University of the State of New York

NEW YORK STATE MUSEUM

Fifty-second Annual Report

OF THE

REGENTS

1898

VOL. I

REPORTS OF THE DIRECTOR, STATE BOTANIST AND STATE ENTOMOLOGIST AND APPENDIX

TRANSMITTED TO THE LEGISLATURE 4 JANUARY 1899

ALBANY
UNIVERSITY OF THE STATE OF NEW YORK
1900

University of the State of New York

REGENTS

With years of election

1874 Anson Judd Upson L.H.D. D.D. LL.D.
Chancellor, Glens Falls

1892 William Croswell Doane D.D. LL.D.
Vice-Chancellor, Albany

1873 Martin I. Townsend M.A. LL.D. – – Troy

1877 Chauncey M. Depew LL.D. – – – – New York

1877 Charles E. Fitch LL.B. M.A. L.H.D. – Rochester

1877 Orris H. Warren D.D. – – – – Syracuse

1878 Whitelaw Reid LL.D. – – – – New York

1881 William H. Watson M.A. M.D. – – Utica

1881 Henry E. Turner – – – – – Lowville

1883 St Clair McKelway L.H.D. LL.D. D.C.L. – Brooklyn

1885 Hamilton Harris Ph.D. LL.D. – – Albany

1885 Daniel Beach Ph.D. LL.D. – – – – Watkins

1888 Carroll E. Smith LL.D. – – – – Syracuse

1890 Pliny T. Sexton LL.D. – – – – Palmyra

1890 T. Guilford Smith C.E. M.A. LL.D. – Buffalo

1893 Lewis A. Stimson B.A. M.D. – – – New York

1895 Albert Vander Veer Ph.D. M.D. – – Albany

1895 Charles R. Skinner M.A. LL.D.
Superintendent of Public Instruction, ex officio

1897 Chester S. Lord M.A. LL.D. – – – Brooklyn

1897 Timothy L. Woodruff M.A. Lieutenant-Governor, ex officio

1899 Theodore Roosevelt B.A. LL.D. Governor, ex officio

1899 John T. McDonough LL.B. LL.D.
Secretary of State, ex officio

1900 Thomas A. Hendrick M.A. LL.D. – – Rochester

SECRETARY

Elected by regents

1900 James Russell Parsons jr M.A.

DIRECTORS OF DEPARTMENTS

1888 Melvil Dewey M.A. *State library and Home education*

1890 James Russell Parsons jr M.A.
Administrative, College and High school dep'ts

1890 Frederick J. H. Merrill Ph.D. *State museum*

REGENTS STANDING COMMITTEE ON STATE MUSEUM 1898

T. Guilford Smith *Chairman*

Lieutenant-Governor	Orris H. Warren
Superintendent of Public instruction	Daniel Beach
	Carroll E. Smith

STATE OF NEW YORK

No. 60

IN SENATE

4 JANUARY 1899

52d ANNUAL REPORT

OF THE

NEW YORK STATE MUSEUM

To the Legislature of the State of New York

I have the honor to submit herewith pursuant to law, as the 52d annual report of the University on the New York state museum, the reports of the director of the museum, of the state botanist, of the state entomologist and of the state geologist and paleontologist, with appendixes.

ANSON JUDD UPSON
Chancellor

CONTENTS

VOL. 1

VOL. 2


HUDSON RIVER
EAST RIVER
BLACKWELLS ISLAND
WARD'S ISLAND
RANDALL ISLAND
EAST RIVER
BLOOMINGDALE
GREENWICH
Road to Bloomingdale
Road to Kings Bridge or Boston
Kips Bay
Turtle Bay
Shell Reef
Hell Gate
Corlears Hook or Crown Pt
The Wallabout Bay
The Battery
HARLEM
Snake Hill
Point of Rocks
Mc Gowans Pass
MADISON AVE.
LEX. AV.
Fort Washington
Fort George
The Blue Bell
Jeffrys Hook
Spuyten Duyvil
Kings Bridge
Dykeman's Bridge
UNIVERSITY OF THE STATE OF NEW YORK.
NEW YORK STATE MUSEUM.
F.J.H. Merrill, Director.
MAP OF MANHATTAN ISLAND
Showing the original Topography and Hydrography with Culture as it Existed in 1776.
Compiled from various sources by
C.C. Vermeule, C.E.
1898.
Scale, 5703 ft = 1 in.
Tide Marshes. Filled before 1776. Streets &c. 1776 Roads open in 1807. Modern Streets &c.
Modeled by Edwin E. Howell.

New York State Museum

REPORT OF THE DIRECTOR

for the fiscal year ending 30 Sep. 1898

The honorable, the regents of the University of the State of New York

GENTLEMEN: In consequence of the recent increase of the museum appropriation, the director of the museum is enabled to report a larger variety of new work accomplished during the last fiscal year.

A synopsis of the work of the several divisions is given herewith, followed by detailed reports.

Geology and paleontology

The work of the season of 1898 in pure geology and paleontology was carried on under the direction of Prof. James Hall, state geologist and paleontologist, till his death in August of that year. A memorial of Prof. Hall's scientific career is included in the report of the state geologist, which forms the second volume of this report. For the remainder of the year this work was continued under the supervision of Dr John M. Clarke, assistant state geologist and paleontologist.

Not all the operations of that season are here covered by detailed reports, as they were in part a continuation of investigations touching problems which will be considered in future publications. Thus Dr Clarke, accompanied by D. D. Luther, spent some time in the study of the Portage formation and fauna in Chautauqua and Erie counties, and the latter carried forward a revision of the areal geology of Ontario county. Professors J. F. Kemp, H. P. Cushing and C. H. Smyth jr, continued their work in the crystallines of the

Adirondack region, with the purpose of summarizing the results of their study of this region during several preceding seasons. Prof. Kemp's report is concerned specially with the geology of Essex county, and that of Prof. Cushing with the geology of Franklin county. Prof. Smyth has rendered a brief report of the progress in the mapping of the crystallines in parts of Hamilton, Herkimer and St Lawrence counties.

Dr H. B. Kümmel was engaged for most of the season in a study of the Newark or new red sandstone rocks of Rockland county, and he presents a full and important report on this subject.

Museum bulletin 21, *Geology of the Lake Placid region*, has been prepared by Prof. J. F. Kemp, at the request of Sec. Melvil Dewey for the use of the teachers who frequent that summer resort.

Considerable time was given to the revision of the geologic map of the state, involving the correlation of the formation boundaries according to newly acquired data.

In the office, paleontologic investigations were carried forward, pertaining to the study of the fauna of the western Portage or Naples beds. A first instalment of this work, relating to the cephalopods of this fauna, was published in the report for the year 1897, and another on the lamellibranchs is nearly completed. The study of the Oriskany fauna of Columbia county and of the genera of the Paleozoic corals was also advanced.

Dr R. M. Bagg jr was employed in Geological hall, under the supervision of the director, as temporary assistant in paleontology for five months, from Nov. 1, 1897, to Mar. 31, 1898, in the revision and labeling of a collection of Mesozoic and Cenozoic fossils of the United States, and the collection of British fossils donated to the state museum by Sir Roderick Murchison in 1857. He also re-identified and relabeled a collection of Cenozoic fossils from France. His report on this work is given herewith.

A large fragment of a fossil tree trunk, 12 feet long, from Monroe, Orange co., was collected by J. N. Nevius, who devoted several weeks of the summer to the labor of putting together the hundreds of fragments of this fossil plant and preparing it for exhibition in Geological hall.

Considerable work has been done toward the completion of the introductory and synoptic collections of rocks on exhibition in

Geological hall. Specimens have been collected from various parts of the state to strengthen the weak points in the synoptic collection. A list of these will be found in the appendix. A few specimens from the Carboniferous system of Pennsylvania have been added and, under the title card of each formation or group throughout the collection, a small map of the state, which is colored to show the location of the outcrops of that group, has been placed. With a few additions, the synoptic collection will be the most complete exhibition in existence of the rock formations of New York state; and, as New York is the classic field of American Paleozoic geology, it is most appropriate that the state museum should possess the best collection it is possible to obtain.

Economic geology

The work in this branch was chiefly conducted, this year as heretofore, by the director of the museum, but, for lack of available funds the field work in this branch, was limited.

Many reports having appeared in the newspapers and many others having been verbally circulated, describing the discovery of gold in paying quantities in the sands of Saratoga, Warren, Herkimer and other counties, it seemed important to visit the plant of the one company which had erected a mill and announced that it was operating on a profitable basis. Accordingly a visit was made to Hadley, Saratoga co., by Mr J. N. Nevius and by the courteous permission of the superintendent the operations of the Sacandaga mining and milling co. were studied. The result of the investigation may be found in the appendix following this report.

In connection with this newly aroused interest in gold deposits, considerable time has been spent in the laboratory determining mineral specimens for citizens of the state. Many hundreds of samples of all sorts of material have been submitted as gold ore, but none of them has shown an appreciable amount of that metal. Apparently the public fails to appreciate that gold is a widely distributed metal, rarely occurring in quantities sufficient to pay for working it. Almost any rock on assay will yield a trace of gold. In Central park, New York city, a number of specimens have been collected which yielded a result equivalent to $4 of gold in a ton of rock.

Toward the close of the year, Mr J. N. Nevius was sent to visit the roofing slate quarries of Washington county, for the purpose of obtaining full information concerning their geology and commercial features. A large series of specimens was collected, and photographs were taken at nearly all the quarries to illustrate their working. These materials will be used in making a representative exhibit of the slate industry in the state museum. As the study of the slate region was not completed in September, but was continued into the succeeding fiscal year, the detailed discussion of this work will be found in next year's report.

The clay and shale industry, which is so prominent among the mineral activities of New York, and which was discussed at length in bulletin 12 of the state museum, has increased to such an extent that a new edition of that work has become necessary, and Dr Heinrich Ries, the junior author of the former publication, has been charged with the labor of preparing it. Much field work is necessary for this, and the report will probably be published next year. As a preliminary step, Dr Ries made an examination of the valley between Rondout and Port Jervis. Some notes on that region are contained in the following pages.

Mineralogy

An important piece of work accomplished in this subject was the rearrangement of the duplicate minerals according to their sequence in Dana's *System of mineralogy*, and the cataloguing of the drawers. This has already resulted in the saving of considerable time in effecting exchanges and referring to the duplicates. The duplicate minerals are stored in part of the drawer case at the foot of the basement stairs.

March 23 and 24 an examination was made of a collection of minerals which Mr S. C. H. Bailey, of Oscawana, wished to sell to the museum. With proper arrangement this collection would be a magnificent addition to the museum's mineralogic department, but Mr Bailey's price for it, while not excessive, places the collection far beyond the reach of the museum, unless a special appropriation can be secured for its purchase.

Indian museum

The legislature of 1896 passed an act providing for a collection of historical and ethnologic records and relics of the American Indians of the state of New York and making an appropriation therefor in the following terms:

There shall be made as the Indian section of the state museum, as complete a collection as practicable of the historic, ethnographic and other records and relics of the Indians of the state of New York, including implements or other articles pertaining to their domestic life, agriculture, the chase, war, religion, burial and other rites or customs, or otherwise connected with the Indians of New York.

The trustees of the state museum shall appoint on its staff a competent curator, without salary, to make and arrange this Indian collection, and for his necessary expenses, and for collecting or buying specimens for the Indian collection, there shall be paid by the treasurer, on the warrant of the controller, from any money not otherwise appropriated, not to exceed $5000.

In consequence of this act and the accompanying appropriation, it was voted by the regents at their meeting of June 24, 1896, that "the museum committee be authorized to spend the $5000 appropriated for the Indian museum and to make any necessary appointments on request of the honorary curator of archeology and of the director of the museum."

Mr Adelbert G. Richmond, of Canajoharie, having been some time before appointed honorary curator in archeology, by reason of his long and active interest in this subject and his industry in building up the large private collection which is so well known in the Mohawk valley, the work of spending the appropriation to the best advantage was placed in his hands.

A small collection of Indian relics had been in the possession of the state museum for many years, some of which were described and illustrated in the fifth annual report of the state cabinet of natural history.

In view of the fact that New York was known to be rich in relics of the Indian tribes which formerly lived within its borders, and that other states, notably Wisconsin, Ohio and Pennsylvania, were already making collections of such relics and meeting with great success, it was considered that our state, with great resources of that description, should, with proper attention, be able to gather such a collection as would be a source of pride and education to its people.

Mr Richmond, with the assistance of Mrs Harriet M. Converse, which has been of great value on account of her extended personal acquaintance with the members of the Indian tribes and her enthusiasm in the collection of archeologic relics, has made extensive purchases of material from private collections and from the Indians of New York. The material thus obtained was shipped to Albany, where cases for its exhibition were made and placed in the corridor at the head of the library staircase on the fourth floor of the capitol. In these cases the material has been arranged and labeled with great care by Mr J. N. Nevius under the supervision of the director.

The objects collected may be partially listed under the following heads:

Pottery vessels — very rare in New York, as, owing to the extreme cold, they are easily broken, or absorb moisture and flatten out. This collection contains the greatest number known, and their state of preservation is in many cases perfect.

Clay and stone pipes — in great variety, plain and decorated, many of them in perfect condition. They are rare and difficult to obtain.

Bone carvings, tools, fishhooks and needles in great variety and in fine condition. They are very rare on account of their liability to destruction by decay.

Shell ornaments of various forms.

Ceremonial stones in variety and in good condition.

Stone carvings in curious designs, stone agricultural tools, axes, gouges, celts, mortars, pestles, hammers, sinkers, plummets and chert spearheads, arrow-points, scrapers, knives and drills.

Iron axes and thousands of venetian beads, brought to this country by the early settlers and traders and bartered with the Indians for furs and pelts.

Two large stones, each of 500 pounds weight, grooved across the face by use as arrow shaft workers. These stones are seldom found, and are therefore great prizes. A full description of them will be found in a future bulletin of Dr Beauchamp, who photographed these stones in their natural position at Pompey.

Altogether, thousands of articles not enumerated above have been secured, many of rare type, and all are fully described in the catalogues which will in due time be printed.

The wampum belts and silver brooches now deposited in the state library are invaluable and can not be duplicated.

Mrs Converse has presented to the state a large and valuable collection of relics, consisting largely of objects made and used by the Indians during the last 100 years. Objects of this nature are now difficult to obtain, and it is doubtful whether the collection could be duplicated. We have also, through her kind offices, been able to procure a large number of Iroquois wooden masks, no other institution or collection having a like number. Nearly all are very old, and all have seen service at the hands of the Indians. It is a most valuable addition to the state's treasures, and can be appreciated only by a full and careful examination.

In addition to the sum of $5000 appropriated by the legislature of 1896, $2000 was granted by that of 1897, $2000 by that of 1898 and $1000 by that of 1899, nearly all of which has been expended, with very satisfactory results. A small amount of money has been expended in excavating, though not as much work has been done in that direction as was desired. If a sufficient approtion is made by the legislature, much more work can be accomplished, as new sites have been found, people are becoming interested, and the outlook is encouraging.

It is suggested that to conduct this department properly, an annual appropriation should be made. The sum need not be large, simply enough to enable the curator to be ready to act in any emergency that may arise, which he can not do if appropriations are uncertain. A wide-spread and growing interest is manifesting itself in archeology; and it is of the utmost consequence that steps be taken to secure the desired objects, either by purchase or excavation, as each year develops the fact that the relics of the red men are fast disappearing, many objects now being unobtainable, and that farther delay will cause more loss. The work is now well in hand, active men are interested, great success has been obtained thus far, and much more is promised, if assistance can be obtained from the legislature.

In the sudden death of the honorary curator, Mr Richmond, the museum has lost a valuable ally and an indefatigable worker in the cause of ethnology.

Rev. W. M. Beauchamp has written a most comprehensive article, *Aboriginal chipped stone implements*, illustrated with upward of

200 drawings, which appears as bulletin 16 of the state museum, and also an illustrated monograph, *Polished stone articles used by the New York aborigines*, which was published as museum bulletin 18. These two bulletins are bound with the 51st report of the state museum. In addition to these, Dr Beauchamp has prepared a most valuable illustrated bulletin, *Earthenware of the New York aborigines.* This is 22 of the museum series, and is bound with the present report.

Dr Beauchamp has also given valuable assistance in other directions, and it is hoped that future appropriations will be sufficiently large to enable him to give all of his time to state work, as he has it well in hand, is an authority on New York archeology and takes great interest in the future of the collection.

The collections in ethnology are so extensive that it is not practicable to give a catalogue of them in the present report. It is proposed to issue this as a bulletin when ready for publication.

General zoology

In connection with the collections in Geological hall, a large amount of work has been accomplished during the past season.

Prominent in this regard is the collection of fishes from the waters of Long Island made by Dr Tarleton H. Bean for the state museum during the summer and autumn of 1898. In this work 84 species were collected, many of them being previously not recorded within our limits. An article describing this work in detail is published in the present report.

By special arrangement with Gerrit S. Miller jr, of the United States national museum, an annotated catalogue of the mammals of New York has been prepared, which is published as bulletin 29 of the state museum. This will be followed by a *Key to the land mammals of northeastern North America.*

In continuation of the study of the unionidae taken up a few years ago by William B. Marshall, of which some results were published in bulletins 1 and 9 of the state museum, the attempt was made to secure a collection of embryonic unios. For this purpose frequent visits were made by Mr J. N. Nevius during 12 months to the Hudson river, a short distance below Albany, in order to secure specimens of unios in which the eggs were developing. A brief note on this work is given in the following pages.

Among the important specimens added by purchase is a series of 17 preparations, each illustrating the life history of an animal species, and showing each form assumed by the species from the egg to the adult. These are mounted on glass and preserved in formaldehyde or alcohol, in jars of convenient size.

March 9 an examination was made by the assistant curator of a collection of birds which Thomas W. Grosvenor, of Herkimer, desired to sell to the state. The taxidermist's work on them proved not to be of such a quality that they would be of use to the museum, and the matter was dropped.

Entomology

Under this head is carried on a very important branch of the zoologic work of the museum.

The report for 1898 of the state entomologist, Dr Ephraim P. Felt, appears separately as museum bulletin 23.

The introduction notes some of the more important insects studied, describes briefly the work of the year, and contains several recommendations.

The contents of the report may be grouped under the following divisions:

Injurious insects. Under this title are included general accounts, giving illustrations, life history, habits, remedial and preventive measures, and bibliographies of the following insects: Byturous unicolor, the pale brown Byturus; Trypeta canadensis, the gooseberry fruit fly; Notolophus leucostigma, the white marked tussock moth; Clisiocampa americana, the apple tree tent-caterpillar; Clisiocampa disstria, the forest tent-caterpillar; Mamestra picta, the zebra caterpillar; Xylina antennata, an elm leaf miner; Lecanium tulipferae, the tulip tree scale; Lepisma domestica, bristle tail fishmoth; Eurypelma hentzii, a tarantula.

Hints about insecticides. Under this head are discussed the general principles which must be observed in fighting insects and the more important insecticides.

Some insects of the year in New York state. This comprises brief notes relating to the comparative abundance, destructiveness and other interesting features regarding the following species:

Eriocampoides limacina, cherry or pear tree slug; Silvanus surinamensis, saw-toothed grain beetle; Byturus unicolor, Elaphidion villosum, Galerucella luteola, elm leaf beetle; Galerucella cavicollis, Notolophus leucostigma, ravages by tent caterpillars, Clisiocampa americana and C. disstria, Mamestra picta, Xylina antennata, an elm leaf miner; Chermes strobilobius, Pemphigus tessellatus, Pulvinaria innumerabilis, Lecanium armeniacum, L. cerasifex, Aspidiotus perniciosus, San José scale.

List of publications of the state entomologist. Gives title, date, place and time of appearance and summaries of 73 publications.

Contributions to the collection. Includes the common and scientific names of the insects and the addresses of the contributors, with brief items of interest.

A detailed index facilitates ready reference.

In addition to this official report, the following bulletins are bound in the present volume:

20, *Elm leaf beetle in New York state*, by Ephraim Porter Felt, giving a life history of this destructive insect and a discussion of the means of destroying it; also bulletin 24, entitled *Memorial of the life and entomologic work of Joseph Albert Lintner*. This bulletin gives a notice of the life of the late Dr Lintner, a list of new species described by him, a list of his entomologic publications and an index to the state entomologist's reports from 1 to 13. This constitutes the entomologic portions of the report of the state museum.

Botany

The report for the year 1898 of the state botanist, Prof. Charles H. Peck, which appears separately as museum bulletin 25, gives the names of the counties in the state in which specimens of plants for the herbarium were collected, either by the botanist himself or by his correspondents, and gives a list of the names of the species added to the herbarium during the year. Also a list of the names of the contributors of specimens and of their respective contributions.

In the recently published *Illustrated flora of the northern states and Canada*, many plant names have been changed, so that its nomenclature differs considerably from that of Gray's *Manual*.

This disagreement affects about 600 names of New York species of flowering plants and ferns. A list of the names of these species is given, those found in the *Manual* standing in one column and the corresponding names in the *Illustrated flora* standing opposite them in another.

A record is made of species found in the state but not before officially reported as belonging to its flora. This record gives the name of the locality where the plant was found, the month in which it was found and any other matter of interest observed concerning it. The number of species added to our flora is 57. In a similar way a record is made of species previously reported but concerning which something new has been learned or some observation of interest has been made. This part of the report includes remarks on 39 species.

A brief account of some of the physical features of the open summit of Mt Marcy, the highest mountain in the state, reference to its climatic and meteoric conditions and their influence on its vegetation and a list of the names of plants found growing there are given. These number 206 species. To this list, remarks are added concerning some of the more interesting and notable species.

The final chapter contains descriptions of 12 edible species of mushrooms on the plan of those described in previous reports. A brief scientific diagnosis of the species is followed by a simple description in plain language, as devoid of technical terms as possible. These species are illustrated by colored drawings of natural size on five quarto plates. An index to the report is added.

Photography

Considerable photographic work has been accomplished during the year, and good negatives have been obtained of the following subjects. By Heinrich Ries Ph.D., views of the clay pits, brick factories, topography and general geology of Long Island, Staten Island and the highlands of the southeastern part of the state. By J. N. Nevius, views of the Quaternary geology and the topography about Albany, and Luzerne, Warren co.; the slate belt of Washington co.; the Hudson river formation about Albany and along the shore of Lake Champlain; Trenton limestone at Glens Falls and near Albany; Precambrian rocks at Littlefalls, Herkimer co., and

Hadley, Saratoga co. The latter has also photographed the exterior and interior of the Sacandaga mining and milling co.'s mill at Hadley; several of the museum's specimens showing ripple marks, mud cracks, Triassic footprints, concretions and impressions of raindrops; and panoramic views of the Helderberg escarpment near Albany.

These views are of much value in illustrating the museum collections and reports and the negatives are all carefully preserved for reference.

Physiography

Three valuable additions to the collection of relief maps has been made. These were modeled by Edwin E. Howell, of Washington D. C., for the New York state museum, and an arrangement has been made with the manufacturer to supply duplicates of them at a reasonable price. A list of these new relief maps with prices will be found in the list of accessions.

This collection is of great interest and value to teachers, and will be developed as rapidly as possible by the addition of new examples.

Publications issued during 1898

20 Felt, E. P. Elm leaf beetle in New York state

21 Kemp, J. F. Geology of the Lake Placid region

22 Beauchamp, W. M. Earthenware of the New York aborigines

23 Felt, E. P. 14th report of the state entomologist, 1898

24 Felt, E. P. Memorial of life and entomologic work of Joseph Albert Lintner, Ph.D.

25 Peck, C. H. Report of the state botanist, 1898

29 Miller, Gerrit S., jr, entitled *Preliminary list of New York mammals*, belongs to the present report, but by an oversight of paging will be bound with the report of next year

Office work

In the administration of the state museum the routine office work has been particularly heavy during the last year. Many inquiries, both verbal and by letter, have received careful attention, and work in connection with the publication of the museum bulletins has occupied considerable time, as well as the clerical labor of keeping records and making catalogues.

A card catalogue of the scientific papers contained in the annual reports of the United States geological survey, has been made for reference in the office.

During odd hours, the work of compiling a list of public museums of natural history in North America has been continued. It will soon be ready for the printer.

Mr George Douglas Miller of Albany has removed, to the rooms of the Historical and art society, some of the ethnologic material which he deposited several years ago in the rear wing of Geological hall, and, in order to fill the space thus left vacant, the collection of military relics has been removed from the cases in the front of the third floor and placed in the vacated case in the rear wing.

Attendance at the museum

1 Oct. 1897 — 30 Sep. 1898

Total attendance	54 907
Greatest monthly maximum, August	6 430
Greatest daily maximum, Sep. 14	671
Average monthly attendance	4 575
Average daily attendance	180

The following is a comparison of the turnstile records for the past five years showing the averages of yearly, monthly and daily attendance.

	YEARLY ATTENDANCE	AVERAGE MONTHLY ATTENDANCE	AVERAGE DAILY ATTENDANCE
1 Oct. 1893—30 Sep. 1894	72 185	6 015	233
1 Oct. 1894—30 Sep. 1895	61 368	5 114	197
1 Oct. 1895—30 Sep. 1896	52 003	4 333	170
1 Oct. 1896—30 Sep. 1897	53 366	4 447	175
1 Oct. 1897—30 Sep. 1898	54 907	4 575	180

From these statistics it will be seen that the attendance of visitors at Geological hall is subject to slight annual variations, but that it is quite large for a museum suffering from the disadvantages of the present building, which can not be opened during the evening for lack of illumination.

Respectfully submitted

FREDERICK J. H. MERRILL

Director

ACCESSIONS TO COLLECTIONS IN GEOLOGICAL HALL

Historic geology

Donations

From Dean M. C. Ihlseng, State college of Pennsylvania: collection of 12 specimens to illustrate the Carboniferous system of Pennsylvania. Also one specimen each from the Devonian and Upper Silurian systems.

Formation	No. of specimens
Fish creek sandstone	1
Dunkard "	1
Greene "	1
Upper Washington limestone	1
Waynesburg sandstone	1
Fishpot limestone	1
Connellsville sandstone	1
Morgantown "	1
Clarion "	1
Pottsville conglomerate	3
Oriskany sandstone	1
Helderberg limestone	1
	14

From Prof. W. B. Dwight, of Vassar college, 4 specimens as follows:

1 specimen of Upper Cambrian (Dikellocephalus horizon) limestone, containing fragments of Agraulos Saratogensis and Stychoparia calciferous, from the Sparrkill road, 2½ miles south of Poughkeepsie N. Y.

1 specimen of Middle Cambrian (Paradoxides horizon), Stissing N. Y.

1 specimen of Lower Cambrian (Olenellus horizon). Lower quartzite layer resting on Precambrian gneiss. Containing fragments of Olenellus asaphoides or thompsoni and Camerella minor. From Stissing mountain, Stissing N. Y.

1 specimen of Lower Cambrian (Olenellus horizon) limestone layer, resting on the Olenellus quartzite, Stissing mountain, Stissing N. Y.

From William Hooper, of Ticonderoga N. Y.:

1 specimen of graphite schist from Hague, Warren co. N. Y. Mined by American graphite co. (Dixon graphite co.)

From the E. W. Spurr Co., of Lakeville Ct.:

1 block of dove-colored marble, 4″ × 5″ × 4″, from their quarry in that town; together with data of its analysis and of its crushing test.

From J. V. Davies, of New York:

1 specimen of red clay (residuum of limestone) from a boring on Tallman's island, Queens co.

Collected for the museum

By Prof. I. P. Bishop, of Buffalo, the following rock specimens from the region about Niagara Falls and Lake Erie:

Formation	No. of specimens
Genesee shale	2
" " (Styliola limestone)	4
Hamilton "	6
" " (Concretions from)	2
" " (Encrinal limestone)	1
Marcellus "	4
Salina "	1
Niagara "	2
Clinton limestone	2
" shale	1
Medina "	2
	27

By J. N. Nevius:

2 specimens of Trenton limestone overlying Hudson river shale 1½ miles east of Rensselaer, Rensselaer co.

Purchases

From Oscar Rohn, of Madison Wis.: a collection of 86 specimens from the typical localities of the various formations of the iron-bearing region of Lake Superior. The specimens were accompanied by printed labels and flakes for the preparation of microscope slides.

This collection has been placed on exhibition near the stairway on the second floor of Geological hall. The arrangement in the catalogue accompanying it was found to be incorrect, in that it represented the basal quartzite as lying above some of the younger rocks. It became necessary, therefore, to arrange the specimens in their proper relationship according to the published reports on the geology of the region. The following arrangement was adopted for labeling.

SYNOPSIS

III Paleozoic time	Cambrian system
II Algonkian time	2 Keweenawan system 1 Huronian system (Penokee and Marquette formations are synchronous)
I Archean time	Rocks of the basement complex

Rocks of the basement complex

I Archean time	Northern complex	(Dike rocks) Syenite Granite Mona schist Kitchi schist Peridotite
	Southern complex	(Dike rocks) Palmer gneiss Micaceous schist Hornblende schist Granite

Rocks of the Penokee iron-bearing district of Michigan and Wisconsin

II Algonkian time	2 Keweenawan system		
	1 Huronian system	Penokee formation	Upper slate member Iron-bearing member Quartz slate member Cherty limestone

Rocks of the Marquette iron-bearing district of Michigan

III Paleozoic time	Cambrian system

II Algonkian time	Huronian system	Upper Marquette series	1 *c* Clarksburg formation
			1 *b* Michigamme formation
			1 *a* Ishpeming formation
		Lower Marquette series	1 *f* Negaunee formation
			1 *e* Siamo slate
			1 *d* Ajibik quartzite
			1 *c* Wewe slate
			1 *b* Kona dolomite
			1 *a* Mesnard quartzite

Rocks of the Keweenawan area of Lake Superior

II Algonkian time	2 Keweenawan system	*a* Basic original rocks
		b Acid original rocks
		c Detrital rocks
		Conglomerate, sandstone

Paleontology

Donations

From Dr A. H. Getty, of Athens N. Y.: fragments of the Carapace and a few bones of a large turtle, found in Quaternary deposits near Athens, Greene co.

On deposit

From Dr Isaac B. Davenport, of Paris France: 1 specimen of Uphantaenia chemungensis, from Vistal, Broome co.

Purchases

From Charles Lewis: a fossil stump of a tree from the Hamilton strata of Gilboa, Schoharie co.

From Ogden H. Cooley, of Monroe N. Y.: a large fossil plant, in situ in the Hamilton strata, near Monroe, Orange co.

From Dr R. M. Bagg jr: 2 boxes of unidentified fossils from the Eocene, Miocene and Pleistocene formations of Maryland and Virginia.

From S. W. Adamy: 1 specimen of Uphantaenia chemungensis, from Union, Broome co.

Economic geology

Donations

MATERIAL	LOCALITY	BY
4 boxes of gravel,	Yosts, Mont. co	J. C. Irwin, Albany

Road metal

Limestone	Rochester, Monroe co ..	Whitmore, Rauber & Vicinus
"	Buffalo, Erie co	Barber asphalt paving co.
"	Palatine Bridge, Montgomery co...........	Mohawk valley stone co.
"	Perryville, Madison co..	Cyrus Worlock
"	Sharon Springs, Schoharie co	W. T. Smith
"	Howecave, Schoharie co.	Helderberg cement co.
"	Verplanck, Westchester co	Brown & Fleming
"	Buffalo, Erie co	Buffalo cement co. limited
"	Hudson, Columbia co..	Shute & Rightmyer
"	Tomkins Cove, Rockland co.............	Tomkins Cove stone co.
"	Jamesville, Onondaga co.	Robert Dunlap & Co.
"	Waterloo, Seneca co....	Dwight Babcock
"	Chazy, Clinton co. ...	Chazy marble lime co.
"	South Bethlehem, Albany co	Callanan road improvement co.
"	Saratoga Springs, Saratoga co.	Isaac Wagar
"	New Hamburg, Dutchess co	Hudson river stone supply co.
"	Oriskany, Oneida co...	F. E. Conley
Sandstone	Medina, Orleans co	A. L. Swett iron works
"	Duanesburg, Schenectady co.	Albert Shear & Co.
"	Higginsville, Oneida co.	F. E. Conley

Sandstone	Lockport, Niagara co...	C. B. Whitmore
Granite	Round island, Rockland co	Daniel E. Donovan
Trap..........	Guttenberg N. J..... .	Carpenter Bros.
"	Fort Lee N. J.	John S. Lane
"	Rockland Lake, Rockland co....	Conklin & Foss

Bricks and clays collected by Dr Heinrich Ries for the state museum

MATERIAL	LOCALITY	DONATED BY
5 brick... ...	Canandaigua N. Y.....	N. Y. hydraulic pressed brick co.
5 brick........ pavers builders acid	Syracuse N. Y.........	N. Y. paving brick works
Bottom clay ...	Farmingdale, Queens co.	Garden City brick co.
Middle " ...	"	"
Upper " ...	"	Meyer's brick works
Bottom " ...	"	"
Medium grade fire-clay	Kreischerville S. I.....	Kreischer Bros.
White fire-clay.	"	"
" " .	Opp. Kilmeyer's hotel, Kreischersville S. I...	"
Medium grade fire-clay	Near factory Kreischersville S. I..........	"
Blue clay......	Glens Falls Warren co..	Glens Falls brick & terracotta co.
Lower clay....	Rochester, Monroe co..	Rochester brick & tile co.
Brick clay.....	West neck L. I........	Hammond's yard
" .. .	Southold L. I.........	Arshmomoque brick works
Yellow clay....	Littleneck L. I.........	Northport fire-clay co.
Black clay.....	Northport L. I........	"

Mineralogy

Donations

From Andrew Lackey, of Johnsburg, Warren co. N. Y. the following specimens from the vicinity of that town:

1 almandite garnet, a large crystal presenting on the bottom the appearance of the hexagonal rutile, or aragonite twin. A piece broken out of the top gives a rounded, hexagonal pyramid due to cleavage.

7 almandite crystals of the same peculiar rounded form as above

4 black tourmaline crystals

1 quartz cluster (small)

1 limonite

From A. P. Adams, of Albany:

1 pyrargyrite and auriferous pyrite, Dunton Col.; carries about 10 oz. of gold to the ton.

From W. S. Snyder:

1 gold, native gold in quartz vein from South Bennington Vt.

From F. M. Kronse, of Washington D. C.:

12 zircon crystals from French Broad river N. C.

From Klaber & Co., of New York:

1 green onyx, cut and polished, from Argentina.

1 section of onyx stalactite from Bisbee Ariz.

From John Bridgeford, of Albany:

1 cerargyrite, Lovelock, Humboldt co. Nev.

By exchange

From Edgar Nock, of Providence R. I.:

1 peridote, cut gem from Mt Mica, Paris Me.

1 opal (fire opal) gem from Queretaro Mex.

1 garnet, var. almandite gem, from Liberia.

