

ings of the Society was in the hands of the Librarian for distribution.

Mr. Fisher reported the decease of Mr. Levett Harris, a member of this Society.

Stated Meeting, December 6.

Present, thirty-two members.

Dr. PATTERSON, Vice-President, in the Chair.

The following donations were received:—

FOR THE LIBRARY.

The Transactions of the Royal Irish Academy. Vol. XVIII. Part Second. Dublin, 1839.—*From the Royal Irish Academy.*

Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. Aus dem Jahre, 1837. Berlin, 1838.—*From the Royal Academy of Sciences of Berlin.*

Bericht über die zur Bekanntmachung geeigneten Verhandlungen der Königl. Preuss. Akademie der Wissenschaften zu Berlin, im Monat Juli, 1838. Berlin, 1838.—*From the same.*

Roteiro Geral dos Mares, Costas, Ilhas, e Baixos reconhecidos no Globo. Extractado per Ordem da Academia Real das Sciencias, por Antonio Lopes da Costa Almeida. Vol. II. Part Third. Lisbon, 1838.—*From the Royal Academy of Lisbon.*

Compendio de Botanica do Doutor Felix de Avellar Brotero. Apresentado á Academia Real das Sciencias. Vol. II. Lisbon, 1839.—*From the same.*

Astronomia Spherica e Nautica, por Mattheus Valente do Couto. Lisbon, 1839.—*From the same.*

Memoria sobre os Pesos e Medidas de Portugal, Espanha, Inglaterra, e França. Por Fortunato Jose Barreiros. Lisbon, 1838.—*From the same.*

Annaes da Marinha Portugueza. Por Ignacio da Costa Quintella. Vol. I. Lisbon, 1839.—*From the same.*

- Reports on the Fishes, Reptiles, and Birds of Massachusetts. Boston, 1839.—*From Mr. G. B. Emerson.*
- Histoire Militaire du Piémont par le Comte Alexandre de Saluces. Five volumes. Turin, 1818.—*From the Author.*
- Tableau Statistique et Politique des Deux Canadas. Par M. Isidore Lebrun. Paris, 1833.—*From Mr. Du Ponceau.*
- Memoirs of the Hon. Thomas Jefferson. Two volumes. New York, 1809.—*From the same.*
- La Revue Américaine. Vols. I. II. & III. Paris, 1826 and 1827.—*From the same.*
- Archives of Useful Knowledge. By James Mease, M. D. Philadelphia, 1813.—*From the Editor.*
- Annals of Tryon County, or the Border Warfare of New York, during the Revolution. By William W. Campbell. New York, 1831.—*From the same.*
- Memoir of Nathaniel Bowditch. By Nathaniel Ingersoll Bowditch. Boston, 1839.—*From the Author.*
- A Descriptive Catalogue of the Chinese Collection in Philadelphia. Philadelphia, 1839.—*From Mr. Dunn.*
- Discourse on the Integrity of the Legal Character. By Job R. Tyson, Esq. Philadelphia, 1839.—*From the Author.*
- General Karte der sichtbaren Seite der Mondoberfläche. Von W. Beer und J. H. Mädler. Berlin, 1837.—*From Professor A. D. Bache.*
- Sopra una Meteora luminosa osservata in Filadelfia dal Regio Console delle Due Sicilie negli Stati Uniti di America. Naples, 1839.—*From the Chev. Morelli.*
- Magazine of Natural History. Edited by Edward Charlesworth. Vol. II. New Series. Nos. 31, 32, 33, 34 and 35. London, 1839.—*From the Editor.*

FOR THE CABINET.

A Bust of Simeon De Witt, late Surveyor General of the State of New York.—*From Mr. Richard V. De Witt.*

The Librarian presented to the Society, in the name of the Rev. James P. Engles, a manuscript Treatise on the Means of extending the Learning and Civilization of Europe to the English Empire in India. By C. E. Trevelyan, at Kotah, which was ordered to be deposited in the Archives of the Society.

The Committee of Publication reported, that the sixth volume of the Transactions of the Society was completed.

Professor A. D. Bache made a verbal communication, accompanied by a chart, showing the changes of magnetic variation on the last two terms of the German Magnetic Association; namely, the 30th of August and 30th of November, of the present year.

