distant. A typical record indicates velocities of 200-400 m/s, larger and less uniform by day than by night. The second letter describes a similar method using two short-wave transmissions on close wave lengths. --C. E. P. B.

A-1168 Southworth, Mason P. (ARRL-IGY Project Supervisor), The ARRL-IGY propagation research project. American Geophysical Union, Transactions, 39(5):995-997, Oct. 1958. DWB, DLC--Outline of program, the reporting and recording of data, the circulation of PRP news among the observers and the further uses of the propagation research data during the IGY are discussed. --N. N.

A-1169 Southworth, M. P. (Radio Propagation Lab., Stanford Univ., Calif.), Night-time equatorial propagation at 50 Mc/s: first results from an IGY amateur observing program. Journal of Geophysical Research, Wash., D. C., 65(2):601-607, Feb. 1960. 9 figs., 10 refs. DLC.

A-1170 Srivastava, C. M., The propagation of a radio atmospheric. Institution of Electrical Engineers, London, Proceedings, Pt. B, 103(10):542-546, July 1956. 4 figs., 2 tables, 9 refs., 12 eqs. DLC--The smooth oscillatory type of atmospheric is interpreted on the basis of optical properties of wave guides. The pulse is considered to originate from a pilot streamer and to be rectangular with a duration of 100 microsec. The propagation path is the space between the earth and ionosphere, taken as parallel planes. The wave form characteristics are calculated and agree with observation. --C. E. P. B.

A-1171 Srivastava, J. P. and Rajan, V. D., Anomalous variations in the angle of downcoming radio waves and their bearing on the fading of short wave signals. Indian Journal of Physics, 25(6):287-297, June 1951. 9 figs., table, 5 refs., 8 eqs. DLC--A detailed study of the problems of angle of arrivals and intensity variations of short-waves between the 16 and 41 m band. Cause and effect of circumstances resulting in abnormal values are discussed. Single and double reflected waves give normal values of angles whereas rays arising from magnetoionic splitting give anomalous variation and values of angle. Observational examples are presented. --W. N.

A-1172 Staley, Raymond C., Some problems in modelling water waves for the study of back-scattering of microwave radio energy. Deutsche Hydrographische Zeitschrift, Hamburg, 11(6):255-258, 1958. 12 refs., 11 eqs. English, German and French summaries p. 255. DWB.

A-1173 Staley, R. C., High altitude observation techniques. Science, 130(3386):1435, Nov. 20, 1959.

A-1174 Stanley, J. P., The absorption of long and very-long waves in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 1(2):65-72, 1950. 4 figs., 9 refs. MH-BH--The Radio Research Group at Cavendish Laboratory made a detailed study of the variations in reflection of long and very long waves from the ionosphere during the daytime and at night. The experimental curves are presented and an attempt made to explain theoretically the variation from summer to winter and noon to night. Older linear or parabolic models of ionization density are abandoned in favor of one in which an absorbing layer of low ion density (D region) and of great thickness underlies the main reflecting region. The exponential model is developed in detail and the sunset effect explained qualitatively. --M. R.

A-1175 Stanley, J. P., Ionospheric reflection of very long radio waves. Canadian Journal of Research, Section A, Physical Sciences, 28(6):550-557, Nov. 1950. 3 figs., 6 refs., eqs. DGS--The "tarnished mirror" model of the long wave reflecting region of the ionosphere is used to calculate the variation of reflection and conversion coefficients with angle of incidence, assuming the earth's magnetic field to be vertical and the reflection and conversion coefficients at vertical incidence in an oblique magnetic field inclined 23° to the vertical. The solution of the equations of propagation under both conditions is presented. It was found that the assumption of a vertical magnetic field theory did not lead to errors in the calculated sky wave reflection and conversion coefficient that were greater than about 10 percent although the field was inclined as much as 23° to the vertical. --I. L. D.

A-1176 Stanford Univ. Radio Propagation Laboratory, Study of sporadic ionization of the upper atmosphere by means of backscattered radio signals. Contract DA-04-200-ORD-181, Status Report, No. 1, July 1-Oct. 1, 1952. 7 p. Photostat of typescript. DWB--Report on the initial phase of a project aimed at the collection of data on the nature and characteristics of "clouds or patches of ionization" appearing sporadically in the E layer, and on concurrent weather phenomena. A continuously operating scatter-sounding apparatus (completed and installed as the first task undertaken toward the project) is described and its operation explained. --G. T.

A-1177 Staras, H., Scattering of electromagnetic energy in a randomly inhomogenous atmosphere. Journal of Applied Physics, 23(10):1152- , 1952. --First-order perturbation theory is used to derive an integral representing the scattered power at a receiver resulting from random inhomogeneities in the propagating medium. The expression obtained corresponds with that used by Booker and Gordon, but instead of the space-correlation function of refractive index used by them a time-correlation function is introduced which permits evaluation of the time average of the scattered power; this time-correlation function is directly measurable. For small-scale turbulence the average scattered power is not affected by the particular model of atmospheric turbulence chosen for large-scale turbulence the results depend on the particular time-correlation function chosen and on particular assumptions regarding the scattering bodies.

A-1178 Steiger, W. R. (Univ. Hawaii) and Matsushita, S. (High Alt. Obs., Univ. Colorado), Photographs of the high-altitude nuclear explosion "Teak". Journal of Geophysical Research, Wash., D. C., 65(2):545-550, Feb. 1960. 7 figs., 4 refs. DLC.

A-1179 Stein, Sidney (Ionosphere Research Lab., Penn. State Univ.), The role of ionospheric-layer tilts in long-range high-frequency radio propagation. Journal of Geophysical Research, Wash., D. C., 63(1):217-241, March 1958. 11 figs., 16 refs., 2+ eqs. DLC--The role of ionospheric-layer tilts in long-range HF and VHF radio propagation is discussed. A derivation of the ray trajectories for a simple ionospheric model is given. The characteristic ranges on the radio frequencies observed between 12 Mc and 30 Mc are the same; but sometimes there is a complete absence of intervening ground backscatter. The back scatter from the distant E region and the reflection from the upper side of the E layer are very noticeably associated with F-layer tilts. --N. N.

A-1180 Stoffregen, W., Ionospheric measurements in connection with thunderstorm research. Arkiv för Matematik, Astronomi och Fysik, Stockholm, 39(4), No. 19, 1944. 10 p. 13 figs., 6 refs., eqs. DLC--At the Institute of High Tension Research, Upsala, complete equipment for ionospheric research has been constructed and operated to study the relation between thunderstorms and conditions in the ionosphere. The ionization in E and F layers has been measured continuously and the abnormal increase in E region ionization often observed during the summer is found to be caused by thunderstorms. During strong earth magnetic activity the effect of thunderstorms on the ionosphere is found to be much lower. These investigations are to continue over several thunderstorm periods. --Author's abstract.

A-1181 Stoffregen, W., A panoramic ionospheric echo recorder. Terrestrial Magnetism and Atmospheric Electricity, 53(3):269-271, Sept. 1948. 3 figs. DLC--

Oscillograph arrangements connected to the receiver yield a 18 x 9 cm standing picture of the ionospheric layer on a 9 in. cathode-ray tube screen with 10 sec afterglow. --W. N.

A-1182 Storey, L. R. O., Whistlers. Scientific American, N. Y., 194(1):34-37, Jan. 1956. figs. DWB, DLC--Whistlers differ from radio atmospherics in that they occur at long wave lengths, are drawn out rather than abrupt (as are clicks) and occur repeatedly at fixed intervals (as echoes do) when they are reflected back from the opposite hemisphere via the ionosphere. If they originate in opposite hemispheres, no click precedes whistlers. The theory is explained and illustrated and recorders (sound spectrograph) and records described and illustrated. The timing of the whistlers and (their length) after the lightning click gives a clue to the distance travelled, if frequency is taken into account. Results indicate that atmosphere (400 electrons/cc) extends up to 7,000 miles instead of 1500 miles and consists of ionized hydrogen, perhaps picked up by geomagnetic field as earth passes through space. --M. R.

A-1183 Storey, L. R. O. (Nat. Center of Scien. Res., Paris), The joint use of the ordinary and extraordinary virtual height curves in determining ionospheric layer profiles. U. S. National Bureau of Standards, Journal of Research, Sec. D, 64(2):111-124, March/April 1960. 5 figs., table, 12 refs., 74 eqs. DWB, DLC.

A-1184 Straker, T. W., The ionospheric propagation of radio waves of frequency 16 kc/s over short distances. Institution of Electrical Engineers, London, Proceedings, Part C, 102(1): 122-133, March 1955. 18 figs., 18 refs. DLC--Investigations carried out between March 1948 and Oct. 1949 over a 90 km path from Rugby to Cambridge at 17 kc/s. The abnormal component of downcoming wave was isolated and measured separately. Results show reflection occurred from height of 72 km in daytime and 87 km at night, with apparent height of reflection varying with zenith angle of sun (16.8 km in summer and 13.5 km in winter). Diurnal cycles of amplitude change and phase change occurred independently. Sunrise effect on amplitude occurs 1 hour before effect on phase. No evidence was found of waves reflected twice from ionosphere. During and after magnetic storms diurnal variations were abnormal (for as long as 10 days). --M. R.

A-1185 Stranz, Dietrich, A study of impressive wave formation in the atmosphere. Chalmers Univ. of Technology, no. 71, 1948. Göteborg, Sweden.

A-1186 Stranz, Dietrich, Eng begrenzte Ionisationswolken in 125 km Höhe während einer Nordlichtstörung. (Isolated ionization clouds at height of 125 km during an auroral disturbance.) Archiv der elektrischen Übertragung, 4:213-216, (1950). 3 figs., table. Reprint available. MH-BH--From 22 h on Sept. 15, 1948 to 1 h on 16th at Göteborg 3 MHz waves showed isolated ionization clouds beginning at 200 km and descending to 125 km. Attributed to a bundle of deflected corpuscular rays. There were pulsations of 3-5 sec in intensity of echo. This observation raises a number of problems. The magnetic disturbance vector is analyzed. --C. E. P. B.

A-1187 Stranz, Dietrich, Ergebnis einer Fade-out-Statistik. (Results of fade out statistics.) Archiv der elektrischen Übertragung, 4:217-218, (1950). 7 refs. Reprint available. MH-BH--Distribution of spots about central meridian of sun on days with total fading and without fading at Göteborg compared for Aug.-Dec. 1948. This showed a significant rarity of spots near central meridian on days without fading. --C. E. P. B.

A-1188 Stranz, Dietrich, The lowest of the ionized layers of the upper atmosphere. Tellus, 2(3):150-157, Aug. 1950. 4 tables, 25 refs. DWB--The effects of ionization on chemical composition of the layer from 75 to 100 km height (D layer) and on electron density, absorption, radio propagation, etc. are treated. Various theories of the formation of the D layer are discussed. --M. R.

A-1189 Strohfeldt, M.; McNicol, R. W. E. and Gipps, G. de V., Ionospheric measurements, at oblique incidence over eastern Australia. Australian Journal of Scientific Research, Physical Sciences, Ser. A, 5(3):464-472, Sept. 1952. 3 figs., 3 plates, 10 refs. DWB--An account is given of night observations of oblique incidence pulse transmissions on 5.8 Mc/s over a baseline of 763 km, using a responder technique. The experiments aimed at measuring apparent path lengths as a guide to the identification of the reflection to the echo system received after ionospheric reflection. A correlation of Es occurrences as observed at oblique incidence and vertical incidence near the midpoint of the trajectory was effected, and certain characteristics of the Es layer are presented. Unusual records of Pedersen rays are reproduced and sudden height increases and diffuseness of F2 echoes are discussed. A check on the oblique incidence theory using a Millington transmission curve on vertical incidence hf records yielded reasonable agreement between measured and deduced reflection heights, although there is evidence of a tendency for the predicted obliquity factor to be too low. A rough analysis of oblique incidence penetrations yielded an average value for the frequency separation of the magnetoionic M. U. F.'s close to half the gyromagnetic frequency. --Authors' abstract.

A-1190 Sugar, G. R. (Nat'l. Bureau of Standards, Wash., D.C.), Some fading characteristics of regular VHF ionospheric propagation. Institute of Radio Engineers, N. Y., Proceedings, 43(10):1432-1436, Oct. 1955. 11 figs., 3 refs., eqs. DLC--Some short-term fading characteristics of a type of ionospheric propagation first described by BAILEY et al (See item No. A-94) are presented and discussed. Continuous wave transmissions from Cedar Rapids, Iowa, on 49.8 mc were received at Sterling, Va., on either rhombic or Yagi antennas directed toward the transmitter. The second detector output of a linear receiver was used to provide a voltage proportional to the envelope of the received signal. This fluctuating voltage was recorded, edited, and then analyzed to determine the probability distribution and autocorrelation function of the signal envelope. The correlation of the envelopes of signals received on spaced antennas was similarly determined for antennas spaced both normal and parallel to the transmission path. --Author's abstract.

A-1191 Sullivan, A. W., Van Valkenburg, H. M. and Barney, J. M., Low-frequency atmospheric radio noise in Florida. American Geophysical Union, Transactions, Pt. 1, 33(5):650-656, Oct. 1952. 11 figs. MH-BH--This study of diurnal and seasonal variations in average noise level and frequency spectra is based on the data of 15, 52, 189 and 530 Kc frequencies obtained since 1947, eight miles from Gainesville, Florida, where man-made noise is at a minimum and the noise levels are quite high from March to Sept. The use of 23 m high antennas enables reception of noise from any azimuth on the Signal Corps BC969 and the BC779 receivers used. The results show: 1) that noise levels are almost inversely proportional to frequency in the 10-500 Kc range; 2) the possibility that the average noise spectrum is constant at the source of the noise, hence, if this is true, atmospheric noise will prove valuable as a tool in studies of propagation; 3) diurnal and seasonal variation in noise intensity depends on frequency and propagation conditions; 4) SID generally tend to cause an increase of noise. --W. N.

A-1192 Sullivan, A. W.; Hersperger, S. P. and Brown, R. F., Investigation of atmospheric radio noise. Florida. Univ. at Gainesville, Engineering and Industrial Experiment Station, Contract AF 19(604)-876, Scientific Report, No. 10, Jan. 20, 1956. 95 p. 14 figs., 6 refs., 31 eqs. 52 abstracts. Atmospheric waveforms bibliog. p. 45-57 (151 refs.).

Also: Sullivan, A. W.; Brown, R. F. and Nawricki, P. J., Scientific Report, No. 11, April 15, 1956. 79 p. 22 figs., 3 tables, 25 refs., 26 eqs. DWB--In Report No. 10 the effect of atmospheric noise on a radioteletype system is discussed and a statistical model presented. Waveforms received from 380 mi are analyzed at source and at the receiver and the noise peaks found to be distributed according to a log-normal distribution law at the receiver but not at source. A bibliography on p. 45-57 lists 151 references of which 52 are abstracted or summarized (at some length) on p. 58-92, and an author index appended. The items are classified according to: (1) lightning discharge mechanisms, (2) electromagnetic radiations from lightning and (3) ionosphere and propagation of sferics. In the second report the correlations between the performance of the teletype and the noise distribution functions are examined and studies of VLF ground-wave polarization begun. --M. R.

A-1193 Sulzer, Peter G. and Underhill, B. B. (Pa. St. Coll. Radio Propag. Lab.), Preliminary vertical incidence equivalent height versus time recordings on 150 Kc/s. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-144, Basic Ionospheric Research, Technical Report, No. 8, Dec. 15, 1949. 13 p. 34 figs., 3 tables, 6 refs. DWB--Vertical incidence equivalent height versus time measurements at 150 Kc/s are described in this report. The preliminary measurements reported were obtained during the interval March 4 to June 21, 1949. The transmitting and receiving equipment utilized for the measurements is described in some detail. Reproductions of the photographic records procured during the above interval are included for each day on which satisfactory records were obtained. Some initial correlations and interpretation of the data are attempted. --Authors' abstract.

A-1194 Swenson, George W., Jr., VHF diffraction by mountains of the Alaska range. Univ. of Alaska, Contributions of the Geophysical Institute, Series B, No. 14, 1956. Reprinted from: Institute of Radio Engineers, Proceedings, 44(8):1049-1050, Aug. 1956. --Usable TV signals at 57 and 200 Mc/s were received during the winter 1953-54 at Lake Minchumina (across the mountain ridge including the Mt. McKinley 20, 300 ft and the Mt. Foraker 17, 395 ft) from two transmitting stations 200 mi away at Anchorage, Alaska. The subsequent series of experiments conducted, and discussed here, substantially support the validity of the knife-edge approximation. --W. N.

A-1195 Symposium on ionospheric drifts, Journal of Scientific and Industrial Research, Sec. A, New Delhi, 14(10):482-485, Oct. 1955. 2 refs. DWB, DLC--Report of symposium held at the National Physical Laboratory of India at New Delhi on July 30, 1955, in which ionospheric drifts and their measurements were discussed by Dr. K. S. Krishnan; S. N. Mitra, K. R. Ramanathan; Nanda Bhargava and others. Fading drifts in ionospheric records, the 150 km echo at nighttime, vertical ion transport and other aspects of this special problem were considered. --M. R.

A-1196 Tantry, B. A. P. and Khastgir, S. R., Studies in fading of medium wave radio signals. Indian Journal of Physics, 25 (5):217-232, May 1951. 12 figs., 4 tables, 13 refs., eqs. DLC--Evening and early night hour data are presented in curves and tables. Two types of fading pattern were observed: (1) Periodic or quasi-periodic with distinct slow and quick periods, of which the slow one is attributed to ionospheric interference described by APPLETON and BEYNON (1947) whereas the quick one is considered due to the vertical movement of the ionospheric layer that usually occurs at night. The Doppler-beat interpretation (order 3, 5 m/sec) and expression for the periodicity are given. (2) Random fading. The analysis disagrees with RAYLEIGH's formulas, possibly explainable by the existence of rays following slightly different paths. Observations of more than one peak (for distant stations) in the distribution curve must be due to single and double E layer reflections. --W. N.

A-1197 Tantry, B. A. P. and Srivastava, R. S. (both, Banaras Hindu Univ.), Preliminary studies of the energy spectrum of near atmospherics over the frequency range 3-15 kc/s. Journal of Scientific and Industrial Research, Secs. B and C, New Delhi, 17(2):47-51, Feb. 1958. 4 figs. (incl. photo), table, 4 refs. DLC--The energy spectrum of near atmospheric pulses has been investigated by the tuned amplifier method. Narrow band amplifiers, tuned to different sets of frequencies within the range 3 to 15 kc/s were employed to obtain simultaneous responses of the individual atmospheric pulses. The sinous wave patterns delineated on the oscillograph screens were focussed by suitable lenses on a photographic film. The wave form pattern of the same atmospheric pulse was also recorded simultaneously employing an automatic atmospherics recorder. The distances of the sources of atmospherics were obtained from the time intervals between the successive pulses reflected from the ionosphere. The study of the relative amplitudes of the wave patterns shows that, for most of the atmospherics recorded near the source, the amplitude distribution has a maximum between 8 and 10 kc/s. The low frequency tuned amplifiers and the automatic atmospherics recorder are briefly des cribed. --Authors' abstract.

A-1198 Tantry, B. A. P. and Srivastava, R. S. (both, Banaras Hindu Univ., India), Polarization of atmospheric pulses due to successive reflections from the ionosphere. Journal of Geophysical Research, Wash., D. C., 63(3):527-538, Sept. 1958. 6 figs., 3 tables, 9 refs., 16 eqs. DLC--In determining the direction of arrival of atmospherics by using a "crossed"-loop cathode-ray tube direction-finder, it was found that, on occasions, in addition to the usual straight-line responses on the oscillographic screen, there were elliptic patterns of gradually decreasing eccentricity, size, and tilt-angle. The observed elliptic patterns are considered as due to the abnormal polarization of the atmospheric pulses reflected successively from the ionosphere, while the linear responses are due to the direct atmospheric pulses. It has been shown in the paper how from the observed polarization ellipses and the orientation of the linear response, the polarization characteristics of the atmospheric pulses reflected successively from the ionosphere can be determined. On analyzing the observed patterns, it is found that, in general, the phase-difference between the normal and abnormal components increases gradually with the increasing order of reflection. It is suggested that the observed straight lines in the D/F pattern, bunched within a small angle, are due to the radiation pulses originating at the branching points of a long horizontal or slightly inclined lightning channel from one cloud to another. The approximate calculation from the observed angular width of the bunch of straight lines has shown that the horizontal length of the channel is consistent with SHIPLEY's observations of horizontal lightning channels along the lower edge of a cloud. --Authors' abstract.