1 spinel (red) cut gem from Ceylon.

1 zircon (brown) cut gem from Ceylon.

Relics

Donations

From Dr A. W. Van Slyke, of Coxsackie N. Y., 2 arrowheads from Greene county.

By purchase with Indian relics

From A. G. Richmond:

1 bayonet from Saratoga battlefield
1 bayonet from Point Peninsula, Jefferson co. N. Y.
Part of gunlock from Oriskany battlefield
2 buttons from Saratoga battlefield
1 cannon ball, presented by J. L. Towning, of Copenhagen
2 grapeshot?

Relief maps

1 geologic relief map of Manhattan island, showing its original topography. Scale: horizontal, 1000 ft=1 in., vertical, 500 ft=1 in. Price on application.

1 map of Manhattan island, showing topography and hydrography with culture as it existed in 1776 Scale: horizontal, 1000 ft=1 in., vertical, 500 ft=1 in. Price $60.

1 map of the Catskill mountains. Scale: both horizontal and vertical, 1 in.=1 mile. Price $40.

Zoology

Donations

Birds

Common name	Scientific name	Sex	Locality	Donor
Northern raven	Corvus corax principalis (*Ridgw.*)	Female	Lake George	H. H. Murdock
American goshawk	Accipiter atricapillus (*Wils.*)	Male	Albany county	
American osprey	Pandion haliaëtus carolinensis (*Gmel.*)	Male	Slime pond, Herkimer co.	F. B. Harrington
American osprey	Pandion haliaëtus carolinensis (*Gmel.*)	Female	Feura bush, Albany co	Willis Johnson
Blue goose	Chen coerulescens (*Linn.*)	Female	Schenevus, Otsego co.	C. H. Graham

Insects

Common name	Scientific name	Sex	Locality	Donor
Bumblebee	Xylocopa virginica (*Dury*)		Albany, Albany co.	J. H. Finch

Purchases

Common name	Scientific name	Sex	Locality	Donor
Tarantula	Eurypelma hentzii (*Girard*)		Panama	
Turkey buzzard	Cathartes aura (*Linn.*)	Female	Bristol, Ontario co.	Ward's nat. sci. estab.
Whistling swan	Olor columbianus (*Ord*)	Male	St Lawrence county	
Great horned owl	Bubo virginianus (*Gmel.*)	Female	Albany county	

Life histories of animals

17 *preparations illustrating the complete course of development of crustaceans, insects, fishes, batrachians and reptiles, purchased from the Kny-Scheerer Co., New York city*

Kingdom	Subkingdom	Phylum	Class	Order	Scientific name	Common name
Animals	Invertebrata	Arthropoda	Crustacea	Decapoda	Limulus polyphemus *Linn.*	King crab
					Astacus fluviatilis *Rond*	River crawfish
			Insecta	Isoptera	Termes bellicosus *Smeathman*	White ant
				Orthoptera	Locusta viridissima *Linn.*	Green katydid
				Trichoptera	Phryganea striata *Linn.*	Caddis fly
				Diptera	Culex pipiens *Linn.*	Mosquito
					Musca domestica *Linn.*	House fly
				Coleoptera	Melolontha vulgaris *Fabr.?*	Cockchafer
					Ergates faber *Linn.*	Pine borer
				Hymenoptera	Formica rufa *Linn.*	Red ant
					Vespa crabro *Linn.*	Hornet
					Bombus lapidarius *Fabr.*	Bumblebee
					Apis mellifica *Linn.*	Honey bee
	Vertebrata	Chordata	Pisces	Teleostei	Salmo fario *Linn.*	European trout
			Batrachia	Urodela	Triton cristatus *Laur*	Salamander
				Anura	Rana esculenta *Linn.*	European frog
			Reptilia	Squamata	Lacerta vivipara *Linn.*	Lizard

Marine invertebrates collected in Long Island waters, July–September 1898, *by Dr Tarleton H. Bean*

Common name	Scientific name	No. of specimens
	Insecta	
Cicindelid beetle	Cicindela punctulata *Fabr.*	1
Scarabeid beetle	Lachnosterna sp	1
	Crustacea	
Spider crab	Libinia canaliculata *Say*	4
Blue crab	Calinectes hastatus *Ordway*	2
Lady crab	Platyonichius ocellatus *Latreille*	13
Rock crab	Cancer irroratus *Say*	4
Mud crab	Panopeus sayi *Smith*	1
Smaller hermit-crab	Eupagurus longicarpus *Stimpson*	13
Larger hermit-crab	Eupagurus pollicaris *Stimpson*	6
Sand shrimp	Crangon vulgaris *Fabricius*	3
Common prawn	Palaemonetes vulgaris *Stimpson*	10
Isopod	Livoneca ovalis *Harger*	13
Isopod	Aegathoa sp	3
Copepod	Pandarus sp	3
Acorn barnacle	Balanus balanoides *Stimpson*	3
	Mollusca	
Common squid	Loligo pealii *Le Sueur*	2
Winkle	Sycotypus canaliculatus (*Gill*)	3
Egg case of Winkle	Sycotypus canaliculatus (*Gill*)	1
Natica	Natica duplicata *Stimpson*	1
Drill	Urosalpinx cinerea *Stimpson*	1
Periwinkle	Littorina littorea *Linn*	9
Nassa	Ilyanassa obsoleta *Stimpson*	370
	Melampus bidentatus *Say*	13
Horse mussel	Modiola plicatula *Lamarck*	10
Scallop	Pecten irradians *Lamarck*	1
Oyster	Ostrea virginiana *Lister*	Group
Sea clam	Mactra solidissima *Chemnitz*	1
Edible mussel	Mytilus edulis *Linn*	11
Boat shell	Crepidula plana *Say*	4
	Vermes	
Nereis sp		2
Leech		1

Echinodermata

Common name	Scientific name	No. of specimens
Starfish	Asterias vulgaris *Stimpson*	1

Fishes[a]

BEAN COLLECTION

Collected by Dr Tarleton H. Bean, during July, August and September 1898, in Long Island waters (except where noted).

Common name	Scientific name	No. of specimens
Great sea lamprey	Petromyzon marinus *Linn* C. H. Walters, donor.	1
Dog shark	Mustelus canis (*Mitch.*)	4
Dusky shark	Carcharinus obscurus (*Le S.*) W. F. Clark, donor.	1
Sand shark	Carcharias littoralis (*Mitch.*)	3
Mackerel shark	Lamna cornubica (*Gmel.*) A. P. Latto, donor.	1
Spined dogfish	Squalus acanthias *Linn* A. P. Latto, donor.	1
Common skate	Raja erinacea *Mitch*	1
Big skate	Raja ocellata *Mitch*	1
Clear-nosed skate	Raja eglanteria *Bosc*	2
Horned pout	Ameiurus nebulosus (*Le S.*)	8
Carp	Cyprinus carpio *Linn* C. H. Walters, donor.	1
Blunt-nosed minnow	Pimephales notatus (*Raf.*) L. Stone, donor.	17
Golden shiner	Abramis chrysoleucas (*Mitch.*) L. Stone, donor.	7
Spawn-eater; shiner	Notropis hudsonius (*De Witt Clinton*) L. Stone, donor.	8
Silver-fin	Notropis whipplii (*Girard*) L. Stone, donor.	1
Silvery minnow	Notropis atherinoides *Raf.*	1
American eel	Anguilla chrysypa *Raf.*	9
Conger eel	Leptocephalus conger (*Linn.*) A. P. Latto, donor.	1
Big-eyed herring	Elops saurus *Linn* A. P. Latto, donor.	1

a In this list the species are arranged in the same general order in which they are found in Jordan and Evermann's *Fishes of North and Middle America*, bull. 47 U. S. nat. mus. The nomenclature of this work is also followed. The names marked with an asterisk differ from those adopted by Dr Bean in his report. See p. r92–r111.

Common name	Scientific name	No. of specimens
Hickory shad	Pomolobus mediocris (*Mitch.*)...	2
Alewife	Pomolobus pseudoharengus (*Wilson*)	35
Menhaden	Brevoortia tyrannus (*Latrobe*) ...	4
Striped anchovy........	Stolephorus brownii (*Gmel.*)	2
Anchovy..............	Stolephorus mitchilli (*Cuv. & Val.*)	58
Labrador whitefish......	Coregonus labradoricus *Rich.*....	1
	Hemlock lake N. Y., James Annin jr, donor.	
Cisco...............	Argyrosomus artedi (*Le S.*)	2
	Hemlock lake N. Y., James Annin jr, donor.	
American smelt	Osmerus mordax (*Mitch.*)......	1
	C. H. Walters, donor.	
Banded pickerel	Lucius americanus (*Gmel.*)	4
Common eastern pickerel	Lucius reticulatus (*Le S.*)	4
Common pike..........	Lucius lucius (*Linn.*)...........	1
	L. Stone, donor.	
Great northern pike.. ..	Lucius masquinongy immaculatus (*Garrard*)	1
	Chautauqua lake N. Y., James Annin jr, donor.	
Killifish	Fundulus majalis (*Walbaum*)....	11
Common killifish	Fundulus heteroclitus (*Linn.*)...	20
Killifish	Fundulus diaphanus (*Le S.*).....	8
Rainwater fish	Lucania parva (*Baird & Girard*)	67
Sheepshead minnow	Cyprinodon variegatus *Lacépède*	16
Garfish	Tylosurus marinus (*Walbaum*) ..	27
Common halfbeak	Hyporhamphus roberti (*Cuv. & Val.*).........................	4
Nine-spined stickleback..	Pygosteus pungitius (*Linn.*)	11
Common eastern stickleback	Gasterosteus bispinosus *Walbaum*	2
Four-spined stickleback..	Apeltes quadracus (*Mitch.*)	71
Common pipefish.......	Siphostoma fuscum (*Storer*).....	19
Common American seahorse	Hippocampus hudsonius *De Kay*	2
Pirate perch	Aphredoderus sayanus (*Gilliams*)	1
Silverfish.............	Kirtlandia vagrans laciniata (*Swain*)	1

Common name	Scientific name	No. of specimens
Fresh-water silverside ...	*Menidia gracilis beryllina (*Cope*)	41
Silverside	*Menidia menidia notata (*Mitch.*)	64
Common mullet	Mugil cephalus *Linn*...........	3
White mullet	Mugil curema *Cuv. & Val*.......	5
Crevalle...............	Caranx hippos (*Linn.*)	3
Threadfish...	Alectis ciliaris (*Bloch*)..........	1
	W. F. Clark, donor.	
Moonfish	Selene vomer (*Linn.*)...........	1
Common pampano......	Trachinotus carolinus (*Linn.*) ...	7
Bluefish	Pomatomus saltatrix (*Linn.*)....	12
Rudder-fish	Palinurichthys perciformis(*Mitch.*)	4
Dollar-fish	Rhombus tricanthus (*Peck*)	2
	A. P. Latto, donor.	
Common rock bass......	Ambloplites rupestris (*Raf.*)....	2
	St Lawrence river, L. Stone, donor.	
Common sunfish........	Eupomotis gibbosus (*Linn.*).....	6
Small-mouthed black bass	Micropterus dolomieu *Lacépède*..	1
	St Lawrence river, L. Stone, donor.	
Large-mouthed black bass	Micropterus salmoides *Lacépède*..	1
	St Lawrence river, L. Stone, donor.	
Yellow perch	Perca flavescens (*Mitch.*)........	2
Striped bass	Roccus lineatus (*Bloch*)........	2
White perch	Morone americana (*Gmel.*)......	2
Black sea bass..........	Centropristes striatus (*Linn.*)....	22
Common scup..........	Stenotomus chrysops (*Linn.*)....	9
Silver Jenny...........	Eucinostomus gula (*Cuv. & Val.*)	1
Common weakfish	Cynoscion regalis (*Bloch & Schneider*)..................	14
Yellow-tail	Bairdiella chrysura (*Lacépède*)...	10
Kingfish................	Menticirrhus saxatilis (*Bloch & Schneider*)..................	20
Cunner................	Tautogolabrus adspersus (*Walbaum*)	12
Tautog................	Tautoga onitis (*Linn.*)..........	20
Fool fish	Monacanthus hispidus (*Linn.*)...	1
File fish..............	Alutera schoepfii (*Walbaum*) ...	4
Puffer	Spheroides maculatus (*Bloch & Schneider*).................	14

Common name	Scientific name	No. of specimens
Miller's thumb	Uranidea gracilis (*Heckel*)	2
	C. H. Walters, donor.	
Common gurnard	Prionotus carolinus (*Linn.*)	8
Northern striped gurnard	Prionotus strigatus (*Cuv. & Val.*)	24
Naked goby	Gobiosoma bosci (*Lacépède*)	66
Toadfish	Opsanus tau (*Linn.*)	7
Whiting	Merluccius bilinearis (*Mitch.*)	1
	A. P. Latto, donor.	
Tomcod	Microgadus tomcod (*Walbaum*)	8
Codling	*Urophycis tenuis (*Mitch.*)	2
	A. P. Latto, donor.	
Summer flounder	Paralichthys dentatus (*Linn.*)	7
Common flatfish	Pseudopleuronectes americanus (*Walbaum*)	15
Window pane	*Lophopsetta maculata (*Mitch.*)	3
American sole	Achirus fasciatus *Lacépède*	32

REPORT OF WORK ON THE COLLECTIONS OF MESOZOIC AND CENOZOIC FOSSILS IN GEOLOGICAL HALL

The first three weeks of November 1897 were spent in arranging the Mesozoic, Cenozoic and Quaternary collections of fossils from the United States. It was found necessary to relabel the entire collection in order to bring it into accord with the latest nomenclature and classification. The old labels were in a number of instances incomplete, and sometimes the generic as well as the specific identifications were at fault.

No attempt was made in relabeling the collections to change in any way the localities from which the fossils were stated to have come. This can never be done with safety, owing to the wide geographic distribution of nearly all species. Very few forms of life in the fossil world are confined to one locality, though most are limited in vertical range. The same forms which flourished in the British Isles as early as the Carboniferous period grew also in the Alleghany mountain region of the United States, and the same might be said of the fauna as well as the flora.

Corrections were made in the horizon of the fossils, and additional information was given whenever possible. We can safely infer the horizon when the locality is known and the fossil in question has been determined. Mistakes in the horizon of the fossils had been made in a great many instances. For example, in the British Tertiary all the specimens from Barton were labeled Middle Eocene. As only beds of Upper Eocene age occur at Barton, the correction from Middle to Upper Eocene was made. Many forms marked Upper Eocene are Oligocene, and this change was made and the Oligocene specimens placed in a separate division. In the same way, a number of forms marked Upper Eocene were transferred to Lower Eocene. This task was made possible and was much simplified by the use of Prof. Richard B. Newton's excellent memoir on the Oligocene and Eocene Mollusca. This report forms one of the special publications of the British museum, and was issued in 1891.

The classification of British strata adopted is the one given by Sir Archibald Geikie in his *Textbook of geology* (edition of 1893).

The marked changes in the nomenclature of the Mollusca have resulted from a more thorough and exhaustive study of this group during the last few years. This study has necessitated alterations and in many cases rejections of generic and specific terms which were applied some twenty years ago. According to the so-called "law of priority," the earliest name of any organism has preference over any later and perhaps more generally used term. The preoccupation, however, of some of the molluscan names by organisms belonging to other groups, Vermes, Insecta, etc. has necessitated a rejection of several well-known and largely used generic terms.

Among the more important changes recently made in Lamellibranchiata for the above reason are the following:

The name Glycimeris must be used in place of Panopaea- for the former was applied in 1753 by Klein to a bivalve shell identical generically with one from the Pliocene of northern Italy, whereas the Italian fossil was not named Panopaea till 1807 by Menard de la Groye.

The genus Pectunculus, applied by Lamarck in 1799, must be discontinued, and the term Axinaea used in its place, as the latter was given in 1795 by Poli for a similar shell.

The use of Cyprina by Linnaeus in 1766 for a fish antedates the application of the word in conchology, and it is therefore not available. Schumacher in 1817 describes the genus under the name Arctica, and the latter will therefore replace the more familiar term of Cyprina.

Another example is seen in the substitution of Meretrix in lieu of Cytherea. The former term, given in 1799 by Lamarck, is synonomous with his Cytherea of 1806, and according to the law of priority Meretrix must be accepted, and Cytherea, though better known and more generally used, allowed to disappear. A second reason why Cytherea can not be used now, lies in the fact that in 1805 Fabricius used the name for a Dipterous insect, a fact probably not known by Lamarck.

Among the Gasteropoda the generic term Hydrobia, founded in 1821 by Hartmann, was used in 1817 for an insect belonging to the Coleoptera, and consequently this name can not longer be applied. Prof. R. B. Newton has suggested that the term Paludestrina of D'Orbigny be used in its place, and this seems to have met with approval.

The genus Pteronotus, given in 1840 by Swainson, had already been employed in 1838 by J. E. Gray for a genus of bats. The use of the word for a bat two years previous makes the word unavailable, and Triplex, given by Humphrey in 1797 for a similar shell, must take the place of Pteronotus.

The well-known genus Cylichna of Loven, which that author used in 1846, was in 1844 applied by Burmeister to a genus of the Coleoptera, and Prof. Newton has changed the genus to Bullinella, a name of new construction. Other examples might be given, but the above will prove sufficient to show why so many generic terms have been altered. Changes have likewise been made in the species name. The earliest specific name has acceptance, while all others are considered as synonyms or, where they show varietal distinctions, would follow the specific name as varieties of it. Though many instances of a large synonomy under each species result from this method, it is the only way to avoid confusion in paleontologic and conchologic nomenclature.

At a meeting of the British association held recently the following reasons were given why the *first* term used should be accepted and employed :

In zoology no one person can subsequently claim an authority equal to that possessed by the person who is the first to define a new genus or describe a new species, and hence it is the name originally given, even though it may be inferior in point of elegance or expressiveness to those subsequently proposed, which ought as a general principle to be permanently retained.

To this consideration we ought to add the injustice of erasing the name originally selected by the person to whose labors we owe our first knowledge of the object and we should reflect how much the permission of such a practice opens a door to obscure pretenders for dragging themselves into notice at the expense of original observers.

A more thorough knowledge of the anatomy and the phylogeny of a group of organisms of which the mollusca furnish a good example has introduced in conchology many subgeneric names and varieties. The use of subgeneric terms does not replace the early generic word used for a larger number of organisms, but is placed in parenthesis between the generic and specific names. We have followed this method in relabeling the collections.

The earlier conception of *species* was that of a fixed unit, limited and immutable. Cuvier, the founder of paleontology, gave a good definition of this idea as follows. "A species is an assemblage of all organized creatures which have descended, one from another or from common ancestors and of all those which resemble them as closely as they resemble each other".

Lamarck first showed that species were not immutable, but were derived from one another. Darwin's later researches demonstrated that species are derived one from another, and that there consequently exist between all organisms living and extinct, true relations of parentage more or less removed.

In revising the collections in the museum and adopting in labeling the latest authoritative works on the subject, the old names are often put in parenthesis below those now proposed. Where the author's name is inclosed in parenthesis, it is intended to imply that the author gave the specific term but used a different generic word when he first described the species.

The following is a brief outline of my work in the museum.

The first three weeks of November were spent on the Mesozoic, Cenozoic and Quatenary collections of the United States. Some of the fossils from the New Jersey greensands were assigned by the old labels to localities from which they could not possibly have come. The most noticeable of these errors was found in a number of "Lower marl" fossils (now called the Navesink marl bed of the Monmouth formation) which were labeled "Shark river". All the formations along Shark river are of much later age than the marl beds which carry the Navesink fossils. In fact, only the uppermost portion of the greensand series is represented along this river. It is very probable that these Navesink fossils (Lower marl bed of Cook) came from Monmouth county, but, inasmuch as their distribution is along the entire Lower marl belt of New Jersey, it was impossible to assign any locality with certainty. Fortunately duplicates of these doubtful locality fossils were found, so that they were removed from the cases without impairing the number of species previously represented. In fact, new species were added by a re-sorting and separation of material. A number of Upper Cretaceous leaves from the Dakota sandstone, found stowed away in cases below, were labeled and put on exhibition. These beautiful leaf impressions, so wonderfully preserved in a rather coarse sandstone, are practically the only forms which we have illustrating the Dakota group of America. The revision of the Cretaceous collection was made in accordance with the late work of Prof. W. B. Clarke and myself on the greensand series of New Jersey. With the exception of the Matawan, we have now representative specimens and fossils from each horizon of the series.

The Raritan formation is almost without fossils, and, since lithologic specimens have little value in a paleontologic collection, we can not well represent this formation. The Matawan fossils are, however, very abundant and easily obtained.

The Tertiary collection is much larger. Many of these fossils, especially the Miocene forms, came from the Smithsonian institution, and were in many instances labeled in the original handwriting of the celebrated American paleontologist, F. B. Meek. It was intended to save all of these original labels, but unfortunately most of them were destroyed.

While the Tertiary collection, as a whole, is large and includes specimens from a number of localities in each horizon, the most needful addition is in the Miocene Gasteropoda, of which the museum has only a few forms. The great abundance of Miocene Mollusca along the middle Atlantic slope, which are so remarkably preserved, should be a sufficient cause for enlarging this collection.

Such material as desired could probably be secured by exchange of paleozoic fossils from New York with the large collections to be found in many of the southern institutions. Excellent material is in this way added annually to the Johns Hopkins university collections, and the expense of obtaining it reduced to a minimum.

The work of revising and arranging the British Tertiary was completed in December. All of the specimens in the museum which were relabeled were remounted on blocks, they being covered over with pinkish paper, such as was used in the synoptic mineral and rock collections. The British collection is of interest because it was given in the year 1858 by the renowned English geologist, Sir Roderick Murchison, who at that time was at the head of the geological survey of Great Britain.

The Eocene fossils from the Paris basin, France, were presented to the museum in 1858 by W. C. Johnson, of Utica. The first two weeks of January were spent in remounting and labeling this superb collection. Scarcely any locality in the world exceeds the "Paris basin" in the variety and wonderful preservation of fossi-shells, and the museum is fortunate in having so good a representation of them. Where illustrations of the fossils could not be found, I was obliged to accept the earlier determinations as correct. The changes made in most cases contain the older synonyms in parenthesis. All of these specimens came from Damery, France. The collection of Tertiary fossils from Europe contains 337 different species, which is just twice as many as our American Tertiary.

The Miocene is, however, wanting in Great Britain, and we have no specimens from that horizon, though it is well developed on the continent of Europe.

The task of relabeling the British Eocene and Oligocene was simplified by the use of Prof. R. B. Newton's report previously mentioned.

The following specimens labeled as coming from the European Eocene do not agree either with the horizon or the locality assigned to them by Newton in his memoir.

LOWER EOCENE

1 Astarte rugata *Sow.* Alum bay.
This, according to Newton, is A. rugata var. subrugata Wood.

2 Cryptodon angulatum *Sow.* London.
Not given at all.

3 Corbula pisum *Sow.*
Not recorded from Alum bay but given *Lower* Eocene elsewhere.

4 Teredo antenautae *Sow.*
Not given from Whetstone.

5 Teredina personata (*Lamarck*)
Not given from Chapham.

6 Stenothyra parkinsoni *Morris*
Is given Woolwick beds.

MIDDLE EOCENE

7 Cyrena obovata *Sow.*
Not recorded from Middle Eocene.

8 Neritina concava *Sow.*
Reported Oligocene only.

9 Planorbis oligyratus *Edw.*
Oligocene, not Middle Eocene, no locality on specimen.

UPPER EOCENE

10 Axinaea deleta (*Solander*)
Not reported from Hordwell.

11 Nucula dixoni *Wood*
Given only *Middle Eocene.*

12 Protocardium semigranulatum *Sow.*
Considered by Newton *Lower* Eocene only.

13 Meretrix (Cytherea) obliqua (*Desh.*)
Not reported from Upper Eocene. As this determination seems correct there is probably some mistake about the locality.

14 Psammotaea compressa *Sow.*
Middle Eocene only.

15 Potamides ventricosus *Sow.*
Not recorded from Bagshot.

16 Neritina glandulata *Sandberger*
Not recorded at all.

17 Planorbis euomphalus *Sow.*
Reported Oligocene only.

The latter part of January was spent in the revision of the Cretaceous fossils from Great Britain. After this was completed the Jurassic fossils were relabeled and arranged, and, as this division was so large and the number of species so great, nearly the entire month of February was spent in this task. A recently purchased collection of Tertiary shells from a deep well boring at Galveston Tex., was put in glass-covered boxes, which were filled with black cotton for a background. This method of mounting was necessary on account of the small size of the shells, which were too minute to be seen distinctly in any other way.

The work of relabeling the European collection was continued during March and completed as far as the Upper Carboniferous or coal measures. A large number of plants from the coal fields of England were unlabeled, and many of these were determined and labeled. The authority for this work was the *Catalogue of the paleozoic plants in the department of geology and paleontology, British museum*, by Robert Kidston, a work which appeared in 1886. In the revision of the British collection of fossils, the important memoirs published by the Paleontographical society made the task comparatively simple. Many other reports were consulted, such as Agassiz's *Poissons fossiles*, Phillips's *Geology of Yorkshire*, Brogniart's *Histoire de vegetables fossiles*, Lesquereux's *Coal flora of the Carboniferous formation in Pennsylvania*, Fontaine and White, *Permian or Upper Carboniferous flora*, and monographs by English specialists on the brachiopods, echinoderms and mollusca.

It is believed that the collections, as far as studied, relabeled and remounted, are thoroughly up to date, and will not require at any future time any farther study. The different divisions of the formations have been kept separate, and the proper stage name placed at the head of each division in large black letters. The labels are all lettered in waterproof india ink on pearl colored card labels, and are a great improvement over the former finely written labels, all becoming indistinct and fading with age. This alone is worth a good deal, and the names of the specimens can now be read at a glance at some distance away.

I wish to thank the director, Dr F. J. H. Merrill, for his kind assistance and his help in securing everything needful for my work, and trust that the results will prove in every way satisfactory. A catalogue of the species and number of specimens and their localities was typewritten. In addition to this laborious task, a synopsis of all the genera and species of fossils contained in the whole museum has been made out together with the number of specimens in each case. The results of this synopsis show that there are in the museum at the present time a total of 3490 American and European species, represented by 12,220 specimens. This is a very large and valuable collection, worthy of careful study by all interested in paleontology.

Trusting that it may be possible to finish this work at a later time, and thanking the director for his kindness in making this revision possible, I remain

Respectfully yours

RUFUS M. BAGG JR

CATALOGUE

American

Cretaceous	Upper	Dakota sandstone: Raritan clays
		Monmouth formation: Lower or Navesink Marlbed
		Rancocas formation or Middle Marlbed of N. J.
		Manasquan formation or Upper Marlbed of N. J.

Eocene
Miocene
Phosphate beds and western formations of Tertiary age.
Pleistocene

Cretaceous

Upper

Angiosperms DAKOTA

Viburnum robustum *Lesq.*	1	Dakota sandstone, Kan.
Sassafras cretaceum *Newb.*	1	"
S. acutilobum *Lesq.*	1	"
Greviopsis haydeni *Lesq.*	1	"
Populus kansasensis *Lesq.*	1	"
Ilex dakotensis *Lesq.*	1	"
Aralia sapertanea *Lesq.*	1	"
Hedera orbiculata *Lesq.*	1	"
Diospyros rotundifera *Lesq.*	1	"
Sterculia snowii *Lesq.*	1	"
Rhamnus inaequilateralis *Lesq.*	1	"
R. apiculatus *Lesq.*	1	"
Betulites flabelliformis *Lesq.*	1	"
B. vestii var. obtusa	1	"
B. vestii var. latifolia	1	"

MONMOUTH FORMATION AND VARIOUS SOURCES

Brachiopoda		
Terebratella plicata *Say*	9	Marlboro N. J.
Lamellibranchiata		
Ostrea larva *Lam.*	7	Marlboro N. J.
O. larva *Lam.*	5	Prairie bluff Ala.
O. cretacea *Morton*	5	Marlboro N. J.
O. cretacea *Morton*	5	Passim Ala.
O. in calcareous rock	mass	Between Sheep mountain and range west
Exogyra costata *Say*	6	Marlboro N. J.
E. costata *Say*	1	near Austin Tex.
E. costata *Say*	2	Prairie bluff Ala.
Gryphaea vesicularis *Lam.*	1	"
G. vesicularis *Lam.*	6	Marlboro N. J.
G. sp	1	Texas
Cyrena dakotensis *M. & H.*	1	Missouri river Dak.
Dianchora echinata *Morton*	1	Navesink marl bed N. J.
Inoceramus problematicus *Schloth.*	2	Laramie plains
Limopsis parvula *M. & H.*	mass	Yellowstone river
Protocardia subquadrata *E. & H.*	mass	"
P. rara *E. & H.*	8	Milk river Mo.
Idonearca antrosa (*Morton*)	1	Arneytown N. J.
Cephalopoda		
Baculites compressus *Say*	1	Sage creek Dak.
B. compressus *Say*	2	5 miles E. Rock creek
B. compressus *Say* (section)	1	Fox hills S. D.
B. ovatus *Say*	1	Navesink marl bed N. J.
B. ovatus *Say*	1	Missouri river Dak.
B. ovatus *Say*	2	Arneytown N. J.
B. grandis *H. & M.*	2	Big Cheyenne river Dak.
B. americana *Mort.*	1	Holmdel N. J.
Phragmacone of B. americana *Mort.*	1	Navesink marl bed N. J.
Belemnitella americana *Mort.*	4	Marlboro N. J.
B. americana *Mort.*	5	Arneytown N. J.
Scaphites nodosus var. brevis *Meek*	5	Converse co. Wy.
Placenticeras placenta *DeKay*	1	Deadwood S. D.
P. placenta *DeKay*	1	Sage creek Dak.
P. placenta *DeKay* (sections)	2	Northwest U. S.
Nautilus dekayi *Mort.*	2	Fox hills S. D.
Reptilia		
Saurian vertebrae	3	Bad river Dak.
Saurian vertebrae	3	Laramie plains

RANCOCAS FORMATION

Hexacoralla		
Anthophyllum atlanticum *Mort.*	1	New Jersey

Echinodermata		
Trematopygus crucifer (*Mort.*)	1	Gloucester co. N. J.
Vermes		
Vermetus rotula *Mort.*	12	Blackwood N. J.
Bryozoa		
Flustra in limestone	mass	Timber creek N. J.
Eschara digitata *Mort.*	mass and fragments	Blackwood N. J.
Brachiopoda		
Terebratula harlani *Mort.*	11	New Egypt N. J.
T. harlani *Mort.*	5	New Jersey
Lamellibranchiata		
Gryphaeostrea vomer *Mort.*	4	New Egypt N. J.
Gryphaea vesicularis *Lam.*	8	Blue Ball N. J.
Idonearca medians *Whitf.*	2	Pemberton N. J.
Teredo tibialis *Mort.*	17	Blackwood N. J.
Greensand		Sewell marl bed N. J.

MANASQUAN FORMATION

Hexacoralla		
Trochosmilia conoides *G. & H.*	3	Squankum N. J.
Lamellibranchiata		
Ostrea glandiformis *Whitf.*	3	Squankum N. J.
Idonearca compressirostra *Whitf.*	1	New Jersey
Caryatis veta *Whitf.*	3	Shark river N. J.
Vertebrata. Squalidae		
Galeocerdo pristodontus *Agas.*	1	S. C.
Shark tooth and young Exogyra	well-boring	S. C.

Eocene

Echinodermata		
Scutella atlantica	1	Georgia
Scutella in buhrstone	1	"
Lamellibranchiata		
Ostrea compressirostra *Say*	6	Coggins point Va.
O. sellaeformis *Con.*	1	Claiborne Ala.
O. panda *Mort.*	4	Clarksville Ala.
Cucullaea gigantea *Con.*	2	Fort Washington Md.
Anomia ephippioides *Say*	8	Wheelock Tex.
Cardita brittoni *Whitf.*	2	Shark river N. J.
C. perantiqua *Con.*	11	"
C. alticostata *Con.*	4	Claiborne Ala.

Caryatis ovalis. *Whitf.*	5	Shark river N. J.
Venericardia planicosta *Lam.*	11	Wheelock Tex.
V. transversa *Lea.*	1	Claiborne Ala.
Corbula nasutoides *Whitf.*	1	Shark river N. J.
C. oniscus *Con.*	3	Claiborne Ala.
C. texana *Gabb*	3	Wheelock Tex.
Lucina pandata *Con.*	3	Claiborne Ala.
Meretrix (Cytherea) perovata (*Con.*)	3	"
M. (Cytherea) aequora *Con.*	6	Bells Landing Ala.
Nuculana albaria (*Con.*)	2	Shark river N. J.

Gasteropoda

Crepidula lirata *Con.*	3	Claiborne Ala.
Turritella mortoni *Con.*	7	Aquia creek Va.
T. mortoni *Con.*	3	casts
T. mortoni *Con.*	7	East Virginia
T. nasuta *Gabb*	7	Wheelock Tex.
Sp	1	Shark river N. J.
Siliquaria vitis *Con.*	11	Claiborne Ala.
Conus sauridens *Con.*	3	Wheelock Tex.
Oliva alabamensis *Con.*	2	Claiborne Ala.
Mesalia elongata *Whitf.*	1	Shark river N. J.
Volutolithes symmetrica *Con.*	4	Jackson Miss.
V. sayana *Con.*	3	Shark river N. J.
Calyptrophorus velatus *Con.*	7	Claiborne Ala.
Pseudoliva perspecta *Con.*	2	Vicksburg Miss.
P. carinata *Con.*	5	Wheelock Tex.
Pleurotoma lesueurii *Lea*	11	"
Phos texanus *Gabb*	15	"
Natica perspecta *Whitf.*	5	Jackson Miss.
Pyropsis sp	1	Shark river N. J.
Fusus pleuricostata *Whitf.*	1	"
Fasciolaria hercules *Whitf.*	4	"

Vertebrata. Squalidae

Lamna elegans *Agas.*	12	Shark river N. J.
L. compressa *Agas.*	11	"
L. cuspidata *Agas.*	9	"
L. gracilis *Agas.*	13	"
Pridonta antiquus *Agas.*	2	"
Pristis sp...... (fragments)	3	"
Galeocerdo latidens *Agas.*	8	"
Carcharodon megalodon *Agas.*	1	"
C. megalodon *Agas.*	1	?
C. angustidens *Agas.*	7	"
C. polygyrus *Agas.*	1	"
C. productus *Agas.*	2	"
Otodus obliquus *Agas.*	8	Shark river N. J.

Otodus obliquus *Agas.*	9	casts
Oxyrhina desorii *Gibbes*	6	
Carcharodon megalodon *Agas.*	5	casts
C. sulcidens	2	casts
C heterodon *Agas.*	1	cast
Buhrstone with fossils	mass	Georgia

Miocene

Hexacoralla

Madrepora palmata *E. & H.*	3 masses.	James river Va.
M. palmata *E. & H.*	mass	Edgecome co. N. C.