Professor Bache also presented, on behalf of the Committee on Magnetic Observations, appointed at the last meeting of the Society, a Memorial, addressed to the Secretary of War of the United States, inviting the establishment of Magnetic Observatories, and co-operation in the system of magnetic and meteorological observations now in progress under the direction of the British Government.

Hall of the American Philosophical Society,

PHILADELPHIA, *December, 1839.*

To the Hon. JOEL R. POINSETT, Secretary of War, &c. &c.

Sir:—The undersigned have been appointed a Committee of the American Philosophical Society, to call your attention to, and to invite, through the medium of your department, co-operation in, the extensive system of magnetic and meteorological observations about to be made under the direction of the British Government, and in connexion with their Antarctic expedition, particularly directed towards magnetic investigations.

The science of terrestrial magnetism has of late years made great advances, through the instrumentality of Humboldt, Hansteen, Gauss and others, and has now reached that point where a system of combined observations at widely distant points over the surface of the globe, appears to be necessary to its further progress: desultory effort has already done all that it is competent to effect. Such a series of systematic observations has now been set on foot by the British Government, directed to a better determination of the magnetic lines, for the use of navigators, and to the accurate investigation of the magnetic elements for theoretical purposes. The objects embraced are the measurement of the magnetic intensity, dip, and variation, at different stations, by a nautical expedition, and at fixed observatories, and especially the investigation of the variations of these elements at the latter points. As subsidiary to these objects, combined meteorolo-

gical observations are to be made, which cannot fail to elucidate some of the most important questions in this useful science.

The magnetic changes to be investigated are of three kinds: first, those which, depending upon a cause not yet satisfactorily explained, take place slowly but regularly, causing a general displacement of the lines of equal variation and dip; secondly, those which, depending upon the position of the sun, run through their period of change in a year or day, producing different values in the magnetic elements, according to the season or to the hour of the day; and thirdly, the small disturbances which appear to be constantly taking place, and which require for their measurement continued observation with the most accurate instruments.

The striking fact was proved in 1818, by the observations of Arago at Paris, and of M. Kupffer at Kasan, that the large changes which take place in the position of the horizontal needle during the day, are simultaneous at these places, so distant from each other; and a confirmation of the fact as applying to even more distant stations, resulted from the system of observations established by Humboldt and others in 1830, and extended, through the influence of the Imperial Academy of Sciences of St. Petersburg, to the most remote parts of the Russian empire, and even to Pekin. In 1834, the celebrated German philosopher Gauss, invented an instrument for measuring the variation of the needle and its changes, which introduced into these determinations an accuracy similar to that attainable in astronomical measurements. This instrument was soon furnished to different observatories, and a concerted system of observations of the minute changes of variation was introduced, which is now going on at no less than twenty-three places in Europe, the smaller and larger states having vied with each other in providing the means of executing them. The stations include Altona, Augsburg, Berlin, Bonn, Brunswick, Breda, Breslau, Cassel, Copenhagen, Cracow, Dublin, Freyberg, Göttingen, Greenwich, Halle, Kasan, Leipsic, Marburg, Milan, Munich, Naples, St. Petersburg, and Upsala.

The results already obtained and published by the German Magnetic Association, have proved satisfactorily that the minute changes in the direction of the needle, as well as the larger ones, are simultaneous at the different stations, varying however in amount, and the variation appearing to decrease in passing southward; but the influence of the position of the place, whether depending upon geographical or magnetic position, not having yet been fully determined, and being

probably determinable only by observations at places even more distant from each other than those now embraced in the German series.