A-1199 Tanzman, H. D.; MacLeod, G. A. and Scott, W. T., Doppler satellite measurements. Institute of Radio Engineers, Proceedings, 47(1):75-76, Jan. 1959. 5 figs., ref.

A-1200 Taubenheim, Jens (Berlin-Adlershof), Messungen der Absorption von Kurzwellen in der Ionosphäre. (Measurement of the absorption of short waves in the ionosphere.) Freiberger Forschungshefte, Ser. C, Geophysik, No. 29:1-18, Oct. 1956 (issued Berlin, Akademie Verlag). 8 figs., 22 refs., 10 eqs. DWB--A review of recent knowledge concerning absorption of short radio waves in the various ionospheric layers, methods of measurement, the relation to propagation and the relation of propagation to knowledge of the electrical properties of these layers of the upper atmosphere. Diurnal, seasonal, sunspot cycles and eclipse effects or variations are discussed and illustrated. Focussing and de-focussing are illustrated schematically. --M. R.

A-1201 Taylor, William L., Description of recording equipment to be used in the study of whistling atmospherics. U. S. National Bureau of Standards, NBS Report, No. 3559, Nov. 30, 1955. 25 p. 9 figs. DWB--The discovery, nature and cause of whistlers (atmospherics that bounce back and forth from opposite hemispheres along magnetic lines of force via the ionosphere) are reviewed and equipment designed by the National Bureau of Standards for use in a project which they are setting up to verify Storey's theory (by installations in Bermuda and the Falkland Islands), described and illustrated. Simultaneous recordings will be made for a 3-5 min period every 30 min for 12-24 hrs, two or three times a week. Magnetic tapes will be analyzed at Stanford University. --M. R.

A-1202 Taylor, William L. and Lange, L. Jerome (both, Nat'l. Bureau of Standards, Boulder, Colorado), Some characteristics of VLF propagation using atmospheric waveforms. Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings, issued 1958. p. 609-617. 6 figs., 6 refs., 3 eqs. DWB (M(055) C748pr)--Simultaneous observations have been made of the waveforms of atmospherics ("sferics") at four widely separated stations. VLF attenuation characteristics have been computed by comparing the spectra of the waveforms recorded at the four locations for each discharge. The results of some preliminary measurements of VLF attenuation are presented for the band of frequencies from 4 kc to 30 kc at distances of 1200 km to 6500 km. --Author's abstract.

A-1203 Theissen, Emil, Quelques résultats relatifs à la fréquence critique et au facteur de transmission de la couche ionosphérique F1. (A few results concerning critical frequency and propagation factor of the ionospheric F1 region.) Académie des Sciences, Paris, Comptes Rendus, 237(18):1104-1106, Nov. 2, 1953. 3 refs., 5 eqs. DWB--Assuming z for zenithal angle of the sun and K for critical frequency at z = 0, the author proposes two formulas representing (1) critical frequencies: $foF1 = K \cos n_z$; and (2) propagation factor: $(M3000)F_1 = M_o \cos m_z$. From measurements made at Freiburg, values of n and m are given as 0.22 and 0.08 ($\pm$ 0.02) respectively. Data available for Freiburg and for Washington are discussed. A relation between ionospheric propagation and solar activity is indicated. --G. T.

A-1204 Thomas, J. A. and McNicol, R. W. E., Automatic recording of the direction of arrival of radio waves reflected from the ionosphere. Institution of Electrical Engineers, London, Proceedings, Pt. B, 102(6):793-799, Nov. 1955. 11 figs., table, 10 refs. DLC--

Equipment is described which, for a fixed frequency, simultaneously determines the direction of arrival of all resolved pulses reflected from the ionosphere by measuring the phase differences for two pairs of fixed orthogonal spaced-loop serials. The vector sum and difference of the signals for each pair of loops in turn are formed in a special unit. These are amplified in normal receivers and the rectified video outputs applied to the Y and X plates respectively of a cathode-ray tube. The orientations of the resulting lines are thus governed by the phase differences between the signals at the pairs of loops. Pulse resolution is achieved by the simultaneous application of a time-base in the X direction. Phase balanced receivers are not required; since the phase sensitive portion of the equipment is confined to the loops, pre-amplifiers and the sum-and-difference unit, the system is stable enough to run without attention for up to one week. --Authors' abstract.

A-1205 Thomas, J. A. (Univ. of Queensland, Brisbane), Sporadic E at Brisbane. Australian Journal of Physics, Melbourne, 9(2): 228-246, June 1956. 19 figs. (incl. photos), table, 28 refs. DLC--Further data are presented in support of MC NICOL and GIPP's classification of two types of sporadic E at Brisbane (lat 27.5°S), namely, sequential type (Ess) and constant height type (Esc). Information is given on the occurrence, critical and blanketing frequencies, reflection coefficients, range spreading, vertical movements, and lateral extent of Es patches. No correlation is found with sunspot cycle, meteor occurrence, or thunderstorm activity. Scattering from a turbulent medium is not responsible for Esc at Brisbane. Tidal movement is regarded as most likely cause of both types of Es. --Author's abstract.

A-1206 Thomas, J. A. (Physics Dept., Univ. of Queensland, Brisbane), Double layer phenomena in the E region. Australian Journal of Physics, Melbourne, 9(4):575-577, Dec. 1956. 8 figs., 4 refs. DLC--Six ionospheric P'f and P't (2.28 Mc) records are presented for Brisbane, and models sketched to show how a multiple-layer effect could be produced by a sloping Es layer. It is presumed that the moving Es layer could be made up to an aggregate of disk-like clouds with sloping regions of the order of those postulated. Large sloping regions necessary to produce high multiple Es echoes similar to F layer echoes are rare (over a two year period) and even doubtful existence.--M. R.

A-1207 Thomas, J. A.; Svenson, A. C. and Brown, H. E. (Univ. of Queensland, Brisbane), Ionospheric recorders and sporadic E. Australian Journal of Physics, Melbourne, 9(1):159-161, March 1956. 2 figs., plate, 4 refs. DLC--

Repetitive sequences of records of Es frequency were made with different receiver gains (every 2 minutes) showing that fEs and fbEs values are reliable for stations in mid-latitudes. Marked variations in Es between stations may then be due to varying nature of the Es itself, and not as suggested by RAWER (1949), BOOKER (1950) and MC NICOL and GIPPS (1951), due to variations in the sensitivity of the recording equipment. Graphs and recorder records show no dependence of fEs on receiver sensitivity up to at least 6dB above normal recording sensitivity. --M. R.

A-1208 Thomas, J. A. (U. Queensland, Australia), Classification of sporadic E. AGARDograph, Paris, No. 34:33-36, Sept. 1958. fig., ref. DWB (629.1323 N864a)--The various approaches to the problem of classification are discussed, and the inevitable defects of various local classifications when the problem is one of determining the world-wide behavior of sporadic E are pointed out. The present IGY Classification is given, and a few comments are made on the analysis of the data so obtained. --Author's abstract.

A-1209 Thomas, J. A. (U. Queensland, Australia), Outline of suggested theories of sporadic E. AGARDograph, Paris, No. 34: 23-30, Sept. 1958. 40 refs. DWB (629.1323 N864a)--The various theories are briefly examined in the light of present day knowledge of sporadic E obtained by variety of techniques. The proposals for reflection mechanisms are outlined and these are followed by a short analysis of the suggested energy sources. Some comment is made on the general applicability of the various theories and the frequent lack of the vital connecting link between a proposed energy source and the reflection mechanism. --Author's abstract.

A-1210 Thomas, J. A., Satellite Doppler measurements and the ionosphere. Journal of Atmospheric and Terrestrial Physics, 13 (3/4):376-379, Feb. 1959. fig., 2 refs.

A-1211 Thomas, J. A. (Dept. of Phys., Univ. of Queensland, Brisbane) and Smith, E. K. (Nat'l. Bureau of Standards, Boulder, Colo.), A survey of the present knowledge of sporadic E ionization. Journal of Atmospheric and Terrestrial Physics, London, 13(3/4):295-314, Feb. 1959. 2 figs., tables, 142 refs. DLC. Also issued as U. S. National Bureau of Standards, NBS Report, No. 5564, May 15, 1958. DWB--This is a literature survey on sporadic E reflections characterized by one or more of these: random time of occurrence, partial transparency, variation of penetration frequency or of a uniform apparent reflection height. In a tabular form the survey includes the types of zones, seasonal variation of Es, the diurnal and seasonal variations of h'Es and the apparent vertical thickness of the ionization, meteor-magnetic correlations and weather and thunderstorm correlations, as well as airglow measurements in the equatorial, temperate and auroral zones. Suggestions on subjects deserving special experimental attention are added. --N. N.

A-1212 Thomas, J. O.; Haselgrove, Jenifer and Robbins, Audrey (all, Cavendish Lab., Cambridge), The electron distribution in the ionosphere over Slough, Pt. 1, Quiet days. Journal of Atmospheric and Terrestrial Physics, London, 12(1):46-56, 1958. 5 figs., 2 tables, 14 refs., 6 eqs. DLC--A method of calculating the distribution of electron density with height from experimental virtual height-frequency records using an electronic digital computer is outlined. The method assumes that the N(h) curve is monotonically increasing but makes no other a priori assumptions about the shape of the layer. It allows for the effect of the earth's magnetic field. The method has been applied to a representative selection of h'(f) records taken at Slough and the F2 layer results for the International Quiet Days are presented and compared with previous work. The height of maximum electron density in the F2 layer is found to be considerably lower than previously supposed, particularly in the summer and equinox months. Results for the F1 layer show that the peak of the layer (h_mF1) is lower than previously supposed and that the seasonal variation of h_mF1 is the opposite to that expected for a Chapman layer. --Authors' abstract.

A-1213 Thomas, J. O. and Robbins, A., The electron distribution in the ionosphere over Slough, Pt. 2: Disturbed days. Journal of Atmospheric and Terrestrial Physics, 13(1-2):131-139, Dec. 1958. 6 figs., 9 refs.

A-1214 Thomas, J. O. and Robbins, Audrey (both, Cavendish Lab., Cambridge), Ionospheric true height and M. U. F. calculations. Journal of Atmospheric and Terrestrial Physics, London, 12(1): 77-79, 1958. 2 tables, 9 refs. DLC--A recent investigation resulted in new and more accurate determinations of the electron density distribution in the ionosphere over Slough, England (51.5°N, 0.5°W). It is now known that the larger deviations from the predicted values of MUF occur in summer and in sunspot minimum years, the predicted MUF being too low. In this paper the original MUF calculated for north-south transmission of the ordinary ray has been modified by taking into account the effects of the earth's magnetic field. --N. N.

A-1215 Thomas, J. O., The distribution of electrons in the ionosphere. Institute of Radio Engineers, N. Y., Proceedings, 47(2):162-175, Feb. 1959. 11 figs., 4 tables, 92 refs., 15 eqs. DLC --This paper describes the methods now available for calculating the distribution of electrons in the ionosphere from observed virtual height-frequency records. Particular emphasis is given to recently developed machine and manual methods which make it practicable to produce electron distributions on a rapid, routine basis. Attention is drawn to the importance of these data for the physics of the ionosphere by quoting from the results of some existing surveys. --Author's summary.

A-1216 Thomas, L., Some measurements of horizontal movements in region F2 using widely spaced observing stations. Journal of Atmospheric and Terrestrial Physics, 14(1/2):123-137, April 1959. 13 figs., 2 tables, 9 refs.

A-1217 Thompson, M. C., Jr. and Waters, D. M., Comparison of phase difference and Doppler shift measurements for studying ionospheric fine structure using earth satellites. Institute of Radio Engineers, Proceedings, 46(12):1960, Dec. 1958. 2 figs., ref.

A-1218 The Threshold of Space: the Proceedings of the Conference on Chemical Aeronomy, sponsored by the Geophysics Research Directorate Air Force Cambridge Research Center, Air Research and Development Command, Cambridge, Mass., June 25-28, 1956. Coordinated by Wentworth Institute. Ed. by M. Zelikoff. pub. N. Y., Pergamon Press, 1957. 342 p. figs., photos, refs., eqs. DLC--About 200 scientists from many countries participated in this conference held at Cambridge, Mass., on June 25-28, 1956. The 45 papers are presented under 4 main heads: I. Atmos. photochemistry-earth and Venus; II. Spectroscopy and photochemistry; III. Rocket probing of the upper atmos.; and IV. Phenomena produced by hypersonic flight. Subjects concerning the airglow, ozone formation, water vapor photolysis, sodium emissions, and other aspects of photodissociation, recombination and chemical luminescence in the high atmosphere as well as basis theoretical and laboratory studies are of interest to meteorologists and aeronomists.--M. R.

A-1219 Titheridge, J. E. (Cavendish Lab., Cambridge), Variations in the direction of arrival of high-frequency radio waves. Journal of Atmospheric and Terrestrial Physics, London, 13 (1/2):17-25, Dec. 1958. 2 figs., 4 refs., 9 eqs. DLC--A general relation is derived for determining the effect of a nonhorizontally uniform ionosphere on the propagation of short radio waves. The deviations for linear and parabolic layers are evaluated and the results generalized to include an ionosphere with several layers. Some experimental results showing large diurnal changes in apparent bearing are discussed and shown to be consistent with the foregoing theory. --Author's abstract.

A-1220 Titheridge, J. E. (Cavendish Lab., Cambridge), The use of the extraordinary ray in the analysis of ionospheric records. Journal of Atmospheric and Terrestrial Physics, N. Y., 17 (1/2):110-125, Dec. 1959. 7 figs., 3 tables, 4 refs., 12 eqs. DWB, DLC--When the ordinary ray trace on an h'(f) record is used to compute an electron density profile (N(h) curve) assumptions have to be made about (a) the form which the h'(f) curve would have taken at frequencies less than those actually employed, and (b) whether or not there is appreciable ionization in the "valley" between the E and F layers. In this paper it is shown how, by considering both the ordinary and the extraordinary ray traces on the h'(f) record, it is possible to avoid both these assumptions to a considerable extent, and to deduce something about the electron distribution in the lower ionosphere and in any valley. The method is applied to some experimental records, and it is shown (a) that neglect of the low-lying ionization leads to an overestimate of the height of the night-time F region ionization of about 20 km where the plasma frequency is 2 Mc/s, and up to 15 km near the peak of the layer, and (b) that the "valley" between the E and F layers is small and nearly "full". --Author's abstract.

A-1221 Titheridge, J. E. (Cavendish Lab., Cambridge), The calculation of real and virtual heights of reflection in the ionosphere. Journal of Atmospheric and Terrestrial Physics, N. Y., 17 (1/2):96-109, Dec. 1959. 3 figs., 3 tables, 8 refs., 13 eqs. DWB, DLC--A rapid and accurate manual method is described by means of which the heights h corresponding to a given series of electron densities N can be calculated from an ionogram which shows the h'(f) curve for the ordinary or extraordinary wave. The method makes allowance for the presence of the earth's magnetic field. The virtual height is read only once at about twenty frequencies, and the calculation of a complete N(h) curve requires less than 15 min. A slightly modified method is described for use when very accurate results are required, as, for example, in a study of the fine structure of the E layer. The method makes use of a series of coefficients which may be quickly calculated once and for all, for a given place, with the aid of a desk calculating machine. The law assumed for the shape of the segments used in the analysis eliminates the necessity for the calculation and subsequent integration of the group refractive index in deriving these coefficients. The coefficients for the extraordinary wave are readily obtained by applying a correction to the "longitudinal" expression for the group refractive index. It is shown how the same coefficients can be used in the inverse process of deriving an h'(f) curve from a known N(h) curve. --Author's abstract.

A-1222 Titheridge, J. E. (Cavendish Lab., Cambridge), Ionization below the night-time F layer. Journal of Atmospheric and Terrestrial Physics, N. Y., 17(1/2):126-133, Dec. 1959. 4 figs., 2 refs. DWB, DLC--By making use of both the ordinary and extraordinary ray traces on h'(f) records it is possible to estimate the amount and distribution of low-lying ionization, having plasma frequencies less than the lowest frequency recorded. By applying this method to h'(f) curves obtained at night, it is possible to estimate the electron content of the E region, even when its critical frequency is less than the lowest recorded frequency. Results are given for Slough and Watheroo for both summer and winter conditions, and for maximum and minimum sunspot numbers. Near midnight the amount of ionization below the F region is equivalent to a constant density of about 4000 electrons/cm^3 extending down to a height of 130 km. The variation in the amount of this ionization near sunset gives a constant effective recombination coefficient of 2×10^{-8} cm^3/sec. F layer heights calculated from the ordinary ray trace only are found to be too great by about 30 km at f_N = 1 Mc/s and 5 km at f_N = 6 Mc/s. --Author's abstract.

A-1223 Toman, Kurt (Cruft Lab., Harvard Univ.), Movement of the F region. Journal of Geophysical Research, 60(1):57-70, March 1955. 19 figs., 10 refs., 3 eqs. DWB--In the course of a fixed-frequency ionospheric study, employing a pulse-triggered transmitter operating on 3.5 Mc/s and three spaced receivers, the transmission delay was continuously recorded. Aside from a vertical-incidence transmission, two oblique transmissions were thus available with 62 and 109 km as base lines, the latter being correspondingly oriented in an approximate west-east and northwest-southeast direction. An analysis of the echoes from the F region was made for the period between August 1952 and December 1953. Successive irregularities observed simultaneously on three records displayed frequently consistent time-displacements. Assuming the mid-points of the transmissions to be characteristic and preferred areas for the reflection of the h. f. -pulses, the time-displacements were interpreted as being due to a mechanical motion of the F region. Direction and speed of this movement were thus obtained, and semiannual and annual periods of these components became apparent. --Author's abstract.

A-1224 Toman, Kurt, New geometrical properties and their usefulness for ionospheric radio propagation. Institute of Radio Engineers, Proceedings, 47(8):1381-1382, Aug. 1959. 5 figs., 9 refs.

A-1225 Tomner, J. and Sigvard A., The experimental development of traveling-wave tubes. Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar (Transactions), No. 67, 1948.

A-1226 Tonning, Andreas (Norwegian Defence Res. Estab., Bergen), Scattering of electromagnetic waves by an acoustic disturbance in the atmosphere. Applied Scientific Research, Sec. B, 6 (6):401-421, 1957. 6 figs., 3 refs., eqs. DLC--The variations in density associated with an acoustic wave are shown to influence the propagation of an electromagnetic wave. The variation in electric permittivity of the atmosphere, caused by an acoustic wave, is expressed by the power density of the wave. Under the assumption that the acoustic waves are spherical, the scattered field at large distances is given in terms of definite integrals which are evaluated by means of the method of Stationary Phase. The limiting case of plane acoustic waves is discussed, and two numerical examples are given. --Author's abstract.

A-1227 Toshnival, C. R., Radio studies of the upper atmosphere at Allahabad. National Institute of Sciences of India, Proceedings, 3:337-354, 1937.

A-1228 Tsukada, Sohei (Central Radio Wave Observatory), Field intensity of WWV during geomagnetic disturbances. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan, 5(4):197-198, 1951. DWB--Abstract of a scientific study of two fluctuations in the field intensity of the station WWV (Bureau of Standards, Wash., D. C.) received at Hiraiso, Japan from July 1949 to Dec. 1950. Three types of fluctuations and their diurnal and annual course are briefly discussed. --A. A.

A-1229 Tufts College. Dept. of Electrical Engineering, Blossom IV-F; Aerobee Round 12; Development of VHF transmitter, power supply, antenna, and insulating package for use with high altitude balloons. Contract AF 19(122)-63, Progress Reports, 8 and 9, March 15 to Sept. 15, 1951. 26 p. 45 figs. (many fold.) DWB--Report covers details of preparation and flight of two rockets: Aerobee Round 12 and Blossom IV-F, and improvements on data decoding facilities. Also the work done in developing a balloon-borne transmitter, power supply, antenna and thermal package which was produced for flight testing and all of the wiring, details, photographs of parts of equipment, test data, etc. are presented. --M. R.