Bryozoa

Bryozoa sp	2 masses.	James river Va.
Bryozoa sp.	mass	York river Va.

Lamellibranchiata

Ostrea disparilis *Con.*	2	James river Va.
O. subfalcata *Con.*	2	"
O. sculpturata *Con.*	3	Coggins point Va.
Pecten madisonius *Say*	3	eastern Virginia
P. madisonius *Say*	3	James river Va.
P. jeffersonius *Say*	9	"
P. clintonius *Say*	10	"
Arca incile *Say*	3	"
A. centenaria *Say*	5	"
A. centenaria *Say*	5	Coggins point Va.
A. (Scapharca) idonea *Con.*	8	St Mary's river Md.
Axinaea subovata (*Say*)	9	James river Va.
Astarte coheni *Con.*	3	"
A. undulata *Say*	3	"
A. undulata *Say*	3	East Virginia
A. exaltata *Con.*	8	"
Crassatella marylandica *Con.*	7	"
C. undulata *Con.*	2	"
C. undulata *Con.*	4	James river Va.
C. turgidula *Con.*	5	"
Carditamera protracta *Con.*	2	....
Venericardia granulata *Say*	6	York river Va.
V. granulata *Say*	6	James river Va.
V. granulata *Say*	5	Coggins point Va.
Lucina anodonta *Say*	3	James river Va.
L. anodonta *Say*	5	Prince George co. Md.
Chama congregata *Con.*	9	Dinwiddie Va.
C. congregata *Con.*	6	James river Va.
C. corticosa *Con.*	5	Yorktown Va. & James river
Venus rileyi *Con.*	2	James river Va.

Venus tridacnoides *Con.*	1	James river Va.
V. tridacnoides *Con.*	2	Coggins point Va.
V. mercenaria *Linn.*	2	York river Va.
V. tetrica. *Con.*	5	St Mary's river Md.
V. mortoni *Con.*	3	"
V. alveata *Con.*	4	"
Artemis acetabulum *Con.*	1	York river Va.
A. acetabulum *Con.*	3	Coggins point Va.
Mactra ponderosa *Con.*	2	St Mary's river Md.
Nucula obliqua *Say*	1	York river Va.
Glycimeris reflexa (*Say*)	1	James river Va.
Teredo fistula *Lea*	8	"
T. fistula *Lea*	10	Coggins point Va.

Gasteropoda

Dentalium attenuatum *Say*	13	York river Va.
D. attenuatum *Say*	4	St Mary's river Md.
Crucibulum costatum *Say*	2	"
Terebra simplex *Con.*	3	"
Fusus (Neptunea) rusticus *Con.*	2	"
F. parilis *Con.*	1	"
Fissurella redimicula *Say*	1	York river Va.
Natica heros *Say*	4	"
Echphora quadricostata *Say*	5	Wind mill point Md.
E. quadricostata *Say*	1	James river Va.
Sycotypus coronatus *Con.*	1	St Mary's river Md.
Turritella variabilis *Con.*	3	"
T. variabilis *Con.*	7	James river Va.
T. alticostata *Con.*	7	"
T. plebia *Say*	9	Wind millpoint Md.
Trochus (Ziziphinus) mitchelli *Con.*	1	James river Va.
Architectonica (Phillipia) trilineata *Con.*	1	Plum point Md.

Cirripedia

Balanus proteus *Con.*	4 mass & 3	James river Va.

Plantae

Lignite	1	Shark river N. J.

Tertiary : western formations

Plantae

Silicified wood	1	Wolf mountains Mont.
Coal (Lignite)	4	Disco Greenland
Coal (Lignite)		Carbon Wy.
Coal (Lignite)	1	Yellowstone river
Silicified wood	1	Cedar creek Mont.
Silicified wood	2	Grand river Dak.
Fossil wood	1	Columbia river
Sandstone	1	Cliffs of Benton

Sandstone with leaf impressions	1	Carbon Wy.
Bone fragments and limestone	11	Well, Antelope sta.

Tertiary: phosphate beds S. C.

Vertebrata: miscellaneous

Bone fragments 19, Cetacean vertebrae	5	Cetacean otolith 1, C.
Coprolite 1, Buck horn 1		

Vertebrata: Squalidae

Carcharodon angustidens *Agas.*	7	Wando and Parrott creeks
C. angustidens *Agas.*	5	
C. megalodon *Agas.*	8	
C. ferox *Emmons*	2	
Lamna elegans *Agas.*	2	Wando and Parrott creeks
Galeocerdo aduncus *Agas.*	1	"
G. contortus *Gibbes*	3	"
Oxyrhina desorii *Gibbes*	2	"
Hemipristis serra *Agas.*	6	
Shark teeth miscellaneous	11	
Vertebrae	9	Wando
Elliptonodon compressus *Emmons.?*	1	

Pleistocene

Brachiopoda

Rhynchonella prittacea *Gmel.*	6	Champlain valley

Lamellibranchiata

Mytilus edulis *Linn.*	8	Champlain valley
Pecten islandicus *Müller*	5	Lake Champlain
Saxicava arctica *Linn.*	11	Champlain valley
Mya truncata *Linn.*	4	"
Gnathodon cuneatus *Gray*	2	South Carolina
Arca transversa *Say*	1	Cuba
Lucina edentula *Lam.*	4	"
Venus latilirata *Con.*	1	"
Lamellibranchiata, undetermined	1	

Gasteropoda

Chrysodomus despectus *Linn.*	1	Champlain valley
Buccinum ciliatum *Fabr.*	1	"
B. cyaneum *Brug.*	1	"
B. glaciale *Linn.*	2	"
Scala (Acirsa) costulata *Mighels*	1	"
Natica clausa *Brod. & Sow*	2	"
Natica canrena *Lam.*	1	Cuba
Natica lactea *Guild*	1	"
Bulla sp?	9	"
Strombus pugilis *Linn.*	2	"
Gasteropoda, undetermined	1	

Cirripedia

Balanus miser	2	Champlain valley
Balanus sp?	1	"

CATALOGUE

OF

Collection of European fossils presented to the New York state museum by Sir Roderick Murchison in 1857

Classification of Strata

- Jurassic..
  - Lias
    - Lower
    - Middle
    - Upper
  - Inferior oolite
  - Fullers' earth
  - Great oolite
  - Forest marble
  - Cornbrash
  - Oxford clay
  - Coral-rag
  - Kimeridge clay
  - Portland oolite
  - Purbeck
- Cretaceous
  - Lower
    - Wealden
    - Lower greensand
  - Upper
    - Gault
    - Upper greensand
    - Chloritic marl
    - Lower chalk
    - Upper chalk
- Tertiary..
  - Eocene
  - Oligocene
  - Pliocene
- Pleistocene

List of Fossils

Jurassic. England

Lower Lias

Echinodermata

Diadema minimum *Agas.*	2	Cheltenham

Brachiopoda

Rhynchonella calcicosta *Quenstedt*	5	Stonehouse
R. moorei *Davidson*	5	Gloucestershire

Lamellibranchiata

Ostrea liassica *Strickl.*	1	Bristol
O. laeviuscula *Sow*	2	Chipping Camden
Gryphaea incurva *Sow*	4	Bristol
G. cymbium *Lamarck*	12	England
Lima pectinoides *Sow*	mass	Chipping Camden
L. punctata *Sow*	1	Saltford
L. gigantea *Sow*	3	Frethern and Bristol
Pecten and Lima pectinoides *Sow*	2 masses.	Chipping Camden

Avicula inaequivalvis *Sow*	1	Bristol
Crenulata ventricosa ?	1	Chipping Camden
Arca truncata *Buckm.*	2	"
A. elongata *Buckm.*	3	"
Plicatula interstriata	1	Saltford
Modiola minima *Sow*	1	Saltford
Cucullaea sp ?	1	Bristol
Myacites unionides *Roemer*	2	Chipping Camden
Myacites sp ?	3	Bristol
Goniomya literata *Sow.*	2	Chipping Camden
Cardinia lanceolata *Stutchbury*	3	Gloucester
C. listeri *Stutch.*	1	Bishport
C. attenuata (*Stutch.*)	1	Stow-on-Wold
Cardium ?	3	Bristol
C. truncatum *Sow*	7 & mass	Chipping Camden
Naiadites acuminatum *Buckm*	1 & mass	Bristol

Gasteropoda

Pleurotomaria anglica *Sow*	1	Bristol

Cephalopoda

Belemnites acutus *Miller*	7	Bristol and Cheltenham
B. pistilliformis *Sow*	3	Cheltenham
Amaltheus oxynotus *Quenstedt*	5	Cheltenham
Aegoceras angulatum *Schlotheim*	4	Kegnoham and Denbury hill
A. armatum *Sow*	1	Lyme
A. planicostum *Sow*	3	Chipping Camden and Lyme
A. carusense *d'Orb*	5	Stonehouse
Arietes bucklandi *Sow*	1	Germany
A. stellaris *Sow*	1	Yorkshire
A. obtusus *Sow*	1	England
A. raricostatus *Zieten*	1	Yorkshire

Vertebrata

Ichthyosaurus platydon *Con.*	1	Lyme
Ichthyosaurus vertebrae and teeth, etc	8	
Ichthyodorulites dorsetiensis *Buch*	1	

Middle Lias

Echinodermata

Ophioderma edgertoni *Broderip*	1	Lyme Regis

Brachiopoda

Lingula beanii *Phillips*	3	Stinchcomb
Terebratula punctata *Sow.*	4	S. of Paulton
Rhynchonella tetrahedra *Sow*	4	Yeovil
R. variabilis *Schlotheim*	3	Radstock
Spiriferina walcotti *Sow*	4	"

Lamellibranchiata and Gasteropoda

Lima aequivalvis *Sow*	1	Gloucestershire
Avicula cygnipes *Phillips*	1	England
A. novemcostae *Brown*	1	Gloucestershire
Pecten demissus *Phillips*	1	"
Arca truncata *Buckman*	2	Nibley Green
Astarte sp ?	1	Stow-on-Wold
Cardinia listeri var. hybrida *Stutch.*	mass & 1	Bridgend
Cardium truncatum *Sow*	7	Nibley Green and Yorkshire
Unicardium cardioides *Phil.*	1	Gloucestershire
Myacites rotundatus *Sow*	2	Radstock
M. unionides *Roemer*	2	Gloucestershire
Pleurotomaria anglica *Sow.*	2	Paulton
P. expansa *Sow*	2	Radstock

Cephalopoda

Belemnites bruguierii	6	Dorset
Aegoceras capricornum *Schlotheim*	2	England
Amaltheus spinatus *Brug.*	2	Gloucestershire
Harpoceras nitescente *Young & Bird*	1	Yorkshire

Upper Lias

Lamellibranchiata

Leda ovum (*Sow.*)	1	Whitby

Cephalopoda

Belemnites compressus *Voltz*	6	Dorset
Nautilus truncatus *Sow*	1	England
Ammonites nodosus *Sow*	1	England
Harpoceras bifronte *Brug.*	5	Yorkshire Alham
Harpoceras serpentinum *Rein.*	3	Stinchcomb and Yorkshire
Harpoceras striatulum *Sow*	4	Dorset and Sanford
Arietes sp ?	1	Yorkshire
Stephanoceras commune *Sow*	3	Lowth and Yorkshire
Stephanoceras annulatum *Sow*	4	Alham and England

Inferior oolite

Hexacoralla

Thecosmilia	2	Upton
Thamnastrea walcotti ? *Duncan*	1	Dundry

Echinoidea

Acrosalenia spinosa *Agas.*	3	Bath
Stomechinus perlatus *Desm.*	1	Cheltenham
Holectypus depressus *Leske*	3	" Fromand Road
H. hemisphericus *Agas.*	2	Burton Bradstock
Pygaster semisulcatus *Phil.*	3	Cheltenham

Clypeus plotii *Klein*	1	Cheltenham
Pygurus michelini *Cotteau*	1	Cornbrash Road
Collyrites ringens *Agas.*	2	Burton Bradstock
Pseudodiadema depressum (*Agas*)	1	Cheltenham

Brachiopoda

Waldheimia carinata *Lam.*	4	Miserden
W. ornithocephala *Sow.*	3	Egford
Terebratula perovalis *Sow.*	6	Cheltenham
T. globata *Sow.*	6	"
T. fimbria *Sow.*	4	Cotteswolds
T. sphaeroidalis *Sow.*	8	Dorset
T. maxillata *Sow.*	6	Pen hill
R. phillipsii *Mor.*	3	Sherborne
Rhynchonella subtetrahedra *Dav.*	1	Dundry
R. spinosa *Schloth.*	4	Stroud
R. varians "	7	Whatley
R. obsoleta *Sow.*	4	Stroud
R. angulata (*Sow.*)	6	Stanley hill

Lamellibranchiata

Ostrea acuminata *Sow.*	mass and 3	Upton
Ostrea sp?	1	Dundry
Pecten lens *Sow.*	1	Cheltenham
Lima bellula *Lyc. & Mor.*	1	Dundry
L. pectiniformis *Schloth.*	2	Cheltenham
L. duplicata *Sow.*	2	Stanley hill
L. gibbosa *Sow.*	4	Stroud
Avicula costata *Sow.*	2	"
Modiola gibbosa *Sow.*	2	Whatley
M. plicata *Sow.*	3	Stanley hill
Trigonia sculpta *Lyc.*	1	England
T. costata *Sow.*	2	Cheltenham
Cardium striatulum *Sow*	1	Hadspen
Astarte obliqua *Desh.*	2	Burton cliff
A. excavata *Sow.*	1	Bradford Abbas
A. recondita (*Phil.*)	1	Stroud
A. elegans *Sow.*	1	Dundry
Myoconcha crassa *Sow.*	2	"
Pholadomya ambigua *Sow.*	2	Cheltenham
P. fidicula *Sow.*	3	Porchester hill and Dundry
P. producta *Sow.*	1	Ironbridge
P. murchisoniae *Sow.*	2	Cheltenham
Ceromya striata *Sow.*	1	Dundry
Myacites decurtatus *Phil.*	5	Loders and Stroud
M. securiformis *Phil.*	2	Burton Bradstock
M. aequatus *Phil.*	1	Stroud
Gresslya peregrina *Phil.*	3	Greenland
Tancredia sp?	1	Stroud

Gasteropoda

Spinigera longispina *Deslon.*	1	Dundry
Trochus bisertus *Phil.*	1	"
T. duplicatus *Sow.?*	2	Smokenham
Pleurotomaria granulata *Sow.*	2	Bridport harbor
Chemnitzia lineata *Sow*	2	Burton cliff
Natica adducta *Phil.*	2	Dundry

Cephalopoda

Belemnites ellipticus *Miller*	6	Dundry and Compton
B. blainvillii *Voltz*	2	Dorset
B. sulcatus *Miller*	4	"
B. abbreviatus *Miller*	3	Camdown
Ammonites sp ?	2	Dundry
A. corrugatus	1	"
A. laeviusculus *Sow.*	1	"
A. compactus	1	"
A. brocchii *Sow.*	1	"
A. sowerbyi *Miller*	1	"
Stephanoceras humphriesianum *Sow.*	1	"
Harpoceras concavum *Sow.*	1	Yeovil
H. murchisonum *Sow.*	2	Dorset
Strophodus magnus *Agas.*	1	Potton

Fullers' earth

Brachiopoda

Terebratula globata *Sow.*	4	Hawkesbury, Upton
Waldheimia ornithocephala *Sow.*	5	Maperton
Rhynchonella varians *Schloth.*	6	Lamyatt beacon
R. concinna *Sow.*	4	Cheltenham

Lamellibranchiata

Ostrea acuminata *Sow.*	1	Bath
Modiola gibbosa *Sow.*	3	Radstock and Orchardleigh

Cephalopoda

Belemnites sulcatus *Miller*	4	Pendomer

Great oolite

Hexacoralla

Anabacia orbulites *E. & H.*	1	Bath
Isastrea limitata *Lamouroux*	1	Minchinhampton

Crinoidea

Apiocrinus parkinsoni (*Schloth.*)	1	Bradford

Vermes

Serpula lacerata *Phil.?*	mass	Bath

Brachiopoda

Waldheimia digona *Sow.*	3	Gloucestershire
Rhynchonella furcillata (*Theodori*)	3	Bradford
R. concinna *Sow.*	3	Sapperton

Lamellibranchiata

Ostrea sowerbyi *Lyc. & Mor.*	4	Sharnbrook and Minchinhampton
Ostrea marshii *Sow.*	1	Bath
Mytilus binfieldi *Lyc. & Mor.*	1	Minchinhampton
Modiola solenoides var. subreniformis (*Lyc. & Mor.*)	1	Minchinhampton
Pecten vagans *Sow.*	2	Bath
P. annulatus *Sow.*	1	"
P. lens *Sow.*	1	Minchinhampton
Avicula echinata *Sow.*	3	Southwick
Lima duplicata *Sow.*	1	Bath
L. cardiiformis *Lyc. & Mor.*	1	"
Limopsis oolitica (*d'Arch.*)	1	Corsham
Placunopsis socialis *Lyc. & Mor.*	1	Minchinhampton
Cucullaea cucullata *Goldfuss*	1	"
C. concinna *Lyc. & Mor.*	1	Bath
Astarte pumila *Sow.*	1	Minchinhampton
A. rustica (*Walton MSS.*) *Lyc. & Mor.*	1	Corsham
Opis lunulatus (*Sow.*)	1	Minchinhampton
Gervillia monotis *Deslong.*	1	"
Isocardia minima *Sow.*	1	Bath
Unicardium varicosum (*Sow.*)	1	Minchinhampton
Trigonia costata var. pullus	1	"
T. duplicata *Sow.*	1	"
Tancredia similis (*WhiteavesMSS.*) *L. & M.*	1	"
T. axiniformis (*Phil.*)	1	"
T. gibbosa *Lyc. & Mor.*	1	"
T. brevis *Lyc. & Mor.*	1	"
Sphaera (Corbis) madridi (*d'Arch.*)	1	"

Gasteropoda

Patella aubentonensis *d'Arch.*	1	Minchinhampton
Chemnitzia phasianoides *Lyc. & Mor.*	1	"
Cylindrites acutus (*Sow.*)	1	"
Trochus spiratus *d'Arch.*	2	Bath
Trochotoma conuloides *Desl.*	1	"

Vertebrata

Hybodus	1	England
Xiphias	1	Stonesfield

Plantae Pteridophyta		
Pterophyllum comptum *Lindl.*	1	Yorkshire
Cornbrash		
Echinoidea		
Holectypus depressus *Leske*	1	Buckland
Echinobrissus clunicularis *Llhwyd*	5	Southwick and Frome
Brachiopoda		
Terebratula intermedia *Sow.*	3	Stony Stoke
Waldheimia digona *Sow.*	3	Stalbridge
W. lagenalis *Schloth.*	2	"
W. obovata var. perovata *Walk.*	3	Dorset
Rhynchonella concinna *Sow.*	4	Melbury
Vermes		
Serpula quadrata *Phil.*	3	Hooper's pool
Lamellibranchiata		
Ostrea rugosa *Goldfuss*	6	Dorset
Pecten vagans *Sow.*	2	Stony Stoke
Avicula echinata *Sow.*	5	Frome
Ceromya concentrica *Sow.*	1	Road
Pholadomya phillipsii *Mor.*	2	E. Cocken
Gresslya peregrinus *Phil.*	2	Bishop's Caundle
Myacites securiformis *Phil.*	2	Rhyme
M. decurtatus (*Phil.*)	3	Road and Hensbridge
Forest marble		
Mollusca		
Terebratula maxillata *Sow.*	4	Pickwick
Cardium striatulum *Sow.*	1	Corsham
Chemnitzia variabilis *Lyc. & Mor.*	6	" and Lacock
Oxford clay		
Lamellibranchiata		
Ostrea inaequivalvis	1	England
Gryphaea dilitata *Sow.*	2	St Neats
Modiola bipartita *Sow.*	1	Studley
Glycimeris oblata	1	Road
Cephalopoda		
Belemnites abbreviatus *Miller*	1	Melksham
B. hastatus *Blainville*	3	St Neats
Ammonites elizabethae (*Jason*)	2	Christian Malford
Stephanoceras macrocephalum *Schlotheim*	1	England

Ammonites spinosus *Sow.*	3	St Neats
A. biplex *Sow*	1	"
Amaltheus lamberti *Sow.*	2	Isle of Skye
Cosmoceras jason *Zeit*	1	"

Coral-rag

Hexacoralla

Thecosmilia annularis *Fleming*	3	Wiltshire and Steeple Ashton
Stylina tubulifera *Phil.*	1	Steeple Ashton
Thamnastrea arachnoides *Parkinson*	2	" and Wootton Bassett

Echinodermata

Echinobrissus costatus *Lamarck*	4	Wiltshire and Dorset
Pseudodiadema versipora *Phillips*	1	Wiltshire
Hemicidaris intermedia *Fleming*	3	"

Lamellibranchiata

Ostrea gregaria *Sow.*	3	Westbrook and Hudley
O. sandalina	3	Todbere
Pecten fibrosus *Sow.*	2	Ringstead
P. vimineus *Sow.*	1	Wilts
Gervillia aviculoides (*Sow.*)	1	Hillmartin
Trigonia costata	1	Wilts
Lithodomus inclusus *Phillips*	mass	Westbrook
Myacites decurtatus (*Goldfuss*)	1	Abbotsbury

Gasteropoda

Natica cincta *Phillips?*	1	Hazelbury
Chemnitzia heddingtonensis (*Sow.*)	1	Hillmartin
Chemnitzia sp?	1	Bourton

Portland oolite

Hexacoralla

Isastrea oblonga *Fleming*	1	Wiltshire

Lamellibranchiata

Trigonia incurva *Benett*	1	Portland
T. gibbosa *Sow.*	1	"
Cardium dissimile *Sow.*	1	Swindon

Kimeridge clay

Brachiopoda

Discina latissima (Sow.)	1	Weymuth
Rhynchonella inconstans *Sow.*	1	Ringstead Bay
Waldheimia lagenalis *Schlotheim*	2	England

Lamellibranchiata

Ostrea deltoidea *Sow*	1	Ringstead Bay
Cardium striatulum *Sow*	2	Devizes
Myacites recurvus *Phillips*	2	" and Ringstead Bay
Myacites sp ?	1	Cumberland

Gasteropoda

Pleurotomaria reticulata *Sow*	1	Devizes

Cephalopoda

Perisphinctes virgatus *Buch.*	1	Tatorowo, Russia

Vertebrata

Sphaerodus gigas *Agas.*	3	Potton
Steneosaurus rostro-minor *Geoff.*	3	"

Purbeck

Echinodermata

Hemicidaris purbeckensis *Forbes*	1	Swanage

Lamellibranchiata

Meretrix (Cytherea) rugosa *Sow.*	1	Swindon

Vertebrata

Hybodus sp	2	Swanage
Lepidotus minor *Agas*	1 whole specimen	"
Leptolepis sprattaeformis	1 whole specimen	Bavaria
Plesiosaurus sp	2	Potton

Miscellaneous

Insect and plant remains	3 masses	Swanage
Cycadoidea microphylla *Buckl.*	1	Isle of Portland

Cretaceous. Lower

Wealden

Lamellibranchiata

Cyrena media *Sow*	5	Hastings and England

Gasteropoda

Actaeon sp	2	Tunbridge Wells
Viviparus (Paludina) fluviorum *Sow.*	1	St Leonards
V. (Paludina) elongata *Sow*	3	Tunbridge Wells

Crustacea

Cypris tuberculata *Sow*	2 masses	Isle of Wight
C. valdensis *Sow.*	mass	"

Squalidae

Lepidotus mantelli *Agas.*	2 masses	Hastings

Lower greensand

Echinodermata		
Holocystis elegans *Lons.*	2	Sandown
Brachiopoda		
Terebratula sella *Sow.*	6	Atherfield
Rhynchonella gibbsiana *Sow.*	6	Isle of Wight
Bryozoa		
Undetermined	1	Nice, Italy
Vermes		
Vermetus polygonalis *Sow.*	1	Atherfield
Lamellibranchiata		
Anomia laevigata *Sow.*	1	Atherfield
Exogyra sinuata *Sow.*	2	"
Exogyra sp ?	1	Nice, Italy
Gryphaea harpa (*Goldf.*)	1	Sandown
Gryphaea sp ?	1	Nice
Pecten aptiensis	2	Sandown
Neithea (Pecten) quinquecostata *Sow.*	2	"
Pinna restituta *Hoeninghaus*	2	Atherfield
Gervillia anceps *Desh.*	1	"
G. aliformis *Sow.*	1	Blackgang Chine
Modiola reversa *Sow.*	1	Atherfield
Arca glabra (*Parkinson*)	2	"
A. raulini *Leymerie*	3	"
Astarte obovata *Sow.*	1	Sandown
Arctica sp ?	1	Haslemere
A. (Cyprina) angulata *Fleming*	1	E. Halford
Thetis sowerbyi *Roemer*	1	Sandown
T. sowerbyi var. minor *Sow.*	3	Atherfield, Sandown
Trigonia caudata *Agas.*	1	Isle of Wight
Venus (Pullastra ?) ovalis *Sow.*	1	"
V. parva	2	Sandown
Myacites plicatus *Sow.*	2	Atherfield
Corbula striatula *Sow.*	1	"
Gasteropoda		
Rostellaria robinaldina *d'Orb.*	3	Atherfield
Tornatella forbesiana	2	"
Cephalopoda		
Ammonites deshayesii *Leymerie*	2	Atherfield
Crustacea		
Meyeria magna *M'Coy*	5	Atherfield
Vertebrata		
Iguanodon mantelli *Meyer*	2	Potton

Gault

Hexacoralla

Cyclocyathus fittoni *Edw.*	1	Folkestone

Lamellibranchiata

Nucula ovata *Mantell*	1	"
N. pectinata *Sow.*	1	"
Inoceramus concentricus *Park.*	2	"
I. sulcatus *Park.*	1	"
Pholas constricta *Phil.*	1	Polegate

Cephalopoda

Ammonites tuberculatus *Sow.*	1	Folkestone
A. lautus *Sow.*	1	"
A. varicosus *Sow.*	1	"
A. splendens *Sow.*	1	"
Ammonites sp ?	1	
Scaphites sp ?	1	"
Ancyloceras spinigerum *Sow.* ?	1	"
Hamites attenuatus *Sow.*	1	"
Helicoceras rotundus (*Sow.*)	1	"
Belemnites attenuatus *Sow.*	2	"
B. minimus *Lister*	1	"

Squalidae

Otodus appendiculatus *Agas.*	3	Herts

Upper greensand

Foraminifera

Orbitolites concavus *Lamarck*	mass	Le Mans France
Orbitoides complanatus *Lamarck*	2	Warminster

Hexacoralla

Trochocyathus harveyanus *E. & H.*	2	Cambridge
T. conulus *Phil.*	2	"
Micrabacia coronula (*Goldfuss*)	4	Folkestone and Warminster

Echinoidea

Cottaldia benettiae (*Konig*)	1	Warminster
Echinocyphus difficilis *Agas.*	2	"
Holaster leavis *De Luc*	1	Salcombe
Discoidea subuculus *Klein*	6	Warminster and Sidmouth
Catopygus columbarius *Lamarck*	2	Warminster

Vermes

Serpula (Vermilia) ampullacea, *Sow.*	2	Warminster
S. plexus	2	" "
S. sp ?	2	" "
Vermicularia concava *Sow.*	1	"

Brachiopoda

Terebratula biplicata (*Brocchi*)	6	Dorset and Cambridge
T. biplicata (*Brocchi*)	4	Warminster
Terebratella pectita (*Sow.*)	1	"
Rhynchonella grasiana *d'Orb.*	4	"
R. elegans *Sow.*	1	Cambridge

Bryozoa

Bryozoa sp	1	Nice Italy

Lamellibranchiata

Exogyra columba (*Lam.*)	1	Sidmouth
Ostrea carinata *Sow.*	1	Cambridge
Neithea (Pecten) quinquecostata (*Sow.*)	1	Salcombe
Modiola reversa *Sow.*	1	Blackdown
Arca carinata *Sow.*	1	Devizes
Cucullaea fibrosa *Sow.*	1	Blackdown
Axinaea umbonata (*Sow.*)	2	"
Astarte formosa *Sow.*	2	"
Cardium hilmanii *Sow.*	1	"
Arctica (Cyprina) oblonga	2	Devizes
A. (casts) sp ?	2	Stokely
Meretrix (Cytherea) caperata (*Sow.*)	3	Blackdown
Thetis gigantea *Sow.*	1	"
T. sowerbyi *Roemer* var. minor *Sow.*	1	Isle of Wight
T. sowerbyi *Roemer* var. major *Sow.*	1	Devizes
Trigonia alæformis *Sow.*	1	Warminster
T. alæformis *Parkinson*	1	Blackdown
T. spinosa *Parkinson*	1	"
Venus sublaevis *Sow.*	1	"
Glycimeris plicata	1	"
Myacites mandibula *Sow.*	1	Devizes
Mactra angulata *Sow.*	1	Blackdown
Corbula truncata *Sow.*	1	"

Gasteropoda

Rostellaria calcarata *Sow.*	2	Blackdown
Murex calcar *Sow.*	1	"
Fusus rusticus *Sow.*	1	"
Fusus sp ?	1	
Turritella granulata *Sow.*	5	Blackdown
Solarium ornatum *Sow.*	2	Cambridge and Warminster
Actaeon (Tornatella) affinis	1	Blackdown

Cephalopoda

Ammonites varians *Sow.*	1	Warminster
Ammonites sp ?	1	"
Ammonites sp ?	2	Cambridge

Crustacea

Notopocorystes stokesii *Mantell*	1	Cambridge

Vertebrata

Spinax major *Agas.?*	1	Cambridge
Lamna cuspidata *Agas.?*	3	"
Vertebra sp ? — family Squalidae	1	"

Chloritic marl

Hexacoralla

Trochosmilia sulcata *E. & H.*	2	Cambridge

Echinoidea

Echinoconus castanea (*Breyn*)	2	Dorset

Brachiopoda

Terebratula obtusa *Sow.*	3	Dorset
Terebratulina gracilis *Schloth.*	5	Cambridge

Lamellibranchiata and Gasteropoda

Arca fibrosa ?	2	Dorsetshire
Pleurotomaria moreansiana	2	"

Cephalopoda

Ammonites varians *Sow.*	2	Dorsetshire
A. rhotomagensis *Defrance.*	1	Isle of Wight ?
Schloenbachia inflata *d'Orb.*	1	Cambridge
Scaphites aequalis *Sow.*	1	Dorset

Crustacea

Notopocorystes stokesii (*Mantell*)	1	Cambridge

Vertebrata

Lamna elegans *Agas.*	3	Cambridge
Otodus appendiculatus *Agas.*	4	Whitmore
Saurocephalus lanciformis *Har.*	3	Cambridge
Phosphatic nodules	4	Binstead

Lower chalk

Porifera

Spongia.	1	Sidmouth
Ventriculites	1	Lewes
Cephalites	1	"

Echinodermata

Marsupites ornatus *Miller*	1 plate	Craydon
Cyphostoma konigi (*Mant.*)	1	Charlton
Echinoconus conicus *Breyn*	1	Herts
Holaster laevis *De Luc?*	1	England
Micraster coranguinum *Klein*	1	Sidmouth

Vermes		
Serpula	1	England
Bryozoa		
Flustra inelegans *Dixon?*	mass	Brighton
Sp ?	1	Brighton
Brachiopoda		
Rhynchonella cuvieri *d'Orb.*	2	Isleham
Lamellibranchiata		
Inoceramus mytiloides *Mantell*	1	Sussex
Cephalopoda		
Ammonites varians *Sow.*	1	Eastbourne
Nautilus elegans *Sow.*	1	Hamsey
Turrilites costatus *Lam.*	1	England
Belemnites ultimus *d'Orb.*	1	Margate
Vertebrata		
Corax falcatus *Agas.*	1	Brighton
Otodus appendiculatus *Agas.*	1	"
Polyptychodon interruptus *Owen*	1	Potton

Upper chalk

Flint nodules	2	
Porifera		
Spongia plana *Phil.*	1	Yorkshire
Hippalimus radiciformis *Phil.*	1	"
Hexacoralla		
Parasmilia centralis (*Mant.*)	3	Charlton and Northfleet
Echinodermata		
Bourgueticrinus ellipticus *Miller*	16 fragments	Gravesend
Cidaris clavigera *Konig* var. Comm'is *Dix.*	4	"
C. septrifera *Mantell*	2	Charlton
Cyphostoma corallare *Klein*	2	Gravesend
C. sp ?	1	Arundel
Discoidea dixoni *Forbes*	2	Dover
Cardiaster pillula (*Lam.*)	1	Brighton
Echinocorys vulgaris *Breyn*	3	Craydon and Gravesend
Echinoconus conicus *Breyn*	2	Gravesend
E. subrotundus (*Mantell*)	2	"
Micraster coranguinum *Klein*	1	"
Bryozoa	2	England
Vermes		
Serpula plexus *Sow.*	1	Newhaven

Brachiopoda

Terebratula sp?	1	Northfleet
T. semiglobosa *Sow.*	2	Gravesend
Terebratulina gracilis *Schloth.*	5	Northfleet
Rhynchonella mantelliana *Sow.*	1	"

Lamellibranchiata

Spondylus (Lima) spinosus *Desh.*	1	Charlton
Pecten nitidus *Mantell*	1	Gravesend

Cephalopoda

Belemnitella mucronata *Schloth.*	1	England

Vertebrata

Corax falcatus *Agas.*	1	"
Strophodus reticularis *Agas.*	1	Potton

Eocene. England

Lower

Foraminifera

Nummulites laevigatus *Lam.*	15	Alum bay

Echinodermata

Pentacrinus sub-basaltiformis *Mill.*	4	Islington

Vermes

Ditrupa plana *Sow.*	mass	Whitecliff bay

Lamellibranchiata

Ostrea bellovacina *Lam.*	(3)	Newhaven, and Alum bay
Pinna affinis *Sow.*	1	Alum bay
Modiola elegans *Sow.*	1	Highgate
Axinaea brevirostris (*Sow.*)	(2)	Bognor
A. decussata (*Sow.*)	5	"
Nucula bowerbankii *Sow.*	4	Finchley
Astarte rugata *Sow.*	mass	Alum bay
Venericardia planicosta *Lam.*	(2)	Clarendon
Protocardium semigranulatum (*Sow.*)	mass	Alum bay
P. wateleti *Desh.*	(1)	Portsmouth
Cyrena cordata *Morris*	(2)	Charlton
C. deperdita (*Lam.*)	(3)	Woolwich
C. cuneiformis (*Sow.*)	mass and 2	"
C. dulwichiensis *Rickman*	(1)	Dulwich
Arctica morrisii *Sow.*	(1)	Herne Bay
Meretrix (Cytherea) sp?	(1)	Portsmouth
Glycimeris intermedia (*Sow.*)	2	Alum bay
Pholadomya margaritacea *Sow.*	1	"
Cryptodon angulatum *Sow.*	4	London
Corbula pisum *Sow.*	mass and (6)	Alum bay
Nuculana amygdaloides (*Sow.*)	3	Finchley