The invention of an instrument by Gauss, for determining the changes in horizontal magnetic intensity with the same accuracy as those of the direction of the needle, will give rise to interesting developments in regard to them; and the changes of the three elements of horizontal direction, and horizontal and vertical intensity are all included by the two instruments before referred to, and a third invented by Professor Lloyd, of Dublin. It is the object of the series now projected, to embrace these three elements; to extend the number of stations with special reference to their distribution at points of the earth interesting in their magnetic relations; to keep up a constant series of simultaneous observations for three years; and thus to effect, on an extended scale, what the German Magnetic Association has so well begun. The execution of this plan, with observations of an appropriate kind, directed also to magnetic research, by a naval expedition, was recommended to the British Government by the members of the British Association, including men of science from different countries, in 1838. It subsequently received the sanction of the Royal Society of London, was adopted by the Government, and is now in course of execution. It may be considered, therefore, to have been approved by the highest scientific authorities. In pursuance of this plan, stationary observatories are to be established, and regular observations made, for the next three years, at Toronto in Upper Canada, at St. Helena, at the Cape of Good Hope, and at a station in Van Dieman's Land. The East India Company have also undertaken to furnish the means of observation at nine points in their dominions. European Governments, who have not hitherto joined in the German system, with which this will be in connexion, have also promised similar aid. It is this extended scheme, to which our attention has been specially invited by a circular from the Royal Society of London, and in which the American Philosophical Society desires that our country should co-operate. It is on a broad scale, worthy of all encouragement, and the magnitude of the scheme, the objects for which it is undertaken, and the possibility of its execution, all mark the character of the period in which we live.

The Society would propose, in furtherance of this plan, that five magnetic observatories should be established in the N. E., N. W., S. E., S. W., and at some central point of the United States, furnished with the instruments and observers necessary, fully to carry out the

proper plan of combined magnetic and meteorological observations. Should the proposition to make this co-operation truly national, be acceded to, the details in relation to it can easily be arranged, and the Society will, the undersigned confidently believe, feel proud to lend any aid in their power, in planning or executing them. It may perhaps be more satisfactory however, to state briefly, beforehand, the nature of the observations to be made, and the means required for their execution.

The magnetic observations to be undertaken at the fixed observatories are, first, of the variation (declination), absolute horizontal intensity and dip; second, of the changes of the variation of the horizontal intensity, and of the vertical intensity. The regular observations for changes in these elements, are to be made every two hours every day, (with the exception of Sundays,) for the next three years, beginning as soon as the several observatories can be arranged. To these are to be added more frequent observations on one day of each month, including the four terms during the year, fixed by the German Magnetic Association. At each station, a building of stone or wood will be required, in the construction of which no iron must be employed. The instruments adopted by the British observers are the following: A magnetometer for the declination, one for the horizontal force, one for the vertical force, a dipping needle, azimuthal transit, two reading telescopes, and two chronometers. The estimated cost of each set of these, is about fourteen hundred dollars. The cost of the observatory must vary with the place at which it is erected, and the material chosen for it, but may be estimated at from one thousand to fifteen hundred dollars. One principal and three assistants will suffice for making and reducing the observations at each station, and for carrying on a supplementary series of meteorological observations. The meteorological observations proposed, are on the pressure, temperature, and moisture of the air; on the direction and force of the wind; on the quantity of rain; on the temperature of the ground at different depths; on solar and terrestrial radiation; besides a few miscellaneous and occasional observations, not necessary to be here stated. Regular observations are to be made on these points, four times every day, and every hour on one day in each month. The instruments required at each station, are a barometer, a standard thermometer, a maximum and minimum thermometer, a hygrometer, an anemometer, several extra thermometers, an actinometer, and an apparatus for atmospheric electricity. The probable cost of each set of these would

not exceed two hundred and fifty dollars. The value of the results would be much increased, by providing a self-registering anemometer and rain-gauge, instead of the common ones, which would increase the cost of each set of instruments to five hundred and seventy dollars. The whole cost of erecting the five observatories, and providing them with excellent instruments, will probably not exceed sixteen thousand dollars; and if the observatory already existing at Philadelphia, and provided with the necessary instruments, should be adopted as one of the five, and four others be erected and furnished, the expense to the United States would not exceed twelve thousand dollars.

No estimate is made of the cost of the principal and assistants for the proposed observatories. In the organization of the new British stationary observatories, these persons are taken, in part, if not altogether, from the officers, non-commissioned officers, and privates of the artillery. The acquirements of the graduates of our Military Academy, admirably fit them for directing the observatories, which might be appropriately placed at military posts; so as to provide the officers and men necessary for making the observations, without additional expense. The direction thus given to the views of the Committee; the fact that you have long been enrolled as a member of the American Philosophical Society; and the interest which you have always manifested, both as an individual and in a public capacity, in all enterprises calculated to shed a lustre upon your country, have induced the Society to direct us to address ourselves particularly to you on this subject.