A-1230 Tufts College. Dept. of Physics, Construction of a toroid-like discharge tube with a coannular magnetic field to reduce loss of ions to the walls by diffusion. Contract AF 19(122)-89, Quarterly Progress Report, No. 8, June 15, 1951. 31 p. 4 plates, 6 refs. DWB--Report describes equipment under construction at Tufts College in collaboration with the Geophysical Research Directorate, for studying electronic and ionic processes in atmospheric gases, under conditions which simulate conditions in the ionosphere. A large copper toroid with a magnetic field of 1500-3000 oersteds is described and practical as well as theoretical problems connected therewith are analyzed and illustrated. --M. R.

A-1231 Tuve, M. A. and Dahl, O., A transmitter modulating device for the study of the Kennelly-Heaviside layer by the echo method. Institute of Radio Engineers, Proceedings, 16(6):794-798, June 1928. 3 figs., 3 refs. DLC--A method for modulating the transmitter, based upon the sudden pulses of plate current occurring in an unbalanced multivibrator circuit, is described briefly.

A-1232 Underhill, Bradford B. (Penna. State Col., State College, Penna.), Ionospheric research at the Pennsylvania State College. U. S. Air Force. Cambridge Research Laboratories, Geophysical Research Papers, No. 7:143-153, Dec. 1950. 7 figs. DWB--An account of the research work at the Radio Propagation Laboratory. The problem of frequencies below the broadcast band is the subject of primary interest. The diurnal changes of height and absorption at vertical and oblique incidence at 150 Kc/sec are determined. --A. A.

A-1233 U. S. Army. Forces in the Pacific. Report on Japanese research on radio wave propagation. Tokyo, General Headquarters, U. S. Army Forces, Pacific Office of the Chief Signal Officer, 1946. 2 v. (v. 1, 177+ p.; v. 2, 133+ p.) figs., numerous tables. DLC--Vol. 1 consists of a survey and summaries of Japanese technical literature (most of it in Japanese) written between 1926 and 1945. A list of the reports by source and by subject precedes the actual summaries. The heading of each summary contains the number, title, date of publication and author of paper and classification as to type (field manual, training manual, theoretical study, engineering study, etc.). A historical survey of Japanese propagation work (p. 10-13) and a summary of the more noteworthy features of the ionosphere as revealed by the Japanese observations (p. 18-19) are also included in Vol. 1. Vol. 2 consists almost entirely of tables summarizing Japanese ionospheric observations during the period from June 1934 to Aug. 1945. --M. L. R.

A-1234 U. S. National Bureau of Standards. Central Radio Propagation Laboratory, Basic radio propagation predictions three months in advance. Latest issue seen, No. 128, for July 1955, pub. April 1955. Its CRPL, Series D. No. 128, almost entirely graphs. Price: annual, domestic, $1.00 from U. S. Govt. Print. Off., Wash. 25, D. C. --Predictions are issued monthly to provide information on lust sky-wave frequency over any path at any time of day for average conditions in month in question 3 months in advance. Prediction charts are based on data from 75 stations throughout the world and 12-months zenith sunspot numbers centered on month in question. Contour charts of monthly median F2-zero-MUF, and F2-4000-MUF for each 3 zones, W, I. and E (shown on chart) into which the world is divided by longitude, are presented along with a world-wide contour chart of monthly median E-2000-MUF, contour chart of median fEs and a chart showing % of time occurrence for Es-2000-MUF in excess of 15 Mc. --M. R.

A-1235 U. S. National Bureau of Standards, Ionospheric radio propagation. Washington, D. C., Government Printing Office, June 25, 1948. 209 p. Numerous figs., refs. and eqs. --The basic theory of radio propagation is discussed and the current knowledge of the subjec t is summed up. --W. N.

A-1236 U. S. National Bureau of Standards, N. B. S. Research in radio propagation. Technical News Bulletin, 38(4):49-59, April 1954. photos. DLC--A brief review of the work of the Central Radio Propagation Laboratory, which has four main divisions: (a) the Ionosphere Research Laboratory, whose investigations include solar rf radiation, upper atmospheric winds, etc; (b) the Systems Research Laboratory, which is concerned with tropospheric propagation and with research on the best use of the frequency spectrum; (c) the Measurements Standards Laboratory, which is responsible for the standard-frequency broadcasts from WWV and WWVH; (d) the propagation prediction services. --I. R. E., Proceedings, No. 3018, Nov. 1954.

A-1237 U. S. National Bureau of Standards. Central Radio Propagation Laboratory, Ionospheric data. Its Report CRPL-F81, May 1951. 67 p. 84 figs., 69 tables. DWB--Sources of ionospheric data in various parts of the world, which are regularly sent to the Central Radio Propagation Laboratory at Washington, D. C. and are coordinated with data obtained at Washington, are given. Terminology and symbols are defined. Hourly data for Washington, D. C., for April 1951 includes all manner of ionospheric characteristics. Mean values of these characteristics for each day are included for all available parts of the earth. Ionospheric storminess at Washington, sunspot numbers at Zurich, coronal observations in Colorado and New Mexico and much other data are included. --M. R.

A-1238 U. S. National Bureau of Standards. Central Radio Propagation Laboratory, Boulder, Colo., Ionospheric data. Its. CRPL-F127, March 1955. 95 p. 156 figs., 106 + tables. DWB--World wide sources of ionospheric data are listed; tables give hourly data for Wash., D. C. and 49 other places; storms, SID's, radio propagation data, solar coronas, relative sunspot data, solar flares, etc. Also presents data in graphic form for 50 stations throughout world, both observed and predicted 5 months previously for comparative purposes. Date of data varies from Feb.-Dec. 1953 for Macquarie Island to Feb. 1955 for Wash., D. C. --M. R.

A-1239 Utah. University. Dept. of Physics, Physical properties of the upper atmosphere. Contract W19-122-ac-15, Progress Reports, Nos. 1-10, June 30, 1948-Dec. 5, 1951. 10 pieces. diagrs., graphs, eqs. DWB--Description of construction, theory and performance of a 16 level step-voltage generator, and a theoretical and experimental analysis of dispersive networks. A helical delay line possessing inductive dispersion was constructed and delays were measured. Developmental investigations of antennas for installation in tail fin of V-2 rocket, and receiving antenna for ground installation were carried out. Further development on tests of antenna transmitters, circuits and cameras are indicated and illustrated in last two reports. --M. R.

A-1240 Utah. University, Physical properties of the upper atmosphere. Contract W19-122-ac-15, Progress Report, No. 11-16, Dec. 31, 1950-March 31, 1952. 6 pieces. figs., refs. DWB--Detailed report on the development, design, construction and testing of transmitter and antenna to be installed in a Blossom IV (V-2) and an Aerobee rocket and of the recording receiver to be used on the ground. Numerous diagrams are included. The purpose was to determine the ion densities in the ionosphere and their variations in time and space. This was to be done by pulse transmissions through the ionosphere, mainly at frequencies near the critical frequency of the E layer. It was also desired to determine the effect of the ionosphere on pulse transmissions. Unfortunately, no data were obtained at the moment of explosion during the firing of the rocket. --A. A.

A-1241 Utah. University, Physical properties of the upper atmosphere. Contract W19-122-ac-15, Progress Report, No. 17, May 31, 1952, and Final Report for the Contract. Pub. July 30, 1952. 50 p. 8 figs., table, refs. DWB--

An administrative report outlining the activities of the project which was mainly concerned with the development of airborne and ground equipment for the study of electromagnetic waves at various altitudes by means of V-2 rockets and aerobees. The method of attack was several times modified during the development of the work. Great care was taken in the construction of an antenna adequate from both the transmission and aerodynamical points of view. The desired data about ion density transmission constants, etc. were not obtained since all the rockets misfired with the exception of one whose beacon failed shortly after landing. Circuit schemes for the developed equipment are included. --A. A.

A-1242 Utlaut, W. F., Ionospheric effects due to nuclear explosions. U. S. National Bureau of Standards, NBS Report, No. 6050, April 30, 1959. 5 p. 2 figs., 5 refs. DWB (621.384 U585io)--Vertical-incidence ionograms of every 15 min routine observations with a type C-2 ionosonde at the U. S. Nat. Bur. of Standard's Field Station at Maui, Hawaii located approximately 1450 km NE of Johnston Island are presented. The discussion deals with the extreme disturbances on Aug. 1 and again Aug. 12 coinciding with the high altitude nuclear explosions over Johnston Island. Complete radio fadeouts at several South Pacific circuits, abnormal magnetic perturbations, and a rare tropical aurora (observed at Apia) are reported to be effects of the blasts. --W. N.

A-1243 Uyeda, Hiroyuki; Miya, Kenichi and Kobayashi, Tsuneto (Radio Wave Res. Lab.), On the cause for unnatural distribution of occurrence of fEs and $f\,min^F$. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 6(4):179-183, Dec. 1952. 4 figs., ref., 3 eqs. DWB.

A-1244 Uyeda, H.; Ogata, Y.; Uchikura, K.; Arima, Y. and Obayashi, H., Three components of the field strength of the wave reflected from the surface of the ionosphere: their level and time variation. Japan. Radio Research Laboratories, Tokyo, Journal, 2(8):143-161, April 1955. 10 figs., refs., 40 eqs. DWB--Sky waves reflected from the surface of the ionosphere represent the different field strength varying with time for the different components in level and form. Especially, the fading of the different components are not always of the same phase or form and sometimes not of the same period. On the other hand, the ionospheric observation has revealed that the ionosphere flows with irregular surface, which produce the variation of the same order as that of the fading period of E and F echoes. In order to approach these observational results, the field strength of the three components of the received wave is estimated theoretically in the case where the form of the reflecting surface of the ionosphere is mathematically defined and the velocity is assumed. A few examples thereof are illustrated. Finally the formula to give the fading period is derived in simple cases where two clouds or a series thereof of the same form move in the same direction at the same velocity, keeping constantly a short interval of time. The calculated result coincides well with the observed one, when they are assumed to be separated by the distance of several kms and to have the velocity of about 0.1 Kc/sec. --Authors' abstract.

A-1245 Uyeda, Hiroyuki; Ishida, Tadashi; Shibata, Hisashi; Mambo, Masayoshi (all, Radio Res. Labs.) and Ishida, Tadashi (Kanto Radio Regulatory Board), On the reception of radio waves from Sputnik I. Japan. Science Council. Ionosphere Research Committee. Report of Ionosphere Research in Japan, 12(1):37-39, 1958. 2 figs. DWB, DLC--A short note analyzing the satellite's orbits obtained from the data observed at the Monitoring Division, Kuiki Radio Regulatory Bureau, Ministry of Posts & Telecommunications and from the ephemeris given by the Smithsonian Astrophysical Observatory. The regions of reception analyzed on the normal propagation by F2 and Es layer reflections, and graphically represented, are divided into two regions. Region I corresponds to the region in which the satellite is in flight lower than the height of points of maximum electron density in the F2 layer, and region II corresponds to the other region in which the satellite is in flight higher than the height of points of maximum electron density in the F2 layer. An analysis of both regions is presented. --I.S.

A-1246 Valverde, J. F., Motions of large-scale travelling disturbances determined from high-frequency backscatter and vertical incidence records. Stanford University, Electronics Research Laboratories, Contract AF 19(604)-1830, Scientific Report No. 1, May 1958.

A-1247 Van Meter, D. (Pa. St. Coll. Radio Prop. Lab.), Vertical incidence equivalent height versus time recording on 150 Kc/s. Pennsylvania. State College. Radio Propagation Laboratory, Contract AF 19(122)-44, Basic Ionospheric Research, Technical Report, No. 12, June 15, 1950. 6 p. + 8 figs., table, 2 refs. Appendix: Tabulation of equivalent-height-versus-time data from March 4, 1949 to Jan. 31, 1950. DWB--This report, a continuation of Technical Report, No. 8, presents equivalent-height-versus-time data taken at 150 Kc/s between March 4, 1949 and Jan. 31, 1950. The body of the report is a tabulation, at 15-minute intervals, of the equivalent heights obtained over the above period. Included also are graphs and a table presenting: 1) Diurnal height variations for a few days at the end of December 1949. 2) Monthly mean heights versus diurnal time, 3) Sunset and sunrise correlations, 4) Seasonal variations of midnight and noon heights, 5) Comparison of storminess indices with CRPL indices and 6) Effects of sudden ionospheric disturbances reported by CRPL. --Author's abstract.

A-1248 Vassy, Etienne (Prof., Faculte des Science de Paris), Perturbation apportees par l'atmosphere aux aides a la navigation. (Disturbing effects of the atmosphere on navigation aids.) L'Onde Electrique, Paris, No. 295:379-383, Oct. 1951. 8 figs., 13 refs. Abstracted from reprint. DWB--Disturbing effects on radio communication are summarized. Author takes up first the effect of the inclination of the ionized layers, of inhomogeneous ionization along the trajectories and of absorption and diffusion in the ionosphere and then discusses disturbances due to the troposphere (lateral refraction, conductivity and diffusion phenomena). --A. A.

A-1249 Vassy, E., La haute atmosphere. (The upper atmosphere.) Meteorologie, Paris, 4th Ser., No. 35:185-194, July/Sept. 1954. 12 figs. DWB--Review of different indirect methods for obtaining information on the high atmosphere (radio and sound propagation, meteors, ozone, twilight airglow and auroral data), and direct methods used since the war (rockets) to obtain density, temperature, chemical composition, ozone and mass spectrometer data. Measurement of electrical properties by means of (a) UHF; (b) the U. S. Naval Research Laboratory (NRL) method using two figures, 2.34 Mc and 25.6 Mc, or the sixth harmonic of the first, to determine ionization at 80-160 km; (c) the Langmuir method which determines that no electrons exist below 70 km, although + and − ions occur at 60 km, and (d) Dopper method are described. --M. R.

A-1250 Vassy, Etienne (Prof. Faculty of Sciences, Paris), Physique de l'atmosphère, tome I, Phénomènes d'émission dans l'atmosphère. (Physics of the atmosphere, Vol. 1, Emission phenomena in the atmosphere.) Paris, Gauthier-Villars, 1956. 338 p. numerous figs. --A most complete and up-to-date textbook, based on a lecture course given at the Faculty of Science in Paris. The Introduction covers in detail the methods of investigating the upper atmosphere, both direct and indirect (radiosonde, rockets, rockoons, etc.), structure, physics, chemistry, including latest data; (I) Aurora: history, forms, distribution, frequency, periodicity, spectroscopy, theory, application of results to study of upper atmosphere; (II) Night airglow: measurement, color, spectroscopy, polarization, time and space variations, correlation with other phenomena (ionosphere, geomagnetic, C. R., origin, etc.); (III) Twilight emission phenomena: oxygen, sodium, nitrogen and their photoluminescence; (IV) Meteor trail luminescence: composition, spectra, mechanism of production, OPIK's theory, results with respect to upper atmospheric winds and structure; (V) Lightning and St. Elmo's fire, Sferics (observation, geographical distribution, structure, frequency, relation to meteorological situation). The work is full of illustrations of equipment, representative data, graphs, etc. The literature on each subject is thoroughly reviewed, but no bibliographic references or citations are included. The only other similar works are those by MITRA and KHRGIAN. --M. R.

A-1251 Vassy, Etienne, Radionavigation et teleguidage a grande distance. (Long distance radionavigation and radio-control.) Annales des Telecommunications, Paris, 14(9/10):256-260, Sept./Oct. 1959. 5 figs., 5 refs., eqs. DLC.

A-1252 Veldekamp, J. and Scholte, J. G. J., Magnetische dubbele breking in de ionosfeer. (Magnetic double refraction in the ionosphere.) (In: Netherlands. (K) Meteorologisch Instituut, 1854 Koninklijk Nederlands Meteorologisch Instituut, 1954. 'S-Gravenhage, 1954. p. 430-442. table, 15 refs., 18 eqs. DWB--Measurements of double and triple magnetic refraction in the F2 layer above de Bilt (ϕ = 52°6'.1N, λ = 5°10'6E) are compared with the calculated gyrofrequency. Formulas are derived for the reflection of ordinary and extraordinary rays for vertical incidence in an electron-ion ionosphere, with allowance for collisions of electrons and ions. The observed differences between the critical frequencies f_z, f_o and f_x cannot be explained by the existence of ions, nor by the disturbing influence of electric currents in the ionosphere. It is found that the deviation of the ray-paths in the geomagnetic field may provide a sufficient explanation for the discrepancies. --Authors' abstract.

A-1253 Venkateswarlu, P. and Satyanarayana, R. (both, Physics Dep., Sri Venkateswara Univ., Tirupati), Fading of radio waves. Current Science, Bangalore, 27(8):296, Aug. 1958. fig., 2 refs., eqs. DWB, DLC--A study of the fading of radio waves has been conducted in the Ionospheric Laboratories of the Physics Department of Sri Venkateswara University, Tirupati. Medium wave radio transmissions were observed from Madras (distance - 110 km), Tiruchirapalli (distance - 320 km) and Delhi (distance - 1700 km). Observations were made by using a specially designed sensitive R-F amplifier - detector unit. Details of the work are included in this letter to the editor. --N. N.

A-1254 Vestine, E. H. (Carnegie Inst. of Wash.), Observational and theoretical aspects of magnetic and ionospheric storms. National Academy of Sciences, Wash., D. C., Proceedings, 43(1):81-92, Jan. 1957. 7 figs., 20 refs. DLC--Some of the characteristic features of magnetic and ionospheric storms and the principal theories advanced for their interpretation are reviewed. The great magnetic storm of March 24, 1940 and concurrent ionospheric changes are discussed and the latter is explained by the F region being "driven upward by the electrostatic field directed from west to east within it", following a separation of charge in the E region. The importance of electric field action upon the F region is confirmed by observations of F region behavior on magnetically quiet days. --G. T.

A-1255 Vickers, M. D. (DSIR Radio Res. Station, Slough), The calculation of the m. u. f. factor for a non-parabolic ionospheric layer. Journal of Atmospheric and Terrestrial Physics, N. Y., 17(1/2):34-45, Dec. 1959. 4 figs., 3 tables, 9 refs., 7 eqs. DWB, DLC--A method is described for calculating the ray path of a radio wave through the ionosphere as represented by an N(h) profile based on experimental data. A few such paths are calculated and from these m. u. f. factors are obtained. These factors are compared with those which would have been obtained had the existing methods of calculation been used. In most cases the differences are less than 4%. --Author's abstract.

A-1256 Vickers, M. D., The effect of the F1 layer on the calculation of the height of the F2 layer. Journal of Atmospheric and Terrestrial Physics, N Y., 16(1/2):103-105, Oct. 1959. 2 figs., 3 refs., eq. DWB, DLC--An approximate relationship between the estimated true height of the peak of the F2 layer and that given by assuming a single layer having a parabolic electron-density distribution is derived and compared with experimental data. --Author's abstract.

A-1257 Vilenskii, I. M., K teorii vzaimodeistviia radiovoln v ionosfere. (The theory of radio wave interaction in the ionosphere.) ZHurnal Eksperimental'noi i Teoreticheskoi Fiziki, Moscow, 22(5):544-561, May 1952. 2 tables, 9 refs., 78 eqs. DLC--A highly theoretical paper on the interaction of radio waves containing a calculation of all high frequency terms of such interferences. The theoretical analysis shows that in case of radio wave interaction in the atmosphere there takes place not only the phenomenon of cross modulation (the Luxemburg-Gorkii effect) but also the formation of "side (lateral)" waves - waves with combination frequencies. In the course of the analysis the author derives and discusses terms for amplitudes of "lateral" waves. The role of collision of electrons with ions in various cases has also been investigated. --A. M. P.

A-1258 Villard, O. G. and Peterson, A. M., Scatter sounding: A technique for study of the ionosphere at a distance. Institute of radio Engineers, PGAP-3:186- , 1952. Also issued as: Stanford University, Electronics Research Laboratories, Contract N6-onr-251 (07), Progress Report No. 54, Sept. 1952. -- Research has shown (1) that most oblique incidence backscattering occurs from the earth and not from the ionosphere. (2) that the backscattering coefficient of the open sea is about the same as of land (3) that relatively long pulses enormously increases the strength of the echoes. (4) that the time delay of the leading edge of the scatter echo is a fair measure of ground distance to the skip zone. On the basis of these, scatter sounding may be used to determine muf for either F-layer or sporadic E transmission, and to plot at a distance the growth of sporadic E clouds of ionization. Antenna rotation and ppi display shows at a glance which areas are open to communication at a given time and frequency tests with amateurs confirm expectations. Curves are presented to convert the oblique incidence time delay into skip distance.