Teredo antenautae *Sow.*	mass	Whetstone
Teredina personata (*Lam.*)	mass	Clapham

Gasteropoda

Aporrhais sowerbii (*Mantell*)	4	Clarendon
A. sowerbii (*Mantell*)	1	England
Cassis ambigua (*Sol.*)	1	Sheppy
Pleurotoma teretrium var. tuberculata *Edw.*	3	Clarendon
Cancellaria laeviuscula *Sow.*	1	"
Melania sp ?	5	Alum bay
Melanatria inquinata (*Defr.*)	3	Woolwich
M. inquinata (*Defr.*)	1	Newhaven
Turritella sp ?	1	Woolwich
T. terebellata *Lam.*	3	Clarendon
Stenothyra parkinsoni (*Morris*)	2	Woolwich
Natica hantoniensis (*Pilk.*)	2	Portsmouth
N. labellata (*Lam.*)	1	Alum bay
N. labellata (*Lam.*)	1	Portsmouth
Calyptraea aperta (*Sol.*)	1	Alum bay

Cephalopoda

Nautilus centralis *Sow.*	4	London
N. imperialis *Sow.*	1	"

Crustacea

Xanthopsis sp	1	Sheppy
X. leachii	1	Felixstowe

Vertebrata and Plantae

Carcharodon megalodon *Agas.*	1	London
Lamna elegans *Agas.*	1	Herne bay
Leaf impressions in pipe clay	4	Alum bay

Middle

Foraminifera

Nummulites planulatus (*Lam.*)	mass	Isle of Wight
N. laevigatus *Lam.*	2	Bracklesham
N. sp ?	7	Alum bay

Lamellibranchiata

Venericardia planicosta *Lam.*	1	Bracklesham
Cyrena obovata (*Sow.*)	(1)	Tolland's bay

Gasteropoda

Neritina concava *Sow.*	5	Alum bay ?
Turritella imbricataria *Lam.*	mass and 1	
T. imbricataria *Lam.*	mass and 2	Bracklesham
Planorbis oligyratus *Edw.*	1	
Bayania sp ?	4	Isle of Wight

Selachii

Lamna elegans *Agas.*	2	Bracklesham
Otodus appendiculatus *Agas.*	1	"

Upper

Vermes

Serpula heptagona *Sow.*	2	Barton cliff

Lamellibranchiata

Ostrea flabellula *Lam.*	(7)	Barton
Pecten carinatus *Sow.*	(1)	Barton
P. reconditus *Sol.*	(2)	"
Axinaea (Pectunculus) deleta (*Sol.*)	(1)	Hordwell
A. (Pectunculus) deleta (*Sol.*)	(6)	Barton
Limopsis scalaris (*Sow.*)	(4)	"
Nucula dixoni *Wood*	(1)	"
Crassatella sulcata (*Sol.*)	4	"
Cardita sulcata (*Sol.*)	5 and (1)	"
Venericardia planicosta *Lam.*	1	"
Chama squamosa *Sol.*	2 and (3)	"
C. squamosa *Sol.*	(1)	Isle of Wight
Protocardium semigranulatum (*Sow.*)	2	Barton
P. turgidum (*Sol.*)	1	"
Cyrena obovata *Sow.*	2 and (3).	Barton cliff
Meretrix (Cytherea) obliqua (*Desh.*)	1 and (1).	Barton
Tellina ambigua *Sow.*	2	Barton cliff
Psammotaea compressa (*Sow.*)	1	Barton
Corbula ficus (*Sol.*)	(2)	Hordwell
C. ficus (*Sol.*)	(3)	Barton cliff
C. cuspidata *Sow.*	1 and (2).	"
Pholas sp ?	(1)	Barton

Gasteropoda

Hippocrenes amplus (*Sol.*)	3	Barton
Rimella rimosa (*Sol.*)	5	"
Canarium bartonense (*Sow.*)	9	"
Seraphs sopitum (*Sol.*)	3	Barton
Oliva branderi *Sow.*	4	"
Ancilla canalifera *Lam.*	2	"
A. fusiformis *Sow.*	2	"
Cassis ambigua (*Sol.*)	5	"
Pleurotoma conoides (*Sol.*)	3	Barton cliff
P. exorta (*Sol.*)	2	Barton
P. turbida (*Sol.*)	10	"
P. denticula *Bast.*	6	"
P. crassicosta *Edw.*	8	"
P. rostrata (*Sol.*)	2	"
P. prisca (*Sol.*)	1	"

Conus scabriculus *Sol.*	4	Barton
Conus lineatus *Sol.*	1	"
Conorbis dormitor (*Sol.*)	6	"
Voluta solandri *Edw.*	2	"
V. athleta (*Sol.*)	2	"
V. digitalina *Lam.* var. lima *Sow.*	2	"
V. scalaris *Sow.*	4	Barton cliff
V. luctatrix (*Sol.*)	3	Barton
V. ambigua (*Sol.*)	4	"
V. ambigua (*Sol.*) var. compressa *Edw.*	1	"
Lampusia arguta (*Sol.*)	5	"
Murex minax (*Sol.*)	2	"
Triplex asper (*Sol.*)	1	"
T. asper (*Sol.*)	2	Barton cliff
Typhis fistulosus *Brocchi*	2	Barton
T. pungens (*Sol.*)	8	"
Fusus porrectus (*Sol.*)	7	"
F. sp.	2	"
Clavilithes noae (*Chemnitz*)	2	Barton cliff
C. longaevus var. differens	1	Barton
C. longaevus (*Sol.*)	2	"
Sycum pyrus (*Sol.*)	4	"
Chrysodomus antiquus (*Sol.*)	2	"
C. errans (*Sol.*)	1	"
Metula juncea (*Sol.*)	1	"
Pisania lavata (*Sow.*)	6	"
Strepsidura turgida (*Sol.*)	2	"
Pyrula nexilis (*Sol.*)	2	"
Cominella canaliculata (*Sow.*)	8	"
Cancellaria evulsa (*Sol.*)	8	"
Cerithium mutabile *Lam.*	3	Isle of Wight
Potamides sp ?	1	Barton
P. ventricosus *Sow.*	3	Bagshot
Melania sp ?	5	Isle of Wight
M. acuta (*Sow.*)	mass and 6	"
Turritella edita (*Sol.*)	2	Barton and Alum bay
T. edita (*Sol.*)	2	Barton
Tuba sulcata (*Pilk.*)	4	"
Scala semicostata ? (*Sow.*)	1	"
Xenophora agglutinans (*Lam.*)	5	"
Solarium plicatum *Lam.*	5	Barton
S. canaliculatum *Lam.*	2	"
Viviparus (Paludina) lentus (*Sol.*)	2	"
Natica caillati ? *Desh.*	1	"
N. labellata *Lam.*	2	"
N. epiglottina *Lam.*	3	"
N. ambulacrum (*Sow.*)	5	"

Calyptraea aperta (*Sol.*)	5	Barton
Neritina glandulata *Sandb.*	4	"
Calliostoma nodulosum (*Sol.*)	3	"
Actaeon (Solidula) simulatus (*Sol.*)	6	"
Planorbis euomphalus *Sow.*	2	Isle of Wight
Dentalium striatum *Sow.*	4	Barton
D. substriatum *Desh.*	4	Barton cliff

Crustacea

Candona forbesii	mass	Isle of Wight

Eocene. Italy

Bryozoa sp	1	Nice
Limopsis sp	1	"
Glycimeris sp	1	"
Pholas sp	1	"
Corbula sp	1	"

Eocene. Damery, Paris basin, France

Lamellibranchiata

Ostrea flabellula *Lam.*	(1)
Anomia ephippium *Linn.*	(6)
Arca biangula *Lam.*	(2)
A. modioliformis *Desh.*	(1)
Axinaea (Pectunculus) pulvinata *Lam.*	(3)
Limopsis granulatus (*Lam.*)	(2)
Nucula similis *Sow.* non *d'Orb.*	(4) and 4
Crassatella plumbea *Desh.*	1
Cardita imbricata *Lam.*	(7)
Lucina gigantea *Desh.*	2
Chama calcarata *Lam.*	(6)
Cardium porolosum *Lam.*	(1)
Fimbria subpectunculus *d'Orb.*	1
Cytherea laevigata *Lam.*	1
Corbula rugosa *Lam.*	(1)
C. anatina *Lam.*	(2)
C. lamarckii *Desh*	2

Gasteropoda

Rostellaria murchisoni *Desh.*	1
R. arcuata *Sow*	10
Seraphs sopitum (*Sol.*)	2
Ancilla buccinoides *Lam.*	2
A. olivula *Lam.*	9
Ancilla sp	8
Harpopsis stromboides *Hermann*	6

Pleurotoma prisca (*Sol.*)	2
P. brevicauda *Desh.*	1
P. dentata *Lam.*	1
P. filosa *Lam.*	3
Conus deperditus *Brug.*	1
Voluta solandri *Edw.* (V. spinosa *Sow.*)	6
V. cithara *Lam.*	3
V. luctatrix (*Sol.*)	2
V. maga *Edw.*	3
V. mixta *Nyst* (V. costaria *Lam.*)	2
V. muricina *Brug*	4
Mitra terebellum *Lam.*	1
M. fusellina *Lam*	4
Latirus uniplicatus (*Lam.*)	1
Pteronotus (Murex) asper (*Sol.*)	6
Murex crispus *Lam.*	1
Clavilithes noae (*Lam.*)	6
Leiostoma pyrus (*Sol.*)	3
Strepsidura turgida (*Sol.*)	6
Terebra plicatula *Lam.*	1
Cerithium serratum *Brug.*	7
C. labiatum *Desh.*	1
C. sp	1
C. giganteum *Lam.*	1
Pyrazus angulatus (*Sol.*)	6
Batillaria echinoides *Lam.*	3
B. pleurotomoides *Lam.*	6
Turritella imbricataria *Lam.*	1
Mesalia intermedia (*Desh.*)	6
Xenophora agglutinans *Lam.*	5
Paryphostoma turricula (*Brug.*)	1
Diastoma costellata (*Lam.*)	2
Natica munda ? *Desh*	1
N. coepacea *Lam*	1
Sigaretus clathratus (*Gmelin.*)	1
Ampullina willemeti (*Desh.*)	5
A. mutabilis (*Sol.*)	1
Calyptraea aperta (*Sol.*) C. (trochiformis *Desh.*)	8
Hipponyx cornucopiae (*Lam.*)	8
Fustiaria (Dentalium) striata (*Sow.*)	2
F. (Dentalium) brogniarti *Desh.* ?	1
F. (Dentalium) pellucens (*Desh.*)	1
F. (Dentalium) lentale (*Sol.*) ?	6
F. (Dentalium) circinata (*Sow.*)	1

Oligocene. England

Lamellibranchiata

Ostrea velata *Wood*	2	Colwell bay
Unio gibbsii (*Forbes M. S.*) *Morris*)	mass	Hamstead cliff
Cardita (Venericardia) deltoidea *Sow.*	4	Brockenhurst
Cyrena obovata (*Sow.*)	(8)	Hamstead and Brockenhurst
C. obovata (*Sow.*)	(2)	Hordwell
C. obovata (*Sow.*)	(2)	Headon
C. obovata (*Sow.*)	(7)	Colwell bay
C. pulchra (*Sow.*)	3	"
C. semistriata *Desh.*	mass & (2)	Hamstead
Meretrix (Cytherea) incrassata (*Sow.*)	7	Colwell bay
M. (Cytherea) incrassata (*Sow.*)	(4)	Brockenhurst
Corbula pisum *Sow*	(10)	Hamstead
C. vectensis (*Forbes M. S.*) *Morris*	(12)	"
Erodona plana (*Sow.*)	mass and (3)	"

Gasteropoda

Ancilla buccinoides *Lam.*	6	Colwell bay
Pleurotoma cymaea *Edw.*	1	Brockenhurst
P. turbida (*Sol.*)	1	"
Voluta spinosa (*Linn.*)	1	"
Clavilithes longaevus (*Sol.*)	3	"
Pisania labiata (*Sow.*)	8	Colwell bay
Potamides cinctus (*Brug.*)	2	Headon
P. vagus (*Sol.*)	3	Headon hill
P. vagus (*Sol.*)	2	Brockenhurst
P. submargaritaceus (*d'Orb.*)	2	Isle of Wight
P. elegans (*Desh*)	8	Headon hill
P. ventricosus *Sow*	10	"
Terebralia plicata (*Brug.*)	8	Hamstead ?
Batillaria concava (*Sow.*)	4	Colwell bay
B. concava (*Sow.*)	2	Headon
Melania acuta (*Sow.*)	8	Colwell bay
M. acuta (*Sow.*)	2 masses	Cliffend
M. acuta (*Sow.*)	2	Brockenhurst
M. nystii *Dushastel* (*MS.*) Nyst	5 and mass	Hamstead
Melanopsis buccinoidea *Fer.*	10	Colwell bay
M. carinata *Sow.*	mass	Cliffend
Bayania fasciata (*Sow.*)	9	Headon hill
B. fasciata (*Sow.*)	mass and 11	Hamstead
Viviparus angulosus (*Sow.*)	2	Isle of Wight
V. angulosus (*Sow.*)	1	Bembridge
V. lentus (*Sol.*)	8	Colwell bay
V. lentus (*Sol.*)	mass and 2	Hamstead
Tomichia dushasteli (*Nyst*)	16	"
Stenothyra pupa (*Nyst*)	mass	"

Potamaclis forbesi (*Morris*)	mass	Hamstead
Ampullina parisiensis (*d'Orb.*)	3	Colwell bay
Cyclotus cinctus *Edw.*	mass and 2	Sconce
Neritina concava *Sow.*	8	Colwell bay
Helix vectiensis *Edw.*	3	Sconce
H. d'Urbani *Edw.*	3	Sconce
H. occlusa *Edw.*	3	Sconce
Bulimus ellipticus *Sow.*	1	Bembridge
Glandina costellata (*Sow.*)	2	"
G. costellata (*Sow.*)	1	Isle of Wight
Limnaea longiscata *Brongn*	mass and 3	"
L. longiscata *Brongn*	5	Colwell bay
L. longiscata *Brongn*	1	Bembridge
L. fusiformis *Sow.*	1	Headon hill
L. pyramidalis *Brongn*	mass	"
Planorbis discus *Edw.*	5	Sconce
P. euomphalus *Sow.*	mass and 9	Isle of Wight
P. goniobasis (*Sandb.*)	1	Binstead
P. obtusus *Sow.*	2	Isle of Wight

Squalidae

Lamna elegans *Agas*	3	Brockenhurst

Pliocene. England

Coralline crag

Lamellibranchiata

Pecten opercularis *Linn*	(4)	Suffolk
Cardita senilis (*Lam.*)	(1)	"
C. scalaris (*Sow.*)	(3)	Oxford
Astarte burtini *Desh.*	(3)	Suffolk
A. omalii var. bipartita *Sow.*	(6)	"
A. gracilis *Munster*	(3)	Oxford
Cyrena cuneiformis (*Sow.*)	(1)	Suffolk
Cyrena 3 sp	(3)	"
Venus casina *Linn*	(2)	"

Cirripedia

Balanus crassus *Sow*	1	Oxford

Red crag

Echinodermata

Echinocyamus pusillus *Muller*	5	Alderton

Lamellibranchiata

Pecten opercularis (*Linn.*)	(3)	Suffolk
P. puscio *Pennant*	(1)	"
Axinaea glycimeris (*Linn.*)	(2)	"
Nucula cobboldiae *Sow.*	(2)	"
Cardita senilis (*Lam.*)	(3)	"
C. senilis (*Lam.*)	(2)	Sutton
Astarte digitaria (*Linn.*)	(1)	Oxford

A. gracilis *Munster*	(1)	Suffolk
A. omalii *Delajonk*	(2)	Sutton
A. omalii (young)	(1)	Oxford
Diplodonta astartea (*Nyst.*)	(1)	Suffolk
Cardium angustatum *Sow.*	(2)	"
C. edule *Linn.*	(1)	"
C. edule *Linn.*	(1)	Sutton
Cyprina islandica (*Linn.*)	(1)	Suffolk
Artemis lentiformis (*Sow.*)	(1)	Walton
Tellina benidinii *Nyst & West*	(1)	Sutton
T. praetenuis *Woodw.*	(1)	Ipswich
T. (Macoma) balthica *Linn.*	(1)	Sutton
T. crassa *Pennant*	(3)	Ipswich
T. crassa *Pennant*	(1)	Sutton
T. obliqua *Sow.*	(2)	"
T. obliqua *Sow.*	(3)	Suffolk
Mactra ovalis *Sow.*	(13)	"
M. ovalis *Sow.*	(2)	Sutton
M. subtruncata *DaCosta*	(1)	Suffolk
M. arcuata *Sow.*	(1)	"

Gasteropoda

Trochus papillosus *DaCosta*	1	Suffolk
T. subexcavatus *Wood*	1	"
Turritella incrassata *Sow.*	4	"
T. communis *Risso*	3	Sutton
Natica flarians *Dujard.*	2	Suffolk
N. multipunctata *Wood*	2	"
N. millepunctata *Lam.*	1	Essex
Littorina littorea (*Linn.*)	1	Sutton
Trivia europaea (*Mont.*)	1	Suffolk
T. europaea (*Mont.*)	6	Alderton
Nassa reticosa (*Sow*)	6	Brightwell and Suffolk
Purpura lapillus (*Linn.*)	4	Suffolk
P. lapillus (*Linn.*)	8	Sutton
Fusus gracilis *DaCosta*	1	"
Chrysodomus antiquus var. contrarius (*Linn.*)	6	"
Chrysodomus antiquus var. contrarius (*Linn.*)	2	Suffolk
Trophon costiferum *Wood*	1	Ipswich
T. antiquus var. despectus *Linn*	1	Suffolk
Ringicula buccinea (*Sow.*)	1	Sutton
Pleurotoma (Clavatula) turricula (*Mont.*)	1	"

Cirripedia

Balanus sp		Sutton

Selachii

Otodus obliquus *Agas.*	2	Woodbridge
O. obliquus *Agas.*	1	Sutton
Oxyrhina hastilis *Agas.*	5	"
O. plicatilis *Agas.*	1	"
O. plicatilis *Agas.*	2	Alderton
O. plicatilis *Agas.*	2	Suffolk
O. xiphodon *Agas.*	1	Sutton
O. crassa *Agas.*	1	"
Carcharodon megalodon *Agas.*	1	Sutton
C. megalodon *Agas.*	1	
Lamna crassidens *Agas.*	3	Suffolk
Shark teeth, miscellaneous	7	Sutton

Cetacea

Otolith	1	Sutton
Balaenodon sp	1	Woodbridge

Pliocene. Italy and Savoy

Hexacoralla (Turbinolidae)	1	

Lamellibranchiata and Gasteropoda

Pecten sp	(1)	La Trinite, Nice
P. sp	(3)	
Syndesmya (Erycina) sp	(3)	
Corbula sp	(2)	
Leda sp	4	
Yoldia sp	3	
Fusus sp	2	
Natica sp	2	
Buccinum sp	2	
B. sp	4	
Ringicula sp	1	
Dentalium (sp 3)	5	

Pleistocene. England

Lamellibranchiata and Gasteropoda

Anomia ephippium *Linn.*	(3)	England
Astarte compressa (*Montagu*)	(4)	Clyde
A. compressa (*Montagu*)	(2)	Bridlington
Cyrena consobrina *Caillaud*	(2)	Grays
Cardium edule *Linn.*	(6)	Colchester
Tellina (Macoma) balthica (Linn.)	(6)	"
Turritella terebra *Linn.* (T. communis *Risso*)	2	Hetley
Buccinum undatum *Linn.*	3	Colchester
Cionella lubrica (*Linn.*)	3	Copford
Littorina littorea *Linn.*	6	Colchester

Littorina littoralis *Linn.*	6	Colchester marshes
Viviparus (Paludina) tentaculatus *Linn.*	6	Grays
Planorbis spirorbis	1	Falkland
Helix rotundata *Mull.*	6	Copford

SYNOPTIC CATALOGUE

BY R. M. BAGG JR

United States

Cambrian

	species	specimens
Vermes	2	2
Brachiopoda	3	11
Gasteropoda	1	2
Crustacea	3	12
Total	9	27

Silurian

Lower

	species	specimens
Hydrozoa (Graptolites)	25	113
Actinozoa	35	113
Crinoidea	11	24
Bryozoa	11	15
Brachiopoda	62	313
Lamellibranchiata	32	116
Gasteropoda	59	195
Pteropoda	3	13
Cephalopoda	57	137
Crustacea	40	181 *a*
Plantae	10	27
Miscellaneous	...	1
Total	346	1248

Upper

	species	specimens
Porifera	3	8
Hydrozoa (Stromatoporidae)	9 ?	18
" (Graptolites)	5	9
Actinozoa	61	189
Cystoidea *c*	21	135 *b*
Crinoidea	18	53
Vermes	3	4
Bryozoa	60	163

a 1 showing complete metamorphosis of one species.
b Some have been removed to state hall.
c Including some crinoids.

	species	specimens
Brachiopoda	122	1038
Lamellibranchiata	39	110
Gasteropoda	64	253
Pteropoda	6	20
Cephalopoda	27	73
Crustacea	35	171
Plantae	11	20
Miscellaneous (Ichnolites and trails, etc.)	...	13
Total	490	2262

Devonian

	species	specimens
Porifera	4	9
Hydrozoa (stromatopora)	...	1
Actinozoa	99 ?	288*a*
	...	...
	...	...
Crinoidea and cystoidea	52	156
Echinoidea	1	1
Bryozoa	24*f*	96
Brachiopoda	230	1904
Brachiopoda from Jura (for comparison)	12	242
Lamellibranchiata	114	255*h*
Gasteropoda	96	428
Pteropoda	10	14
Cephalopoda	1	1
Crustacea	25*c*	131
Pisces	31*c*	177
Plantae	41*e*	107
Miscellaneous	7	1
Total	748	3851

g Carboniferous

Protozoa. Endothyra (Rotalia) baileyi *Hall*. A few specimens from Spurge hill, Ind.

	species	specimens
Actinozoa	about 10	about 10
Blastoidea	2	25

a Additional corals of upper Helderberg without labels amount to 133 specimens.
b The species are probably more.
c May be more.
d Exact number not made out.
e And some undetermined.
f Specimens marked Bryozoa include some corals.
g The Carboniferous is not well represented in New York state, and the material here catalogued comes from the western and southern states.
h 21 additional specimens unlabeled.

	species	specimens
Bryozoa	..	3 or 4
Crinoidea	..	between 300 and *a* 400
Brachiopoda about	30	100
Lamellibranchiata about	30	50
Cephalopoda	3	18
Pisces	1	2
Plantae	..	22 (coal plant)
" (Leaf impressions from Mazon creek)	..	between 50 and 60 (undetermined)
Total about	..	500 specimens

Triassic and Jurassic

Represented only by large slabs of sandstone with reptile impression, leaf marks, etc., from the Newark sandstone of the Connecticut and Massachusetts valley region.

Cretaceous

Upper

	species	specimens
Angiosperms	15	15 Kansas
Washed clay	...	1 New Jersey
Hexacoralla	2	4
Echinodermata	1	1
Vermes	1	12
Bryozoa	2	2
Brachiopoda	2	25
Lamellibranchiata	18	92
Cephalopoda	8	32
Squalidae (teeth)	2	2
Reptilia (vertebra)	...	6
Total	51	192

Eocene

	species	specimens
Echinodermata	2	2
Lamellibranchiata	18	76
Gasteropoda	18	102
Squalidae (teeth)	15	103
Buhrstone from Georgia with fossils	...	1
Total	53	284

a Not very well determined and not yet arranged.

Miocene

	species	specimens
Hexacoralla	1	4
Bryozoa	...	3 masses
Mollusca	93	254
Cirripedia	2	7 and 25 fragments
Vegetable lignite	...	1
Cetacean bones	...	25
Coprolite	...	1
Squalidae (teeth)	10	45
Miscellaneous vertebrae	...	2
116 and a few cetarean bones.		
Total	106	639

Western formations of Tertiary age

	specimens
Silicified wood from western U. S.	5
Lignite (coal) " "	6
Sandstone " "	2
Limestone with bone fragments, western U. S	11

Pleistocene

	species	specimens
Mollusca	19	65
Cirripedia	1	3

Total in museum from United States—about 2113 species, 9095 specimens.

European

Cambrian

	species	specimens
Vermes	1	1 mass
Brachiopoda	2	2
Crustacea	1	1
Plantae	3	4
Total	7	8

Silurian

Lower

	species	specimens
Graptolites	14	20
Actinozoa	4	9
Cystoidea	5	10
Asteroidea	1	1

Vermes	1	2
Bryozoa	9	15
Brachiopoda	15	27
Lamellibranchiata	22	29
Gasteropoda	15	27
Pteropoda	12	20
Cephalopoda	5	8
Crustacea	21	39
Unlabeled	...	15
Total	124	222

Eocene

	species	specimens
Protozoa (Foraminifera)	3	25[a]
Echinodermata	1	4
Vermes	2	3
Bryozoa	1	1
Lamellibranchiata	63	203
Gasteropoda	133	456
Cephalopoda	2	5
Crustacea	3	3
Pisces	3	5
Plantae	...	4
Total	211	711

Oligocene

	species	specimens
Lamellibranchiata	10	69
Gasteropoda	38	196
Selachii (squalidae)	1	3
Total	49	268

Miocene

Wanting in Britain.

Pliocene

Older. Coralline crag

	species	specimens
Lamellibranchiata	11	26
Cirripedia	1	1

Newer

	species	specimens
Hexacoralla	1	1
Echinodermata	1	5
Lamellibranchiata	27	70

[a] Box of foraminiferous sand and ore from France.

	species	specimens
Gasteropoda	26	69
Crustacea (cirripedia)	...	1
Vertebrata	9	29
Total	64	175

Pleistocene

	species	specimens
Lamellibranchiata	6	24
Gasteropoda	6	33
Total	12	57

Total European	1377	species
" American	2113	
	3490	

Silurian

Upper

	species	specimens	
Porifera	2	2	
Hydrozoa	1	2	(Stromatopora)
" (Graptolites)	5	6	
Actinozoa	64	101	
Crinoidea	15	16	
Asteroidea	3	4	
Vermes	6	7	
Bryozoa	30	38[a]	
Brachiopoda	47	124	
Lamellibranchiata	27	32	
Gasteropoda	29	41	
Pteropoda	6	8	
Cephalopoda	16	19	
Crustacea	17	24	
Pisces	...	4	
Unlabeled miscellaneous	...	12	
Total	268	440	

Devonian

	species	specimens
Actinozoa	3	7
Vermes and Echinodermata	2	2
Brachiopoda	6	8
Total	11	17

a Including Monticuliporidae and Syringoporidae.

Carboniferous limestone

	species	specimens
Actinozoa	8	a11
Blastoidea	3	4
Crinoidea	10	21
Bryozoa	4b	25
Brachiopoda	26	55
Lamellibranchiata	7	10
Gasteropoda	22	29
Cephalopoda	6	12
Crustacea	2	2
Pisces	2	2
Unlabeled miscellaneous		3
Total	90	174

Coal

	species	specimens
Vermes	1	1
Gasteropoda	1	1
Cephalopoda	2	3
Crustacea	1	1
Pisces	6	41
Plantae	30	63
Total	41	110

Permian

	species	specimens
Bryozoa	3	5
Brachiopoda	6	19
Lamellibranch	12	18
Gasteropoda	2	4
Cephalopoda	1	3
Plantae	1	1
Total	25	50

Triassic

	species	specimens
Lamellibranchiata	7	7
Crustacea	1	1
Pisces	12	42 undetermined
Plantae	1	1
Total	21	51

a Includes Syringopora.
b Includes Chaetetes.

Jurassic

	species	specimens
Hexacoralla	13	15
Echinodermata	17	35
Vermes	2	6
Brachiopoda	26	142
Lamellibranch	120	218
Gasteropoda	20	32
Cephalopoda	47	117
Vertebrata	12	23
Plantae	3*a*	5
Phosphatic nodules	...	4
Total	266	597

Cretaceous

	species	specimens
Protozoa (Foraminifera)	2	3
Porifera	5	5
Hexacoralla	6	14
Echinodermata	25	55
Vermes	7	10
Bryozoa	5	6
Brachiopoda	14	47
Lamellibranchiata	55	78
Gasteropoda	13	26
Cephalopoda	25	29
Crustacea	5	10
Vertebrata	13	29
Plantae	1	2
Total	176	314

a Also insect remains.

A FOSSIL PLANT FROM ORANGE COUNTY

BY J. N. NEVIUS

Having been informed by the state geologist of the existence of a large fossil plant at Monroe, Orange co., in the Upper Devonian sandstone, which is thought to belong to the Hamilton group, the director of the museum requested me to investigate the matter; and Ap. 8, 1898, the specimen was collected and shipped to the museum, where it is now being prepared for exhibition.

The plant was imbedded in the typical thin-bedded, blue sandstone of that region, which is extensively used for flagging. It was located in a cut which had been excavated to obtain flagging, on a side hill about a mile and a half northward of the village of Monroe. The strata dip sharply toward the southeast at this locality, and the sandstone, alternately bedded with shale, outcrops in a series of ridges up the side of the hill. The plant was imbedded in one of these sandstone ridges. The plant was in a partially inverted position, the lower end being several feet above the point at which the limbs diverge; and the angle of dip of the trunk was greater than that of the strata containing it.

The cross section of the trunk averages 15 × 11 inches, the shorter diameter being perpendicular to the bedding, and probably caused by the pressure of the superincumbent rocks. Both flattened surfaces show prominent transverse ridges and depressions, which were evidently the natural contour of the plant. The rounded surfaces were so badly weathered that it was impossible to save several feet of them, but, where they were in a better condition, they showed the same ridges, which extend entirely around the trunk. The ridges are somewhat irregular in contour, but their general characteristics are the same. They average about 4½ inches apart, with an average altitude, from the depression to the crest of the ridge, of 1¼ inches.

About six feet of the base had previously been removed by other persons, a 16 inch section being in the possession of Columbia university. The section obtained for the museum is about 12 feet in length and includes the bases of several limbs. Six limbs were counted, all branching within a distance of 4 feet along the trunk.

They are from 4 to 7 inches in diameter, and were so compressed that it was difficult to trace any particular one for any distance. Also, the close similarity between the material of the fossil limbs and the surrounding sandstone rendered the tracing of a limb very difficult. On the opposite end of the excavation (20 feet away) the continuations of two limbs were perfectly distinguishable on the face of the rock; the larger one being 5½ inches in diameter and of nearly circular cross section. As these limbs are imbedded in solid sandstone several feet below the surface of the ground, they could be removed by careful working, and would give an idea of the total hight of the plant, and possibly would lead to the discovery of some fossil fruit or foliage. At this time it was impossible to do better than to save the stumps of a few limbs.

The material of the fossil varies considerably. While the greater part of the interior of the specimen varies in no particular from the surrounding blue sandstone, and is homogeneous entirely across the trunk, at some places the interior is a crumbling mass of carbonaceous sand and impure limonite (the latter probably derived from the decomposition of pyrite) and in other places the material is almost a quartzite, and shows the cellular structure to better advantage. The latter condition prevails particularly in the limbs, which show more of a cellular structure than does the trunk; several of them are hollow centered and have a tendency to fracture along the rings of growth. Much of the exterior of the trunk was covered with a thin layer of limonitic, earthy material, having a fibrous appearance, which suggested bark; and many of the troughs between the ridges contained minute layers of soft coal. These materials were so fragile that the greater part of them were destroyed by the necessary handling of the specimen. Thin sections of the plant, under a microscope, show a more marked cellular structure than can be detected by the eye. Sections of the sandstone composing the trunk, which show no structure whatever to the eye, under the microscope reveal a typical cellular structure. The specimen has not yet been carefully studied under the microscope.

As the specimen had laid partially uncovered for several years, it was badly fractured by the action of frost and other atmospheric agencies, and it was only with the greatest care that the several hundreds of pieces, into which it fell on attempting to remove it,

J. N. Nevius, photo.

The fossil tree in Devonian sandstone at Monroe, Orange county (under snow)

Plate 2. To face p. 81

J. N. Nevius, photo.

The fossil tree in Devonian sandstone, at Monroe, Orange county

J. N. Nevius, photo.

Impression in Devonian sandstone, after removing the fossil tree, Monroe, Orange county could be so marked and preserved that it was possible to reunite them at the museum.

Evidence of plant life abounds in the sandstone and shale at this locality. Strata overlying those from which this plant was taken, and outcropping 50 yards farther up the hillside, are filled with fragments of plant remains a few inches in length and ¼ inch wide, which resemble fragments of seaweeds.

At several localities the black, carbonaceous condition of the shale has lead to considerable excavating in a search for coal, which is, of course, fruitless. It is stated that small quantities of "soft coal" (lignite) have been found that will burn readily in an open grate.

As no paleobotanist has yet studied this specimen, its identity is not determined. The transverse ridges may have been formed at the bases of the leaves, in a manner similar to the ridges thus formed on a cornstalk or sugar cane. Prof. John M. Clarke, assistant state geologist, suggests that it may be the gigantic seaweed, described by Dawson under the name "Celluloxylon primaevum."

The separate fragments have all been united with glue, the interstices filled with cement, and the entire specimen will be mounted in a bed of sand, over which a layer of hydraulic cement will be spread to hold the specimen rigid and to prevent the access of air and dampness.

Whatever the family and species of this plant may prove to be, it is extremely rare from this horizon, and is a very valuable accession to the collections of the museum.

Plate 1 shows the plant under a light mantle of snow. The transverse ridges are very prominently shown. Plate 2 shows the plant with the surrounding rock removed, and ready to be taken out. The branching end is at the bottom of the picture; and the impossibility of collecting the branches will readily be noticed. A comparison of plates 1 and 2 shows the length of the section that had been removed by other persons. Plate 3 shows the impression left in the sandstone after the specimen was removed.[1]

1 Since the above was written a microscopic examination of a part of the trunk has been made by Prof. D. P. Penhallow who determines it to be Nematophyton logani Dawson.

THE SACANDAGA MINING AND MILLING CO. AND THE "SUTPHEN PROCESS"

BY J. N. NEVIUS

Public attention has so frequently been called to the claims of persons who have reported the finding of gold in paying quantities in the vast Quaternary sand plain of Saratoga, Warren and Essex counties, that it was deemed advisable for the museum to investigate some of the many localities in which the gold was said to occur. Accordingly a visit was made to the mine and mill of the Sacandaga mining and milling co., which are located on the north bank of the Sacandaga river about a mile and a half west of the village of Hadley, Saratoga co. The officers of the company courteously permitted an examination of their property to be made and explained their process.