With the hope that your views may coincide with those of the Society, in regard to the plan now presented for your consideration, we are,

Very respectfully, yours,

A. D. BACHE,	}	<i>Committee.</i>
R. M. PATTERSON,		
JOSEPH HENRY,		
J. K. KANE,		
Jos. G. TOTEN,		

Dr. Patterson laid before the Society a specimen of the Daguerreotype, by Mr. Robert Cornelius, of Philadelphia.

Dr. Hays communicated a case of perverted vision, in which all perpendicular lines appeared double, while horizontal ones

were seen accurately. This occurred in a gentleman who was labouring under catarrhal inflammation of the conjunctiva, and ceased with the removal of the disease.

Dr. Hare made the following verbal communications.

For effecting the congelation of water by the evaporation of ether, it had been usual to expose a bulb, containing water and moistened by the ether, to a current of air. Recently Dr. Hare had succeeded far more satisfactorily by exposing a quantity of water, twenty times as large as that usually employed, covered by ether in a capsule to a blast of air, proceeding from a vessel in which it had been condensed by a pressure equal to one or two atmospheres. By these means, the freezing of the water might be seen by five hundred spectators.

Having mentioned that the pure hyponitrous ether recently obtained, caused a cold of 15° by its evaporation, it would of course be inferred, as he had found to be the fact, that this last mentioned ether might be advantageously employed.

When hydric ether is employed, it should not exceed 730 in specific gravity.

Dr. Hare further said, that it would probably be remembered, that about two years since, he had published an account of a new process for freezing water by the evaporation of ether, caused by a diminution of atmospheric pressure. In the process then described, concentrated sulphuric acid was interposed between the retort holding the water and ether, and the air pump. Since that time he had rendered the process more rapid and interesting by interposing an iron mercury bottle, with two cocks between the receiver holding the acid and the pump. The ether and water were introduced into the retort. The beak of the retort, properly bent, entered the receiver, through the tubulure to which it was luted. The beak was of such a length and curvature, as to cause its orifice to be below the surface of the acid. The neck of the receiver communicated with the cavity of the bottle, that of the bottle with the pump. The apparatus being thus arranged, the bottle was exhausted, and the cock, communicating with the pump, closed. Under these circumstances, on opening a communication between the bottle and receiver, the pressure in that vessel and in the retort was so much reduced as to cause the instantaneous ebullition of the ether, so that little, if any subsequent aid, was required from the pump. But the

result which gave increased interest to the process, was the inconceivable rapidity with which the acid, under these circumstances, absorbed the ethereal vapour, which it appeared to do with greater avidity as the process advanced.

In fact, the water, in the act of congealing, flew all over the inner surface of the retort, in consequence of an explosive evolution of ethereal vapour, generated amid the aqueous particles. The congealment of the water was rendered evident to the ears as well to the eyes of his class of more than three hundred students.

Doctor Bache communicated the decease of the Hon. Jonathan Sewell, of Quebec, a member of the Society.

Stated Meeting, December 20.

Present, forty members.

MR. DU PONCEAU, President, in the Chair.

The following donations were received:—

FOR THE LIBRARY.

- Appendix to Part V. of the Greenwich Observations, for the year 1834. (A missing number.) London, 1834.—*From the Royal Society of London.*
- The Statutes at Large, of South Carolina. Edited under the authority of the Legislature. By Thomas Cooper, M. D., LL.D. Vol. V. Columbia, 1839.—*From Dr. Tidyman.*
- A Map of the Extremity of Cape Cod. Executed under the direction of Major J. D. Graham, U. S. Top. Engrs.—*From the Author.*
- Crania Americana; or a Comparative View of the Skulls of various Aboriginal Nations of North and South America. By Samuel George Morton, M. D. Philadelphia, 1839.—*From the Author.*
- Medical and Topographical Observations upon the Mediterranean; and upon Portugal, Spain, and other Countries. By G. B. R. Horner, M. D., U. S. N. Philadelphia, 1839.—*From the Author.*
- The State of the Prisons in England and Wales. By John Howard, F. R. S. Warrington, 1784.—*From Mr. John Vaughan.*