A-1259 Villard, Oswald G., Jr. and Peterson, Allen M. (Radio Prop. Lab., Stanford Univ.), Scatter-sounding: a new technique in ionospheric research. Science, 116(3009):221-224, Aug. 29, 1952. 3 figs., 6 refs. DLC--Suggests that ionospheric investigations may be considerably extended in range from one station by the use of echoes back-scattered from the ground after reflection at oblique incidence at the E or F regions. It is found that pulse lengths about 10 times those commonly used for vertical-incidence sounding received on conventional communication equipment provide satisfactory ground back-scattered echoes for ionospheric reflecting points as far away as 1250 mls (F layer) or 600 mls (E layer). Possible applications are considered. --Physics Abstracts, No. 561, 1953.

A-1260 Villard, O. G. and Peterson, A. M., Instantaneous prediction of radio transmission paths. QST, 36(3):11-20, March 1952.- -- An experiment, conceived and performed by amateurs, that represents not only a useful scientific contribution but also confirms a technique that has immediate applications in practical communication. By using the method discussed here it is possible to determine whether or not a band is "open" in a given direction, and to what distance if so, using familiar equipment with relatively simple modifications. The determination can be made entirely at the transmitter, and does not depend on other stations being "on the air."

A-1261 Villard, O. G., Jr.; Stein, Sidney and Yeh, K. C. (all, Radio Propagation Lab., Stanford Univ., Calif.), Studies of transequatorial ionospheric propagation by scatter-sounding method. Journal of Geophysical Research, Wash., D. C., 62(3):399-412, Sept. 1957. 13 figs., 10 refs. Also: Silberstein, R., (Comments on) O. G. Villard, Jr.; Stein and K. C. Yeh: Studies of transequatorial ionospheric propagation by the scatter-sounding method. Ibid., 62(4):645-646, Dec. 1957. 3 foot-refs. DLC--Echoes of exceptionally long delay detected by a HF radar located in the West Indies are interpreted as ground backscatter propagated by two or more successive reflections from the F region of the ionosphere, without intermediate ground reflection. Propagation of this sort is associated with tilts in the reflecting layers. Pronounced tilts are encountered regularly in equatorial regions; one occurs almost daily at approximately 1900 local time over the geomagnetic equator; another occurs around noon in the vicinity of the subsolar point. It is shown that tilt-supported propagation can take place at frequencies considerably in excess of the MUF predicted in the usual way. It is believed that these results may explain the reports by radio amateurs of anomalous propagation between North and South America. --Authors' abstract.

A-1262 Villard, O. G., Jr.; Stein, S. and Yeh, K. C., New evidence of anomalous transequatorial ionospheric propagation. Institute of Radio Engineers, Convention Record, Pt. 1:19-30, March 1957.

A-1263 Vitkevich, V. V. and Kokurin, Iu. L., Measurement of phase and amplitude fluctuations of radio waves which have traversed ionosphere. Radio Engineering and Electronics, 3(11):70-78, 1958. Transl. of original Russian in Radiotekhnika i Elektronika, 2(7):826-832, 1957.

A-1264 Wait, James R., Induction by a horizontal oscillating magnetic dipole over a conducting homogeneous earth. American Geophysical Union, Transactions, 4(2):185-188, April 1953. table, 10 refs., 22 eqs. MH-BH.

A-1265 Wait, James R. and Froese, Charlotte (Radio Physics Lab. Defence Res. Board, Ottawa), Reflection of a transient electromagnetic wave at a conducting surface. Journal of Geophysical Research, 60(1):97-103, March 1955. 5 figs., 7 refs., 25 eqs. DWB--A solution is given for the reflection of a transient electromagnetic plane wave at oblique incidence from the plane interface of a dissipative medium. The inversion of the Laplace transforms can only be carried out in closed form in special cases. Series solutions are developed for the general case and the numerical results are presented in graphical form. Brief mention is made of the possible application of this solution to the reflection of a radio atmospheric at a sharply bounded ionosphere. --Authors' abstract.

A-1266 Wait, James R., Radiation resistance of dipoles in an interface between two dielectrics. Canadian Journal of Physics, Ottawa, 34(1):24-26, Jan. 1956. fig., 3 refs., 11 eqs. DWB, DLC--Exact expressions are derived for the radiation resistance of electric and magnetic dipoles located in the plane interface between two semi-infinite lossless dielectrics. --Author's abstract.

A-1267 Wait, James R. and Murphy, Anabeth (Nat'l. Bur. of Standards, Boulder, Colo.), Multiple reflections between the earth and the ionosphere in V.L.F. propagation. Geofisica Pura e Applicata, Milan, 35:61-72, Sept./Dec. 1956. 8 figs., 9 refs., 15 eqs. DLC--Treating the ionosphere as a sharply bounded ionized medium, sky wave field intensities are calculated by geometrical-optical methods for very low radio frequencies. The reflection coefficients are discussed in some detail and the numerical data are compared with experiment. --Authors' abstract.

A-1268 Wait, James R. (Nat'l. Bureau of Standards, Boulder, Colo.), The attenuation vs. frequency characteristics VLF radio waves. Institute of Radio Engineers, N. Y., Proceedings, 45(6):768-771, June 1957. 10 figs., 7 foot-refs., eqs. DLC--The theoretical dependence on frequency of the attenuation of the wave guide modes in VLF propagation is discussed in some detail. It is indicated that most of the published experimental data between 1 and 30 kc was compatible with the sharply bounded model of the ionosphere with a reflecting height of about 70 km during the day and 90 km during the night. --Author's abstract.

A-1269 Wait, James R. and Perry, Loris B. (Nat. Bur. of Standards, Boulder, Colo.), Calculations of ionospheric reflection coefficients at very low radio frequencies. Journal of Geophysical Res., Wash., D. C., 62(1):43-56, March 1957. 7 figs., 9 refs., 12 eqs. DLC. Also issued as U. S. National Bureau of Standards, NBS Report, No. 3588, May 15, 1956. DWB--A set of calculated curves are presented for the reflection coefficients at a sharply bounded homogeneous ionized medium with a superimposed magnetic field. The results are plotted parametrically to permit general comparisons with experimental data. Both steady-state and transient cases are considered. --Authors' abstract.

A-1270 Wait, James R. and Murphy, A. (both, Nat'l. Bureau of Standards, Boulder, Colo.), The geometrical optics of VLF sky wave propagation. Institute of Radio Engineers, N. Y., Proceedings, 45(6):754-760, June 1957. 5 figs., 3 tables, 10 foot-refs., eqs. DLC--At distances not exceeding 1500 km, it is convenient to calculate the field strength of a VLF transmitter by geometrical optics. In such computations, it is usual to assume some equivalent height for the (ionospheric) reflecting layer with a reflection coefficient that does not vary with angle of incidence. In the present paper, the ionosphere is taken to be a homogeneous ionized medium with a sharp lower boundary. The reflection coefficient, which is a function of angle of incidence, is utilized to compute the strength of the single and multiple hop sky waves. Combining these with the numerical results of the amplitude and phase of the ground wave, the total field is obtained. The theoretical field-strength-vs-distance curves compare favorably with the experimental data of Heritage for frequencies of 16. 6, 18. 6, 19. 8 kc over daytime paths in the Pacific Ocean. Finally, diffraction by the earth's bulge of the first hop sky wave is considered. This effect is important at ranges greater than 1200 km or so. --Authors' abstract.

A-1271 Wait, James R. (Nat'l. Bureau of Stands, Boulder, Colo.), Introduction to the VLF papers. Institute of Radio Engineers, N. Y., Proceedings, 45(6):739-740, June 1957. DLC--Thirteen out of 47 papers presented at the Boulder, Colo. symposium on VLF propagation Jan. 23-25, 1957 are presented in this issue of the IRE. Most of them deal with noise from atmospherics and with international standards for ionospheric propagation. The introductory paper summarizes the subsequent papers. --M. R.

A-1272 Wait, James R. (Nat'l. Bureau of Standards, Boulder, Colo.), On the mode theory of V. L. F. ionospheric propagation. Geofisica Pura e Applicata, Rome, 37:103-115, 1957. 3 figs., 7 refs., 47 eqs. DLC. Also issued with title: Mode theory of VLF ionospheric propagation for finite ground conductivity. Institute of Radio Engineers, N. Y. Proceedings, 45(6):760-767, June 1957. 7 figs., 14 foot-refs., 42 eqs. DLC--The space between the earth and the ionosphere is considered as a wave guide with sharply bounded walls. Employing a representation in terms of spherical wave functions of complex order, the field of a vertical dipole source is calculated for very low frequencies. It is shown that the dominant mode for 16 kc is of order one and not zero as has been commonly supposed. Good agreement is obtained with the experimental results of J. HERITAGE. --Author's abstract.

A-1273 Wait, J. R. and Howe, H. H. (both, Nat'l. Bur. of Standards, Boulder, Colo.), The waveguide mode theory of VLF ionospheric propagation. Institute of Radio Engineers, N. Y., Proceedings, 45(1):95, Jan. 1957. 2 figs., 5 refs., 3 eqs. DLC --The lower boundary (earth's surface) is a sharply bounded isotropic medium, but the upper boundary (the ionosphere) is a diffuse anisotropic medium. However, for frequencies around 16 kc or less it can be assumed that both boundaries are sharp and isotropic, so a simple solution of the wave guide mode theory becomes possible under certain assumptions (vertically-polarized field at large ranges). Geometrical path calculations, integrated for complex patterns or modes, and allowing for curvature of earth and conductivity of ground (a very important factor) lead to attenuation rate curves and calculations (as examples) of actual long distance propagation cases. The detailed calculations will be presented in a later paper. The dependence of sferic waveforms on geographic location is said to be due to influence of ground conductivity on dominant mode. --M. R.

A-1274 Wait, James R. (Nat'l. Bu. of Standards, Boulder, Colo.), An extension to the mode theory of VLF ionospheric propagation. Journal of Geophysical Research, Wash., D. C., 63(1): 125-135, March 1958. 9 figs., 9 refs., 10 eqs. DLC--The wave-guide mode theory of VLF propagation for a sharply-bounded homogeneous ionosphere is refined to include stratification at the lower edge of the ionosphere. The numerical results for a two-layer model are discussed in detail. By choosing the upper medium to have a conductivity with a factor of 10 greater than the lower medium, the attenuation vs frequency characteristic of the model is consistent with experimental data from 1.0 to 20 kc. The effect of the finite thickness of the E layer, important for frequencies less than 1.0 kc, is treated by an ionospheric model which has a sharp lower edge and an exponential taper to zero at greater heights. --Author's abstract.

A-1275 Wait, J. R., Propagation of very-low-frequency pulses to great distances. U. S. National Bureau of Standards, Journal of Research, 61(3):187-203, Sept., 1958. 9 figs., 9 refs.

A-1276 Wait, James R. (Nat. Bu. of Standards, Boulder, Colo.), A study of VLF field strength data, both old and new. Geofisica Pura e Applicata, Milan, 41:73-85, 1958. 16 figs., bibliog. p. 83-85, 2 eqs. DLC.

A-1277 Wait, J. R., Transmission and reflection of electromagnetic waves in the presence of stratified media. U.S. National Bureau of Standards, Journal of Research, 61(3):205-232, Sept. 1958. 12 figs., 15 refs.

A-1278 Wait, J. R., Transmission loss curves for propagation at very low radio frequencies. Institute of Radio Engineers, Transactions, 6(2):58-61, Dec. 1958. 7 figs., 9 refs.

A-1279 Wait, James R. and Conda, Alyce M., Diffraction of electromagnetic waves by smooth obstacles for grazing angles. U. S. National Bureau of Standards, Journal of Research, Sec. D, 6(2):181-197, Sept./Oct. 1959. 8 figs., 26 refs., 42 eqs. DWB, DLC.

A-1280 Wait, James R. (Nat. Bureau of Standards, Boulder, Colo.), Diurnal change of ionospheric heights deduced from phase velocity measurements at VLF. Institute of Radio Engineers, N. Y., Proceedings, 47(5, Pt. 1):998, May 1959. 11 refs., 6 eqs. DWB--This is a review of some previous work by Pierce and Crombie as reported in Nature, Vol. 177, pp. 178-179, Jan. 28, 1956, on the variation of the phase of VLF waves propagated over great distances. The present report discusses the experimental data of Pierce and Crombie from the viewpoint of the mode theory of VLF propagation. The author objects to any analytical presentation which supports the idea that ionospheric reflection coefficient remains the same for day and night. --N. N.

A-1281 Wait, J. R., Downcoming radio waves. Measurements of characteristics. Electron Radio Engineers, 36(3):106-107, March 1959. fig., 6 refs.

A-1282 Wait, James R. (Nat. Bureau of Stands., Boulder, Colo.), On the propagation of ELF radio waves and the influence of a nonhomogeneous ionosphere. Journal of Geophysical Research, Wash., D. C., 65(2):597-600, Feb. 1960. 3 figs., 6 refs., 8 eqs. DLC.

A-1283 Wait, James R. (Nat. Bu. of Stands., Boulder, Colo.), Terrestrial propagation of very-low-frequency radio waves, a theoretical investigation. U. S. National Bureau of Standards, Journal of Research, Sec. D, 64(2):153-204, Mar./April 1960. 10 figs., table, bibliog. p. 201-204, 13 eqs. DWB, DLC.

A-1284 Warwick, James W., Scientific Report, No. 3 on Contract AF 19(604)-1491. Climax, Colo. High Altitude Observatory of the Univ. of Colorado, March 15, 1956. 9 p. 6 refs., 19 eqs. DWB--At an early stage in the evolution of the research program conducted under this contract, we decided to make the measures of ionospheric absorption and refraction by means of the type of phase-switching interferometer pioneered by Ryle, at Cambridge, Eng. In the first report under the contract I assumed results on the signal-to-noise ratio for this equipment from the published papers of Ryle who, however, did not discuss the detailed derivation of the results. In the present report I discuss problem of signal-to-noise ratio in the phase-switching system, as well as the equipment's overall operation. --Author's abstract.

A-1285 Warwick, J. W. and Zirin, H. (both, High Altitude Obs., Colorado Univ.), Diurnal absorption in the D-region. Journal of Atmospheric and Terrestrial Physics, London, 11(3/4):187-191, 1957. 2 figs., 9 refs., 7 eqs. DLC--We have analyzed the diurnal variation of cosmic noise at a frequency of 18 Mc/s, From these records we derive the electron density as a function of local time and height in the D region. We also derive a one-parameter, exponential approximation to the vertical distribution of the ionizable constituent, nitric oxide. The electron density curves fit those derived in different ways by other groups. We predict that the recombination coefficient, within the D region, is either constant, or increases with height. --Authors' abstract.

A-1286 Warwick, James W. and Zirin, Harold, Research carried out Oct. 1-Dec. 31, 1956 (at the High Altitude Observatory). Colorado. Univ. High Altitude Observatory, Climax, Contract AF 19(604)-1491, Scientific Report, No. 6, April 1, 1957. 6 p. 2 figs., 9 refs., 7 eqs. DWB (M10.535 C719s)--Construction of the 18 Mc/s wide-angle interferometer continues through the report period. The antenna superstructures were essentially completed, in unassembled form, receiver tests on Ewen-Knight Radio Astronomy Receiver Model 1620 continued, but were not completed during the period. In view of the incomplete status of the equipment we decided to devote time to analysis of the records from the IGY Radio Flare Detector, constructed at HAO with funds from another source. The records show the intensity of cosmic noise (at 18 Mc/s) vertically incident through the ionosphere. We are able to derive from these records the march of electron density as a function of time of day and height in the D region. Surprisingly, we also can discuss the variation of recombination coefficient within a limited height range of the D region. The electron density curves fit, more or less, those derived in different ways by other groups. On the other hand, we predict that the recombination coefficient either is constant with height (in the D region), or increases upwards. --Authors' abstract.

A-1287 Warwick, James W. and Zirin, Harold, Research carried out in the Report Period, Jan. 1, 1957-March 31, 1957. Colorado Univ. High Altitude Observatory, Climax, Contract AF 19(604)-1491, Scientific Report, No. 7, June 27, 1957. 5 p. 2 figs., 5 refs., 11 eqs. DWB--

A technique is indicated for solving numerically the problem of the variation, f(t) of the ionizing Lyman - α flux throughout a sudden cosmic noise absorption (SCNA). The principal unknown in the solution is the recombination coefficient in the D region. The observed discontinuity in the slope of the absorption at the outset of an SCNA demonstrates the existence of a hundred-fold discontinuity in the ionizing flux at the beginning of a flare. This may be interpreted as a flash phase in Lyman - α. Finally, the uncertainty in derivation of recombination coefficients from the time lag between flare maximum in the optical spectrum, and maximum absorption in the D region is noted. --Authors' abstract.

A-1288 Warwick, James W., Measures of ionospheric absorption and refraction at 18 megacycles/second. Colorado. Univ. High Altitude Observatory, Contract AF 19(604)-1491, Final Report, Dec. 15, 1958. 9 p. 2 figs., 10 refs. DWB (M10. 535 C719s) --Ionospheric absorption and refraction at a frequency of 18 Mc/s has been measured by means of the techniques of radio astronomy. A description of the two experiment techniques used are described in this report. --N. N.

A-1289 Watanabe, Tomiya (Geophysical Inst. Tohoku Univ.), Studies on P. S. C. after the Ashour-Price's model for the ionospheric shielding effect. Tohoku Univ., Science Reports, 5th Series, Geophysics, 8(1):11-18, Nov. 1956. 4 figs., table, 15 refs., 8 eqs. DWB, DLC--Theories of pulsational sudden commencements proposed up to the present are classified into two groups: the intra-ionospheric origin theory and the extra-ionospheric origin theory. The latter seems to be more favoured by the observational facts than the former. Especially, the daily behaviour of the horizontal disturbing vector may be explained fairly well by the ionospheric shielding effect for the original extra-ionospheric magnetic field. --Author's abstract.

A-1290 Watanabe, Tomiya (Geophysical Inst., Tohoku Univ.), Electrodynamical behaviour and screening effect of the ionosphere. Tohoku Univ., Science Reports, 5th Series, Geophysics, 9(2): 81-98, Oct. 1957. 6 figs., 4 tables, 16 refs., 59 eqs. DWB, DLC--According to whether the fractional amount of the ionized gas relative to the neutral gas is great or small, and to whether the period concerned is short or long, an ionized gas containing neutral particles behaves as a hydromagnetic medium or as a metal-like substance. For the period of the geomagnetic pulsation, from several seconds to a few minutes, the earth's ionized outer atmosphere behaves as a hydromagnetic medium; on the other hand, the lower ionosphere shows a metal-like characteristic. Therefore, the Alfven wave caused in the outer atmosphere will be propagated downward, and in the lower ionosphere, it will be transformed into an electromagnetic wave, which will be propagated to the earth's surface and will be observed as a geomagnetic pulsation. Because of the metal-like behaviour, the lower ionosphere shows a screening effect for the downwards-coming Alfven wave. If the ionospheric conductivity is sufficiently good, the screening effect is so strong that the observed intensity of the geomagnetic pulsation will be weakened considerably.

A-1291 Waterman, A. T., Jr.; Aden, A. L. and de Bettencourt, J. T., A note on ionospheric radio-wave polarization, Journal of Geophysical Research, 55(1):53-56, March 1950.

A-1292 Waterman, A. T., Jr., Modulations imposed on a radio signal by satellite motions. Stanford University, Electronics Research Laboratories, Contract AF 33(600)-27784, Progress Report No. 758-1, Aug. 29, 1958.

A-1293 Watson-Watt, Sir Robert A., Directional observations of atmospherics 1916-1920. Philosophical Magazine, London, 45 (269):1010-1026, May 1923. 4 figs., 2 tables. DLC--A statistical analysis of the 1300 bearings of atmospherics taken between 1916-1920 by six British coastal finding stations.