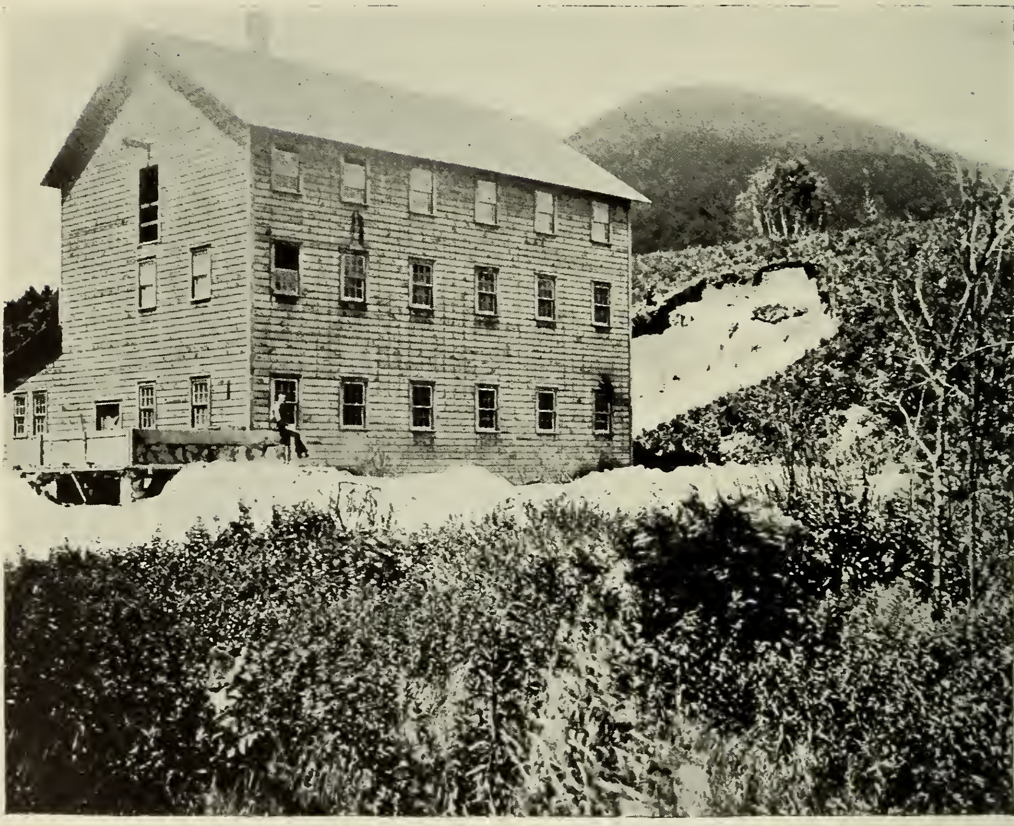
This company has prospected the sands of that part of the state extensively. Its representatives affirm that their investigations prove that the sand, throughout almost the entire region, carries gold, in quantities varying from mere traces at some localities to several dollars' worth a ton at other places; that the standard fire assay generally fails to reveal the gold because it does not exist as native gold, but is thought to be combined with bromin as a bromid, and the bromin prevents the gold from forming a button when assayed; and that the bromid of gold exists throughout the interiors of the quartz particles of the sand.

The history of the discovery of gold in the New York sands is said, by Alfred E. Copp of Buffalo, to be as follows.

More than 15 years ago William T. Bullis, of Glens Falls, declared that he had discovered gold in the sand of that region, and he spent the remainder of his life endeavoring to find a process to extract it on a commercial scale. He claimed that the fire assay was unreliable in its results and said that he secured fair results by using a barrel amalgamator containing cobblestones, and amalgamating in the presence of water.

About the same time Dr C. P. Bellows, a dentist of Gloversville, collected a sample of black sand from a neighboring stream and

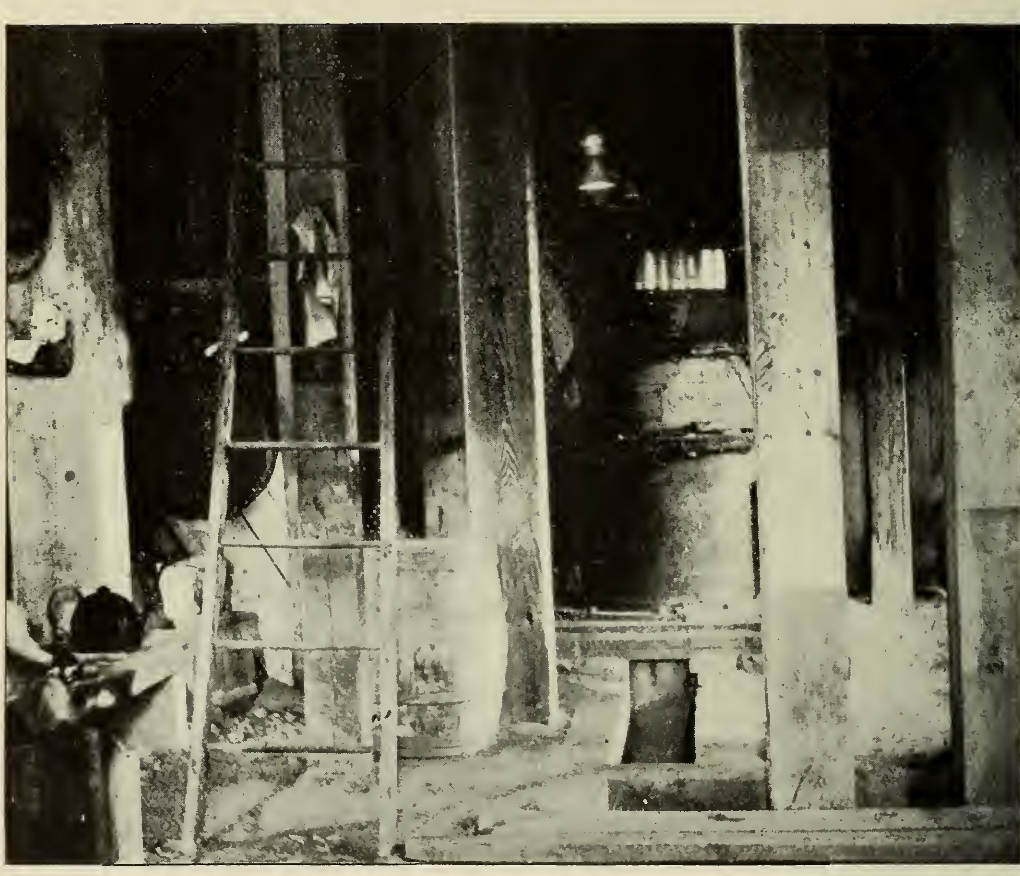
Plate 4. To face p. 83



J. N. Nevius, photo.

Gold mill and mine at Hadley, Saratoga county

Plate 5. To face p. 83



J. N. Nevius, photo.

Sand dryer and pulverizer, Hadley gold mill, first floor had it assayed. The report stated the value to be $7.63 a ton. He undertook an investigation, and arrived at conclusions similar to those of Mr Bullis. Other investigators were C. O. Yale, inventor of the famous lock, and Alonzo Chase, of Redfield S. D. The latter made a great many tests of sands from Hamilton and Fulton counties, and states that the average value obtained was $4 a ton; he also states that his fire assays frequently gave widely differing results from the same sample of sand.

A few years ago John E. Sutphen, of Albany, took up the investigation with Mr Bullis. After the death of the latter, Mr Sutphen developed the process which bears his name, and which is being tried for the first time on a commercial scale at this mill.

At the point where the mill is located the Sacandaga river has cut the Quaternary sand plain into three distinct terraces, the lowest of which rises abruptly from the river to a hight of 35 feet. The mill is situated on this terrace, about 100 yards from the river bank and directly against the face of the second terrace, which is 40 feet in hight. This second terrace consists of a 10 foot stratum of clear sand, underlain and overlain by strata of sand and gravel; the pebbles of the latter rarely exceeding 5 inches in diameter.

The sand consists almost exclusively of quartz grains, with a small percentage of magnetite and mica and a still smaller quantity of garnet and other minerals. It is stained a light buff color by the presence of a small amount of oxid of iron. The majority of the grains are rather sharp and regular, though a considerable proportion of them are well rounded by abrasion. This indicates that the greater part of the sand was derived from local sources with a smaller amount of material transported by water from a distance. Such is probably the case, as the sand is typically of postglacial flood plain origin, which the river has subsequently cut into three well defined terraces.

Plate 4 shows the mill, the tailings dump and the opening in the second terrace from which the sand is taken. Plate 5 shows the ground floor of the mill.

The sand is removed from the terrace in wheelbarrows, and is dumped into a trough on the second floor of the mill, from which it is led down to the dryer and sifter shown in the background on the left of plate 5. This consists of a revolving cylindric screen incased in a brick structure into which hot air is led. As the sand passes through the screen, it is dried and sifted; all the coarser gravel, passing out at the open end, is discarded. The dried sand is raised by a belt conveyor to a receiver, from which it feeds into the Narod mill, shown on the right of plate 5.

This mill consists of a number of small steel rolls arranged in pairs, which are kept in contact by powerful springs. The rolls are incased in a cylindric screen of 100 mesh. A draft of air meets the pulverized sand as it comes from the rolls, and throws it against this screen, through which it passes to a conveyor, which elevates it to the third floor of the mill and deposits it into a hopper. The particles which are too coarse to pass the screen find their way between the rolls again.

As previously stated, it is asserted that the bromid of gold exists throughout the interiors of the quartz grains; hence the fine pulverization is necessary.

Plate 6 shows the hopper, on the third floor, which receives the pulverized sand from the conveyor, and from which it is packed in bags of definite weight. Plate 6 also shows two of the four funnel-shaped vats set in the floor, in which the sand, one bag at a time, is mixed with the chemicals that reduce the bromid of gold and leave the gold free to amalgamate in the next step of the process. It is this chemical solution on which the success of the process is said to depend, and the secret of its composition is closely guarded.

After the sand is mixed with the chemicals, it is conducted through iron pipes leading from the bottoms of the mixing vats to the Sutphen amalgamators on the floor below. (*See* plate 7)

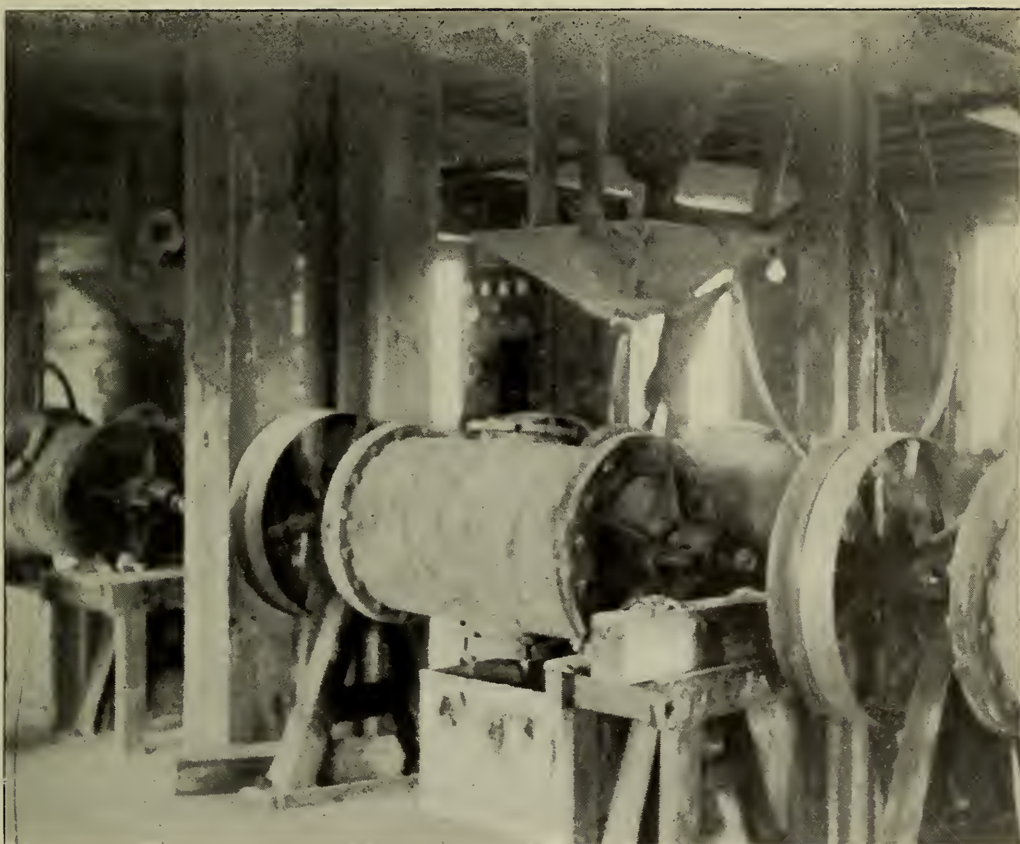
There are eight of these amalgamators arranged in four pairs, each pair being supplied from one of the four mixing vats above. They are hollow iron cylinders, about 4 feet in length and 16 inches in diameter, with an opening at the center into which a cover screws. In each amalgamator is a solid steel cylinder 7 inches in diameter. They are connected with the power shaft by belts and pulley wheels, by which they are revolved. This amalgamator is the invention of one of the persons interested in the mill, and was designed specially for this process. The amalgamators are charged with the sand, after it has been acted on by the chemicals, and with mercury to amalgamate the now free gold. As they are revolved,

Plate 6. To face p. 84

J. N. Nevius, photo.

Bags of crushed sand and vats for mixing sand with chemicals. Hadley gold mill

Plate 7. To face p. 84



J. N. Nevius, photo.

Sutphen amalgamators, Hadley gold mill, second floor

the rolling of the inclosed steel cylinders forces the mercury through the sand most effectively. When sufficient time has elapsed to complete the amalgamation, the amalgamator is stopped, the cover removed, and the amalgamator revolved to a definite point marked on the circumference, where the sand and liquor are allowed to escape, but the mercury is retained. The sand and liquor are led off to vats, where the sand settles to the bottom and allows the liquor to be drawn off to be used again. The sand is shoveled onto the trailings dump. The amalgamator is then ready for a new charge of sand and liquor. The gold is recovered from the amalgam in the usual manner.

The mill is operated by steam power; the boiler being of 60 horse power, and the horizontal engine of 50 horse power. It is excellently arranged for its purpose, and is estimated to have a daily capacity of 10 tons.

Much difficulty has been experienced in obtaining a grinder that would pulverize the quartz sand to the necessary degree of fineness—100 mesh. Several types of machines have been tried, but the quartz wore away the grinding surfaces in a short time and rendered them useless. Another difficulty experienced was that oil from the pulverizer permeated the sand and interfered with the amalgamation. The Narod mill, which is now in use, has proved more satisfactory than any other. The Kent mill is also being experimented with, successfully.

It is stated that the results obtained from three trial runs of the mill have been as follows:

1st run; 5 tons of sand yielded $5.90 in gold a ton. 2d run; 30 tons of sand yielded $7 in gold a ton. 3d run; about 30 tons of sand yielded $7.40 in gold a ton. The superintendent of the mill stated that a recent trial run had been made, during which 100 tons of sand were used, from which gold to the value of $460 was obtained, at an estimated cost of $2.50 a ton. Later a quantity of amalgam which had escaped was discovered, from which $70 worth of gold was obtained, making the total value of the run about $530. The sand used is estimated to contain on the average $7.50 worth of gold and a small amount of silver to the ton. The corresponding terrace on the south side of the river, opposite the mill, is said to contain an average value of but 50c to the ton.

Sands from many localities in this section of the state have been tested by the "Sutphen" process, and nearly all samples have shown some values of gold when treated by this method, which can not be obtained by the standard fire assay.

The fire assay is the method at present employed for determining the actual quantity of gold that an ore contains. To make this test, a portion of ore is accurately weighed, mixed with the proper fluxes to aid the heat in breaking down the chemical composition of the rock, placed in a crucible, and submitted to a heat sufficient thoroughly to fuse the mass. The gold, being heavier than the rock, sinks through the molten mass, and is collected in pure lead at the bottom of the crucible. The button of lead and gold thus formed, is then freed from the mass and cupelled, by which process the lead is oxidized off, and the gold is left in the form of a spongy mass, the weight of which, compared to the weight of ore used, shows the percentage of gold contained in the ore. The proportion is usually expressed by the value of gold contained in one ton of ore. This process is so perfect that no commercial method of treating ore has yet been devised which will extract all the gold that the fire assay shows to be present in the ore. The fire assay will separate the gold from an ore that contains only 20c worth a ton. The sand at Hadley is said to show about $7.50 worth of gold a ton when treated by the Sutphen process. It is said that this gold is thought to exist as a bromid. Bromin is an extremely volatile element, and there is no visible reason why its chemical combination with the gold should not be readily broken down by the heat of the fire assay, and the gold obtained as usual.

A sample of sand collected from the spot from which the mill's supply is obtained was assayed for the museum, and the value was reported to be a "trace" of gold to the ton, which means a value of less than 20c a ton. No value of silver was obtained. Another sample of the same sand was tested by Dr E. J. Wheeler, of Albany, for the presence of bromin, but no trace of this element was detected. These two tests prove that the Hadley sand does not contain bromid of gold to the value of $7.50 a ton. In just what chemical combination or physical condition the gold could exist in the sand to the value of $7.50 a ton, and would not be detected by the fire assay, but, after undergoing a simple chemical operation, would be susceptible to amalgamation in paying quantities, is a question which remains for the people interested in this process to explain, before the scientific world, whose confidence rests implicitly on the accuracy of the fire assay, will credit their theory.

The laboratory at Glens Falls

This company operates an experimental laboratory at Glens Falls. Here is located a small plant on the same principles as the commercial mill at Hadley, in which are tested the samples of sand from the various localities the company is investigating. Ores received from persons outside are also tested.

The laboratory receives from the United States mint at Philadelphia the "sweeps" after they have been assayed at the mint. These consist of the sweepings from the floors and chimneys, the broken crucibles and cupels, and everything that has been in contact with the precious metals. These materials are saved, and are treated to recover the minute particles of gold and silver which adhere to them. After the mint has recovered all the value that can be economically saved, the refuse is turned over to this company, and is treated by its process to recover farther values. Just what results are obtained from the "sweeps" was not stated.

One sample of sand from the mine at Hadley that was tested here is reported to have shown a value of $34 a ton, and a sample from Essex county was reported to carry $1.11 worth of silver and a little over $27 worth of gold a ton.

The curiosity and interest aroused by the operations of this company, aided by the excitement produced by the exaggerated accounts of the gold discoveries in the region of the "Klondyke", are chiefly responsible for the 3000 claims for gold and silver properties that have been filed with the secretary of state of New York during the past two years. Most of these claims refer to sand, or "placer" properties, and most of them are located in the counties of Saratoga, Essex, Fulton, Herkimer, Warren and Lewis. At some localities the sand areas are almost entirely covered by claims, so intense has the latent interest become. A large number of claims are held by parties directly interested in the "Sutphen process".

NOTES ON A TRIP FROM PORT JERVIS TO RONDOUT

BY HEINRICH RIES

This trip was undertaken partly to ascertain the conditions existing in this region during the glacial and postglacial period, and also to determine, if possible, whether the estuary clays extended up the Rondout valley toward Ellenville, as maintained by Darton.

While most of the facts noted are rather superficial, as the work was in the nature of a reconnaissance, at the same time they are very suggestive and point to the desirability of farther and more detailed work in this area.

The monoclinal valley extending from Rosendale to Port Jervis is bounded on its southeastern side (for it runs northeast and southwest) by Shawangunk mountain, while on its northwestern side as far as Kerhonkson, northeast of Ellenville, the valley is bordered by the ridge of Hamilton and Marcellus shales and sandstones.

The valley has been eroded in the Corniferous limestone, remnants of which can be seen at several localities, as on Carpenter's point at Port Jervis, and again north of Port Orange.

This valley from Kingston to Port Jervis and southwestward is Postcretaceous.[1]

Its exact depth is not known, but it was undoubtedly considerable, as at Port Jervis for instance the drift has been penetrated to a depth of 113 feet without striking bed rock.[2]

This drift material consists of sand, gravel and boulders. Usually the pebbles do not exceed a diameter of 8 or 10 inches, and the material shows little or no stratification.

Subsequent to the deposition of this drift the water flowing down the valley eroded much of it, but left more or less along the sides of the valley in the form of two series of terraces. The one coincides with the upper terrace at Port Jervis, the other with the lower one, and this latter above Huguenot forms the broad, flat, bottom of the valley.

The upper terrace can be traced quite continuously, specially on the northwest side of the valley, as far as Summitville, at which point the best developments are on the southeastern side.

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1 R. D. Salisbury. Final rep't, N. J. geol. sur. 4: (3)

2 Rep't G 6, Pa geol. sur.

At Port Jervis the upper terrace is about 470 feet A. T., while the lower one is 425. From Port Jervis to Huguenot this former fills nearly the whole valley, but above this it narrows rapidly, so that only a narrow shelf remains, leaving the lower terrace to form the valley bottom.

The two are well seen north of Huguenot village, where the upper one projects out into the valley with great distinctness.

Following up the valley, other good developments of the upper terrace are at Port Clinton and again at Cuddebackville, though here there is no longer the same difference in level between the two terraces, the upper being only 35 feet above the lower according to barometric determinations. The upper terrace also extends up the valley of Neversink river as far as Oakland Valley. At this latter point there is a deposit of fine-grained pottery clay in an embayment of the valley, which is said to be 60 feet thick as determined by boring.

At West Brookville the upper terrace appears to be wanting, while the lower extends a short distance up a small valley to the northwest.

From West Brookville nearly up to Wurtsboro the bottom of the valley is flat and swampy with an occasional island of gravel. This swamp was formed some years ago during a period of freshet, when the tributary of Basherkill washed down such a quantity of gravel as to form a low dam across the valley at this point. A comparatively small outlay would clean out the river bed and drain the tract, which at present is, to a large extent, useless.

There are benches at several points on the west side of the valley between West Brookville and Wurtsboro, which are probably stream terraces, but the rain wash from the hillsides, and erosion of the terrace escarpment, has rendered them somewhat indefinite.

The stream which occupied the valley when the bottom was at the level of the upper terrace, has left evidence of its meanderings, for on this terrace, northeast of Port Jervis, can be seen an oxbow formed by the stream at this earlier date, and now occupied in part by a pond.

Summitville, on the New York, Ontario and Western railroad, is the dividing point of the drainage into the Delaware and Hudson rivers. Homowack creek flows from Summitville northeast to

Homowack, where it joins Sandburg creek, entering the valley from the west and continuing down it to Ellenville.

Two miles northeast of Ellenville, Rondout creek enters the valley and follows it to the Hudson.

The points, or rather the more important ones, noted in driving down the valley from Summitville to Rosendale, are these.

At Summitville there is a considerable accumulation of drift in the valley, and no evidence of any bed rock. None was seen in the valley from Summitville to Ellenville, or indeed beyond this point. The stream descends 90 feet from Ellenville to Port Jackson according to barometric readings, while from this latter point to Rondout it descends 200 feet. From Ellenville to Port Benjamin the valley is quite narrow, but it then begins to broaden out to the northwest, and in the triangular area between Port Hixon, Mombaccus and Port Jackson, there is a low, undulating region underlain by considerable fine, sandy material and extensive beds of clay. The first impression is that these might be associated with the Hudson valley estuary deposits, but their elevation, which is about 350 feet A. T. as near as I can estimate it from barometric readings, would indicate a much greater postglacial submergence for this region than hitherto supposed. One possible explanation, and it seems to me a very plausible one, would be that a glacial lake existed for a time in this region. One shore of this lake would be along the northwest side of Shawangunk mountain, another shore would be along the southeast edge of the Catskills, while on the north the water would have been held in by the ice, and the drift barrier at Summitville would have checked it in that direction. Then again the flowing off of the water to the southeast, down the valley from Summitville to Port Jervis, might account for the abundant development of a stream terrace below the former point, and its apparent absence northeast of it, though it should be mentioned that the valley from Summitville to Ellenville is narrower than southeast of the former locality, and consequently any drift accumulations might be more easily washed away.

Whether the theory of a glacial lake is correct is a point which could be proven only by more detailed field work in the region northwest and north of Port Hixon and Kerhonkson, but, as I have said before, the facts seem to favor that view.

Darton, in his report on the geology of Ulster co.[1] seems to consider these as a part of the estuary deposits, but he probably did not give them very careful consideration.

The area which this lake occupied, if it did exist, is not a heavily wooded one, and the detail could consequently be the more easily worked out. The points to look for would, of course, be the existence of any deltas at the mouths of streams entering this lake, and possibly some trace of shore lines in the form of either wave-built or wave-cut terraces might be found.

The estuary clays and overlying sands extend up the valley as far as Rosendale, and even to Highfalls. There is a well marked terrace area one mile west of Rosendale, at the point where Coxingkill enters Rondout creek. The main estuary terrace, however, extends up the valley of the Wallkill; the country between Rondout creek and the Wallkill, east and south of Rosendale, is underlain by a broad terrace area. In the vicinity of Springtown, farther up the valley, the western border of the terrace is not over an eighth of a mile west of the railroad, while its eastern edge is fully a mile or more to the east of Springtown. At New Paltz, the Wallkill Valley railroad follows the eastern edge, while the western is across the valley about one mile distant. Southeast of New Paltz the terrace can be traced as far as Libertyville, and a short distance beyond. All of the sections between this point and Springtown show an abundance of sand and very little clay, indicating that the delta of the Wallkill was in this vicinity, and that most of the clay was washed farther down toward the valley. There is some clay just south of New Paltz, but it is quite sandy.

1 Rep't N. Y. state geol. 1893. 1:369.

REPORT ON THE FISHES OF LONG ISLAND COLLECTED IN THE SUMMER OF 1898

BY DR TARLETON H. BEAN

Investigations carried on for the New York state museum from July to September, in the waters of the southern part of Long Island, resulted in the collection of 73 species of fishes belonging to the region, besides 11 additional species from Lakes Ontario and Chautauqua and Coldspring Harbor.

Work was begun at Southampton, July 21, and continued till September 16. The waters explored were Shinnecock, Mecox, Peconic and Great South bays and the ocean near Southampton.

Fine-meshed seines, a gill net of two inch stretch mesh, and a trawl line with about 200 hooks were used in capturing the fishes, and some interesting species were obtained from the seines and nets of fishermen on the ocean beach and the pound nets in Great South bay. Barton A. Bean assisted the writer during the first month of the explorations.

An abstract of the season's work was published by permission of Director F. J. H. Merrill, in *Science* Jan. 13, 1899. In that article the writer gave a brief account of some noteworthy changes which he has observed in Great South bay since his former investigations, in 1884 and 1890. The fewness of summer visitors was probably due to the prevalence of strong southerly winds and the high water temperatures, which kept the migrating fishes in more northerly waters till later than usual in the fall.

One of the most interesting species collected is the rough silverside (Kirtlandia laciniata), which has never before been recorded in the state waters. Only a single example was taken, and this was associated with the common silversides in Mecox bay. Other fishes of greater or less rarity were the halfbeak, the threadfish, the lookdown, the pompano, the "Irish" pompano (Eucinostomus gula), of which a single small specimen was secured, and the yellowtail or silver perch.

A large reflector lantern was very successfully used at night for the capture of halfbeaks, gars and many other fishes, and for studying the attitudes of the species when at rest on the bottom.

Contributions were received from Livingston Stone, Cape Vincent N. Y., A. P. Latto, Southampton N. Y., Charles H. Walters, Coldspring Harbor N. Y., W. F. Clark, Islip N. Y., and James Annin jr, Caledonia N. Y. Reference is made to their gifts in the notes on the species.

The following is a detailed list of the fishes and the localities from which they were obtained.

Petromyzon marinus *Linnaeus*

Sea Lamprey

A young individual, taken at Coldspring Harbor L. I., was received from Charles H. Walters in September.

Mustelus canis (*Mitchill*)

Dog-shark; smooth dogfish

The following examples were obtained.

	Southampton, Atlantic ocean	4 Aug.
	Islip, Great South bay. (W. F. Clark)	18 Aug.
♂	Wigo inlet, Great South bay	8 Sep.
♀	Wigo inlet, Great South bay	8 Sep.

Carcharhinus obscurus (*Le Sueur*)

Dusky shark

A young specimen was caught in a pound by W. F. Clark, of Islip, Long Island, and presented to the state museum.

Carcharias littoralis (*Mitchill*)

Sand shark

Some of the teeth of a large individual were secured from A. P. Latto at Southampton in July. Instead of a single basal cusp, as usual, certain teeth had two such cusps on each side. The last sand shark seen by me during the summer was observed September 16 near the inlet at Fire Island, swimming slowly westward near the surface. A list of specimens follows.

(Teeth)	Southampton, Atlantic ocean	July
♂	Clam Pond cove, Great South bay	6 Sep.
♀	Clam Pond cove, Great South bay	6 Sep.

Lamna cornubica (*Gmelin*)

Mackerel shark

A fine young example, about 3½ feet long was presented to the museum in July by A. P. Latto, who caught it in a gill net at Southampton L. I.

Squalus acanthias *Linnaeus*

Spined dogfish

Small examples were sent from Southampton L. I., October 20 by A. P. Latto.

Raja erinacea *Mitchill*

Prickly skate

This skate was caught sparingly at Southampton L. I., August 3, and specimens were presented by A. P. Latto.

Raja ocellata *Mitchill*

Spotted skate

A female was caught near the inlet, at Fire Island, September 29. The species was more abundant later in the fall.

Raja eglanteria (*Bosc*)

Clear-nosed skate

These specimens were collected:

♀	Fire Island inlet	7 Sep.
♀	Fire Island inlet, speared	7 Sep.
♂	Wigo inlet, on trawl line	8 Sep.

Ameiurus nebulosus (*Le Sueur*)

Bullhead

The species was seined in moderate numbers in Swan river, at Patchogue L. I., August 12.

Cyprinus carpio *Linnaeus*

Carp

A young individual of the scale carp was received from Charles H. Walters, Coldspring Harbor L. I., in September.

Pimephales notatus (*Raf.*)

Fathead minnow

Obtained in the St Lawrence river, at Cape Vincent N. Y., August 9, by Livingston Stone and by him presented to the museum.

Abramis crysoleucas (*Mitchill*)

Roach

Specimens were collected in the St Lawrence river, August 9, at Cape Vincent N. Y., by Livingston Stone, and presented to the museum.

Notropis hudsonius (*De Witt Clinton*)

Spawn eater

Livingston Stone collected specimens in the St Lawrence river, at Cape Vincent N. Y., August 9, and presented them to the museum

Notropis whippli (*Girard*)

Specimens were obtained in the St Lawence river, at Cape Vincent N. Y., August 9, by Livingston Stone for the state museum.

Notropis atherinoides *Raf.*

Silvery minnow

Taken in the St Lawrence river, at Cape Vincent N. Y., August 9, by Livingston Stone, and presented by him to the state museum.

Anguilla chrysypa *Raf.*

Eel

Young eels were obtained in Shinnecock bay, July 22; in Peconic Bay, July 28; and in Swan river at Patchogue L. I., August 24. Larger individuals were taken in Peconic bay, July 29. A male was seined at the mouth of Duncan's creek, Great South bay, August 29. The male is rarely recorded, and most of the specimens known have been secured in Great South bay.

Leptocephalus conger (*Linnaeus*)

Conger eel

An individual nearly 3 feet long was captured with a hand line by A. P. Latto in the ocean, near Southampton L. I., August 3 while fishing for sea-bass and scup. Conger eels are occasionally taken in that way. The fishermen dislike to handle this eel on account of its pugnacity and strength.

Elops saurus *Linnaeus*

Big-eyed herring

Several examples, each about one foot long, were taken at Southampton L. I., in October, and presented to the state museum by A. P. Latto.

It was reported to me by Capt H. E. Swezey that a tarpon was found in Swan river, at Patchogue, after my collecting season closed. He said the fish was 4 feet long, and he believes it came into the river alive.

Pomolobus mediocris (*Mitchell*)

Hickory shad

A few specimens were seined at Bluepoint cove, Great South bay, August 16, and at Howell's point, in the same bay, August 31.

Pomolobus pseudoharengus (*Wilson*)

Alewife; branch herring

Young individuals were collected as follows:

Shinnecock bay	22 and 26 July
Scallop pond, Peconic bay	28 July
Peconic bay	29 July
Mecox bay	1 and 2 Aug.
Swan river, Patchogue	12 and 23 Aug.
Great South bay, south side	15 Aug.
Duncan's creek, Great South bay	29 Aug.
Howell's point, Great South bay	31 Aug.

Adults were obtained in Mecox bay, August 1, and at Howell's point, August 31. The Mecox bay fish had been landlocked by the filling up of the inlet from the Atlantic.

Brevoortia tyrannus (*Latrobe*)

Menhaden

The young were obtained at the following localities: Duncan's creek, Howell's point and Nichols's point on the same date, August 29. Adults were sent from Islip, August 18, by W. F. Clark.

Stolephorus brownii (*Gmelin*)

Anchovy

Not common during the summer. Found at Bluepoint cove, Great South bay, August 18. Young examples were obtained at Nichols's point, September 1.

Stolephorus mitchilli (*C. & V.*)

Anchovy

A very common species in summer. The following list of localities will show its general distribution.

Scallop pond, Peconic bay	28 July
Mecox bay	2 Aug.
Bluepoint cove, Great South bay	13 and 18 Aug.
Howell's point, "	29 and 31 Aug.
Duncan's creek, "	29 Aug.
Nichols's point, "	1 Sep. (young)
Fire Island inlet, "	13 and 16 Sep.
Oak island beach, "	14 Sep.

One of the specimens secured at Fire Island inlet had a lernean parasite attached to it.

Osmerus mordax (*Mitchill*)

Smelt

The only one obtained was sent by Charles H. Walters from Coldspring Harbor L. I., in September. It had been preserved for some time by Mr Walters.

Lucius americanus (*Gmelin*)

Banded pickerel

This little pickerel was found in moderate numbers in Swan river, at Patchogue, August 12 and 24. It is an excellent food fish.

Lucius reticulatus (*Le Sueur*)

Chain pickerel

Seined in moderate numbers at Water Mill L. I., in a small tributary of Mecox bay and in the fresh portion of the bay itself. Young and adults were secured August 1.

Lucius lucius (*Linnaeus*)

Pike

Livingston Stone obtained a specimen at Cape Vincent N. Y., in the St Lawrence river, and presented it to the state museum.

Lucius masquinongy immaculatus (*Garrard*)

Unspotted mascalonge

A fine example, caught in Chautauqua lake N. Y., August 25, was presented for the collection by James Annin jr.