A-1294 Watt, A. D. and Maxwell, E. L., Measured statistical characteristics of VLF atmospheric radio noise. Institute of Radio Engineers, N. Y., Proceedings, 45(1):55-62, Jan. 1957. 15 figs., tables, 18 refs., 4 eqs. DLC--Instrumentation for measuring the cumulative distribution of the amplitudes and spacings of pulses in the instantaneous envelope of the atmospheric noise field strength is described. In general, the VLF atmospheric noise observed at 22 kc in a 1-kc band during the fall of 1955 from 9°N to 71°N lat. was found to have a maximum variation in average power level, including the effects of both time and geographic location, of about 46 db. The dynamic range of the instantaneous noise envelope, measured during a 20- to 30-min period of time, is defined to be the ratio of the field strength exceeded 0.0001% of the time to that exceeded 90% of such periods of time. This dynamic range in a 1-kc band, for the 66 periods measured, varied from 59 to 102 db. The average dynamic range in the Arctic was 68 db and in the Tropics 81 db. The noise envelope at the low amplitude levels is found to be Raleigh distributed, while at the higher levels approaches a distribution having a much greater change in probability. In general, at higher levels the spacing between pulses does not appear to be more random at temperate and Arctic locations, but the noise pulses observed in the Tropics appear to be more randomly spaced. When the bandwidth of the receiver is reduced, the dynamic range approaches 21.18

db, the value expected for the Raleigh distributed envelope resulting from a thermal noise input. The bandwidth at which this occurs will depend on the character of the atmospheric noise at the time of observation, but appears from our measurements at 22 kc to be approximately 0. 2 cycle per sec. --Authors' abstract.

A-1295 Watt, A. D.; Maxwell, E. L. and Whelan, E. H., Low frequency propagation paths in Arctic areas. U. S. National Bureau of Standards, Journal of Research, Sec. D, 63(1):99-112, July/Aug. 1959. 26 figs., 3 tables, 25 refs., 6 eqs. DLC, DWB--The very low ground conductivities encountered in Arctic areas, and the particular ionospheric conditions prevailing at high latitudes, can lead to rather unusual radiation and propagation conditions. In order to determine the magnitude of these effects, field intensities from transmitters located in the Labrador and Greenland areas were measured both on the surface of the earth and during several aircraft flights over this area. The many factors involved in LF propagation are considered and calculated field intensities compared with experimental values. Under conditions where the initial portion of the propagation path is across icecap or permafrost, the attenuation observed is very great, and when the propagation path extends out over sea water, the field intensity recovery taking place after the coastline is crossed is very marked. Estimates of skywave field intensity appear to agree with the observed results provided the radiated field pattern is suitably modified by the antenna cutback factor which accounts for the presence of a finitely conducting curved earth. These vertical patterns based on work by Wait, along with the field intensity flight data, indicate that the siting of low-frequency stations several miles or more inland in Arctic regions may cause a great increase in total transmission path loss. --Authors' abstract.

A-1296 Watts, J. M. and Brown, J. N., Effects of ionosphere disturbances on low frequency variation. Journal of Geophysical Research, 56(3):403-408, Sept. 1951. 8 figs., 3 refs. MH-BH--Observations made at the National Bureau of Standards from May - Nov. 1950 of vertical incidence pulses from a vacuum-tube transmitter at frequencies of 50, 100 and 160 kc show a uniform virtual height of about 90 km. Fluctuations on disturbed days are shown in 7 figures, where records of the reflections from 1 to 3 layers between 60 and 320 km height are reproduced, as made on 35 mm film. The explanation of these variations, given for each case, shows that ionospheric storms have sudden and marked effects in nighttime reflection from the E layer. Daytime effects are more limited. Close correlation is shown between % disturbed operating time and normal magnetic K indices, (for Cheltenham) at night. --M. R.

A-1297 Watts, J. M. (Central Radio Prop. Lab., Wash., D. C.), A note on the polarization of low frequency ionosphere echoes. Journal of Geophysical Research, 57(2):287-289, June 1952. 3 refs. MH-BH--The use of a low frequency pulse transmitter in conjunction with antennas for emitting waves of nearly circular polarization gave additional information on the state of polarization of vertically incident reflected waves from the ionosphere. Automatic switching of sense of rotation provided a means of "tagging" portions of complicated h-t recorder traces if the amplitude response varied with incident wave polarization sense. --Author's abstract.

A-1298 Watts, J. M. (Central Radio Propagation Lab., Nat'l. Bureau of Standards, Wash., D. C.), Oblique incidence propagation at 300 kc using the pulse technique. Journal of Geophysical Research, 57(4):487-498, Dec. 1952. 7 figs., 6 refs. MH-BH --The results of an oblique incidence pulse experiment at 300 kc, using a path length of 1185 km over sea-water, are presented. These consist of median time delays of sky wave vs surface wave for March, April and May, 1951, together with pulse envelope photographs of typical pulse groups, continuous film recordings of surface- and sky-wave pulses, a plot of sunrise transition times, and a discussion of the sunrise conditions. --Author's abstract.

A-1299 Watts, J. M. and Brown, J. N., Some results of sweep-frequency investigation in the low frequency band. Journal of Geophysical Research, 59(1):71-86, March 1954. 13 figs., 10 refs. MH-BH--Sweep-frequency techniques, long in use in high-frequency ionospheric research, have been used recently in low frequency research at the U. S. National Bureau of Standards. The discovery of a nighttime layer between the E and F layers, which is erratic in appearance, but which seems to have continuity with the daytime E layer during sunset, is announced. Trace characteristic of magneto-ionic splitting are exhibited for the new layer and also for the low-level E layer. Polarization and virtual height records of F layer at night are shown and the effects of ionosphere storms on E and F regions are demonstrated. Daytime reflections have been recorded from three distinct E region boundaries, each of which appears to be quite sharp in ion gradient. These extend from about 70 km to over 100 km in virtual height. Several recordings of turbulent conditions in the lower levels of the daytime E region are shown. --Authors' abstract.

A-1300 Watts, J. M. (Nat'l. Bur. of Stand., Boulder, Colo.), Audio-frequency electromagnetic hiss recorded at Boulder in 1956. Geofisica Pura e Applicata, Rome, 37:169-173, 1957. 4 figs., 3 refs. DLC--

Hissing noise is very frequently heard on receivers used for detecting whistlers during geomagnetic disturbances. This phenomenon may be associated with the "dawn chorus" or whistlers, but is distinct from either and also from sferics. The energy is concentrated in narrow band widths that fluctuate, giving a surging rather than a steady hissing effect. Relative amplitude of the hiss, compared with the geomagnetic field records, is shown graphically. The hissing begins about 8 hrs after the rapid commencement of the storm. Records show the peak energy of the hiss was near 3 kc. Variations in spectra of hiss frequency are illustrated by numerous reproduced records from March-Dec. 1956, hissing was heard on 9 out of 15 major magnetic storms recorded at Boulder, Colo., at Sunset Field Station. --M. R.

A-1301 Watts, J. M. (Nat. Bur. of Stand., Boulder, Colo.), Complete night of vertical-incidence ionosphere soundings covering frequency range from 50 Kc/s to 25 Mc/s. Journal of Geophysical Research, Wash., D. C., 62(3):484-485, Sept. 1957. photo. DLC--A presentation of ionospheric sounding records for each half hour from 1730 MST to 0730 MST for one complete night, covering the entire range of frequencies from $<$ 100 Kc to $>$ 25 Mc/s. The composite records are made by joining a 2 Mc/s record made with a Model C-4 recorder at Boulder to a simultaneous record made with a low frequency recorder at Sunset Field Station 15 miles away. Series shows sunset and sunrise effects during moderately disturbed conditions. --M. R.

A-1302 Watts, J. M. (Nat. Bur. of Stand., Boulder, Colo.), An observation of audio-frequency electromagnetic noise during a period of solar disturbance. Journal of Geophysical Research, Wash., D. C., 62(2):199-206, June 1957. 5 figs., 6 refs. DLC.

A-1303 Watts, J. M. (Nat'l. Bur. of Stands., Boulder, Colo.), The interpretation of night-time low-frequency ionograms. Journal of Geophysical Research, Wash., D. C., 63(4, Pt. 1):717-726, Dec. 1958. 6 figs., 4 refs., eqs. DWB, DLC--Two types of retardation of the extraordinary ray on passing through a region whose critical frequency is below the gyro-frequency are discussed. On a sweep-frequency basis, one is observed near the critical frequency of the ordinary ray and the other appears near the gyro-frequency. Observations of either require near transparency of the lower E region during the night, but information as to the total number and distribution of electrons below the F layer can be deduced from them. --Author's abstract.

A-1304 Watts, J. M. (Nat. Bu. of Stands., Boulder, Colo.), Direction findings on whistlers. Journal of Geophysical Research, Wash., D. C., 64(11):2029-2030, Nov. 1959. photo. DLC.

A-1305 Watts, J. M. (Nat. Bu. of Stands., Boulder Laboratories), Interpretation of some features of low-frequency ionograms. Journal of Atmospheric and Terrestrial Physics, London, 15 (1/2):73-76, Sept. 1959. 5 figs., 3 refs. DLC.

A-1306 Waynick, A. H., The conference on ionospheric research (held at Pennsylvania State College. . . June 27-28-29, 1949). Journal of Geophysical Research, 54(3):281-288, Sept. 1949. MH-BH--Summaries of 12 papers mostly on effect of ionosphere layers on waves of various lengths. Papers indexed separately. Symposia summarized by A. H. WAYNICK include: Long-wave propagation; Physical bases of Appleton-Hartree dispersion equation; Auroral region studies; Ionospheric absorption, theory and measurement. --C. E. P. B.

A-1307 Waynick, A. H., Summary of (Conference on Ionospheric Research, Pennsylvania State College, June 1949). U. S. Air Force. Cambridge Research Labs., Geophysical Research Papers, 7:167-174, Dec. 1950.--Fourteen recommendations of former conferences for its further research are compared with the results of the conference in June 1949. Summarized symposia of five important problems of ionospheric research are given.

A-1308 Waynick, A. H. (Penna. St. Coll., Pa.), Studies of the ionosphere using very long wave pulse techniques. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 161-165. DWB--Results of vertical incidence equipment height records made at Penn. State College from March 1949-April 1950 and vertical incidence absorption records with semi-automatic equipment since April 1950, and vertical incidence polarization measurements since late spring 1950, are summarized and equipment described. --M. R.

A-1309 Waynick, Arthur H. (Ionosphere Res. Lab., Penn. State Univ., University Pk., Pa.), The present state of knowledge concerning the lower ionosphere. Institute of Radio Engineers, N. Y., Proceedings, 45(6):741-749, June 1957. table, 78 footrefs. DLC. Also issued as Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 90, Feb. 1, 1957. 34 p. table, 78 refs. --In this paper an attempt is made to summarize the current state of knowledge concerning the lower ionosphere. This includes at

D and lower E region heights: electron density as functions of height and time, dissipative processes, the possible atmospheric constituents involved and their distributions, physical parameters to be considered, and solar radiation and other factors relevant in the formation of this portion of the ionosphere. Where possible, comparisons between theory and experiment are made. --Author's abstract.

A-1310 Waynick, A. H., Ionospheric research. Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Final Report for Period Jan. 1, 1955 to Aug. 31, 1958. Sept. 30, 1958. 51 p. eqs. --The present statement of work is on the theoretical and experimental investigations on the physics, dynamics and general properties of the ionic layers of the earth's atmosphere. Problems related to ionospheric phenomena, electromagnetic studies, solar and high atmosphere physics as well as equipment developments are discussed. The report concludes with an appendix that contains abstracts of the 36 Scientific Reports issued during Jan. 1, 1955 to Aug. 31, 1958, and a list of over 200 papers and reports issued or published in journals read at meetings, etc., which emanated from this project. --N. N.

A-1311 Webster, H. C. (Physics Dept., Univ. Queensland, Brisbane), A study of "spread-F" ionospheric echoes at night at Brisbane, Pt. 4, Range spreading. Australian Journal of Physics, Melbourne, 11(3):322-337, Sept. 1958. 10 figs., 8 refs., 20 eqs. DLC--In the course of investigations of satellite echoes from the F region of the ionosphere, it was noted that F and Es traces recorded at night, on h't equipment at frequencies well below vertical, are broader than anticipated and tend to change in a characteristic manner as the gain of the receiver is lowered. In this paper, a quantitative explanation of these phenomena is elaborated, based on the postulate of a "rough" ionosphere. This theory leads to a method whereby, from the swept-gain h't records, estimates of roughness index can be formed. These estimates compare satisfactorily, on a statistical basis, with estimates by other methods. The theory is extended to the case of multiple-hop reflections, and to the satellite traces; general agreement with experiment is found. Evidence is presented that the ionosphere appears rougher when transmitter and receiver are adjacent than when they are widely separated, and a tentative explanation is suggested. From the roughness indices, the relative intensities of Z- and O- mode F echoes for Brisbane are computed and the rare appearance of Z-traces on Brisbane records is satisfactorily explained. --Author's abstract.

A-1312 Weekes, K. and Stuart, R. D., The ionospheric propagation of radio waves with frequencies near 100 kc/s over distances up to 1000 km. Institution of Electrical Engineers, Proceedings, Pt. 4, 99(2):38-46, April 1952. 13 figs., 4 tables, 11 refs. DLC--The first paper described steep incidence and this paper is an extension of the observations and discusses oblique incidence. The results show: (1) Height of reflection for distances greater than 400 km is about 70 km at midday in summer and no definite variation of height with frequency was observed. (2) The reflection coefficient increased steadily with distance (0.02 at 300 km to 0.09 at 800 km) for a frequency of 70 kc/s; lesser on higher frequencies. The winter reflection coefficient roughly doubled the summer values. Except for that during sudden disturbances, the amplitude of the sky wave increases by a factor up to 5, and sometimes reaches the night values (distance 850-900 km from the sender). The observations to a great extent correlate well with those discussed in the first paper. --W. N.

A-1313 Weekes, K. (Cavendish Labs., Cambridge), On the interpretation of the Doppler effect from senders in an artificial satellite. Journal of Atmospheric and Terrestrial Physics, N. Y., 12(4):335-338, 1958. fig., 2 refs., 6 eqs. DLC--In 1929 MIRICK and HENTSCHEL observed beats in the signal strength of radio waves from an aircraft at a fixed receiver. They interpreted these beats as interference effects between a direct ray and a ray reflected from the ionosphere and deduced a height for the effective reflecting layer. APPLETON (1930) compared this method of estimating the height of the ionosphere with those previously used. He showed that the beat could be regarded as a Doppler beat between the rays arriving by the two paths and that, as the height of the aircraft was negligible compared to that of the ionosphere, the experiment measured directly sin i where i is the angle of incidence of the ray on the reflecting layer. This problem is very similar to that of the observation of the Doppler effect from a sender in an artificial satellite and it is of interest to enquire whether the Doppler shift depends simply on sin i in this case when the sender is in the ionized medium and the distances are such that allowance must be made for the curvature of the earth. --Author's abstract.

A-1314 Weekes, K. (Cavendish Lab., Cambridge), Drift of an ionized layer in the presence of the geomagnetic field. (In: Polar Atmospheric Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionospheric Section, N. Y., Pergamon Press, 1958. p. 12-19. 4 figs., 7 refs.) Also issued in Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, Pt. 2, 1957, pub. 1958. p. 12-1 DWB, DLC--

This article shows that while the neutral air moves there is both a current flow as well as a drift of the ionization in the plasma which is superposed on the original air movement. The irregularity that is observed in this layer may be moved by wind in the neutral gas or by an applied electric field herein discussed. When a comparison of the relative efficiencies of these two cases is to be made we also have to compare the velocities of drift resulting from a wind of velocity C_o and from an electric field $E = C_o B$, where B is the steady magnetic field. The velocity components of such an irregular drift are relative to the air. If there is a wind C_o, contributing $E_l = C_o B$ to E the velocity relative to any fixed observer is $(V - C_o)$. It is shown that in some areas of the F layer drifts are caused by electric fields due to polarization changes; in the E region they are caused both by wind and by electrical field changes; while in the D region wind alone is the effective factor. --N. N.

A-1315 Weekes, K. (Cavendish Lab., Cambridge, England), Evidence about Es from N(h) profiles. AGARDograph, Paris, No. 34:149, Sept. 1958. DWB (629. 1323 N864a)--Two points are made in this note, one about the classification of Es types by virtual heights, and the other about the shape of the E layer in the presence of Es. It is found that the virtual height of the Es trace may be determined mainly by the gradient of the N(h) curve near the Es, and not by the actual height of the Es layer. On one occasion it was observed that, during an Es condition, a distortion was observed in the E layer which might explain the Es condition by a redistribution process. --Author's abstract.

A-1316 Weiffenbach, George C., Measurement of the Doppler shift of radio transmissions from satellites. Institute of Radio Engineers, Proceedings, 48(4):750-754, April 1960. 6 figs., refs., eq. DLC--This paper describes a receiving station network that was designed to produce Doppler data for use in a satellite Doppler navigation system. As a result of practical exigencies, this equipment is not optimum for its intended purpose, and a continuous effort is being maintained to improve the system. Current and projected changes are described briefly. Some experimental results obtained with the present system are presented. --Author's abstract.

A-1317 Weisbrod, S. and Colin, L., Refraction ov very high frequency radio signals at ionospheric heights. Nature, London, 184 (4680):119, July 11, 1959. figs., 2 refs. Also issued in Institute of Radio Engineers, Transactions, AP-8(1):107, Jan. 1960.

A-1318 Weisbrod, S. and Anderson, L. J., Simple methods for computing tropospheric and ionospheric refractive effects on radio waves. Institute of Radio Engineers, Proceedings, 47(10): 1770- , Oct. 1959.

A-1319 Wells, H. W.; Watts, J. M. and George, D. E., Detection of rapidly moving ionospheric clouds. Physical Review, 69 (9-10):540-541, May 1946. --Observations were made during the magnetic storm of March 25 and 26, 1946, with a new panoramic recording technique that enables the frequency range 1.5 to 20 megacycles to be swept in a time adjustable from 5 to 30 seconds. The ionospheric clouds were observed to move in from 800 to 900 kilometers down to 300 to 400 kilometers at a rate of 1 to 2 kilometers, and sometimes to move out again at a similar rate. 'The principal effects of influx of the clouds are: (1) sudden changes in F layer ionization; (2) rapid changes in F layer heights indicating turbulence which is often progressive from high to low heights and from high to low frequencies; (3) rapid fluctuations of echoes at the lower frequencies with occasional temporary disappearance indicating high absorption. The clouds are provisionally attributed to corpuscular ionization during magnetic disturbances, indicating a corpuscular contribution to F layer ionization. An inaccurate account of these observations was noted in 2889 of October.

A-1320 Wells, H. W., Spot-frequency ionospheric recording: a combination of sweep- and fixed-frequency techniques. Journal of Geophysical Research, 56(4):613-615, Dec. 1951. 2 figs. DLC--The panoramic high-speed ionospheric records are quite useful for the study of ionospheric irregularities, travelling disturbances and eclipse observations, but produce such tremendous amounts of data (3,600 in 10 sec) that nobody can keep up with the evaluation of the results. The author proposes a simplified sampling technique which gives a complete tabulation of virtual ionosphere heights with a minimum of scaling effort. --A. A.

A-1321 Wells, H. W. (Carnegie Inst. of Wash., Wash., D. C.), F-scatter at Huancayo, Peru, and relation to radio star scintillations. Journal of Geophysical Research, 59(2):273-277, June 1954. 2 figs., 6 refs. MH-BH--The scattering of radio waves by the F region of the ionosphere at an equatorial location (Huancayo, Peru) was discussed by BOOKER and WELLS (1938). Subsequent analysis reveals pronouncedly diurnal, seasonal, and annual characteristics. It is fundamentally a night-time event, with greatest frequency of occurrence in the period from four hours before midnight to four hours after midnight. The scattering is most prevalent during seasons when the sun is overhead and is infrequently observed during May, June, July, and August (local winter) when the noon solar zenith angle becomes as great as 35°. The relative total annual occurrence of F region scatter for the period 1938 through 1945 shows low values during 1941-1942, followed by a rapid increase through 1946, which is not closely related to solar activity. The diurnal properties of F scatter closely correspond to reported characteristics of radio star scintillations with peak activity around midnight. However, the annual or seasonal properties are not in simple agreement. --Author's abstract.

A-1322 Wells, H. W. (Carnegie Inst. of Wash., Dept. of Terrestrial Magn.), Large-scale movements of the layers. (In: Polar Atmosphere Symposium, Oslo, July 2-8, 1956, Proceedings, Pt. 2, Ionospheric Section, N. Y. Pergamon Press, 1958. p. 33-40. 12 figs.) Also issued in Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, Pt. 2, 1957, pub. 1958, p. 33-40. DWB, DLC--Various charts and figures are presented to illustrate the typical cloudlike surge in foF2 and its variations. The back-scatter records at different points near Washington, D. C. are included as well as the graphs of critical frequencies for various stations spaced 150-200 km or more in Maryland, Virginia and West Virginia. The results of this work are based on analysis of both the ordinary and the extraordinary wave components as shown on the velocity-vector-wavelength component charts, Dec. 1952. Arrows show the magnitude and direction of drift motions at each significant height. --N. N.