Fundulus majalis (*Walbaum*)

Bass killy

Common everywhere on sandy bottoms. Specimens were taken at the following places:

♀	Scallop pond, Peconic bay	28 July
♂	Peconic bay	29 July
	Great South bay	15 Aug.
(young)	Bluepoint, Great South bay	16 and 18 Aug.
	Fire Island inlet, south side	16 Sep.

Fundulus heteroclitus (*Linnaeus*)

Killifish; mummichog

A very common species, abundant wherever found. Specimens were taken at the following localities:

	East end, Shinnecock bay	21, 22 and 26 July
♀	Scallop pond, Peconic bay	28 July
	South side, Great South bay	15 Aug.
	Bluepoint cove, Great South bay	16 and 18 Aug.
	Bellport life saving station	30 Aug.
	East side, Fire Island inlet	16 Sep.

Fundulus diaphanus (*Le Sueur*)

Fresh water killy

Abundant in the fresh or slightly brackish waters of Long Island.

Collections were obtained at the following places:

	Shinnecock bay, east end	21 July
♀	Scallop pond, Peconic bay	28 July
	Mecox bay	1 Aug.

Lucania parva (*Baird & Girard*)

Very abundant in the bays of eastern Long Island, sometimes found in fresh or slightly brackish water.

A list of localities follows:

East end, Shinnecock bay	21, 22 and 26 July
Peconic bay	23 July
Scallop pond, Peconic bay	28 July
Mecox bay	1 and 2 Aug.
Swan river, Patchogue	12 and 23 Aug.
South side, Great South bay	15 Aug.
Bluepoint cove, Great South bay	16 and 18 Aug.
Howell's point, Great South bay	29 Aug.
Bellport life saving station	31 Aug.

Cyprinodon variegatus *Lacépède*

Lebias; Short killy

This species was obtained at the following localities:

♂ Shinnecock bay	21 and 22 July
Scallop pond, Great South bay	28 July
Mecox bay	1 and 2 Aug.
South side, Great South bay	15 Aug.
Patchogue, Great South bay	29 Aug.
Bellport life saving station	30 Aug.
East side, Fire Island inlet	16 Sep.

The example taken at Patchogue had large tumors, caused by psorosperms.

Tylosurus marinus (*Walbaum*)

Silver gar

Common everywhere and very destructive to seines as well as to fish. Specimens were taken as follows:

(young) Shinnecock bay, east side	21, 22 and 26 July
Peconic bay	23 July
Scallop pond, Peconic bay	28 July
Mecox bay	2 Aug.
Swan river, Patchogue	12 Aug.
Bluepoint cove, Great South bay	13, 16 and 18 Aug.
Bluepoint cove	16 and 18 Aug.

South side, Great South bay	15 Aug.
Fire Island inlet	16 Sep.

Hyporhamphus roberti (*C. & V.*)

Halfbeak

The halfbeak was present in Great South bay in small numbers during August and September. Only one adult was secured. The following is a list of localities.

(young)	South side, Great South bay	15 Aug.
"	Clam Pond cove, Great South bay	22 Aug.
"	Horsefoot creek, Great South bay	25 Aug.
"	Clam Pond cove, Great South bay	16 Sep.

This species, like the silver gar, is readily caught at night by the aid of a lantern. The light seems to daze the fish so that it does not see the net.

Pygosteus pungitius (*Linnaeus*)

10 spined stickleback

Usually not abundant in most of the places visited in summer. The following were taken:

Shinnecock bay	21 and 26 July
Scallop pond, Peconic bay	28 July
South side, Great South bay	15 Aug.
Bluepoint cove, Great South bay	16 and 18 Aug.
Bellport life saving station	30 Aug.

Gasterosteus bispinosus *Walbaum*

Two spined stickleback

Not common in summer. Found only in Shinnecock bay, July 22, and in Scallop pond, Peconic bay, July 28.

Apeltes quadracus (*Mitchill*)

Four spined stickleback

Very common in many localities, as may be seen from the following list.

Shinnecock bay	22 July
Scallop pond, Peconic bay	28 July
Peconic bay	29 July
Mecox bay	2 Aug.

Bluepoint cove, Great South bay	13, 16 and 18 Aug.
South side, Great South bay	15 Aug.
Swan river, Patchogue	24 Aug.
Howell's point, Great South bay	29 Aug.
Bellport life saving station	30 Aug.
Nichols's point, Great South bay	1 Sep.
Fire Island inlet	16 Sep.

The examples taken at Patchogue, August 24, were in fresh water.

Siphostoma fuscum *Storer*

Pipefish; Billfish

Young and adult individuals were abundant during the summer. The following localities furnished specimens.

	Shinnecock bay	22 July
	Peconic bay	23 and 29 July
♂	Scallop pond, Peconic bay	28 July
	Mecox bay	1 Aug.
	Bluepoint cove, Great South bay	13 and 16 Aug.
	South side, Great South bay	15 Aug.
	Aowell's point, Great South bay	29 Aug.
	Duncan's creek, Great South bay	29 Aug.
(young)	Fire Island inlet	8 Sep.
	Oak Island beach, Great South bay	14 Sep.
	East side, Fire Island Inlet	16 Sep.
	Fire Island	7 Sep.
	Fire Island inlet	16 Sep.

Hippocampus hudsonius *De Kay*

Sea horse

The sea horse was scarce in the regions visited during the summer. A single small example was received from A. P. Latto of Southampton, September 11, and a larger one was seined September 16, on the east side of Fire Island inlet.

Aphredoderus sayanus (*Gilliams*)

Pirate perch

Found in moderate numbers in lakes near Patchogue. A few specimens were seined in Swan river, August 24. It is unknown to the fishermen.

Kirtlandia laciniata (*Swain*)

Rough silverside

The only individual obtained was caught in Mecox bay, August 1. This was the first specimen recorded in New York waters. Though diligent search was made in Mecox bay subsequently, no additional examples were seen.

Menidia beryllina (*Cope*)

Fresh-water silverside

Abundant, and occurs sometimes in salt water, but its usual habitat is in fresh or slightly brackish water. The following localities furnished specimens.

	Shinnecock bay	21, 22 and 26 July
(young)	Scallop pond, Peconic bay	28 July
	Mecox bay	1 and 2 Aug.
	Swan river, Patchogue	12 Aug.
	South side, Great South bay	15 Aug.
" ·	Swan river, Patchogue	23 Aug.
	Horsefoot creek, Great South bay	25 Aug.
	Bellport life saving station	30 Aug.

Menidia notata (*Mitchill*)

Silverside

Common everywhere. Specimens were taken at the following localities:

Scallop pond, Peconic bay	28 July
Peconic bay	29 July
Mecox bay	2 Aug.
Ocean beach, Southampton	3 Aug.
Bluepoint cove, Great South bay	13 and 16 Aug.
South side, Great South bay	15 Aug.
Point of woods, Great South bay	16 Aug.
Bellport life saving station	30 Aug.
Howell's point, Great South bay	31 Aug.
Nichols's point, Great South bay	1 Sep.
Fire Island inlet	13 Sep.
Oak Island beach	14 Sep.
East side, Fire Island inlet	16 Sep.

Mugil cephalus *Linnaeus*

Striped mullet

The striped mullet was not abundant in the waters seined till fall. Several were collected in Mecox bay, August 2, and a larger number in Clam Pond cove, Great South bay, August 22, but the great schools were absent till October.

Mugil curema *C. & V.*

Silver mullet

Young individuals were taken at the following places.

Swan river, Patchogue	12 Aug.
South side, Great South bay	15 Aug.
Clam Pond cove, Great South bay	26 Aug.

Adults were scarce, but half-grown specimens were abundant in September and October.

Caranx hippos (*Linnaeus*)

Yellow mackerel

Only young individuals were seen and these were scarce. The following localities furnished them.

Ocean beach, Southampton	3 Aug.
Bluepoint, Great South bay	13 Aug.
Duncan's creek, Great South bay	29 Aug.

A young fish seined at Howell's point, August 29, had its tail and a portion of the caudal peduncle bitten off, probably by a bluefish.

Alectis ciliaris (*Bloch*)

Threadfish

This species was caught in a pound net at Islip L. I., August 18, and presented by W. F. Clark.

Selene vomer (*Linnaeus*)

Look down; Moonfish

Scarce. Taken at Duncan's creek, Great South bay, August 29. Only the young were seen.

Trachinotus carolinus (*Linnaeus*)

Pompano

Young specimens were found in moderate numbers at Oak Island beach, Great South bay, September 14, and on the east side of Fire Island beach, September 16.

Pomatomus saltatrix (*Linnaeus*)

Bluefish

The young were abundant in all the waters visited, and were feeding on anchovies, silversides and other small fishes. Following is al ist of localities:

Peconic bay	23 July
Scallop pond, Peconic bay	28 July
Swan river, Patchogue	12 Aug.
Bluepoint, Great South bay	13, 16 and 18 Aug.
Islip (W. F. Clark)	18 Aug.
Nichols's point, Great South bay	1 Sep.

Palinurichthys perciformis (*Mitchill*)

Rudder fish

Young and half-grown individuals were obtained in the Atlantic off Southampton L. I., August 2, under floating logs and boxes.

Rhombus triacanthus (*Peck*)

Butter fish

Adult examples were caught by A. P. Latto in the Atlantic off Southampton L. I., August 1 and 3.

Ambloplites rupestris (*Raf.*)

Rock bass

Livingston Stone sent a specimen from Cape Vincent N. Y., August 9; it was taken in the St Lawrence river.

Eupomotis gibbosus (*Linnaeus*)

Common sunfish

The common sunfish was seined at Water Mill L. I., August 1 and 2, once in the brackish water of Mecox bay. Livingston Stone also obtained the species, August 9, in the St Lawrence river, at Cape Vincent N. Y.

Micropterus dolomieu *Lacépède*

Small-mouthed black bass

This bass was sent from Cape Vincent N. Y., by Livingston Stone, August 9.

Micropterus salmoides *Lacépède*

Large-mouthed black bass

Sent from Cape Vincent N. Y., by Livingston Stone, who obtained it in the St Lawrence river, August 9.

Perca flavescens (*Mitchill*)

Yellow perch

Sent from Cape Vincent N. Y., by Livingston Stone, August 9. Common in many Long Island streams and lakes.

Roccus lineatus (*Bloch*)

Striped bass

Occasionally taken in Great South bay during the summer. Specimens were obtained at Bluepoint cove, August 18, and at Nichols's point, September 1.

Morone americana (*Gmelin*)

White perch

Young individuals were seined in Shinnecock bay, July 22, and in Swan river, at Patchogue, August 12.

Centropristes striatus (*Linnaeus*)

Black sea bass

Adults were abundant off shore at Southampton, August 3. W. F. Clark sent half grown specimens from Islip, August 18. Young were obtained at the following localities:

Point of woods, Great South bay	16 Aug.
Clam Pond cove, Great South bay	22 Aug.
Nichols's point, Great South bay	1 Sep.
Fire Island inlet	8, 13 and 16 Sep.
Oak island beach, Great South bay	14 Sep.

Stenotomus chrysops (*Linnaeus*)

Scup; porgy

Adults were taken in moderate numbers off Southampton, August 3. Half-grown specimens were obtained at Islip, August 18, by W. F. Clark. A single young individual was seined at Nichols's point, Great South bay, September 1, and a moderate number of young, about 2 inches long, were secured at Fire Island inlet, east side, September 16.

Eucinostomus gula (*C. & V.*)

Silver Jenny

The only individual seen in Great South bay was a very small one, seined in Clam Pond cove, August 22.

Cynoscion regalis (*Bl. & Schn.*)

Weakfish

Young examples were seined at the following places:

Bluepoint cove, Great South bay	13 and 16 Aug.
Nichols's point, Great South bay	1 Sep.

Bairdiella chrysura (*Lacépède*)

Yellow-tail

The young were found in abundance at Nichols's point, Great South bay, September 1.

Menticirrhus saxatilis (*Bl. & Schn.*)

Kingfish

Almost without exception, the examples collected were young, the exception being an adult from Clam Pond cove, August 26. Young were seined as follows:

Peconic bay	29 July
Bluepoint cove, Great South bay	18 and 25 Aug.
Howell's point, Great South bay	31 Aug.
Nichols's point, Great South bay	1 Sep.
Fire Island inlet	8, 13 and 16 Sep.

Tautogolabrus adspersus (*Walbaum*)

Bergall; cunner

The bergall was found at the following localities:

	Scallop pond, Peconic bay	28 July
(young)	Peconic bay	29 July
	South side, Great South bay	15 Aug.
	Bluepoint cove, Great South bay	16 Aug.
	Duncan's creek, Great South bay	29 Aug.
	Fire Island inlet	8 Sep.

Tautoga onitis (*Linnaeus*)

Black-fish; tautog

Abundant. Specimens were collected at:

	Peconic bay	23 July
	Scallop pond, Peconic bay	28 July
(young)	Peconic bay	29 July
	Bluepoint cove, Great South bay	13, 16 and 18 Aug.
"	Bluepoint cove	25 Aug.
	Islip, Great South bay (W. F. Clark)	18 Aug.
"	Nichols's point, Great South bay	1 Sep.
"	East side, Fire Island inlet	16 Sep.

Monacanthus hispidus (*Linnaeus*)

Filefish

A single specimen was obtained, August 16, at Point of woods, Great South bay.

Alutera schoepfii (*Walbaum*)

Orange file fish

The following specimens were secured:

(young)	Ocean beach, Southampton	3 Aug.
"	Islip, Great South bay (W. F. Clark)	18 Aug.
"	Fire Island inlet	16 Sep.

No adults were seen, the largest examples were about nine inches long.

Spheroides maculatus (*Bl. & Schn.*)

Puffer; swellfish

The young were abundant, and adults were occasionally taken. The following are the localities:

(young)	Scallop pond, Peconic bay	28 July
"	Peconic bay	29 July
	Islip (W. F. Clark)	18 Aug.
	Clam Pond cove, Great South bay	22 Aug.
	Nichols's point, Great South bay	1 Sep.
"	Nichols's point, Great South bay	1 Sep.
"	Oak Island beach, Great South bay	14 Sep.
"	East side, Fire Island inlet	16 Sep.

Uranidea gracilis (*Heckel*)

Miller's thumb

A single specimen was received from C. H. Walters of Coldspring Harbor L. I., in September.

Prionotus carolinus (*Linnaeus*)

Sea robin

(young)	Point of woods, Great South bay	16 Aug.
	Islip, Great South bay (W. F. Clark)	18 Aug.
"	Fire Island inlet	8 Sep.
"	East side, Fire Island inlet	16 Sep.

Prionotus strigatus (*C. & V.*)

Striped sea robin

The young were very abundant. Collections were made as follows:

(young)	Bluepoint cove, Great South bay	18 and 25 Aug.
	Howell's point, Great South bay	31 Aug.
"	Nichols's point, Great South bay	1 Sep.
	Clam Pond cove, Great South bay	6 Sep.
"	Fire Island inlet	13 and 16 Sep.
"	Oak Island beach, Great South bay	14 Sep.

Gobiosoma bosci (*Lacépède*)

Mud creeper; oyster fish

Abundant in brackish and salt water. Specimens were obtained in the following localities:

	Mecox bay, near Water Mill	1 Aug.
(young)	Bluepoint cove, Great South bay	13 Aug.
	Bluepoint cove, Great South bay	18 and 25 Aug.
	Swan river, Patchogue	23 Aug.
	Bellport life saving station	30 Aug.
	Howell's point, Great South bay	31 Aug.
	Great River, Great South bay	21 Sep.

Opsanus tau (*Linnaeus*)

Toadfish

Abundant. Specimens were obtained at the following places:

	Scallop pond, Peconic bay	28 July
(young)	Bluepoint cove, Great South bay	13, 16 and 18 Aug.
	Bluepoint cove, Great South bay	13 Aug.
	Islip, Great South bay (W. F. Clark)	18 Aug.
"	Howell's point, Great South bay	31 Aug.
"	Nichols's point, Great South bay	1 Sep.

Merluccius bilinearis (*Mitchill*)

Whiting

Several individuals were received from A. P. Latto of Southampton, October 28.

Microgadus tomcod (*Walbaum*)

Tomcod

A few young individuals were seined in Peconic bay, near Southampton, July 29.

Phycis tenuis (*Mitchill*)

Hake

Two small specimens were seined in Mecox bay, August 2, and a very young example was received from A. P. Latto, of Southampton, September 11. This was caught in the Atlantic.

Paralichthys dentatus (*Linnaeus*)

Fluke

Small fluke were collected as follows:

Mecox bay	2 Aug.
Bluepoint cove, Great South bay	16 Aug.
Islip, Great South bay (W. F. Clark)	18 Aug.

Adults were obtained at Fire Island inlet, September 16, when they were abundant.

Pseudopleuronectes americanus (*Walbaum*)

Flatfish

The young were found abundant and widely distributed. Specimens were obtained as follows:

(young)	Shinnecock bay	22 and 26 July
	Peconic bay	23 July
	Scallop pond, Peconic bay	28 July
"	Peconic bay	29 July
	Mecox bay	1 Aug.
	Bluepoint cove, Great South bay	16 Aug.
"	Bluepoint cove	16 and 18 Aug.
"	Nichols's point, Great South bay	1 Sep.
"	East side, Fire Island inlet	16 Sep.

Bothus maculatus (*Mitchill*)

Window pane

The localities were the following:

	Islip, Great South bay (W. F. Clark)	18 Aug.
(young)	Fire Island inlet	8 Sep.
"	Oak Island beach, Great South bay	14 Sep.

Achirus fasciatus *Lacépède*

American sole

Abundant. Specimens were taken at the following places:

	Scallop pond, Peconic bay	28 July
(young)	Swan river, Patchogue	12 Aug.
	Bluepoint cove, Great South bay	16 Aug.
	Islip, Great South bay (W. F. Clark)	18 Aug.

(young)	Bluepoint cove, Great South bay	18 Aug.
"	Swan river, Patchogue	23 Aug.
	Bluepoint cove, Great South bay	23 Aug.
"	Howell's point, Great South bay	31 Aug.

The writer has personally studied 163 species of fishes in waters extending from Gravesend bay eastward to Mecox bay, and has published accounts of them in the *19th annual report of the New York fish commission* (1890), the bulletin for 1897 of the American museum of natural history, New York city, and *Science* of Jan. 13, 1899. About 350 species of fishes are now assigned to the waters of the state.

Washington D. C.
24 April 1899

University of the State of New York

BULLETIN

OF THE

New York State Museum

VOL. 5 No. 20

JUNE 1898

ELM-LEAF BEETLE

IN

NEW YORK STATE

PREPARED BY

EPHRAIM PORTER FELT, D. Sc.

Acting State Entomologist

CONTENTS

PREFACE

This bulletin was prepared, first to bring prominently before the public the very destructive nature of this imported insect, and second to demonstrate that it can be controlled without great expense, provided intelligent direction is given to the matter.

The life-history and habits of this beetle have been given somewhat in detail because unless they are thoroughly understood, it is very easy to adopt means that are only partially successful or futile. In order to give the bulletin a more practical value, short accounts have also been included of three other insects, which, working with the elm-leaf beetle, have aided greatly in ruining many noble elms.

In the portion devoted to remedies prominence has been given to the cost of spraying per tree, the proper apparatus and the time and manner of application. It is surprising to see what mistakes some men make in dealing with insects and how they cling to methods of no value. To offset this tendency, two of the more common fallacies are mentioned and their futility shown.

E. P. FELT

Albany, N. Y., 21 *June*, 1898

THE ELM-LEAF BEETLE IN NEW YORK STATE

Galerucella luteola Müller

Ord. Coleoptera: Fam. Chrysomelidae

This imported insect has committed such extensive injury to the elms in the cities and villages along the Hudson river that it is worthy of extended notice. The residents of places where this pest has established itself have repeatedly observed the grubs working on their elms and in many instances have seen two or even three crops of leaves destroyed in a single season without taking steps toward the protection of the trees.

The causes for this condition of affairs are not hard to find, as the majority are inclined to trust in providence and hope that the ravages of the insect will not be as severe the next season. Many others see the grubs at work on the underside of the leaves but not being quite sure of the best method of controlling them, and as there is no way of doing this without labor, they usually make no effort to subdue the pest.

Bad reputation of its family. This beetle is a member of the large, leaf-eating family of *Chrysomelidae*, which comprises a number of our most injurious insects. It includes such well-known pests as the asparagus beetle, *Crioceris asparagi* Linn., the Colorado potato beetle, *Doryphora 10-lineata* Say, the 12-spotted Diabrotica, *D. 12-punctata* Oliv. and the striped cucumber beetle, *Diabrotica vittata* Fabr., all well-known insects against which perpetual warfare must be waged. Another member of this family, the cottonwood-leaf beetle, *Lina scripta* Fabr., recently inflicted serious damage upon the large basket industry in the willow growing districts about Syracuse, Rochester and other localities in that part of the state. Judging from the well-known records of its allies, we may expect that the elm-leaf beetle will continue to be very destructive.

Inaction means death to the elms. The elm-leaf beetle was known in Albany in 1892, probably having made its way to the city a year or two earlier, and since that time its ravages have become more and more serious, until in 1897 most of the numerous European elms along our streets were completely defoliated once, the second growth of foliage was seriously injured, and some trees had their third set of leaves attacked. This condition of affairs was observed in Albany and Troy and was true to a greater or less extent in many other places along the Hudson river. The leaves are the breathing organs of a tree. Their removal or destruction weakens it seriously, and to have that occur even once a season for successive years, means the early death of the unfortunate elm. The number of magnificent shade trees killed by this insect in Albany, since its advent, may be estimated at over a thousand, and had not the city taken action to protect the elms many more would have succumbed in the next year or two.

It is useless to hope that another season the pest may not be as destructive. It shows a remarkable vigor and prolificacy in our climate. At Washington, D. C., it has been known for a long series of years and still is very injurious. In New Jersey, New York city, New Haven, Conn., and other localities it has been found necessary to spray the trees with a poisonous mixture in order to avert serious injury. Parasites, diseases of various kinds and predatory enemies seems to have little effect in reducing its numbers. The valley of the Hudson river as far north as Saratoga is now included in the same life zone as that of the latter places named.

Distribution. This insect is common over a large part of Europe, but it is injurious only in the southern portions of Germany and France and in Italy and Austria. The records of the earlier entomologists indicate that the beetle must have made its way to this country about 1834, because in 1838 it was reported as very injurious to elms in Baltimore, Md. It is now found from Charlotte, N. C., to north of Salem, Mass. Up to 1896, so far as known, it was limited to territory east of the Appalachian chain of mountains. In that year it was found established at Elm Grove and Wellsburg, W. Va., by Dr Hopkins of the Agricultural experiment station of that state. Its progress up the Hudson is interesting to follow, indicating, as it does, the distribution of the beetle along the lines of travel. In 1879[a] it was abundant and destructive at Newburg; 12 years later it was reported to this office from Poughkeepsie, in 1890 from Hudson, in 1891 from New Baltimore and in 1892 it had reached Albany and Troy. It was found at Mechanicville in 1896 by Dr L. O. Howard, of Washington, D. C. That same year the larvae were abundant at Averill Park in the town of Sand Lake about seven miles southeast of Troy, the beetles evidently having been transported thither by the numerous electric cars running to that station. In a similar manner it has spread over a large portion of Connecticut and into Rhode Island. It had made its way up the Connecticut valley to Springfield by 1891, and to Amherst by 1895. The latter year it was found by Dr Howard at Millers Falls and was reported to him then at South Vernon, it having crossed the New Hampshire line. It has also been reported from north of Salem, Mass., and at Middlebury, Vt.—two localities distant from others where it has been found.

The above record indicates most clearly that this pest has not made its way to all portions of the state where it may be expected to thrive. The climate of the upper austral life zone seems to agree with the insect, judging from the number of broods and its abundance in Albany and vicinity. The area within the state embraced by this zone has been represented on plate 4, in the *11th Report on the insects of New York*. Briefly, it embraces Long and Staten islands, the valley of the Hudson river north about to Saratoga and a large portion of the northwestern and central part of the state adjacent to the great lakes and including Oneida, Cayuga, Seneca lakes and neighboring bodies of water. This insect will probably make its way along the lines of travel to most of the cities and larger villages lying within the above limits. The beetle having become established at localities not yet included within this zone, indicates that it may have an even wider range, although climatic conditions will probably prevent its becoming destructive.

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a Unfortunately most of these dates indicate only the time when the ravages of the insect were serious enough to attract the attention of some one, and so only approximately the year of its arrival.

Description. The work of this pest is so striking as to excite the attention of even the most casual observer. The majority have little idea of the appearance of the insect in its various stages and but faint conception of its life history. In order to control the pest it must be recognized and its nature understood to a certain extent.

The parent insect may be recognized by aid of the colored figure (pl. 1, fig. 2), although care should be taken not to confound it with the striped cucumber beetle, *Diabrotica vittata* Fabr., which it resembles in a general manner. The elm-leaf beetle is about $\frac{1}{4}$ of an inch long with the head, thorax and margin of the wing covers a reddish-yellow. The coal black eyes and median spot of the same color on the head are prominent. On the thorax there is a median black spot of variable shape and a pair of lateral ovoid ones. The median black line of the wing covers is separated from the broad lateral stripes of the same color by greenish-yellow. The elytra are minutely and irregularly punctured, bear a fine pubescence and at the base of each elytron there is an elongated black spot in the middle of the greenish-yellow stripe. The markings are usually constant in the adult, but the color is quite variable during life and changes more or less after death. In some beetles emerging from winter quarters, the conspicuous greenish-yellow stripes of the wing covers are nearly black. The antennae are a golden yellow with more or less brownish markings. The legs are yellowish with the tibiae and tarsi marked with brown. The under surface of the head and prothorax is yellowish, that of the metathorax and abdomen black.

The orange yellow eggs are deposited in irregular rows side by side, forming clusters of from five to 26 or more on the under surface of the leaf. Each egg is somewhat fusiform, attached vertically by its larger end, with the free extremity tapering to a paler, rounded point (pl. 1, fig. 3). Under a powerful lens, the fine reticulations of the egg shell are easily seen.

The recently hatched larva is about $\frac{1}{20}$ inch long, with the head, thoracic shield, numerous tubercles, hairs and legs jet black. The integument between the tubercles is a dark yellow. The tubercles are so large and the hairs so prominent that the prevailing color of the larva at this stage is black. As the larva increases in size and molts, the stiff black hairs become less conspicious and the yellowish markings more prominent (pl. 1, fig. 4) until the last stage. A full grown larva is about $\frac{1}{2}$ inch long, more flattened than in the earlier stages, with a broad yellow stripe dorsally and a narrower stripe of the same color on each side, the yellow stripes being separated by broad dark bands thickly set with tubercles bearing short, dark-colored hairs. The dorsal yellow stripe is broken on each side by a subdorsal row of dark tubercles, which increase in size posteriorly. The lateral yellow stripe includes a row of prominent tubercles with dark tips bearing short hairs of the same color (pl. 1, fig. 5). The predominating color of the ventral surface is yellow.

The pupa is bright orange yellow, about $\frac{1}{5}$ inch long, and with a very convex dorsal surface which bears transverse rows of stout, inconspicuous setae.

Life-history. In order to control this insect successfully it must be known and its habits understood. Trite though the preceding may appear, I have noticed men in several places spraying for this pest and doing no execution, for the simple reason that they did not understand the fundamental principles involved in fighting insects. In one case the trunk of the tree was sprayed while the grubs were on the leaves, and in the other they used paris green and water when kerosene emulsion or whale oil soap solution should have been employed.

The beetles pass the winter in attics, sheds or out-houses and in various sheltered places. With the advent of warm weather in the spring, they emerge from their retreats and may be found on the walks during the sunny portion of the day or upon the windows of houses, vainly trying to escape. Even when writing this (May 12th) numbers of these beetles are to be seen on the office windows of the fourth story of the capitol, thus showing to what a height they will fly in seeking secure winter quarters. On the appearance of the leaves, the last of April or the early half of May in this latitude, they fly into the trees and eat irregular holes in the foliage (fig. 2). After feeding some time, and pairing, the orange yellow eggs are deposited on the under surface of the leaves in clusters of about 5-26. The duration of the egg stage in July averages about five days, in cooler weather it may be longer. Feeding and oviposition continue for several weeks in the spring, probably from four to six. During this time the beetles consume a large amount of foliage, which is evidently necessary for the development of the eggs, as clusters are laid every day or two until the full complement is discharged, which is in the neighborhood of from 431 to 623. As there seems to have been no attempt, at least in this country, to determine the prolificacy of this insect, the following record may be of interest. On May 31st, two large females were taken and isolated with plenty of food. On June 1st, one had deposited four clusters, comprising 42 eggs; on the 3d, a cluster of 18; on the 6th, clusters of 21 and 26 eggs; on the 8th, clusters of 26 and 4; on the 9th, a cluster of 27; on the 10th, clusters of 3 and 31; on the 13th, clusters of 3, 7, 8, 11, 15 and 19; on the 15th, clusters of 14 and 27; on the 16th, a cluster of 30; on the 17th, a cluster of 32; on the 19th, clusters of 10 and 26; on the 20th, a cluster of 36; on the 21st, clusters of 6 and 25; on the 22d, clusters of 4 and 31; on the 23d, clusters of 1, 2, 7, 11 and 13; on the 27th, clusters of 13, 21 and 32; on the 28th, clusters of 4 and 17, making a total of 623.

The other had deposited on June 1st, two clusters containing a total of 29 eggs; on the 3d, clusters of 9, 9 and 14; on the 6th, another of 18; on the 8th, clusters of 15 and 20; on the 10th, a cluster of 20; on the 11th, a cluster of 23; on the 13th, clusters of 11 and 13; on the 14th, a cluster of 31; on the 15th, a cluster of 16 and 5 scattering; on the 16th, a cluster of 28; on the 18th, clusters of 26 and 30; on the 20th, clusters of 2 and 6; on the 21st, clusters of 3 and 18; on the 22d, clusters of 2 and 20; on the 23d, a cluster of 27; on the 27th, clusters of 5, 7, 9 and 15, making a total of 431.

The continued oviposition and the prolificacy of the beetles is strikingly shown in the above record. They were abroad in numbers by May 12th and oviposition began about the 25th, so that the record of these two individuals is probably lower than the normal as they may have deposited several clusters of eggs before being captured. They were both supplied with fresh leaves from day to day and the eggs removed and counted as soon as detected. The female producing the smaller number of eggs was confined in a small, corked vial, while the other enjoyed the freedom of a jelly tumbler. The difference in conditions undoubtedly had some influence on egg production and the protection from unfavorable weather conditions enabled the beetles to approximate the maximum quota of eggs. The record is of great value since it shows most clearly how long oviposition may be continued by a single individual and the desirability of spraying early in the season for the purpose of killing the beetles.

FIG. 1.—Work of elm-leaf beetle larvae.

The young grubs emerge from the eggs early in June or in about five or six days after oviposition. and soon begin to feed on the under surface of the leaves, producing the familiar skeletonized appearance well represented in figure 1, which is caused by their eating the softer under part, leaving the upper epidermis and the veins. The result of their feeding is so characteristic that it is easy to detect their presence by the semitransparent places in partly eaten leaves and by the skeletonized appearance of the foliage which has been more severely attacked.

The larvae complete their growth in from 15 to 20 days in summer (in cooler weather the time is extended), become restless, forsake the leaves and descend the limbs and trunks of the tree to a greater or less extent, seeking proper shelter for pupation. In warm July weather seven days are passed in this state, in September the time is extended to 12 days and in October to 24. The descent of the larvae of the first brood usually occurs in Albany the latter part of June,—in 1896 some were observed descending May 19, and beetles of the second brood were taken May 30. The oviposition of the second brood of beetles begins about the middle of July. From that date until late in the autumn, it is possible to find the eggs of this insect most of the time in some part of the city. The beetles are naturally more attracted by a fresh growth of foliage and it is on the trees throwing out a second or third crop of leaves that the eggs of the later generations are found most abundantly. Most of the second brood of larvae complete their growth about the middle of August, transforming to adults the latter part of the month. If there is an abundant food supply a third generation is produced. In 1896 numerous eggs were found on elms in Troy the first part of September, and the same was probably true in Albany, as indicated by the large numbers of full grown larvae descending certain Scotch elms, which had been practically uninjured in the early part of the season, near the middle of October.

This latter occurrence shows most conclusively, that the larvae must be able to develop on old leaves. The persistent breeding of this insect late in the autumn is shown by the presence of full grown larvae on trunks of elms October 31 and the finding of living pupae November 7, 1896, and on the still later date of November 16, 1897.

Number of generations. The detailed observations of the past two years have established beyond question the presence of two well marked generations and the occurrence of an incomplete third brood under favorable conditions at both Albany and Troy. In these two cities the insect has continued breeding so long as the elms afforded sustenance. This is the more remarkable since Dr Smith records but one brood a year, or one and a partial second at New Brunswick, N. J., a point about 150 miles to the south. As is well known, most insects are more destructive soon after their introduction than in later years. This may be accounted for by the fact that in time native parasites, diseases and other natural checks gradually assert their power upon new comers. An insect's freedom from natural enemies might have some effect upon its prolificacy, and possibly upon the number of generations. It will not only be of interest, but of great practical importance to ascertain by observations whether this beetle continues to produce two or three generations yearly in this latitude.

Habits of beetle and larvae. Certain habits of this insect are of great value when the problem of controlling it comes up for solution. Its hibernation affords no vulnerable point as the beetles are then too scattered to admit of effective work against them. In the spring they feed on the young leaves for two or three weeks and when abundant may cause considerable injury. The irregular round holes seen in the young leaves (fig. 2) are an indication of the presence of this pest. Under exceptional circumstances the beetles may eat the under surface of the leaves, refusing the veins and tough upper epidermis. This only occurs when the foliage is unusually hard and dry.

One habit the adult insect possesses, which is of much importance, is its disinclination to fly a great distance. The instinct within this beetle to remain near one spot is so marked that it spreads very slowly indeed. This is clearly shown in its taking seven years to make its way in numbers from the point where it established itself first in this city to Washington park, a distance of less than one and one half miles. I have repeatedly seen European elms badly defoliated and within 50 feet others of the same species would be hardly affected. In the past three years the insect made its way along certain rows of European elms in Albany at the rate of about a block a year.

FIG. 2.—Leaf showing holes eaten by elm-leaf beetle

The larvae are very rarely found on the upper part of the leaf, but they occur on the under surface of the leaves and feed there almost exclusively. It is also evident that in most cases the trees are attacked near the top, probably because the foliage of the upper portion of the trees is more tender and clean. This is well shown on plate 2, where the dead tips are high, showing conclusively the preference the beetles have for the younger leaves.

After attaining their growth, the larvae forsake the leaves and may be found crawling along the limbs and trunk. If the tree has comparatively smooth bark, a far greater portion make their way to the ground, in search of proper shelter while passing through the pupa stage, than if a rough bark, which affords numerous secure crevices in which the final changes may be effected. At this time the trunks of infested trees present an interesting sight as thousands of the grubs crawl up and down the shaggy bark. Occasionally their numbers are so great as to give a distinct character to the surface they are moving over, presenting a peculiar grayish yellow mass of motion enlivened here and there with an orange yellow pupa. A few days later the light yellow pupae are more numerous on the trunk and around the base of the tree and adjacent shelter, where they may be found in golden layers nearly an inch in depth interspersed here and there with a dark larva. It will be found that many larvae do not descend the older trees but take refuge in the crevices of the bark, or, if there are overhanging limbs, they may drop in numbers from the tips of the branches. Many are content to transform in the gutters, others seek shelter in the crevices of the sidewalks and large numbers cross wide spaces and pile themselves up against a wall, fence or around any sheltering bush or weed.

SPECIES OF ELMS ATTACKED

It will be observed in most localities that the American elm, *Ulmus Americana*, is comparatively exempt from the attacks of this insect. Sometimes the beetles will make their way from adjacent European elms and seriously injure the American species and, after they have once become established, the but partially migratory habit of the beetle ensures attack for a few successive seasons at least. In most cases the English elm, *Ulmus campestris*, and the Scotch elm, *Ulmus montana*, suffer most seriously from the pest, while our native species are but little affected. This was very noticeable in Troy and Lansingburg. In the former, European elms are numerous and the work of the elm-leaf beetle is conspicuous over a greater part of the city, but as one proceeds northward into Lansingburg the American elms abound almost to the exclusion of the foreign species and evidences of this pest are comparatively rare. Again, in 1895 the American elms of Albany showed very little injury by the insect.

The next year trees here and there gave evidence of a serious attack and in 1897 a much larger number of the American elms was seriously injured than in the preceding year.

No species of elm grown in this country is exempt from attack although there is considerable variation in the degree of injury inflicted upon them. The relative liability to attack is apparently a variable quantity in different localities. According to Dr Howard's observations, the American elm suffers more from the insect than does the Scotch, the English species being the favorite, while in both Albany and Troy the injuries were about equal to the English and Scotch, the latter suffering more in many instances, while the American elm was eaten to a much less degree.

AN ASSOCIATED INSECT

The elms, particularly the European species, in Albany, Troy and other places along the Hudson river are most unfortunate in suffering from the attacks of another imported insect, which is known as the elm tree bark-louse, *Gossyparia ulmi* Geoff. The pest was first discovered in this country at Rye, Westchester county, N. Y., in 1894, on the nursery stock of Mr Charles Fremd. It is now known to occur in a number of localities in the Hudson valley, being generally distributed over Albany, Troy and adjacent towns. It has also become established in the vicinity of Boston and at Amherst, Mass., and Burlington, Vt. Other localities are Washington, D. C.; Michigan Agricultural College; Carson City, Nevada, and Palo Alto, California.

Injuries and characteristics. The injurious nature of this bark-louse in our latitude has been abundantly demonstrated the past few years in conjunction with the work of the elm-leaf beetle. The affected trees are easily recognized in midsummer by their blackened appearance, caused by a growth of the fungus, *Coniothecium saccharinum* Peck, in the honey dew covering the foliage, limbs and the ground beneath. In sunlight, the minute drops of the secretion may be seen falling in showers from the clusters of insects, giving an idea of what a drain this species is upon the vitality of the elm. The limbs which have harbored this bark-louse for a few years begin to die, the tree itself shows signs of weakness, and when it is attacked by both the elm-leaf beetle and this bark-louse its destruction follows in a few years.

FIG. 3.—Females of GOSSYPARIA ULMI (slightly enlarged)

Description and life-history. The adult females are very conspicuous and may be found on the under side of the smaller branches, frequently clustered in masses and appearing not unlike certain lichens. Each at this time is about $\frac{1}{10}$ inch long, oval in outline, with the extremities slightly pointed, and if crushed causes a reddish stain from the contained ova. The body is surrounded with a mass of white, woolly secretion and the segmentation is also indicated by the same substance, as shown in the accompanying figure. The minute yellow young make their appearance early in July and soon settle for a time on the greener twigs and along the principal veins of the leaves. In the autumn the back of the partly grown bark-louse is covered with spiny processes secreting a white waxy matter. At this time most of the insects forsake the leaves and settle for the winter in crevices of the bark. In the early spring the females molt for the last time, and the males spin their oval cocoons (fig. 4). The delicate, four-winged reddish male is rarely seen although of particular interest from its presenting a partially developed form known as the pseudimago.

FIG. 4.— Cocoons of male (three times natural size)

Means of distribution. As the slender males only are winged, the insect is dependent largely upon various agencies for its distribution. It has most probably been carried to Nevada, California and other distant localities on infested nursery stock, but this does not explain its general occurrence in such cities as Albany and Troy. In these two places, at least, the distribution appears to have been largely effected by the aid of the English sparrow and other birds, since the active young could easily crawl upon the foot of a bird and thus be transported to another tree. Other insects may also transport them to a certain extent and some, falling with the leaves, might successfully make their way up another tree, but the chances are against the latter method.

SECONDARY ATTACKS BY INSECTS

It is well known to students of nature that an infeebled tree apparently invites attack by certain insects which seem to find in the unhealthy tissues conditions peculiarly fitted for their development. The ravages of the elm-leaf beetle have encouraged certain of these pests to a marked degree. One of the most common and injurious is known as the pigeon Tremex, *Tremex* *columba* Linn. This insect is a magnificent four-winged fly about 2 inches long, with a wing spread of 2½ inches, and a prominent horn at the extremity of the abdomen, hence the common name of horn-tail. It may be recognized by its cylindrical dark brown abdomen with yellow markings as represented in figure 5.

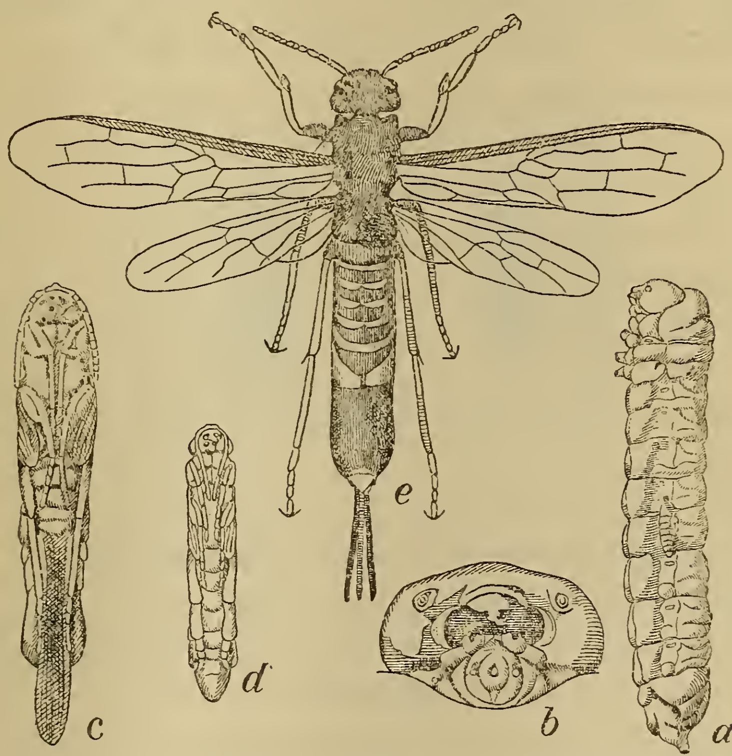


FIG. 5. TREMEX COLUMBA: *a*, larva showing the Thalessa larva fastened to its side; *b*, head of larva; *c*, pupa of female; *d*, male pupa; *e*, adult female — all slightly enlarged

The female deposits her eggs in the trunks of sickly trees, where its larvae run large cylindrical burrows. Many elms in both Albany and Troy show numerous holes caused by this insect. This borer has a deadly parasite in the lunate long sting, *Thalessa lunator* Fabr. This beneficial insect is of great aid in keeping the Tremex under control. In the trunk of one small elm I found the remains of 13 ovipositors. In their efforts to reach the numerous borers in the tree, the females had driven their long ovipositors so far into the wood that they were unable to withdraw them.

Another insect which infests debilitated elms is known as the elm borer, *Saperda tridentata* Olivier. The larvae of this beetle run their burrows under the bark and in the sap wood of the trunk, not many penetrating to a greater depth than an inch. Their burrows may become so thick as to girdle trees two or three feet in diameter. An infested elm may be recognized by the patches of unhealthy bark—in case of a bad infestation large pieces become loose and scale off easily. The beetle is usually less than ½ inch long, and of a dull slate color, with the thorax and wing covers margined with dull orange (fig. 6).

FIG. 6.—SAPERDA TRIDENTATA (twice natural size)

NATURAL ENEMIES OF ELM-LEAF BEETLE.

The natural checks which serve so well to keep thousands of insects under control which otherwise would be very destructive, are unable to reduce the numbers of this beetle to a relatively harmless figure. One of the more important natural agents is the fungus, *Sporotrichum entomophilum* Peck, which has been observed developing on many beetles in this city. Like the disease of the chinch-bug, caused by the allied fungus, *Sporotrichum globuliferum* Speg., the one attacking the elm-leaf beetle requires moist atmosphere for its development. Beetles in close breeding jars or those found under the bark of trees and similar damp places succumbed readily to the disease. On account of the climatic conditions not being ordinarily favorable to the rapid growth of this fungus, it has a relatively slight value as a natural check upon the elm-leaf beetle.

Several insects are known to prey either on this pest, its pupa or larva. Three beetles, *Platynus punctiformis* Say, *Quedius molochinus* Grav. and *Chauliognathus marginatus* Fabr., feed on this species as recorded by Riley. A fly, *Cyrtoneura stabulans* Fall., destroys many pupae in Washington. In this latitude the half-grown larva of *Podisus spinosus* Dallas has been observed with an elm-leaf beetle grub in its extended beak, and it probably preys extensively on the larvae, since in Washington all stages are known to attack it. Unfortunately this beneficial species is not abundant, though it is to be hoped that the large food supply will lead to an increase in its number. A small capsid, *Camptobrochis grandis* Uhler, sucks the eggs. Larvae of lace-wing flies, also called aphis lions, are frequently found on leaves with the young of the elm-leaf beetle, and are reported by Riley to feed on both eggs and larvae. Mites have been seen near egg clusters that had suffered injury. In the southern portion of its range, this insect finds an enemy in the praying Mantis, *Mantis Carolina* Linn.

Although I have seen nothing of the kind in this vicinity, one gentleman affirms most positively that the English sparrow feeds on the elm-leaf beetle larvae, he having repeatedly observed it picking them off the trunks of the trees. If the sparrow has this habit, it offsets to a certain extent the many bad features possessed by this bird.

REMEDIES

Undoubtedly the most satisfactory method of controlling this insect is found in poisoning the foliage. The objection heretofore urged against this means has been the expense involved, and it still applies to a certain extent in the case of the private individual with but a few trees to care for. Aside from the cost of the necessary apparatus, the operation of spraying even large shade trees is not so expensive as is commonly supposed and on the other hand valuable results may be obtained with a comparatively inexpensive outfit, although the cost per tree may be increased.

Cost of spraying elms. I have taken some pains to ascertain the precise cost of spraying per tree in the hope of encouraging those to whom this would be a serious item. It is pleasant to record that the expense is much lower than I had supposed. Dr Smith, of the New Jersey agricultural experiment station, has kindly supplied the following data. The elms on the college campus at New Brunswick are 50 to 75 feet high and were sprayed at odd times by the janitors, it requiring about an hour for two with force pump, tank and ladders to treat one tree. The poison necessary for each spraying was worth about six cents. It will thus be seen that the cost per tree would be between 36 and 56 cents, varying with the price of labor. In the city of New Brunswick the trees were sprayed at a contract price of one dollar for the season, the understanding being that they were to receive three treatments if necessary. The contractor prepared the outfit, furnished the material, did the spraying at the price mentioned and had a neat margin remaining.

Mr Kirkland, Assistant state entomologist of Massachusetts, has kindly supplied me with the following figures. A grove of over 200 red and white oaks ranging in height from 40 to 70 feet were sprayed once at an expense of 49 cents per tree. In this instance arsenate of lead was used at the rate of 20 lbs to 150 gallons of water, a considerably stronger mixture than would be necessary for the larvae of the elm-leaf beetle. In addition, he estimated the expense of spraying smaller trees, 20 to 40 feet high, at 15 to 20 cents per tree.

The cost of spraying the elms in Albany this season, aside from wear and tear of the apparatus, is considerably less than the figures above given. The trees present a wide range in size, although the majority are from 50 to about 70 feet in height. Taking them as they come, Mr Lewis has succeeded in spraying them once at the low cost of about 15 cents per tree. This is largely due to the excellent apparatus, to be described later, and is a most encouraging feature of the work. It is hoped that these figures will induce private individuals to provide protection for their trees, either by doing the spraying themselves or else by hiring some capable party.

Proper apparatus. In order to do this work successfully one must possess a force pump capable of throwing a stream some distance, a number of feet of hose and a nozzle that will discharge a rather fine spray. There must also be something to hold the poisonous mixture, while a ladder facilitates the work greatly.

One of the best arrangements for hand work is most probably found in the spraying outfit mounted on wheels so that it can be readily moved from place to place (Plate 5). In most cases this takes the form of a box or barrel to which a force pump is firmly attached, and either provided with wheels or else designed to be placed in a wagon. In spraying tall trees 25 to 50 or more feet of $\frac{1}{4}$ or $\frac{1}{2}$ inch hose should be provided, while the addition of a brass or iron and brass extension 10 to 25 feet long adds materially to the value of the apparatus. It is also necessary to have a good nozzle that will not clog, but produce a fine spray and that can be quickly adjusted to throw a coarse spray some distance if necessary. Such an outfit is of great service to any individual having considerable spraying to be done and undoubtedly it could be used to advantage by those desiring to make a business of spraying in a small way, as for example the treating of trees here and there for those in cities desiring their trees sprayed and not willing to purchase the necessary apparatus.

In the extended work against this insect conducted by cities and villages, it is desirable to have apparatus that will admit of more rapid work. This has led to the refitting of retired fire engines and the designing of more or less cumbersome outfits for this purpose. In all cases these makeshifts have been successful, although they are not so satisfactory in operation as those specially fitted for the purpose. Probably the best apparatus yet designed for spraying trees is that constructed under the direction of Dr E. B. Southwick, entomologist of the department of public parks of the city of New York, and which is the form used in Albany. The whole outfit is represented in plate 4. It consists of a 'Daimler' gasoline motor operating a Gould force pump—the motor and pump weighing but 300 pounds can be placed in the bottom of a spring wagon along with the 100-gallon tank containing the poisonous mixture. This motor has the advantage of being almost noiseless in operation and is scarcely noticed by passing horses. It is very inexpensive to operate, as a gallon of gasoline is sufficient for a day and it requires so little attention that a tyro can run it. The smallest size Gould 3 piston pump is the one used with the motor, although Dr Southwick now recommends a larger one in order to utilize the power more fully. The motor costs $250 and the pump about $50. They can easily supply four lines of hose, although in Albany not more than two can be used to advantage in most places.

In addition to the lines of hose and other requisites, Mr P. C. Lewis, of Catskill, N. Y., who is in charge of the spraying in this city, has several interesting devices for saving time and increasing the efficiency of the work. He has designed a modified stepladder, about 16 feet high with platforms for two men and on two of its legs there are small wheels which permit ready removal from place to place. It is so constructed that it can be folded up and drawn behind the wagon when some distance is to be traversed. He also has in constant use a metal extension 25 feet long. The lower portion is composed of larger tubing, thus making it stiffer and at the same time rendering it easier to handle because the greater part of the weight is near the operator. This extremely long extension is suspended by a rope from the top of the modified stepladder in such a manner that the man has only to guide the stream. This arrangement does away with all climbing. In many instances the huge steps are placed in the middle of the street and the trees on both sides sprayed either from the steps or the ground.

Time and manner of spraying. Though it is easy to state the proper time to spray, in many cases it is exceedingly difficult to have the recommendations properly carried out. As has been stated, the beetles feed on the young leaves for a considerable time before any eggs are developed and continue feeding for a day or more between the deposition of each cluster. If the partly unfolded leaves are sprayed in the early spring, the beetles can be killed and the production of eggs prevented. This is very desirable, for if at all numerous the beetles injure the foliage considerably. In the second place the mischief is checked at its inception. To accomplish this end, Dr Smith recommends the use of one pound of paris green or london purple to 100 gallons of water. To avoid any danger of injuring the foliage, it is advisable to add also one pound of quicklime to neutralize any soluble arsenic that might be present. Two quarts of cheap molasses added to the mixture will make it adhere longer to the leaves.

In most cases it will also be necessary to spray again at the time the young larvae begin their work, although after the insect has once been brought well under control in a locality, it is possible that a single thorough spraying each year for the beetles may be sufficient. This second spraying should occur at the time the young are beginning to hatch, which in this latitude is about the first week in June. In order to be successful, the poison must be applied to the under surface of the leaves. The reason for the latter statement is found in the fact that only very exceptionally do the larvae feed upon the upper surface of the foliage or even break the upper epidermis, consequently it is impossible to poison them unless the arsenic be placed on the under surface. As the larvae succumb more readily than the beetles to the effects of poison, but one pound of paris green to 150 or 200 gallons of water is needed for the second spraying.

The necessity for subsequent sprayings is determined largely by the manner in which the work has been done. Much depends upon the man who holds the nozzle, even though he be under the eye of one who understands the business. The mixture should be applied evenly in a rather fine spray and so far as possible to every leaf. If the poison be applied thoroughly and at the right time, two sprayings should be ample to keep the beetle under control. Otherwise it may be necessary to spray for the second and even third broods. The proper time for later arsenical sprayings must be determined by observation. In Albany and Troy the spraying for the second brood should be done about the latter half of July.

A PALLIATIVE MEASURE

It frequently occurs that for some reason or other spraying with poison is not or can not be resorted to readily. The habits of this insect are such that large numbers can be destroyed at times with little labor, as has been pointed out year after year. It is well to understand that any such measure is not a remedy for the evil in the true sense of the word, it is simply a palliative. Everyone interested in the welfare of their shade trees should at least destroy the thousands of larvae and pupae found on the trunk or around the base of infested elms. If the base of the trees, their surroundings and other adjacent shelters be thoroughly drenched with boiling water, or sprayed with kerosene emulsion, kerosene or similar preparations, thousands of these insects would be killed. As it requires at least five days for the larvae to transform through the pupal stage to beetles, this operation need not be performed more frequently than that, in order to ensure the destruction of all that pupated within reach of such measures. The nearly simultaneous descent of the grubs is very favorable to this method of checking the insect and reduces the necessary labor to a minimum. To make this method more effective, it has been recommended to inclose a limited smooth area, preferably cemented, around each infested tree with boards so arranged as to prevent the larvae escaping to shelters where they could be less easily destroyed. In the case of small trees with relatively smooth bark and no overhanging limbs, such an inclosure might be advisable, but it would hardly pay to treat larger trees thus on account of the large number of larvae pupating in the crevices of the bark or else dropping from the tips of overhanging limbs. The great objection to fighting the insect at this stage is found in the fact that the destruction has already been accomplished, but even this is much better than allowing the insect to go unchecked because it has some influence upon the future abundance of the beetle.

USELESS MEASURES

Although the life-history of this beetle is well known by entomologists at least, it is surprising how people will cling to some false idea, gained they know not where, of the proper method of fighting this or some other insect.

One of the most persistent of these fallacies is that cotton placed around the trunk will protect a tree from the elm-leaf beetle. Under certain conditions a band of cotton, tar or other substance will protect trees from some insects, but never from the elm-leaf beetle. It should be understood that the parent insect flies up into the tree, feeds for a time and then lays the eggs from which the grubs emerge and commence their injurious work. The band can not have the slightest influence in protecting the elm. It is only when the grubs have become full grown that they are found on the trunks and then only for the purpose of seeking shelter on the ground during pupation. If a band of any kind blocks the way to the ground, they may transform on the tree or even in the meshes of the cotton band and fly away later. In case a band of tar is used, some of the grubs will be caught on its surface by accident, but the number will not be large enough to pay for the trouble incurred.

Another so-called remedy for the elm-leaf beetle consists in boring a hole to some depth in the trunk, nearly filling it with sulphur or other preparation and then inserting a plug. This method of treatment or some modification of it, is being brought forward every few years as one of the 'sure cures.' The destruction by the elm-leaf beetle has encouraged at least one unscrupulous firm, known in 1895 as the Elm inoculation company, to advertise some modification of this method as a sure cure for the pest. They treated many elms in Connecticut, 150 for one man in Westchester county, N. Y., charging 50 cents or more per tree. Chemical analysis showed their secret preparation to be nothing of value. This or any similar treatment may well be regarded with suspicious eyes by any would-be investor. It is hardly necessary to add that such a remedy has no basis in scientific fact and any similar recommendations should not be heeded, unless they come through channels whose authenticity can not be doubted.

REMEDIES FOR ASSOCIATED INSECTS

As the elm bark-louse belongs to that large order of insects, the Hemiptera, which take food only by suction through a fine proboscis from the underlying tissues, it is easily seen that a poison applied externally to the tree, as for example paris green, would have no effect on the insect. The best remedy is found in the use of one of the contact insecticides, preferably kerosene emulsion or whale oil soap solution, which should be sprayed on the under surface of infested limbs and foliage, at the time the tender young are appearing. Kerosene emulsion may be prepared by dissolving one half pound of hard soap in one gallon of boiling water and while yet hot add two gallons of kerosene and emulsify thoroughly by passing it rapidly through a force pump until it is white and has a creamy consistency. For the young, one part of this emulsion to ten parts of water should be effective. the whale oil soap solution may be used in the same manner if one pound of the soap be dissolved in four gallons of water. If desired these preparations could be applied in the autumn after the leaves have dropped, but the solutions should be about four times stronger. Small trees may be cleaned by the use of a stiff brush, which might be made more effective by dipping it in one of the above solutions from time to time.

Preventive measures are of much more importance against borers than any remedies that can be applied. The trees should be kept in as vigorous a condition as possible and careful watch maintained for the first signs of boring, which is indicated by the detached grains of wood popularly termed 'sawdust.' When indications of their presence are found the larvae should be dug out if possible. A badly infested tree should be cut down and burned in order to prevent the development of the insects and the adults making their way to other trees.

BIBLIOGRAPHY

The severe ravages of this insect along the Hudson river and in adjacent states, have brought it prominently to the front as a species of considerable economic importance. In a popular bulletin it is impossible to include everything of interest about such an insect and though the bibliography of this species was brought down to date in the recently published *12th report on the injurious and other insects of the state of New York*, it appears desirable to collate these references, with some additions, that they may be easily consulted by students in the future.

Müller, M. Melanges de philosophie et de mathematique. 1760? 3: 187[a].

Linnaeus, C. Systema naturae. 1767. 2: 600, no. 101 (as *Chrysomela calmariensis*).

Fabricius, J. C. Systema entomologiae. 1775. p. 119, no. 4 (as *Crioceris calmariensis*); Species insectorum. 1781. 1: 150, no. 6; Mantissa insectorum. 1787. 1: 87, no. 7; Entomologia systematica. 1792. v. 1, pt 2, p. 23, no. 46 (as *Galeruca calmariensis*).

Schrank, F. P. Enumeratio insectorum Austriae indigenorum. 1781. p. 78 (as *G. xanthomelaena*).

Olivier, A. G. Encyclopedie methodique — Histoire naturelle insect. 1791. 6: 589 (as *G. calmariensis*).

Westwood, J. O. Introduction to modern classification insects. 1839. 1: 382 (destructiveness in Sevres, as *G. calmariensis*).

Harris, T. W. Treatise on insects of New England. 1852. p. 109; Insects injurious to vegetation. Ed. 3. 1862. p. 124 (brief notice, as *G. calmariensis*).

Emmons, E. Natural history of New York–Agriculture. 1854. 4: 134, pl. 12, fig. 12 (as *G. calmariensis*).

Fitch, A. Transactions of N. Y. State agricultural society for 1858. 1859. 18: 842–43; 3d–5th Rep'ts on insects of New York. (5th rep't) 1859. p. 62–63 (brief notice, as *G. calmariensis*).

LeConte, J. L. Academy of natural sciences (Phil.), Proceedings. 1865. p. 218 (features and references, as *G. xanthomelaena*).

---

a Volume and page references are separated by a colon, e. g. 3: 187 means volume 3, page 187.

Glover, T. U. S. Commissioner agriculture——Rep't, 1867. p. 62 (brief reference and fig.); —— 1870. p. 73–74 (as *G. calmariensis*).

Rathvon, S. S. Field and forest. 1876. 9 : 96–98 (ravages at Lancaster, Pa., as *G. xanthomelaena*).

Riley, C. V. U. S. Commissioner agriculture——Rep't, 1878. p. 245 (brief reference); American entomologist. 1880. 3 : 291–92 (natural history, enemies, etc.); U. S. Commissioner agriculture ——Rep't, 1883. p. 159–70, pl. 12, fig. 3 (extended account); —— republished as bulletin 6, U. S. Dep't agriculture, Division entomology. 1885. p. 5–18, fig. 1 and pl. 1; —— Bulletin 10 (see bul. 6). 1887. p. 8–22. figs. 1–6; American agriculturist. July 1891. 50 : 394–95, 1 fig. (general account); Insect life. 1892. 5 : 132, 133 (broods at Washington); Canadian entomologist. 1892. 24 : 282–86 (two or more broods in Washington); Entomological society (Wash.). Proceedings. 1893. 2 : 364 (broods); Science, 8 July, 1892. 20:47 (number of broods); U. S. Secretary agriculture——Rep't, 1892. 1893. p. 166–167, pl. 5 (life-history, parasites, all as *G. xanthomelaena*); U. S. Dep't agriculture, Division entomology. Bulletin 2 (new ser.). 1895. p. 57 (remedies).

Stone, H. B. Country gentleman. 1878. 43 : 71 (brief notice, as *G. calmariensis*).

Fuller, A. S. American entomologist. 1880. 3 : 3 (at Newburg, N. Y., as *G. xanthomelaena*).

Lockwood, S. American naturalist. 1881. 15 : 242–44 (hibernation, as *G. xanthomelaena*); U. S. Dep't agriculture, Division entomology. Bulletin 4. 1884. p. 90 (ravages at Freehold, N. J., as *G. xanthomelaena*).

Packard, A. S. Insects injurious to forest-shade trees. U. S. Entomological commission. Bulletin 7. 1881. p. 64 (brief description, as *G. calmariensis*); U. S. Entomological commission. 5th Rep't. 1890. p. 234–37, fig. 81 (brief account, as *G. xanthomelaena*).

Lintner, J. A. Country gentleman. 1882. 47 : 805; —— 1885. 50 : 841 (remedies, etc.); Canadian entomologist. 1884. 16 : 183 (reference); Country gentleman. 1886. 51 : 409 (bibliography, etc.); —— 1887. 52 : 421, 565, 694 (spraying for); Insects of New York.

4th Rep't. 1888. p. 15-16, 143-44, 161, fig. 59 (extension of range); Country gentleman. 1888. 53: 209, 249 (remedies), p. 366 (from Scarsdale, N.Y.); Insects of New York. 5th Rep't. 1889. p. 234-42, fig. 29 (general account), p. 303, 319, 322 (abstracts), p. 325 (reference); —— 6th Rep't. 1890. p. 118 (reference); Country gentleman. 1890. 55: 644 (brief notice); Insects of New York. 7th Rep't. 1891. p. 217 (spread northward); Country gentleman. 1891. 56: 735 (identified); Insects of New York. 8th Rep't. 1893. p. 222, 223 (destroyed by rains), p. 286 (abstract); —— 9th Rep't. 1893. p. 297 (spread northward), p. 422, 427 (reference); Country gentleman. 1893. 58: 558 (from Britain, Conn., all as *Galeruca xanthomelaena*); —— 1894. 59: 600 (from Montclair, N. J.); Insects of New York. 10th Rep't. 1895. p. 493, 502 (abstracts), p. 511 (reference); Country gentleman. 1895. 60: 568 (remedies, preceding five as *Galerucella xanthomelaena*); U. S. Dep't agriculture, Division entomology. Bulletin 2 (new ser.). 1895. p. 50–56; republished in Insects of New York. 11th Rep't. 1896. p. 102–3, 189-96 (spread and remedies), p. 275, 279 (abstracts), p. 286 (reference); Country gentleman. 1896. 61: 386 (from Gaylordsville, Conn.); Albany evening journal. 24 June, 1896, p. 4 (remedies); Country gentleman. 1897. p. 62: 7 (criticizing erroneous article), p. 390 (remedies), p. 406 (spraying large trees); Argus [Albany], 10 July, 1897, p. 17 (general account); Insects of New York. 12th Rep't. 1897. p. 253-64, fig. 4, pl. 8, fig. 1 (partial bibliography, observations in Albany and Troy).

Van Wagenen, G. H. Canadian entomologist. 1883. 15: 160 (abundance at Cold Spring, N. Y., as *G. xanthomelaena*).

Clarkson, F. Canadian entomologist. 1884. 16: 124-25 (at Flatbush, L. I., as *G. xanthomelaena*).

Dimmock, G. Kingsley's standard natural history. 1884. 2: 316 (its enemies, etc., as *G. xanthomelaena*).

Henshaw, S. List Coleoptera North America. 1885. p. 111, no. 6912; Psyche. 1893. 6: 557 (reference, both as *G. xanthomelaena*).

Cook, A. J. Rural New Yorker. 1886. 45: 577 (general notice, as *G. xanthomelaena*).

Falconer, W. Country gentleman. 1886. 51: 589 (on Long Island, as *G. xanthomelaena*).

Hulst, G. D. N. J. Agricultural experiment station. Bulletin 46. 1888. p. 9 (mention); —— 9th Annual rep't, 1888. 1889. p. 207–9, fig. 3 (brief account, both as *G. xanthomelaena*).

Smith, J. B. Garden and forest. 1889. 20 : 292, figs. 1–3 (number of broods); N. J. Agricultural experiment station. Rep't, 1888. 1889. p. 207–9, fig. 3 (brief account); —— 1889. 1890. p. 273–78 (broods, remedies); —— 1890. 1891. p. 511–12 (note); Canadian entomologist. 1892. 24 : 246–49 (number of broods); Entomological society (Wash.). Proceedings. 1892. 2 : 365 (broods in New Jersey); Entomological news. 1893. 4 : 10 (broods in N. J.); N. J. Agricultural experiment station. Rep't, 1892. 1893. p. 394, 451–55, figs. 25–27 (life-history); —— 1893. 1894. p. 541, fig. 101 (mention); —— Bulletin 103. 1894. p. 1–9, fig. 1 (general account); N. J. Agricultural experiment station. Rep't, 1894. 1895. p. 435, 509–18, figs. 16–19 (general account: all preceding as *G. xanthomelaena*); U. S. Dep't agriculture, Division entomology. Bulletin 2 (new ser.). 1895. p. 15–16, 56–57 (brief notices); Entomological news. 1895. 6 : 292 (spraying at West Point, N. Y.); Entomological society of Ontario. 26th Annual rep't, 1895. 1896. p. 69 (mention); N. J. Agricultural experiment station. Rep't, 1895. 1896. p. 378–85 (remedies, experiment); —— 1896. 1897. p. 441 (note).

Dyar, H. G. Insect life. 1889. 1 : 285 (at Poughkeepsie, as *G. xanthomelaena*).

Barnard, W. S. Entomological society (Wash.). Proceedings. 1890. 1 : 9 (hibernation, as *G. xanthomelaena*).

Perkins, G. H. Vt. Agricultural experiment station. 3d Annual rep't. 1889. 1890. p. 155–56; Vt. State board agriculture. 11th Rep't. 1890. separate, p. 62–66, fig. 48 (brief account, as *G. xanthomelaena*).

Hamilton, J. Psyche. 1891. 6 : 148 (synonymy).

Reitter, E. Catalogus Coleopterorum Europae, Caucasi, Armeniae rossicae. 1891. p. 375 (synonymy).

Weed, C. M. N. H. Agricultural experiment station. 3d–4th Rep'ts. 1892. p. 257–59 (brief account, as *G. xanthomelaena*).

Beckwith, M. H. Del. Agricultural experiment station. 6th Annual rep't. 1893. p. 166–67 (brief notice, as *G. xanthomelaena*).

Bruner, L. Nebr. State horticultural society. Annual rep't. 1893. p. 204–5, fig. 45 (brief notice, as *G. xanthomelaena*).

Slingerland, M. V. Cornell agricultural experiment station. Bulletin 50. 1893. p. 9 (number of broods, as *G. xanthomelaena*).

Atwater, W. O. Storrs agricultural experiment station. Bulletin 14. 1895. p. 1–8, 1 fig. (general account, as *G. xanthomelaena*).

Carman, E. S. Rural New Yorker. 1895. 54: 646, fig. 205 (brief account from Connecticut bulletin 121); —— 1896. 55: 500 (value of spraying).

Chittenden, F. H. Insect life. 1895. 7: 419 (synonymy); U. S. Dep't agriculture, Division entomology. Bulletin 9 (new ser.). 1897. p. 67 (mention).

Fernald, C. H. U. S. Dep't agriculture, Division entomology Bulletin 2 (new ser.), 1895. p. 58. (at Amherst, Mass.); Mass. agricultural college. 34th Rep't. 1897. p. 186 (mention).

Howard, L. O. Entomological society (Wash.). Proceedings. 1895. 3: 223–24 (distribution, as *G. xanthomelaena*); U. S. Dep't agriculture, Division entomology. Bulletin 2 (new ser.). 1895. p. 40–45, 56, 57 (spread, injuries and remedies); —— Bulletin 6 (new ser.). 1896. p. 36–38 (remedies); U. S. Dep't agriculture, Year book, 1895. 1896. p. 363–68, fig. 85 (general account); —— 1896. 1897. p. 69–88 (power sprayers for elm-leaf beetle and others); American association for advancement of science. Proceedings. 1897. (separate) 46: 15.

Marlatt, C. L. U. S. Dep't agriculture, Division entomology. Circular 8 (2d ser.). 1895. p. 1–4, fig 1 (general account); U. S. Dep't agriculture, Division Entomology. Bulletin 2 (new ser.). 1895. p. 47–50, 58 (work in Washington).

Britton, W. E. Conn. Agricultural experiment station. 19th Annual rep't, 1895. 1896. p. 208–13, 1 fig., 1 pl. (remedies, as *G. xanthomelaena*); Garden and forest. 1897. 10: 326–27 (injuries and remedies, in Conn.).

S. A. Garden and forest. 1895. 8: 346–47 (method of treating).

Schiedt, R. C. Pa. State board agriculture. Rep't, 1894. 1895. p. 190 (injuries, as *G. xanthomelaena*).