A-1323 Wells, W. B., Upper atmosphere studies by means of low-frequency electromagnetic waves. U. S. Navy. Electronics Laboratory, San Diego, Calif., Report 311, Dec. 9, 1953. 72 p. 32 figs., 2 tables. DWB--Electromagnetic measurements were conducted on two consecutive days of each month from April 1950 through February 1951, except May and November, to study the propagation properties of the upper atmosphere. The receiving site was located near Gila Bend, Arizona. Photographic records of oscilloscope traces (A-scan) were taken of signals from distant lightning discharges (sferics) and of echoes from pulse soundings on 196 kc at vertical incidence. Sferics (of frequencies between approximately 5 and 20 kc) at oblique incidence are refracted from heights of 82 to 92 km at night. Pulse soundings at vertical incidence, on a frequency of 196 kc, indicated average nighttime virtual heights of reflection between 76 and 120 km. No significant correlation was found between the data obtained on the electromagnetic studies and those on acoustic studies conducted in the same area. --Author's abstract.

A-1324 Westfold, K. C., The interpretation of the magneto-ionic theory. Journal of Atmospheric and Terrestrial Physics, 1(3): 152-186, 1951.--Studies particular approximate solutions of the quadratic equation determining complex refractive index and polarization. For the case of collision-frequency small compared with the wave frequency, presents a set of curves from which the mathematical behavior of the complex dielectric constant and polarization can be obtained. From these curves other curves are derived depicting the behavior of refractive index and absorption coefficient under physical conditions. Also uses approximations that gyro-frequency is small or large compared with the wave frequency, and collision frequency large compared with the wave frequency. Some discussion is given of the application of the magneto-ionic equations to the solar atmosphere as well as to the ionosphere. --L. A. M.

A-1325 Whale, H. A. and Stanley, J. P., Group and phase velocities from the magneto-ionic theory. Journal of Atmospheric and Terrestrial Physics, 1(2):82-94, 1950. 11 figs., 11 refs., 19 eqs. MH-BH--Calculations of group velocity are made at Cambridge with an electronic computer (EPSAC) and curves presented to show visually the behavior of radio waves passing through an ionized medium, under a variety of conditions. The ordinary No-field case, the ordinary Component and the Extraordinary Component are considered separately. Three dimensional models are drawn to show the dependence of curves on the value of y. The effect of varying direction of propagation angle and of wave length is also shown. --M. R.

A-1326 Whale, H. A., Determination of electron densities in the ionosphere from experimental (h', f) curves. Journal of Atmosphere and Terrestrial Physics, 1(4):244-253, 1951. 5 figs., 10 refs., 12 eqs. DWB--It is shown how a differential analyzer can be used to facilitate the calculation of ionospheric distributions of electron density directly from observed (h', f) curves by previously known methods. It is pointed out that the simple method, in which the earth's magnetic field is neglected, leads to inacceptable results. A modified method by which the effect of the earth's field can be approximately allowed for is described and it is shown that, when this method is employed, feasible results are obtained. --Author's abstract.

A-1327 Whale, H. A., Fine structure of the ionospheric region E. Journal of Atmospheric and Terrestrial Physics, 1(4):233-243, 1951. 6 figs., 12 refs. DWB--Deals with the vertical distribution of electron density of the E region and the way in which this distribution changes with time. This descriptive investigation is based on a series of accurate (h', f) records obtained by employing two oscillators. The experimental results are presented in curves and compared with theoretical curves for various model ionospheres. --W. N.

A-1328 Whale, H. A., Widespread diurnal variations of effective slope of the ionosphere. Nature, London, 175(4445):77-78, Jan. 8, 1955. fig., ref., eq. DWB--Bearing and elevation of radio signals from Fiji and Brisbane, received at Seagrave, Auckland, are used to determine daytime diurnal variation of the effective N - S and E - W slopes of the ionosphere. --C. E. P. B.

A-1329 Whale, H. A., An estimate of the size of the antipodal area in short-wave radio propagation. Journal of Atmospheric and Terrestrial Physics, 9(2/3):159-161, Aug./Sept. 1956. fig., ref. DWB.

A-1330 Whale, H. A., Effective tilts of the ionosphere at places about 1000 km apart. Physical Society of London, Proceedings, Ser. B, 69(3):301-310, March 1, 1956. 8 figs., 5 refs., eqs. DWB--Observations of bearing and elevation of signals received at Auckland, N. Z., from Fiji (9315 Kc/s, distance 2000 km) and Brisbane (9660 Kc/s, 2250 km)" are sometimes consistent with the existence during the daytime of effective ionospheric tilts which are similar at places more than 1000 km apart. These tilts are of the order of half a degree and are in opposite directions during the morning and the afternoon. They may correspond to actual tilts of a uniform ionosphere or be due to horizontal gradients of electron density. "--From author's abstract.

A-1331 Whale, H. A. (Seagrove Radio Res. Sta., New Zealand) and Delves, L. M. (Wadham College, Oxford), Some relations between the bearing and amplitude of a fading radio wave. Journal of Atmospheric and Terrestrial Physics, London, 13(1/2): 72-85, Dec. 1958. 7 figs., 8 refs., 16 eqs. DLC.

A-1332 Whale, H. A. (Seagrove Radio Res. Station, New Zealand), The effects of ionospheric irregularities and the auroral zone on the bearings of short-wave radio signals. Journal of Atmospheric and Terrestrial Physics, London, 13(3/4):258-270, Feb. 1959. 8 figs., 12 refs., 5 eqs. DLC.

A-1333 Wheeldon, A. J., The IXth plenary assembly of C. C. I. R. Point to Point Telecommunications, 4(1):12-16, Oct. 1959. ref. DLC--The activities of the several study groups of the International Radio Consultative Committee (C. C. I. R.) as observed during the 9th plenary assembly at Los Angeles in

1959 are briefly reviewed. The some 300 delegates represented 36 countries. English language, rather than the official French language tends to become the working language of the assemblies. --W. N.

A-1334 Wheelon, A. D. (Ramo-Wooldridge Corp., Los Angeles, Calif.), Note on scatter propagation with a modified exponential correlation. Institute of Radio Engineers, N. Y., Proceedings, 43(10):1381-1383, Oct. 1955. 14 refs., numerous eqs. DLC--A phenomenological exponential space correlation of dielectric fluctuations is normally used to predict scatter field strengths beyond the horizon. This paper introduces a modified exponential model which includes effects of the smallest blob cutoff in the turbulent spectrum and rectifies the correlation's cusp at the origin. It is found that the present agreement of troposphere scatter experiments with the exponential function does not depend on this cusp. It is suggested that frequency-dependent tropospheric fields recently measured below 25 cm may indicate the influence of the correlation's fine structure. The same model is then applied to the ionosphere, where the extended range VHF scatter wavelengths just straddle the smallest blob size ($\sim$ 3 m) in the E layer. The turbulence fine structure is most important for this propagation and gives a qualitative explanation of the curious dualism in frequency scaling laws observed at opposite ends of the VHF band. Satisfactory variation of signal strength with scattering angle is also predicted by this model. It is shown that scatter measurements can provide valuable estimates of the atmosphere's fine structure at various heights. --Author's abstract.

A-1335 Wheelon, Albert D. (Ramo-Wooldridge Corp, Calif.), Diurnal variations of signal level and scattering heights for VHF propagation. Journal of Geophysical Research, Wash., D. C., 62 (2):255-266, June 1957. 6 figs., 16 refs., 4+ eqs. DLC--The scattering of VHF radio waves in the lower ionosphere is identified with turbulent fluctuations of the electron plasma. The theory of gradient mixing is applied to the afternoon and early evening periods, for which solar control is thought to dominate meteoric contributions. The scattering cross-section for this process

$$\sigma = 2\pi r_o^2 \left(\frac{dN}{dh}\right)^2 \left[\frac{4\pi}{\lambda} \sin\left(\frac{\theta}{2}\right)\right]^{-5}$$

depends on ionospheric conditions only through the ambient electron density-height profile's gradient dN/dh. It is found that the afternoon decay of signal strength and simultaneous increase of scattering height can be correlated with independent estimates of electron density and recombination coefficients in the lower ionosphere. The observation of two scattering levels on short paths and the lack of a midday maximum on long paths is predictable. Diurnal variations of the frequency dependence of these transmissions suggest a strong influence of the earth's magnetic field. --Author's abstract.

A-1336 Wheelon, Albert D. (Ramo-Wooldridge Corp., Los Angeles, Calif.), Radio frequency and scattering angle dependence of ionospheric scatter propagation at VHF. Journal of Geophysical Research, Wash., D. C., 62(1):93-112, March 1957. 8 figs., 20 refs., 4+ eqs. DLC--The weak and fluctuating radio signals observed at distances of 1,500 km on VHF are attributed to scattering from E region turbulence. It is noted that propagation constants $k = 4\pi/\lambda \sin(\theta/2)$, corresponding to the experimental frequencies (28 to 108 Mc), just straddle the viscosity cutoff wave-number $k_{,} = (2 \text{ meters})^{-1}$ of the region, thereby giving a qualitative explanation for the curious dichotomy found in the experimental data. The two competitive turbulence theories are then developed in detail near the viscosity transition range. It is found that pressure fluctuations of the ionosphere's neutral gases induce a spectrum of dielectric variations which reproduce the frequency and scattering angle dependence of the experimental results quite well. A theory of turbulent mixing of ionization gradients is then developed along the lines of Heisenberg's original treatment of the velocity field. This process predicts a frequency variation of power levels which is also satisfactory. It is concluded that more precise, simultaneous measurements will be required to choose between the two theories on this basis. --Author's abstract.

A-1337 Wheelon, Albert D., Refractive corrections to scatter propagation. Journal of Geophysical Research, Wash., D. C., 62(3):343-349, Sept. 1957. 3 figs., 12 refs., 14 eqs. DLC--The role played by the ionosphere's mean electron density for scatter propagation is considered. An electron plasma at the scattering point (1) increases the effective wave length and (2) decreases the scattering angle. These effects combine to modify the basic propagation variable

$$g' = \frac{4\pi}{\lambda} \sin\left(\frac{\theta}{2}\right)\left[1 - \frac{f^2_{MUF}}{f^2}\right]^{1/2}$$

by a factor which depends only on the instantaneous maximum usable frequency for the path. Associated signal level variations are found to be insignificant for conventional VHF scatter links. Such an analysis does provide an explanation for recent observations of F layer scattered signals and their correlations with f MUF/f. Apparent scattering-height changes caused by variable refractive pulse delay times are also studied.--Author's abstract.

A-1338 Wheelon, A. D. (Space Technology Labs., Inc., Los Angeles, Calif.), Relation of turbulence theory to ionospheric scatter propagation experiments (summary only). Journal of Geophysical Research, Wash., D. C., 64(12):2230-2231, Dec. 1959. ref., eq. DLC--The subjects discussed are: 1) Statistical behavior of ionospheric scatter signals; 2) scattering of electromagnetic waves by turbulent irregularities; 3) spectrum of electron density deviations and its relation to turbulence; 4) signal level and scattering heights, and finally, 5) an explanation is given of some SID features in terms of increased attenuation. --W. N.

A-1339 Whipple, Fred L. (Harvard College Obs.), Evidence for winds in the outer atmosphere. National Academy of Sciences, Wash., D. C., Proceedings, 40(10):966-972, Oct. 1954. 2 figs., 27 refs. DWB--An integrated account of the numerous methods of estimating winds above the "balloon level." Some of these are: meteor trains (visual and radio tracking and Doppler techniques), noctilucent clouds, night glow, aurora, sound propagation, ionospheric motions, high altitude rockets, etc. Hope is expressed that the IGY will increase our knowledge or understanding of these motions on a global scale. --M. R.

A-1340 White, Marvin L. (Central Radio Propagation Lab., Nat. Bu. of Stands., Boulder, Colo.), Atmospheric tides and ionospheric electrodynamics. Journal of Geophysical Research, Wash., D. C., 65(1):153-171, Jan. 1960. 11 figs., 3 tables, 27 refs., 35 eqs. DWB, DLC--A brief review is given of the resonance theory of atmospheric tidal oscillations including both thermal and gravitational excitation. Semiempirical wind patterns for various latitudes are given in Fig. 1, and the semiempirical variation of solar semidiurnal wind velocities with height are given in Fig. 2, based on (1) solar barometric variations at ground level (Chapman, 1951), (2) wind measurements at Balloon heights (Johnson, 1955), (3) radio meteor echo experiments (Greenhow and Neufeld, 1955), (4) E-region winds from radio pulse techniques (Briggs and Spencer, 1954), and (5) airglow cell movements (Roach and others, 1958). Finally, current work on the extension of modern tidal theory (valid for a neutral envelope) into the dynamo region is discussed (White, in press). --Author's abstract.

A-1341 Whitehead, J. D., The focusing of short radio waves reflected from the ionosphere. Journal of Atmospheric and Terrestrial Physics, 9(5/6):269-275, Nov. 1956. 3 figs., table, 5 refs., 6 eqs. DWB--Increases of amplitude for about 2 min of a 4.2 Mc/s wave vertically reflected from F layer ("bursts") are shown by simultaneous observations at Cambridge (Eng.) and Swaffham, 15 km to E, to result from focusing by large scale distortions moving horizontally overhead (Munro's travelling disturbances). The average velocity was 98 m/s. There were very few bursts at night, a rapid increase at sunrise, more in the morning than afternoon, and a gradual tailing off at sunset. --C. E. P. B.

A-1342 Whitehead, J. D., The absorption of radio waves in an ionospheric layer. Journal of Atmospheric and Terrestrial Physics, 9(5/6):276-281, Nov. 1956. 2 figs., 2 refs., 7 eqs. DWB--Formulas are given for the absorption per unit length of waves absorbed or reflected in the E or F region. The absorption of a 2 Mc/s wave reflected in a Chapman layer of critical frequency 3 Mc/s with and without taking account of the geomagnetic field shows that with the field a considerable amount of the total absorption occurs near the top of the wave trajectory in the deviating region. --C. E. P. B.

A-1343 Whitehead, J. D., The absorption of short radio waves in the ionosphere. Journal of Atmospheric and Terrestrial Physics, 10(1):12-19, Jan. 1957. 7 figs., 4 refs., 2 eqs. DWB--It is shown that the reflection coefficients (p) measured for radio waves on 2 and 4 Mc/sec reflected vertically from the ionosphere do not fit the expression $-\log p = A(f + f_L)^{-2}$ (1) appropriate to "nondeviative" absorption. Since the two frequencies mentioned did not approach near to critical frequencies at the time of the measurements, this failure cannot be ascribed to excessive "deviative" absorption. If the measured values are inserted into the expression $-\log p = C + B(f + f_L)^{-2}$ (2) it is found that (a) C varies with the sun's zenith angle but not with solar epoch and is greatest in winter. (b) B is a very variable quantity, it depends on the solar epoch. With values of B and C deduced from measurements on 2 and 4 Mc/sec, equation (2) gives a reasonable approximation to the measured values of p on 2.4, 3.2 and 4.8 Mc/sec. It is suggested that waves in the frequency range 2 to 4.8 Mc/sec are appreciably absorbed outside the nondeviating region, where equation (1) is appropriate. --Author's abstract.

A-1344 Whitehead, J. D. (Otago Univ., Dunedin, N. Z.), Distance attenuation of radio waves reflected at vertical incidence from the ionosphere. Journal of Atmospheric and Terrestrial Physics, London, 12(2/3):150-152, 1958. table, 3 refs. DLC--It is shown that the assumption that the amplitude of radio waves, propagated from a point source, falls off inversely as the group path P^1 leads to a value of apparent reflection coefficient of the ionosphere which may be seriously in error, and in particular, to a large error in the measurement of the electronic collision frequency in the F region. --Author's abstract.

A-1345 Whitehead, J. D. (Univ. of Otago, Dunedin, New Zealand), The absorption of short radio waves in the D, E and F regions of the ionosphere. Journal of Atmospheric and Terrestrial Physics, N. Y., 16(3/4):283-290, Nov. 1959. 6 figs., 16 refs. DWB, DLC--The published values of the noon absorption of radio waves of frequencies 2, 2.4, 4 and 4.8 Mc/s measured at Slough from 1947 to 1953 have been analyzed. From the absorptions of 2 and 2.4 Mc/s waves, it has been deduced that (a) the electronic collision frequency v, at the height of the maximum electron density in the E region when the sun's rays are incident vertically on the ionosphere is $(1.9 \pm 0.1) \times 10^4$ per sec; and (b) the normal absorption in the D region increases with increasing sunspot number, whereas the additional absorption which occurs on certain winter days and arises in the D region may decrease with increasing sunspot number. The 4 and 4.8 Mc/s waves were reflected from the F region at noon. The absorption in the F region is calculated from the known total absorption and the calculated absorption in the D and E regions. The collision frequency in the F region may then be found. At the height of reflection of 4 Mc/s waves (150 to 180 km) it is $(3.6 \pm 0.6) \times 10^3$ per sec, and at the height of reflection of 4.8 Mc/s waves (180 to 200 km) it is $(3.0 \pm 0.6) \times 10^3$ per sec. The significance of these results is discussed. --Author's abstract.

A-1346 Whitehead, J. D. (Otago Univ., Dunedin, N. Z.), Sudden changes in the virtual height of radio waves reflected from the E region of the ionosphere. Journal of Atmospheric and Terrestrial Physics, N. Y., 12(1/2):99-102, Oct. 1959. fig., 5 refs., eqs. DWB, DLC--It has been observed that the virtual height of radio waves reflected from the E region shows discontinuous changes. The lower height reflections take place from thin layers within the normal E region. From the measurements of the associated amplitude changes it has been possible to deduce that the electronic collision frequency at 110 ± 5 km is $(1.3 \pm 0.1) \times 10^4$ per sec and the semi-thickness of the thin layers is 4 ± 2 km. --Author's abstract.

A-1347 Wiesner, Jerome B. (M. I. T., Cambridge, Mass.), A new kind of radio propagation at very high frequencies observable over long distances. Physical Review, 2nd Ser., 86(2):141-145, April 15, 1952. 5 figs., 8 eqs. DLC--Treats the discovery and some experimental results of the weak vhf ionospheric propagation type observable over ranges up to 2000 km distance, but likely masked by other kinds of propagation at distances less than 1000 km from the transmitter. Using 49.8 Mc/s over a 1245 km path, the particular signal was observed regardless of season, time of day and geomagnetic disturbances. Based on strong indications that the signal is returned from the E region below the maximum ionization level, perhaps even below the absorption region (D region), a speculative explanation in terms of parameter is presented. --W. N.

A-1348 Wiesner, Jerome B., New methods of radio transmission. Scientific American, N. Y., 196(1):46-51, Jan. 1957. 8 figs. (incl. photos). DWB, DLC--A non-technical, illustrated article on the fundamentals of ionospheric and tropospheric propagation, and especially on "scatter propagation" from the troposphere and ionosphere. The latter enables fairly long distance communication by means of 30 to 70 megacycle waves, but equipment and operations are costly. Line-of-sight (30 mi) transmission is much cheaper but requires more installation and personnel, and is not always possible in Arctic or at sea. Some of the giant antenna used (e. g. at Cedar Rapids, Iowa and S. Dartmouth, Mass.) are illustrated. --M. R.

A-1349 Wiesner, Jerome B., Communication using earth satellites. Institute of Radio Engineers, Transactions, MIL-4(1):51-58, Jan. 1960. 5 figs., table, 3 refs., 5 eqs. DLC--A review of the use of earth satellites for reliable ionospheric independent communication circuits includes considerations of losses in propagating path, directivity features, and influences such as Doppler shift. The effects of such influences on bandwidth and range are illuminated. --Author's abstract.

A-1350 Wiewall, Miguel, Jr., Further observations of ionospheric drifts and related phenomena with spaced radio receivers. Puerto Rico. Univ. College of Agricultural and Mechanic Arts, Mayaguez, Contract AF 19(122)-476, (Study of Ionospheric Winds), Scientific Report, No. 4, and Final Report, Jan. 1957. 167 p. 43 figs., 80 tables, 14 refs. DWB (M57 P977s)--A voluminous compilation of tabular and graphic data on seasonal, diurnal and height variations in ionospheric drift directions and speeds for vertical incidence pulse echoes at 2. 33 and 4. 57 mc obtained at a Tripartite receiver network at Mayaguez, Puerto Rico during Feb. 1954— summer 1956, incl. Equipment is described and illustrated, computation techniques outlined and turbulence conditions analyzed. The method of "similar fades" has been replaced by the 6-point correlation method of YERG (1955). --M. R.

A-1351 Wilkins, F. and Minnis, C. M., Comparison of ionospheric radio transmission forecasts with practical results. Institution of Electrical Engineers, Proceedings, Pt. 3, 98:209-220, 1951 The production of muf forecasts for oblique transmission involves numerous operations on basic information obtained at vertical incidence. At each stage, errors are introduced whose cumulative effect determines the difference between predicted and observed circuit performance. The sources of the errors are examined and tentative values assigned to them with special reference to F2 region. The computed value of the total error is compared with results obtained on commercial and Service circuits, and with observations made by other means. It is concluded that, although on the average, agreement is good, discrepancies remain which need further examination after the elimination of known sources of error. In a few cases, comparisons of predicted and actual times of fades due to ionospheric absorption have been made. Although the agreement between these times is reasonably good, it is believed that predictions of the actual field strength may be in error by large amounts.

A-1352 Williams, D., The structure of high-frequency ionospheric scatter signals. Institution of Electrical Engineers, Pt. B., Vol. 105, Suppl. No. 8:19-26, 77, 1958. 7 figs., 13 refs.

A-1353 Wilson, A. C. and Cottony, H. V., High gain, low side-lobe VHF antenna for ionospheric scatter communication. U. S. National Bureau of Standards, NBS Report, No. 6022, Dec. 1, 1958. 7 p. 7 figs. (incl. photos), table, 8 refs. DWB--A corner-reflector antenna having a width of ten wavelengths and the length of reflecting surfaces of two wavelengths was constructed, adjusted, and tested. The driven element was a collinear array of ten half-wave dipoles. Dolph-Tchebyscheff current distribution designed for side lobe suppressions to -45 decibels was computed. The currents in the dipoles were adjusted as nearly as possible to this distribution. The radiation patterns were measured and found to be quite close to the computed. A half-power beamwidth of 9 degrees and -40 db beamwidth of 28 degrees was obtained. The gain was found to be approximately 21 decibels. It was further found that the performance was stable with time and changing weather conditions. --Authors' abstract.

A-1354 Wisbar, Herward, Wellenstreuung und meteoride Einflüsse auf kurzen und den benachbarten ultrakurzen Wellen. (Wave distribution and meteorite effects on short and very short waves.) Archiv der Elektrischen Übertragung, Stuttgart, 10 (8):343-352, Aug. 1956. 12 figs., table, 16 refs. German and English summaries p. 343. DLC--A long technical discussion of scatter-waves due to residual ionization, at medium (500-2000 km) and very great (4000-11,000 km) distances, probably due to meteor ionization. The influence of grazing frequencies and results of observations in 40-70 m/Hz range, long enduring meteor echoes, atmospheric and tropospheric influences at 40-70 m/Hz, effects of an ionospheric disturbance or auroral storm, and commercial applications for radio, telegraph and telephone circuits, are discussed and illustrated with schematic diagrams and synoptic charts. --M. R.

A-1355 Wong, Ming S. (AFCRC Propagation Lab., Bedford, Mass.), Refraction anomalies in airborne propagation. Institute of Radio Engineers, Proceedings, 46(9):1628-1638, Sept. 1958. 16 figs., foot-refs., 5 eqs. DLC--Propagation at 250-10,000 mc often encounters dense fadings, radio holes, antiholes or radio ducting. These anomalies are portrayed by ray tracings using a differential analyzer which solves the simplified ray equation

$$\frac{d^2h}{dx^2} \cong \frac{n(h, x)}{h} + \frac{1}{a}$$

Both hypothetical-prototype and complex-measured refractive index profiles of the atmosphere are used for the analog computation of the ray tracings which are interpreted to explain refraction anomalies in radio wave propagation, and are compared with signal strength measurements. They involve divergence of rays, and concentration and crossing of direct rays in multipath transmission. Resulting radar angular and range errors are shown, as are spatial variations of elevation angles of arrival of interfering rays at the points where they cross, corroborating radio-astronomical data on angular deviation of stars. --From author's abstract.

A-1356 Woodbridge, David D. (Redstone Arsenal, Alabama), Observed winds at high levels. American Meteorological Society, Bulletin, 40(11):549-553, Nov. 1959. 8 figs. DWB, DLC.

A-1357 Woodward, Richard Horace, Model of the ionosphere. Harvard Univ. Cruft Laboratory, Contract N5-ORI-7601 Technical Report, No. 26, Jan. 25, 1948. 24 p. 14 figs., 23 refs., eqs. DWB--Observations and theories of a number of geophysical phenomena associated with the ionosphere are summarized. A proposed model of the ionosphere seems to provide qualitative interpretations of most of these phenomena. In low and intermediate latitudes electrons are assumed to rise; they migrate through the upper ionosphere to the polar region, where they fall and complete the circuit through the ground. Under the action of an electric field, positive ions, which are formed at great heights by ultraviolet light, tend to rise, whereas negative ions descend. Since the ions are constrained to helical paths along the sloping magnetic lines of force, positive ions tend to collect in a ring near the plane of the geomagnetic equator; negative ions accumulate in the polar regions. Solar radiation pressure distorts the ion-ring and blows the tail to a height of several earth-radii. Electric discharges between the positive ion-ring and the negative polar caps produce magnetic disturbances and the associated auroral displays. --Author's abstract.

A-1358 Wormell, T. W., Winds at ionospheric levels – a survey of recent British work. (In: American Meteorological Society and Royal Meteorological Society, Proceedings of the Toronto Meteorological Conference, Sept. 9-15, 1953. p. 33-34. pub. 1954.) DWB--Various radio methods give velocities of 25-200 m/s, mostly near 80 m/s, higher in winter than summer and higher in F (sometimes $>$ 200 m/s) than E layer. Diurnal and seasonal variations are summarized. --C. E. P. B.

A-1359 Wright, J. W.; Knecht, R. W. and Davies, K. (Comps.), Ionospheric vertical soundings. International Geophysical Year, 1957/1958, Annals, 3(IGY Instruction Manual):1-167, 1957. 157 figs. (incl. forms), 21 refs., tables. DWB--This profusely illustrated volume contains a thorough and systematic treatment of vertical sounding theory and techniques prepared by members of the Boulder Laboratories in the U. S. National Bureau of Standards. It presents the history of ionospheric research in polar years, the present IGY program which involves observations at 150 stations; ionospheric physics (structure, wave propagation, effect of magnetic field, absorption, scattering, variations of ionosphere, oblique incidence propagation, true height analysis); sounding equipment (pulse measurements, ionosondes and their adjustment, use, antennas and photo-processing of records); interpretation of ionograms: selection of trace, identification of layers, interpolation difficulties (spread echo, Es, middle and low latitude problems); reduction of ionograms: scaling, tabulation of data and statistical methods; and data quality. Appendices give schedules, suggestions for punch cards and research. --M. R.

A-1360 Wright, J. W. and Knecht, R. W., Atlas of ionograms, compiled for the URSI/AGI Special Committee on World-Wide Ionospheric Soundings. Boulder, Colo., Central Radio Propagation Lab., National Bureau of Standards, June 1957. 7 p. numerous charts. DWB (M10. 535 W951at)--A sizeable compilation of ionograms illustrate the diurnal, seasonal and geographical variations in types of records obtained by vertical sounding techniques all over the world. In Pt. I, ionograms are presented for summer and winter days, at 00, 06, 12 and 18 h local time, for 2 geomagnetically quiet days. Material is arranged by geomagnetic latitude without regard to hemisphere. In Pt. II, ionograms illustrate specific phenomena: Es types, disturbances (auroras, cosmic rays, SID's, lunar stratification multiple echoes, solar flares, etc.) and, finally, effects associated with local times or season (such as sunrise, etc.) Observation and classification techniques are specified. -- M. R.

A-1361 Wright, J. W. and Norton, R. B., Analysis of ionospheric vertical soundings for electron density profile data, Pt. 1, Facilities for convenient manual reduction of ionograms. U. S. National Bureau of Standards, Technical Note, No. 14, July 1959. 8 p. 4 figs., 4 refs. DWB (M(055) U585te)--Facilities for manual reduction of ionospheric vertical soundings to true heights are prepared using the "10 point" ratios of Ventrice and Schmerling. A study of the effects of the earth's magnetic field on true height calculations permits selection of five sets of these ratios assuring equal accuracy of application for any part of the world. The facilities available are in the form of transparent overlays and matching special graph paper. --Authors' abstract.

A-1362 Wright, J. W., Analysis of ionospheric vertical soundings for electron density profile data, Pt. II, Extrapolation of observed electron density profiles above h_{max} F2. U. S. National Bureau of Standards, Technical Note, No. 19, June 1959. 8 p. 2 figs., 8 eqs. DWB (M(055) U585te)--A tentative model of the F region above h_{max} is provided to permit extrapolation of electron density profiles into this region. The model corresponds to a simple "Chapman" curve, and may be fitted to true height data (obtained in Pt. 1) by a simple graphical process. --Author's abstract.

A-1363 Wright, R. W. and Skinner, N. J. (both, Univ. College, Ibadan, Nigeria), Equatorial spread-F. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):121-125, Sept. 1959. fig., 2 tables, 5 refs. DLC--Spread-F conditions have been examined for six low-latitude stations--Dakar, Khartoum, Djibouti, Ibadan, Nairobi and Leopoldville. It is shown that, contrary to the general view, occurrence of disturbed magnetic conditions inhibits the occurrence of spread-F layers during the southern solstice at all these stations. The seasonal variation of the occurrence of spread-F is considerably changed if, instead of all days, only magnetically quiet days are considered. In the northern winter there appears to be widespread correlation of occurrence of spread-F across Africa. This is shown to be due to the magnetic influence. --Authors' abstract.

A-1364 Wright, J. W. and Norton, R. B., Facilities for convenient manual reproduction of ionospheric vertical soundings to true height profiles. U. S. National Bureau of Standards, NBS Report 6031, Jan. 12, 1959. 6 p. 4 figs., table. DWB (621.584 U585fa).

A-1365 Wright, J. W. (Nat. Bu. of Standards, Boulder, Colo.), Note on quiet-day vertical cross sections of the ionosphere along 75°W geographic meridian. Journal of Geophysical Research, Wash., D. C., 64(10):1631-1634, Oct. 1959. 3 figs., 5 refs. DLC.

A-1366 Wright, J. W. (Nat. Bu. of Standards, Boulder, Colo.), A model of the F-region above h_{max}F2. Journal of Geophysical Research, Wash., D. C., 65(1):185-191, Jan. 1960. 6 figs., table, 13 refs., 4 eqs. DWB, DLC--A simple Chapman model (scale height 100 km) of the ionosphere above the peak of the F region is found to be in good agreement with the few observed profiles of this region. The ratio of the above-peak electron content implied by the model to below-peak electron content is found to vary from about 2. 8 to 4. 0, also in good agreement with observations. The model is used in conjunction with electron density profiles observed from the ground to construct meridional cross sections along the 75°W geographic meridian. --Author's abstract.

A-1367 Wright, J. W. and Fine, L. A., Mean electron density variations of the quiet ionosphere, April 2, 1959. U. S. National Bureau of Standards, Technical Note, No. 40-2, Feb. 1960. 50 p. numerous charts, tables, 5 refs. DWB (M(055) U585te).

A-1368 Yabroff, Irving W., Reflection and transmission at a sharply bounded ionosphere. Stanford University, Electronics Research Laboratories, Contract AF 18(603)-126, Progress Report No. 1, July 1957.

A-1369 Yabroff, Irving W. (Stanford Univ., Stanford, Calif.), Reflection at a sharply-bounded ionosphere. Institute of Radio Engineers, N. Y., Proceedings, 45(6):750-753, June 1957. 6 figs., 7 refs., eqs. DLC. Also issued as Stanford Univ. Electronic Research Lab., Contract AF 18(603)-126, Progress Report No. 1, July 1957. --A quantitative description of the waves transmitted into and reflected from a sharply-bounded, anisotropic ionosphere with losses is given. Given curves show the effects of the earth's field and losses for a particular model of the nighttime E layer at vlf.--Author's abstract.

A-1370 Yabsley, D. E., Atmospheric radio noise levels in Australia. I. Measurements at 11. 5 Mc/s on two narrow-beam arrays and on a short vertical aerial at 10 Mc/s at Rockbank, Victoria. Commonwealth of Australia, Commonwealth Scientific and Industrial Research Organization, Div. of Radiophysics, Technical Report No. 135, Oct. 1958.

A-1371 Yeh, K. C. and Villard, D. G., A new type of fading observable on high-frequency radio transmissions propagated over paths crossing the magnetic equator. Institute of Radio Engineers, Proceedings, 46(12):1968-1970, Dec. 1958. 5 figs., 6 refs.

A-1372 Yerg, Donald (College of Agri. and Mechanic Arts, Univ. of Puerto Rico, Mayaguez), Notes on correlation methods for evaluating ionospheric winds from radio fading records. Journal of Geophysical Research, Wash., D. C., 60(2):173-185, June 1955. 3 figs., 2 tables, 9 refs., 39 eqs. DWB--A correlation method requiring six values of the correlation coefficient is developed. Expressions for the drift velocity, fading velocity, and characteristics velocity are obtained from a correlation theory extended to include an elliptical contour in the horizontal plane. The physical significance of the derived velocities is considered. Preliminary data indicate that the correlation ellipse exhibits a preferred orientation and that fading associated with random changes is as important as fading associated with a drifting pattern. --Author's abstract.

A-1373 Yerg, Donald G., Observations of ionospheric drifts and related phenomena with spaced radio receivers. Puerto Rico. Univ. College of Agriculture and Mechanic Arts, Contract AF 19(122)-476, Scientific Report No. 3, Aug. 1955. 67 p. 29 figs., 7 tables, 6 refs., numerous eqs. --Radio Fading Records have been obtained at spaced receivers since Jan. 1954. The six-point Correlation Method has been applied to 86 records corresponding to 2. 33 Mcs and to 68 records corresponding to 4. 57 Mcs. The Method of Similar Fades has been applied to 448 records for 2. 33 Mcs and to 271 for 4. 57 Mcs. Directions and velocities are more variable in winter than summer, and in summer are toward North at 4. 57 Mcs and toward northeast or southwest at 2. 33 Mcs. Large values of turbulence invalidate velocities obtained by the Method of Similar Fades and make unreliable directions computed from small samples. Elliptical contours and anisotropic turbulence may result in small systematic differences between the two methods. A general expression for drift velocity is derived and related to correlation analysis. Velocity vectors obtained for each component of the Fourier expansion of the signal intensity-time records show a grouping about a straight line for records characterized by short mean fading periods and large turbulence and wide scatter for records with long fading periods and small turbulence. --A. A.

A-1374 Yerg, Donald G., Observations and analysis of ionospheric drift. Journal of Atmospheric and Terrestrial Physics, London, 8(4/5):247-259, May 1956. 5 figs., 5 tables, 4 refs., 12 eqs.

DWB--Radio fading records at 3 spaced receivers at Mayaguez, Puerto Rico, on 2. 33 and 4. 57 Mc/s are analyzed for drift. In Feb. drift tends to be to SW, but with considerable scatter; average speed 20 m/s at 2. 33 and 17 m/s at 4. 57 Mc/s. In June drift was more definite; 17 m/s to NNE on 2. 33 and 12 m/s between WNW and NNE on 4. 57 Mc/s. A few observations in March (winter type) and April (summer type) are also shown. Diurnal variation is discussed. Fading resulting from random changes is always significant. The size and shape of the correlation pattern are considered. The correlation method used is more reliable than the method of similar fades, which gives excessive velocities. --C. E. P. B.

A-1375 Yerg, D. G., An analysis of drifts of the signal pattern associated with ionospheric reflections. Journal of Geophysical Research, 64(1):27-31, Jan. 1959. 5 figs., 4 refs.

A-1376 Yonezawa, Toshiyuki (Japan, Central Radio Prop. Obs.), On some results of ionosphere study. International Council of Scientific Unions. Mixed Commission on Ionosphere, Brussels, Sept. 1950, Proceedings, pub. 1951. p. 206-207. DWB --Brief discussion of: 1) absorption of radio waves in ionosphere (about 20% in E layer and nearly 100% in F layer) due to ions and relation to estimates of upper air density; 2) recombination coefficients obtained from analysis of F2 layer electron density variation during a solar eclipse (Feb. 5, 1943 in Hokkaido); 3) a new method of obtaining values of recombination coefficients (doesn't work very well) and 4) values of recombination coefficients obtained from night electron density variations of F2 layer, considering temperature change (α - maximum 3. 3 in Dec. and minimum 0. 3($\times 10^{-10} cm^3 sec^{-1}$) in June and July); a seasonal variation of 11:1. --M. R.

A-1377 Yonezawa, Toshiyuki, On the fluctuation in height of the F2 layer during the night. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 5(4):203-204, 1951. DWB--Short discussion of observation results, obtained during the 29th co-operative observation period from March 10 to April 10, 1951. The height of F2 showed a marked variability (in many cases over 80 km in one hour). The autocorrelation coefficient with the height after one hour was 0. 44, while this value for the electron density was 0. 73. The correlation coefficient between simultaneous observations at two stations with a distance of more than 1000 km was 0. 35. --A. A.

A-1378 Yonezawa, Toshiyuki (Radio Res. Lab., Tokyo), A consideration of the mechanism of electron removal in the F2 layer of the ionosphere. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan, 7(1):15-29, 1953. 14 refs., 21 eqs. DWB--A mechanism of electron removal in the F2 region, which consists in the transformation of atomic ions into molecular ones through charge transfer and the subsequent recombination of the latter ions with electrons, has been considered. It has been concluded that, although this mechanism may be capable of interpreting the attachment type of electron removal, it can hardly explain quantitatively the value of attachment coefficient, and besides, there remains a discrepancy between theory and observation concerning the value of scale height associated with the decrease in attachment coefficient with height. --Author's abstract.

A-1379 Yonezawa, T., A consideration of the mechanism of electron removal in the F2 layer of the ionosphere, Pt. 2. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 9(1):17-37, March 1955. 2 figs., 3 tables, 49 refs., 54 eqs. DWB, DLC--Theoretical considerations on the mechanism of electron removal in the F2 region have been made. The main observational facts hitherto obtained from the analysis of data can be summarized into three items: (1) The temporal rate of electron disappearance is of the attachment type. (2) The value of the attachment coefficient is about $10^{-4}sec^{-1}$ at the 300 km level. (3) The values of the scale height associated with the decrease in the attachment coefficient with height are roughly 100 km. The most probable mechanism of electron removal, which consists of the charge transfer reaction between atomic ions of oxygen and neutral molecules of oxygen or excited nitrogen followed by the dissociative recombination between the resulting molecular ions and electrons, is examined to see whether it can well interpret these observational facts. It is concluded that there is at present no satisfactory theory of the electron removal in the F2 region which can yield a consistent picture of its mechanism.

A-1380 Yonezawa, Toshiyuki, On the influence of electron-ion diffusion on the electron density and height of the nocturnal F2 layer. Japan. Radio Research Laboratories, Tokyo, Journal, 2(8):125-136, April 1955. table, 17 refs., 41 eqs. DWB--Influence of electron-ion diffusion on the electron density and height of the nocturnal F2 layer is considered. It is shown that under some reasonable assumptions Chapman's distribution of electron density does not change its form through electron-ion diffusion, only the lowering of the level of maximum electron density is brought about, the amount of which depends on the molecular density, scale height, and temperature at the height of the layer. It is also shown that any initial distribution of electron density tends to Chapman's one as time elapses, though there is a minor restriction on the initial distribution. As the actual F2 layer does not exhibit any systematic tendency of lowering after sunset, we can obtain the lower limit to the atmospheric molecular density in the F2 region, which is found to be 5×10^{9} cm^{-3} and by about one order of magnitude larger than the value obtained by extrapolating rocket data. --Author's abstract.

A-1381 Yonezawa, Toshiyuki, New theory of the formation of the F2 layer. Japan. Radio Research Laboratories, Journal, 3(11): 1-16, Jan. 1956. 5 figs., 21 refs., 23 eqs. DWB--A new theory is proposed to the effect that in the lower portion of the F2 layer the height distribution of electron density is determined by electron removal due to its dissociative recombination with molecular ions of oxygen generated by the atom-ion interchange reaction between atomic ions and neutral molecules of oxygen, while in the upper portion it is determined by electron-ion diffusion in the earth's gravitational field, the maximum being produced at an intermediate height by both processes. The theoretical variations of the maximum electron density of its height with latitude conform with observations fairly well except near the equator. The low-density (and low-temperature) model of the atmosphere based on rocket data seems to be preferable to the older model. The agreement with observations will become more satisfactory if electron-ion diffusion in the horizontal direction as well as the electric fields in the upper atmosphere and perhaps temperature effect are taken into consideration. --From author's abstract.

A-1382 Yonezawa, Toshiyuki (Radio Res. Labs., Kokubunji, Tokyo), A new theory of formation of the F2-layer. Journal of Atmospheric and Terrestrial Physics, London, 15(1/2):89-94, Sept. 1959. 3 figs., 6 refs., 10 eqs. DLC--The importance is emphasized of the role played by electron-ion diffusion in the mechanism of formation of the F2 layer. Taking into account the electron-ion diffusion in the gravitational field as well as the electron-ion movement in the vertical direction, the velocity of which is assumed to increase exponentially, with height, height distributions of electron density for steady-state conditions have been calculated and are discussed. The latitudinal distribution of the maximum electron density and the height of its level have also been obtained and compared with observations, resulting in a reasonable agreement at least in their broad features. --Author's abstract.

A-1383 Zanotalli, Guglielmo, Su alcune anomalie della frequenza critica ionosferica durante un'eclisse di sole. (Anomalies of the critical frequency of the ionosphere during solar eclipses.) Annali di Geofisica, Rome, 6(3):367-372, July 1953. 2 figs., 3 refs. English summary p. 372. MH-BH--The results of the ionospheric soundings carried out in Rome during the partial eclipse of the sun of Feb. 25, 1952 are presented here. Three minima were found in the electronic concentration; one before the beginning of the eclipse, one for the maximum phase, and one at the end of the eclipse. It is shown, admitting that the cause of the two extreme minima is to be found in the external zone of the visible part of the solar disk, that one can explain the otherwise inexplicable retard of the last minimum with respect to the visible eclipse, and one can interpret, at the same time, strong apparent variation in the coefficient of recombination of the ionospheric electrons. --Author's abstract.

A-1384 Zenneck, J., Physik der höhen Atmosphäre. (Physics of the upper atmosphere.) Ergebnisse der Kosmischen Physik, Leipzig, 3:1-37, 1938. 21 figs., 28 refs. DLC--A scholarly and highly technical summary of all current knowledge of the ionosphere and methods of investigation of the ionospheric layers. In Pt. I, the physics of the ionosphere and physico-chemical processes are discussed: in Pt. II, normal ionization and Pt. III abnormal ionization are treated in detail and quantitative relationships shown in graphs and tables. Variations in ionization with height and time (diurnal and seasonal), solar eruptions, winds and sudden changes are considered. In Pt. IV, the origin of ionization (Dellinger effect) and knowledge of pressure, temperature, atmospheric composition and horizontal and vertical air motion, electrical state in stratosphere gained through radio-propagation studies and meteor phenomena are also treated. The bibliography, though not extensive, is useful. --M. R.

A-1385 Zhekulin, L. A., Raspredelenie elektronnoi kontsentratsii s vysotoi po dannym opytov s raketami i iskusstvennymi sputnikami Zemli i ee vliianie na rasprostranenie radiovoln. (Distribution of electron density with height according to data from rocket and artificial satellite experiments and its effect on radio wave propagation.) Iskusstvennye Sputnik Zemli, Moscow, No. 1:67-79, 1958. 5 figs., 7 refs., 27 eqs. DLC--With the aid of relevant equations, the author presents a comprehensive examination of the propagation of radio waves at high altitudes. The contents of this paper include the following, viz: distribution of the density of ionization with height; effect of the distribution of ionization, as disclosed by the most recent experiments, upon the propagation of radio waves; extinction of radio waves and instable processes in the reflection of an electromagnetic signal from a non-homogeneously ionized layer. The solution of the problem of the propagation of electromagnetic waves in the ionosphere with the distribution of ionization is expressed in Airy functions. A sharp variation of the ionization gradient occurs in the E layer of the ionosphere since the continuous and approximately monotonic increase of ionization with height is maintained. Hence, with increase in the frequency, the level of reflection of electromagnetic waves is displaced gradually in higher regions of the ionosphere. The critical frequency W_o is that at which the dielectric penetrability for the ionization density N_1, corresponding to the level of the sharp ionization gradient becomes zero. The effective height of the ionosphere increases sharply in the transition through W_o and the extinction of waves increases at the same time, since the intensity of the incoming signal is slight. The curves of the establishment of signals reflected from the E and F regions with distributions of ionization correspond to the most recent experimental data. --I. L. D.

A-1386 Zhurnal Tekhnicheskoi Fiziki, Moscow, v. 1, 1931– Latest issue seen, 27(11), Nov. 1957. Issued by Akademiia Nauk SSSR. Monthly (Irregular). Supersedes Zhurnal Prikladnoi Fiziki and Fizika i Proizvodstvo. DLC--In each issue there is an extensive bibliography. Section 10a – on radiophysics – gives 15 or 20 references (each month) to literature on the ionosphere and ionospheric propagation from both native and foreign journals. --M. R.

A-1387 Zmuda, Alfred J. (Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.), Some characteristics of the upper-air magnetic field and ionospheric currents. Journal of Geophysical Research, Wash., D. C., 65(1):69-84, Jan. 1960. 3 figs., 5 tables, 25 refs., 9 eqs. DWB, DLC--Characteristics of the upper-air magnetic field and ionospheric currents are determined through an analysis of published rocket data on the magnetic scalar intensity. For the region between the earth's surface and the E layer of the ionosphere, the observed values are compared with values obtained by extrapolating the surface vector field. The agreement between the two sets of values is very good for equatorial flights but only fair for a flight at White Sands, New Mexico. The equatorial, ionospheric current density, which has a maximum of about 21 amp/km^2, varies considerably with time and location of the rocket flight. The equatorial electrojet has a current intensity of about 130 amp/km and flows practically along the magnetic equator. Some of the computed currents associated with the normal magnetic daily variation are at variance with those expected from considerations, such as harmonic analysis, of the surface transient field and sheet-current approximations. In the area around White

Sands (geomagnetic latitude 41°N) a large negative magnetic anomaly exists that may contribute to the formation of the region of low intensity of radiation that lies between the two Van Allen radiation belts. --Author's abstract.

A N O N Y M O U S

A-1388 A new kind of propagation at very high frequencies. Franklin Institute, Philadelphia, Journal, 254(5):417-420, Nov. 1952. DWB--A theory on tropospheric scattering by BOOKER and GORDON initiated the experimental transmissions at 49 8 Mc/s that started on Jan. 23, 1951 from Cedar Rapids, Iowa over the 774 mile path to National Bureau of Standard's receivers at Sterling, Va., for the purpose of establishing the diurnal and seasonal characteristics as well as the behavior of the signal during ionospheric disturbances. The experimental results strongly indicate that the signal returns from the E region below level of maximum ionization, perhaps from below the absorbing region (D region). --W. N.

A-1389 Conference sur la Physique de l'Ionosphere. International Union of Geodesy and Geophysics, Bulletin d'Information, 3(5):159, April 1954. DWB--Brief note on Conference on Ionosphere, Sept. 6-9, 1954 at Cavendish Laboratory, Cambridge, to discuss a) lower ionosphere, b) irregular movements, c) F2 layer, d) mathematics of wave propagation in ionosphere. --M. R.

A-1390 Electron density profiles in the ionosphere. Nature, London, 181(4626):1770, June 28, 1958. DWB--The Radio Research Station of the Department of Scientific and Industrial Research, at Slough, has organized a program for computing electron density and the true height of the various layers of the ionosphere, as a part of the United Kingdom's program of observations during the IGY. Data are obtained from four stations — Slough, Ibadan, Singapore, and Port Stanley. --N. N.

A-1391 Ionospheric studies using earth satellites. American Geophysical Union, Transactions, 39(1):169-174, Feb. 1958. fig., table. DWB, DLC--At the USNC-IGY meeting held on Nov. 5, 1957 at the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards, Boulder, Colorado, it was decided that a refinement of experimental techniques be undertaken. Representatives from 24 laboratories and organizations were present to give account of their observations of the Russian satellites. Ionospheric turbulence studied and the fluctuations and fading rates of ionospheric characteristics were collectively discussed. Recommendations adopted are contained in this report. --N. N.

A-1392 Mobile ionospheric station. U. S. National Bureau of Standards, Technical News Bulletin, 35(4):45-47, April 1951. 3 figs. DWB--Besides a network of 60 ionospheric stations that furnish data to the Bureau of Standards for forecasts of ionospheric or radio propagation conditions, a mobile ionospheric research unit (with 2 tractors) can be moved to any critical point in the propagation path to transmit impulses to the ionosphere, for reception at stations on either or both sides. Results should give more knowledge of "fading."--M. R.

A-1393 The physics of the ionosphere. Nature, London, 174(4436): 866-868, Nov. 6, 1954. DWB--Account of Physical Society conference at Cambridge, England, Sept. 6-9, 1954. Contributions summarized include D. F. MARTYN on movements in the F layer; D. K. BAILEY on forward scattering between 75 and 90 km; E. O. HULBERT on formation of ionized layers by X-rays; S. A. BOWHILL on irregularities and movements in ionosphere. There were several discussions of outstanding ionospheric problems. It was emphasized that radio methods measure movements of irregularities of electron density, which are not necessarily the same as air movements and should be termed "drifts" instead of "winds". --C. E. P. B.

A-1394 Radio communications mystery. Western Electronic News, 7(12):38, Dec. 1959. --A second VLF signal arriving up to 10 sec after the first one is often heard, and may be explained by the theory advanced by R. A. Helliwell. This brief article deals with method and instrumentation (aboard the Explorer VI) designed to check the ionospheric duct theory. --W. N.

A-1395 Radio field-strengths in the Tropics. Nature, London, 184 (4686):605, Aug. 22, 1959. DLC--A brief note on the subject with reference to a current report by W. R. Piggott on how to identify the most effective type of ionospheric reflexion for particular circumstances. --W. N.

A-1396 Radio research in the British Commonwealth. Nature, London, 171(4355):683-684, April 18, 1953. --Account of Proceedings of a Specialist Conference on Radio Research in London Aug. 1948, published by H. M. Stationery Office (S. O. Code No. 47-148-1949). Includes references to ionosphere investigation in British Commonwealth.

A-1397 Researches on the geomagnetic distortion in the ionosphere. Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan, 9(2):59-104, 1955. Contents: Maeda, Hiroshi, Observed facts of the geomagnetic distortion in the ionosphere, p. 59-70. 6 figs., 2 tables, 20 refs. Maeda, Ken-ichi, Theoretical study on the geomagnetic distortion in the F2 layer, p. 71-85. 6 figs., 5 tables, 18 refs., 22 eqs. Hirono, Motokazu and Maeda, Hiroshi, Characteristics of the F2 layer on the magnetic equator, p. 86-94. 4 figs., 3 tables, 12 refs., 12 eqs. Hirono, Motokazu, Effect of gravity and ionization pressure gradient on the vertical drift in the F2 region, p. 95-104. 3 figs., table, 16 refs., 32 eqs. DWB--In Pt. 1, an extensive study is made on the latitude distribution and the daily variation of all ionospheric layers (F1, F1 and E) during the sunspot minimum period (1953-1954), to examine the fact of geomagnetic distortion in the ionosphere, and the harmonic components of the geomagnetic Sq variations are presented, analyzed from the data of the Second Polar Year. In Pt. 2, the vertical and horizontal drifts of electrons in the F2 region are studied in connection with the geomagnetic variation and the effects of drifts on the F2 layer are treated. It is found that the geomagnetic distortion in the F2 layer can largely be interpreted by the drift. In Pt. 3, the direct relation between the geomagnetic Sq variation and the vertical electron drift of the F2 region on the magnetic equator is examined. It is shown that the electric field in the F2 region accompanied by Sq electric current produces the vertical drift which is sufficient to interpret the main features of the anomaly of the F2 region on the equator. It is to be noticed that the main term of the drift velocity is diurnal. In Pt. 4, the effect of gravity and ionization pressure gradient is examined in relation to the vertical drift by electrodynamic force in the F2 region. It is found that if the number density of the gas at 300 km level is not much less than 10^{10}/cc the semi-diurnal variation of the h_mF2 can be interpreted by drift theory.

A-1398 Station de Recherches Radioélectriques du D. S. I. R., Slough, England: distributions verticales de la densité électronique dans l'ionosphère pendant l'A. G. I. (Station for Wireless Researches of the D. S. I. R., Slough, England. Vertical distributions of the electronic density in the ionosphere during the IGY.) International Scientific Radio Union, Brussels, Bulletin of d'information, n°109:14-17, May/June 1958. 2 tables, 2 refs. DLC--The object of this note is to outline the computation program (electronic calculators) organized by the Station for Wireless Researches of the Department of Scientific and Industrial Research, at Slough, in order to determine the vertical distribution of the electronic density aloft in the ionosphere, the ionograms being the basis of this study. The realization of this work is a part of the program of the United Kingdom during the I. G. Y. --A. V.

A-1399 Third International Geophysical Year 1957-58. Journal of Scientific and Industrial Research, Sec. A, New Delhi, 14(4):162-163, April 1955. DWB--

Brief information on the enterprise is followed by an outline of the co-ordinated work program set up by the National Committee of India. The names and addresses of the members are listed. The national program is explained briefly under the following subject headings: (1) World days, (2) Meteorology, (3) Geomagnetism, (4) Airglow and aurora, (5) Ionosphere, (6) Solar activity, (7) Cosmic rays, (8) Latitudes and longitudes, (9) Glaciology and (10) Oceanography. --W. N.

A-1400 To study whistlers. Science News Letter, Wash., D. C., 67(1):3, Jan. 7, 1956. DWB, DLC--Whistlers, which are radio waves of audiofrequency that are born of individual lightning impulses, will receive special attention during the International Geophysical Year, 1957-1958. Whistlers are not the same as cosmic noise due to radio waves from outer space. The so-called "dawn chorus", a radio effect connected with the aurora and magnetic disturbances and caused by the bombardment of the earth by material shot from the sun, will be also listened to. It is hoped that this will settle what comes from the sun to disturb radio, TV and wire communications on the earth, particularly at the time of the greatest prevalence of sunspots. --A. M. P.

A-1401 (Twenty-two field research projects scheduled by the Arctic Institute of North America.) Science, Wash., D. C., 122 (3162):235, Aug. 5, 1955. DLC, DWB--Projects centered at Point Barrow, Alaska, and scattered through Alaska and North Canada, in geophysics, radio propagation, auroras, geomagnetism and glaciology, among others, are mentioned and names of principal investigators and institutions with which they are affiliated are given. --M. R.

A-1402 The upper atmosphere. Nature, London, 174(4425):334-336, Aug. 21, 1954. DWB--Summary of a Symposium on the Upper Atmosphere held by the Royal Meteorological Society at University of Edinburgh, July 15-17, 1954. SIR EDWARD APPLETON described present knowledge of complexity of upper atmosphere. Recent studies on the morphology of the ionosphere revealed departures from simple theory. Research on recombination coefficient is described. IAN C. BROWNE summarized data on air density and ionospheric wind shear obtained from reflection of radio waves from meteor trails. H. P. PALMER described work at Jodrell Bank on fluctuations, attributed to drift of a screen above F2 region, of emissions from Cassiopaea and Cygnus. D. H. JOHNSON described solar tides at 100 mb level. D. H. MC INTOSH discussed possibility of determining ionospheric winds from geomagnetic observations. A. H. JARRETT explained use of multilayer coatings in an interferometer for auroral spectrographs.

J. PATON discussed noctilucent clouds, including an observation of turbulence. --C. E. P. B.

A-1403 Vselennaia raskryvaet svoi tainy: issledovanie kosmicheskogo prostranstva s pomoshch'iu raket i sputnikov. (The universe reveals its secrets: investigations of cosmic space by means of rockets and satellites.) Pravda, Moscow, 48(196, i. e. 14, 955):3-4, July 15, 1959. photo, 8 figs. "Report issued by A. N. Nesmeianov, Pres. of the Akad. Nauk. March 1959." DLC (Slavic R. R.)--A substantial and official report of the "informative" type giving details of progress in cosmis ray, radio propagation, ionosphere, micrometeorite, magnetic, interplanetary gases, belt of high radiation, upper atmosphere, composition, density, ionization (electron and positive ion concentration), and biological research in space and, finally, basic concepts for cosmic flights, as gained from the 3 Soviet "Sputniks" and later space probe flights. A number of graphs showing quantitative results in the above fields are included. --M. R.

A-1404 Winds and turbulence in the upper atmosphere. Nature, London, 167(4251):626-628, April 21, 1951. table. DLC--An account of the Geophysical discussion at the Royal Astronomical Society on Feb. 23. Mainly describes radio methods but P. A SHEPPARD discussed the meteorology, suggesting that the high velocities reported (drifts up to 100 m/sec at heights of 250-300 km) were probably due to quasi-geostrophic flow in different directions at different levels. --C. E. P. B.

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SUBJECT INDEX

U. S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*

THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its major laboratories in Washington, D.C., and Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant publications, appears on the inside of the front cover.

WASHINGTON, D.C.

Electricity. Resistance and Reactance. Electrochemistry. Electrical Instruments. Magnetic Measurements. Dielectrics.

Metrology. Photometry and Colorimetry. Refractometry. Photographic Research. Length. Engineering Metrology. Mass and Scale. Volumetry and Densimetry.

Heat. Temperature Physics. Heat Measurements. Cryogenic Physics. Equation of State. Statistical Physics.

Radiation Physics. X-ray. Radioactivity. Radiation Theory. High Energy Radiation. Radiological Equipment. Nucleonic Instrumentation. Neutron Physics.

Analytical and Inorganic Chemistry. Pure Substances. Spectrochemistry. Solution Chemistry. Analytical Chemistry. Inorganic Chemistry.

Mechanics. Sound. Pressure and Vacuum. Fluid Mechanics. Engineering Mechanics. Rheology. Combustion Controls.

Organic and Fibrous Materials. Rubber. Textiles. Paper. Leather. Testing and Specifications. Polymer Structure. Plastics. Dental Research.

Metallurgy. Thermal Metallurgy. Chemical Metallurgy. Mechanical Metallurgy. Corrosion. Metal Physics.

Mineral Products. Engineering Ceramics. Glass. Refractories. Enameled Metals. Crystal Growth. Physical Properties. Constitution and Microstructure.

Building Research. Structural Engineering. Fire Research. Mechanical Systems. Organic Building Materials. Codes and Safety Standards. Heat Transfer. Inorganic Building Materials.

Applied Mathematics. Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics.

Data Processing Systems. Components and Techniques. Digital Circuitry. Digital Systems. Analog Systems. Applications Engineering.

Atomic Physics. Spectroscopy. Radiometry. Solid State Physics. Electron Physics. Atomic Physics.

Instrumentation. Engineering Electronics. Electron Devices. Electronic Instrumentation. Mechanical Instruments. Basic Instrumentation.

Physical Chemistry. Thermochemistry. Surface Chemistry. Organic Chemistry. Molecular Spectroscopy. Molecular Kinetics. Mass Spectrometry. Molecular Structure and Radiation Chemistry.

• Office of Weights and Measures.

BOULDER, COLO.

Cryogenic Engineering. Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Gas Liquefaction.

Ionosphere Research and Propagation. Low Frequency and Very Low Frequency Research. Ionosphere Research. Prediction Services. Sun-Earth Relationships. Field Engineering. Radio Warning Services.

Radio Propagation Engineering. Data Reduction Instrumentation. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Propagation-Terrain Effects. Radio-Meteorology. Lower Atmosphere Physics.

Radio Standards. High Frequency Electrical Standards. Radio Broadcast Service. Radio and Microwave Materials. Atomic Frequency and Time Interval Standards. Electronic Calibration Center. Millimeter-Wave Research. Microwave Circuit Standards.

Radio Systems. High Frequency and Very High Frequency Research. Modulation Research. Antenna Research. Navigation Systems. Space Telecommunications.

Upper Atmosphere and Space Physics. Upper Atmosphere and Plasma Physics. Ionosphere and Exosphere Scatter. Airglow and Aurora. Ionospheric Radio Astronomy.

NBS