Southwick, E. B. U. S. Dep't agriculture, Division Entomology. Bulletin 2 (new ser.). 1895. p. 56 (brief mention).

Sturgis-Britton ?. Conn. Agricultural experiment station. Bulletin 121. 1896. p. 3–6, 1 fig. (brief mention, as *G. xanthomelaena*).

Taft-Davis. Mich. Agricultural experiment station. Bulletin 121. 1895. p. 9 (mention, as *G. xanthomelaena*).

Webster, F. M. U. S. Dep't agriculture, Division entomology. Bulletin 2 (new ser.). 1895. p. 58 (north of Salem, Mass.).

Weigel, W. Entomological news. 1895. 6 : 292–93 (report on spraying at West Point, N. Y.).

Cooley, R. A. Hatch experiment station, Mass. Agricultural college. Bulletin 36. 1896. p. 3–7, fig. 1 (brief account).

Johnson, W. G. U. S. Dep't agriculture, Division entomology. Bulletin 6 (new ser.). 1896. p. 66 (injuries and remedies).

Maynard, W. Country gentleman. 1896. 61 : 1003 (a mass of errors).

Sargent, C. S. Garden and forest. 1896. 9 : 199, 217–18 (remedies); —— 1897. 10 : 326–27 (apparatus).

Wickham, H. F. Canadian entomologist. 1897. 29 : 7 (unknown in Canada, as *G. xanthomelaena*).

Felt, E. P. Troy daily times. 7 Apr., 1898 (prospects for 1898, remedies); —— 25 Apr., 1898 (necessity of prompt action, remedies); Argus, [Albany] 15 May, 1898, p. 7 (futility of cotton bands); Country gentleman. 1898. 68 : 513 (brief general account).

EXPLANATION OF PLATES

Plate 1

Fig. 1 Elm leaves showing eggs and work of young larvae.
Fig. 2 Elm-leaf beetle (x2).
Fig. 3 Vertical and lateral view of eggs, very much enlarged.
Fig. 4 Young larva, very much enlarged.
Fig. 5 Full grown larva (x5).

Plate 1a

Fig. 1 Foliage of European elm showing method of work of beetle and larva — natural size.
Fig. 2 Adult beetle.
Fig. 3 Egg mass.
Fig. 4 Young larva.
Fig. 5 Full-grown larva.
Fig. 6 Mouth parts of full-grown larva.
Fig. 7 Pupa.

Plate 2

Work of elm-leaf beetle on Elm street, Albany, taken 15 June, 1898.

Plate 3

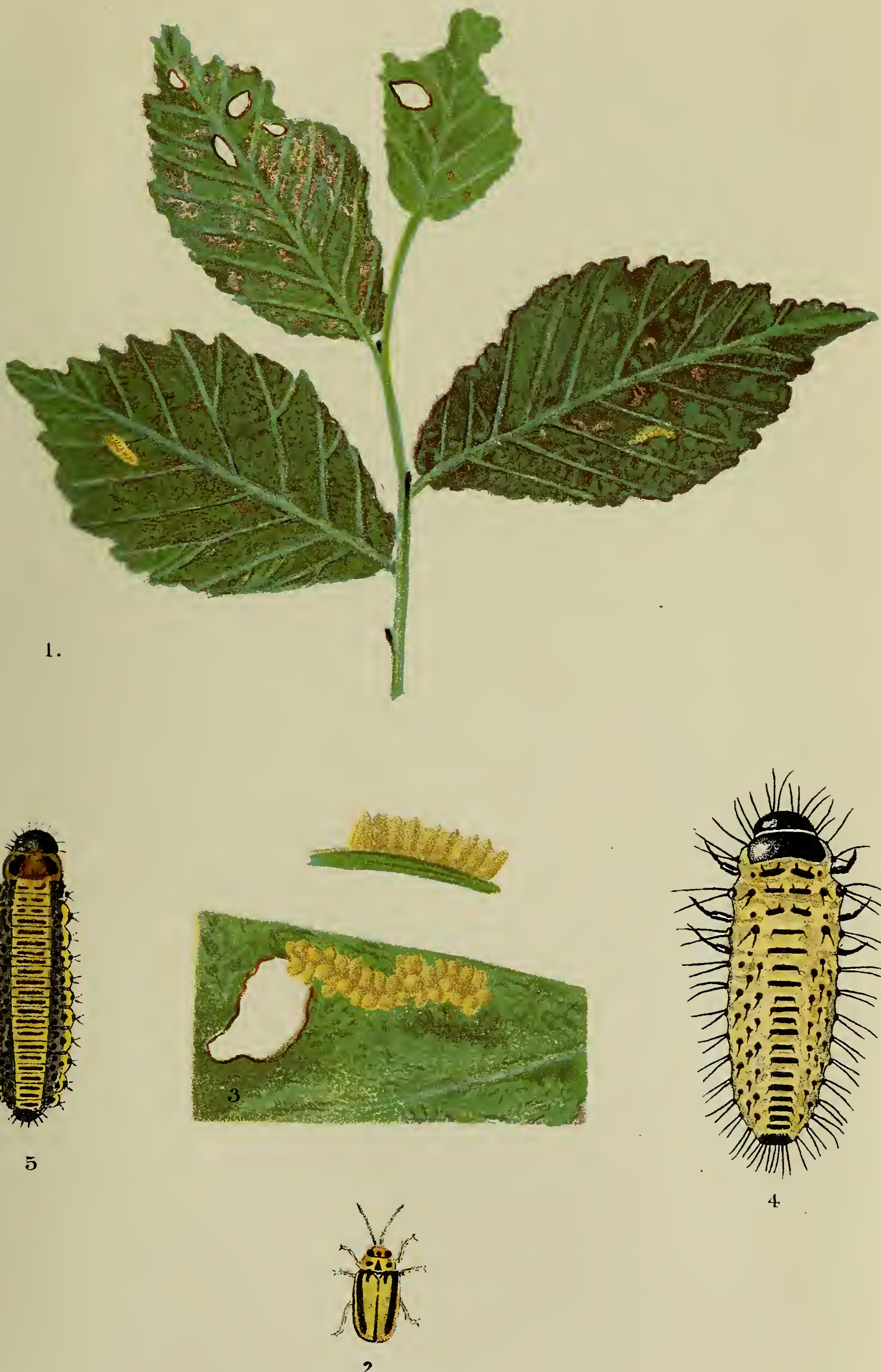
Work of elm-leaf beetle on Jacob street, Troy, taken 15 June, 1898.

Plate 4

Power spraying outfit at work in Albany, taken 15 June, 1898.

Plate 5

Hand spraying outfit at work in Albany, taken 15 June, 1898.



Elm-Leaf Beetle.

ELM-LEAF BEETLE
(After Howard [Division Entomology], U. S. Department Agriculture, Year book, 1895)

Work of elm-leaf beetle on Elm street, Albany

Work of elm-leaf beetle on Jacob street, Troy

Plate 4

Power spraying outfit in operation

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Hedgehog Mt
Rooster Comb
Big Slide Mt
McIntyre Mt
Mt Colden
Mt Marcy
Mt Skylight
Mt Haystack
Gothic Mt
Saddleback Mt
Dix Mt
Nipple Top
Giant Mt
Contour Interval 20 feet

University of the State of New York

BULLETIN

OF THE

New York State Museum

VOL. 5 No. 21

SEPTEMBER 1898

GEOLOGY

OF THE

LAKE PLACID REGION

BY

JAMES FURMAN KEMP, E. M.

prepared with the permission of Prof. James Hall, State Geologist, and Charles D. Wolcott, Director U. S. Geological survey

CONTENTS

GEOLOGY OF THE LAKE PLACID REGION

INTRODUCTION

The following outline of the geology of the region about Lake Placid has been prepared from notes which were taken while the writer was in the field, first under the direction of Prof. James Hall, state geologist and later under that of Dr Charles D. Walcott, director of the United States geological survey. Acknowledgments are due both these gentlemen for permission to use the observations.

It has been the writer's aim to give an observer, and specially a teacher who might be sojourning in the region, a grasp of its larger geologic features, and to suggest the topics in regard to which our present knowledge needs amplification. The writer's attention has been thus far chiefly centered on the hard crystalline rocks as distinguished from the incoherent sands, gravels and moraines that rest on them. Much remains to be done in the study of these last named, for they give the clue to the recent geologic history of the valley and by a careful study of them and by distinguishing moraines, deltas, abandoned lake bottoms and their respective altitudes some interesting problems in geographic geology may be solved.

GEOGRAPHIC OUTLINE

If an observer stands on an elevated point near Lake Placid, with the relief map which will be found opposite p. 62 in hand he will note that the region about him lies to the northwest of the great central group of peaks, which constitutes the backbone of the Adirondacks. The Gothics, Marcy, McIntyre and their neighbors form the southeastern sky line and a broad, open valley lies between their foothills and the lake itself. Whiteface, one of the highest peaks bounds the lake on the north and with its spurs incloses the valley in this direction. Beyond Whiteface, the mountains decrease rapidly in size, and although for many miles the country is wild and rugged, the altitudes gradually decline to the plain that forms the south bank of the

St Lawrence river. The eastern side of the Lake Placid valley is chiefly formed by the fine massif of Sentinel mountain, whose northwestern spur is cleft from Mt Whiteface by the Wilmington Notch, and whose southern is similarly separated from Pitchoff mountain by the narrow pass through which runs the old but now abandoned road to the Keene valley. Pitchoff is in turn split off from Cascade and Porter mountains by the Cascadeville Notch, likewise a precipitous pass. It may be farther remarked that if one goes out to the south one must take the trail through Avalanch pass, another narrow cleft in the mountains, or else the still more famous Indian pass, which lies on the west side of Mt McIntyre, and which is in many respects the most impressive of all the Adirondack passes.

To the west the country is more open, and in driving to Saranac, a broader valley with much lower hills surrounding it is met. The present lack of topographic maps of this section has prevented its accurate study as yet, although its character can readily be seen by a drive or a walk.

The drainage of the Lake Placid valley passes out through the west branch of the Ausable river and enters Lake Champlain through the famous Ausable chasm, just north of Port Kent. The valley lies therefore in the St Lawrence drainage basin, but is near its southern limit. The headwaters of the Hudson are in Avalanch pass a few miles to the south.

In its smaller features the valley south of Lake Placid is to a great degree a plain of sand and gravel, now quite deeply dissected by the various streams which cut across it. Flat-topped hillocks, the stumps of the former general level remain and enable one to fill out its former conditions. Occasional moraines of sand and boulders, such as the one on which the Lake Placid hotels are built, diversify the surface, but the general aspect is that of a plain, whose relief is due to erosion.

The altitude of the lake above tide is 1864 feet. The West Branch at the High Fall is 1300 feet and at Wilmington village 1000, so that the rapid fall of the river explains the great amount of erosion that has been accomplished. The altitudes of the several peaks in the immediate vicinity are as follows: Whiteface, 4872; Sentinel, 3858; Pitchoff, 3450; Cascade, 4092; Porter, 4070. Mt McIntyre, at 5112, can be reached and ascended in a day, and is second only to Mt Marcy at 5344. Of all the Adirondack peaks, these two alone, McIntyre and Marcy, exceed 5000 feet but several others approximate it closely.

Of the minor elevations near the lake, Eagle Eyrie is 2656, Pulpit mountain 2658, the two being practically the same, and Cobble hill is 2330.

ROCKS

The rocks proper, which include the 'hard' formations as contrasted with the incoherent sands and gravel, may be classified into 1) crystalline limestone, 2) quartzite, 3) granite, 4) gneiss, 5) anorthosites or the rocks consisting chiefly of labradorite feldspar, 6) trap dikes. If we add the incoherent sands and gravels, there are, 7) moraines of unsorted sands and boulders, large and small being commingled, and 8) water-sorted sands and gravels, forming abandoned lake bottoms and deltas now more or less modified by erosion both by wind and water.

Crystalline limestone. This rock is not in large amount but it is extremely significant in its geologic relations. Reference to the geologic map (cover p. 2) will indicate its presence in only one place so far as known in the town of North Elba and that is near the trail that leaves the Wilmington road at the house of Mr Watson. A small area outcrops in the bottom of a brook. In the valley of the east branch of the Ausable river, one outcrop occurs in the town of Jay. There are at least six or seven in Keene. The limestone is always a coarsely crystalline variety, and is formed of rather large individuals of calcite, through which smaller crystals of pyroxene, of the variety coccolite, are richly distributed in practically all cases. Graphite is often present and dark bunches of varying size consisting of black hornblende, quartz, pyrrhotite, feldspar and some rarer minerals are frequent. Traces of bedding have been destroyed and although the limestone shows as a rule a banded character, this is the result of pressure exerted during its metamorphism. The invariable presence of the pyroxene and other silicates leads us to infer that the original limestone was an impure siliceous variety, and when metamorphism affected it, the silica, lime, magnesia and iron present, became combined in the included minerals. The limestones furnish the only localities attractive to the collector of minerals and some advice regarding them is given later under the head of mineralogy (p. 63). In fact loose bunches of pyroxene crystals, garnets and other characteristic aggregates and masses of black hornblende often remind us when doing field work that limestones must be near before the actual outcrop is discovered.

Quartzite. In two or more localities small outcrops have been met of a rock that seems to be excessively altered sandstone. One is on the old road from North Elba to Keene, and is in Keene township; the other is at the Red Rocks on the east side of the Keene valley. Additional ones of small size are met in a minor degree associated with the limestones of the Keene-Jay valley. The rock appears to the unaided eye to be an aggregate of little else than quartz grains through which flakes of graphite may occasionally be detected. When cut in thin section the rock from the old Keene road shows much emerald green pyroxene, and a little scapolite. All the minerals are strained and fractured and have clearly been subjected to great pressure. The outcrops in the two localities specially cited are in or near steep precipitous cliffs, that have been produced by faults.

The quartzites were doubtless originally sandstones that had sometimes carbonaceous matter, and sometimes lime, magnesia, iron and alumnia, sufficient in amount to yield the accessory minerals. Along the old Keene road the quartzite passes almost imperceptibly into a gneiss, that may itself be an altered sediment.

Granite. In four localities a rock has been met that corresponds to granite. One is on the steep sides of a spur of Mt Whiteface along the trail from the north end of Lake Placid to Franklin Falls. Another is at the High Falls in Wilmington Notch in the bed of the stream. A third is in a hill a mile east of Scotts Cobble, and the fourth is in the bed of the East Branch at the cascade between Keene Center and the iron bridge a mile and a half south. In each case the rock is chiefly quartz and feldspar, in a coarsely crystalline aggregate. In thin section the quartz is found to be much strained from geologic movements, and the feldspar is the variety microperthite, being an orthoclase thickly set with little spindles of albite.

The three rocks above referred to, and the trap dikes to be later described are minor rock formations, nearly all the country being made up of the two that follow next.

Gneiss. Under this comprehensive name is included a considerable variety of rocks, all of which have however the distinguishing feature of 'gneiss' in strong development. That is, the light and dark minerals are arranged in rudely parallel bands so as to give a foliated or laminated aspect to the rock. The banding varies from coarse to fine, and is produced by innumerable flattened lenses of minerals, strung out with their long diameters parallel. The bands curve and eddy at times and strongly simulate the phenomena produced by the flow of a ropy or viscous fluid.

The commonest gneiss is a dark, and more or less rusty rock, with abundance of black minerals, set in a brown or green mass of feldspar. When a fresh exposure is produced either by pounding to the core of a large fragment or in blasting boulders and ledges for the improvement of highways, it is seen that the rock is a pronounced green. Red garnets are frequently quite prominent in it. In thin sections this variety is found to be chiefly composed of microperthitic feldspar and emerald green pyroxene. With these in places here and there are varying amounts of hornblende, hypersthene, quartz, garnet, magnetite apatite and zircon. When the quartz is abundant, varieties high in silica result; when it and the feldspar are in less amount, dark pyroxenic and hornblendic varieties occur in consequence.

In some gneisses large blue labradorites are quite prominent, but always in rudely lenticular form, giving the general impression of an eye, around which the dark minerals are ranged like eyelashes and eyebrows. For this reason it is customary to describe the labradorites as 'Augen' using the German word for eyes. They indicate relationships with the anorthosites, the next group of rocks.

The obscure geologic questions that arise in connection with the gneisses are those which deal with their original condition and the changes through which they have passed to reach their present condition. The gneisses are essentially 'metamorphic' rocks, and the term means that by recrystallization or by compression, crushing and consequent internal movements, or by both combined, they have been produced from sediments or from igneous rocks. It was formerly believed that the foliation represented the bedding of sediments, but it seems now more reasonable to regard it as the result of pressure and of a movement analogous to a viscous flow, that has strung out the minerals in lines. It is quite probable that some of the gneisses and specially those associated with the limestones and quartzites are altered sediments, and it is also probable that those with the labradorite augen are squeezed igneous rocks, but our investigations do not yet admit of their separation in mapping.

The gneisses are colored brown on the map, by reference to which it will be seen that they bound Lake Placid on the east and appear to some extent in the islands on the east side. Excellent exposures with pronounced foliation will be found in the cliffs of Pulpit mountain, on Eagle Eyrie and in Sunrise Notch. Along the West Branch they are the country rock. Pitchoff mountain and the southwest portions of Sentinel are composed of them and the ledges on the East Branch in Jay and northern Keene are the same. The boundaries between them and the anorthosites are not sharp and passage forms are met so that the areal distribution on the contacts is approximate. Repeated experience has, however, indicated both to the writer in Essex county, and to H. P. Cushing in Franklin county that dark gneisses with labradorite augen, often surround areas of anorthosite and that the transition from one to the other is a gradual one.

Anorthosites. The anorthosites may be considered to be the characteristic rocks of the Adirondacks. In their typical cases they consist of little else than blue labradorite and are then a most beautiful rock. A little pyroxene, mostly augite, appears as a rule, and hypersthene is frequent. The presence of the latter led Prof. Emmons in the early work of the New York state survey to call them hypersthene rock, or hypersthene, but this mineral is a subordinate one. Labradorite is the great component and the rocks might be fittingly described as 'labradorite rocks', following a custom prevalent in Norway, but in English the term is not a good rock name. They are sometimes described as norite meaning a rock composed of labradorite and hypersthene, but experience has indicated the scarcity of hypersthene, and here the word anorthosite is employed, which means a rock chiefly composed of plagioclase feldspar. The rocks resemble a coarse granite, the individual crystals being sometimes very large.

The typical anorthosites grade into varieties with more and more dark silicates and some of the areas colored red on the map have large and prominent amounts of them. These darker pyroxenic and hornblendic rocks are not anorthosites, strictly speaking but are gabbros and diorites; nevertheless the anorthosite is the prominent and characteristic variety and is here used with that understanding. The summit of Mt Whiteface and the southern portion of the mountain consists of a variety that contains large amounts of hornblende and pyroxene, together with milky white feldspar. It is so peculiar that we have been accustomed in the field to refer to it as the Whiteface type of rock. It is characteristic of this mountain ridge. Despite the peculiarities of the rock, it belongs beyond question in the anorthosite series, and is closely involved with typical anorthosites. The latter are found all around the base of the mountain toward Wilmington and on the trail from Wilmington village, to the summit, that passes over Marble mountain, typical anorthosites appear till the peak is nearly reached.

The anorthosites have not escaped the general results of squeezing and crushing that are so strongly shown by the gneisses. On the contrary the feldspar crystals in the area of the map are seldom if ever provided with sharp edges. A blue crystalline nucleus is surrounded by a crushed white pulp of comminuted feldspar, phenomena that will forcibly appeal to an observer as having been produced by pressure on a grand scale. They are also drawn out into gneissoid foliation in many instances, but this structure is not specially marked because of the lack of dark minerals, which accentuate it by contrast with the feldspar. Often a narrow rim of pink garnets will be noticed surrounding such dark silicates as appear in the anorthosite.

The anorthosites in typical development will be found on the west side of Lake Placid, and specially on the hilltop back of the Whiteface Inn. As the Whiteface type they constitute the peak of the same name. They bound the Wilmington valley so far as here mapped, and make up all the central part of the Sentinel range. To the south they become the prevailing rock and beyond the area of the map they form all the high peaks around Mt Marcy.

Trap dikes. The trap dikes constitute minor but striking members in the geology of the region. They are not numerous so far as known within the area of the map. They have been met almost always throughout the mountains, where some great fault line has formed a line of weakness, up through which they have found an outlet from the reservoirs of molten rock in the interior. They are all black basalt and in thin section are shown by the microscope to contain plagioclase feldspar and augite, as the most abundant minerals. Magnetite, apatite and sometimes brown hornblende are also present, and more or less glass.

A dike occurs about a mile north of Eagle Eyrie. A ramifying and very instructive network of them is well exposed at the High Fall in Wilmington Notch. Others were noted in the limestone area a mile or so south of the Notch proper. They occur northwest of Clifford Falls on the east slope of Sentinel. In the Cascade Notch, immediately opposite the hotel and beneath the 'cascade' there is another network of them, and still another in the gorge of the East Branch a mile south of Keene Center. No doubt additional ones will be discovered by observation of the brook bottoms and the writer would be glad to be informed of any that may be met.

Moraines. The moraines of unsorted sand and boulders are the most striking evidence of the glacial period. They meet the eye of the visitor immediately on reaching Lake Placid, because the town is built upon a ridge formed of them. Huge boulders project from the sides of cuttings wherever the highways have been graded. This commingling of large rocks and fine sands will appeal even to the unscientific observer as only to be explained by the work of ice. This particular moraine is an important one because Lake Placid is the result of it. Like a great dam the glacial drift confines the water to the valley between the hills, while Mirror lake is in a depression in the dam itself.

Other moraines are not lacking in the region but as our observations are as yet too incomplete to accurately map them no distinction is made on the map. Some minor points of interest may however be mentioned. In the pass toward French's at the north end of Lake Placid, and beyond Eagle Eyrie, there is a huge boulder that is 25 x 20 x 15 feet, as determined by pacing. It stands by itself in the forest. Others of notable size are abundant on the hillsides south of Keene Center. The boulder at John Brown's grave is one of the sights familiar to the Lake Placid summer visitor.

The boulders in the moraines are chiefly the hard crystalline rocks already described. Occasionally one finds a fragment of Potsdam sandstone, that must have journeyed in from many miles to the north.

Water-sorted sands and gravels. These consist of pebbles and sand in a more or less clearly stratified condition. They tend specially to form level plains and fan shaped terraces. The plains appear to be abandoned lake bottoms, while the terraces are the deltas which entering streams built up in the former lakes. The deltas occur opposite the tributary valleys and specially in the Keene valley, two or three distinct sets can be recognized. Similar phenomena on a small scale can be recognized in the present lakes.

The open valley south of Lake Placid gives much evidence of having once been a lake whose waters were held in, perhaps by an ice wall to the north. As earlier stated the stumps of the sandy plain, and the deltas need to be correlated as regards altitudes before we can be sure of the conditions surrounding the former lake. The valley in which the town of Wilmington lies is a striking case of a lake basin, and not less significant are the lake bottoms and deltas in the Keene valley and in the Elizabethtown valley. The latter is almost diagrammatic.

Geologic age. The hard crystalline rocks are of pre-Cambrian age, with the possible exception of the trap dikes. If the word archean is used in the original sense as proposed by the late Prof. Dana, for the formations that precede the fossiliferous strata, then the Lake Placid crystallines are archean. But if, as has been more recently proposed by the United States geological survey, the name archean is restricted to those ancient rocks that antedate all sediments, then the local formations must be called Algonkian, a name that applies to pre-Cambrian rocks that are sedimentary, or, if igneous, that are later than known sediments.

The name Laurentian has been widely employed for the ancient crystalline rocks in the text-books on geology, and as it was originally used in Canada for rocks geographically and geologically related to those under consideration here, it may be referred to. The Canadian geologists introduced the name Laurentian for the oldest crystalline rocks of the globe, and set off from them under the name Huronian, the metamorphosed sediments and igneous rocks that rest upon the Laurentian around Lakes Superior and Huron. With the exception of the trap dikes, the Lake Placid rocks are all Laurentian, but no Huronian rocks are known in the region.

Fairly extended observation throughout the Adirondacks has led to the conclusion that the limestones, quartzites and probably some of the gneisses are the oldest rocks present. They represent the remnants of a once extended series that formed all the country. They have been invaded and broken up into small detached areas by the igneous anorthosites. The intrusions took place at quite profound depths in the earth, because the anorthosites have all the characteristics of rocks that have cooled and crystallized under pressure and slowly. The limestones were much affected by the neighboring masses of igneous rock and may owe to their influence the great numbers of included pyroxenes and other silicates.

Many facts otherwise inexplicable are accounted for by this conception, as for instance the presence opposite Cascadeville of a small mass of limestone, a sedimentary rock, in a great mountain of anorthosite, an igneous one. The limestone on the northwestern extremity of Pitchoff is a still more striking case, while fragments of quartzite have been found in the anorthosites of the high peaks, as for instance on the summit of the Gothics. The exact relations of the granites to the anorthosites in time, are uncertain, but the granites are probably later.

After the intrusion of the anorthosites great metamorphism ensued, that crushed the component minerals and produced much gneissoid foliation. The rocks were apparently under such compression and strain, that they flowed like a viscous fluid, and the minerals became strung out in linear arrangement. It all occurred however before the deposition of the Potsdam sandstone, because we find the latter to the north and east resting unchanged on the older metamorphic rocks.

The trap dikes were certainly intruded after the metamorphism, for they show no evidence of having been squeezed or sheared. In the region to the north, H. P. Cushing has found dikes that cut the old crystallines, but stop at the Potsdam, and do not penetrate it. He therefore has concluded that they were intruded before the Potsdam was deposited. The writer has found others in the Lake Champlain region that pierce strata even as late as the Utica slate. Clearly therefore two series are present in the mountains, but to which of the two the dikes around Lake Placid belong, we can not say from the local evidence.

As to what took place in this region in the long interval of time represented by the paleozoic and mesozoic eras and the tertiary period, we can but imagine and most imperfectly. Whether the mountains were leveled off, submerged and buried under strata that have since been removed, or whether they were a land area, that suffered great denudation and furnished material for later sediments, we have slight means of knowing. For the later paleozoic and for the mesozoic and tertiary the latter supposition is the more reasonable. Careful study of the physiography may throw some light on the tertiary or even on the later mesozoic times, if remnants of old drainage systems can be made out. Presumably their outlines were not so very different from the present ones.

At some time in this interval the great faults were developed that have served to block out the individual mountains and valleys and that are the primary causes of the relief and of the present drainage. The crushing of the rocks from the faulting gave the rivers their easiest lines of erosion. This inference is corroborated by the cracked and jointed condition of the rocks in the channels, where exposed, and by the steep, precipitous cliffs in the passes, which are due to the scaling off of platy masses along the old lines of fracture. These movements may have occurred in quite recent geologic time, but in no case have we found faulted glacial deposits.

With the opening of the quaternary period came the invasion of the continental glacier and the production of the moraines, boulders and beautiful glacial amphitheaters or cirques on the slopes of Whiteface and Sentinel. The boulders of Potsdam sandstone indicate a movement from the northeast, and the few glacial striae that have been met corroborate the inference. They are not common in the area of the map and should be looked for with care and their directions should be taken with a compass.

The configuration of the mountain slopes is strikingly characteristic of ice action, and if the reader will observe on the relief


Wilmington
Mt. Whiteface
AUSABLE RIVER
BRANCH
Eagle Eyrie
Undercliff
Hawk Id
Moose Id
LAKE PLACID
Buck Id
Long Pond
Sunrise Notch
Wilmington Notch
SENTINEL RANGE
Sentinel Peak
Clifford Brook
Clifford Falls
Malcom Pond
Mud Pond
Newman
North Elba
Scotts Cobble
Round Lake
Pitchoff Mt
Cascade Lakes
Cascade Mt
Porter Mt
Keene
Owls Head
EAST BRANCH AUSABLE
Upper Jay
Ebenezer Mt
Styles Brook
East Hill
Baxter Mt

map, opposite p. 62, the eastern front of Whiteface for example, he will be impressed with the amphitheaters, setting back against precipitous walls, that are everywhere present. The same is true of Sentinel mountain about the headwaters of Clifford brook. Ice appears to have stood in these recesses and to have worked the sides back to the comparatively steep walls which confront us to-day. The open space or 'bergschrund', that usually intervenes as a huge crack between the ice of a glacier and its inclosing wall, is a place of specially active disintegration of rock. The thaw by day is succeeded by freezing during the night and the walls scale off to a fairly vertical condition with exceptional rapidity. An amphitheater with steep walls results, which is a favorite form for the Adirondacks, being well shown on Giant, on the Gothics and not a few other peaks.

The melting of the ice sheet and its retreat, the temporary blocking of lines of drainage and perhaps general submergence of the region led to the production of lake basins, with their attendant deltas and sand plains, now a most suggestive feature of the landscape, but observations, as already stated, have not yet been made in sufficient detail to work out their number, succession and relative altitudes.

MINERALOGY

The larger formations present little that is attractive to the collector of minerals. The labradorite crystals of the anorthosites occasionally reach such dimensions and perfection of development as to exhibit the characteristic twinning striations on cleavage faces. Rarely they show the characteristic play of colors of the labradorite from eastern Canada.

The included masses of limestone are much more prolific. At Cascadeville beautiful light green coccolite is distributed through white calcite. Small dark brown or black garnets are associated, but neither the garnet nor the pyroxene possesses good crystal boundaries, as the individuals have the rounded or corroded aspect, so often seen on minerals contained in limestone.

In earlier notices of this locality zircon and vesuvianite are mentioned but the writer has been unable to find them. Magnetite with included pyrites is available near the Cascade.

At the Weston mine in Keene, magnetite, yellow and brown garnets and pyroxene are quite abundant but the forms are rude in outline. In limestone areas outside the limits of the map, good crystals of pyroxene, titanite, hornblende and quartz can sometimes be freed by acid from the inclosing calcite. They are found in the bunches of silicates that are included in the limestone even up to large size. Calcite and pyrite have also been seen. They may all be found in the future in the outlying areas of limestone shown on the map, and to these a collector may most profitably direct his search.

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University of the State of New York

BULLETIN

OF THE

New York State Museum

VOL. 5 No. 22

OCTOBER 1898

EARTHENWARE

OF THE

NEW YORK ABORIGINES

PREPARED BY

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ALBANY

UNIVERSITY OF THE STATE OF NEW YORK

1898

CONTENTS

INTRODUCTION

The reception accorded the archeologic bulletins already issued is most gratifying to all concerned. Since their inception there have been bought and placed on exhibition in the corridors of the state capitol and in the state library several collections, including articles of much more than a commercial value gathered in their respective fields by enthusiasts in local work. They will be sought and studied by many interested in early New York history. Besides those which are the results of field work, the state is fortunate in its collection of Indian silver brooches, and of the grotesque wooden masks, still used by the Iroquois yet living among us. It is yet more fortunate in having the University appointed keeper of the wampums for the Six Nations of New York. In this way only was it possible to obtain and to save from swift destruction the unique wampum belts now on exhibition, the widest on record.

It was greatly desired that the Rev. W: M. Beauchamp who prepared the present and the preceding bulletins, should give his whole time to the preparation of others while there was opportunity, but the moderate means provided allowed but moderate work, and there must be a waiting for results which might be secured now. Three important subjects, however, have been covered in this preliminary way. Should the series be carried on as hoped, there will come one interruption not unwelcome to many, in preparing an archeologic map of New York, which it has been decided shall constitute the next bulletin. The regular bulletin size will admit less detail than is desirable. Some of the 60 counties have scores of sites, earthworks, hamlets and camps; but not much can be said on each of these for lack of room. Other counties, however, have little of interest, allowing more space. The many plans of forts which have been secured, will probably be made a separate subject. While Dr Beauchamp has a large amount of material ready for this work, he desires the fullest that may be procured, and will be grateful, in the interests of science and the state, for any information from any source. This should be sent as soon as may be convenient, addressed Rev. W: M. Beauchamp, Baldwinsville, N. Y. What is not directly used now will be reserved for future needs.

MELVIL DEWEY

Secretary of the University

EARTHENWARE OF THE NEW YORK ABORIGINES

The art of making vessels or ornaments of baked clay dates from a remote antiquity. The material is so easily molded that it was probably used without baking at an even earlier day. Sun-dried bricks and vessels are frequent in lands where they could advantageously be employed, and the great advantage of burning these may have been accidentally discovered in many places far apart. Without discussing this history, it may be observed that a strong resemblance has been noted between the rude pottery of this part of our land and the early ware of Scandinavian, Celtic and Teutonic peoples. Not alone does this appear in general form, material and ornament, but in the remarkable feature of the dark hue within and the comparative brightness of the exterior.

In aboriginal New York earthenware we can make but three great divisions, the third of which is of small importance. First are those useful vessels whose fragments abound in many fields, but which are now so rare in their complete form. Then we have that remarkable class which gives us our best ideas of aboriginal plastic art, and sometimes even more, the bold or graceful pipes which the natives smoked in days of peace. The third class includes articles of a miscellaneous character, ornamental or useful, as well as some employed in games. These are few in number, and yet have importance in a limited way.

As a rule, vessels of stone or of bark preceded earthenware in New York, the latter being in general use only in recent times. Those of bark have left no trace, but we may sometimes infer their use on sites where nothing else is to be found. Potstone or steatite is not rare in many places, but is usually absent from those where earthenware occurs. The latter was universal among the Iroquois family, and was largely employed by many of the Algonquins.

Going yet farther north we find that the Eskimos still use potstone vessels, much like those whose fragments are found beside our rivers. They have never acquired the art of making earthen pottery, nor have the wandering tribes in the north of Canada ever done so. In fact, the Canadian Indians do not appear to have used earthenware in early days, with the exception of the allied Hurons and Petuns, the Neutrals and the Iroquois of the St Lawrence, all of these being of one family. At Hochelaga or Montreal, the primitive Mohawks made the same types of vessels and pipes before their flight, that they afterwards did in New York. Similar forms appear in the earthworks north of the St Lawrence, and not far from Prescott. The nomadic tribes, however, preferred vessels of bark, easily carried but not easily broken. In these they heated water with hot stones, as the Iroquois may sometimes have done. Mr Frank H. Cushing suggests that the angular forms of many Iroquois vessels may have come from the bark originals of their earlier days. Even now they make many large and convenient vessels of bark, which may be seen in their New York homes.

In his paper on *Ancient pottery of the Mississippi valley*, Mr W. H. Holmes easily distinguished three great groups in the region lying around that river, with earthenware differing in form and ornaments. In speaking of these groups he said, 'The ware of the north is wholly distinct, and need never be confounded with the other groups.' In that valley he placed this group from Iowa inclusive, northward. He said also, and our experience confirms this, that the pottery of Manitoba 'has decided relationships with the ware of the eastern and northeastern states.' The nations in this northern group made a dark paste, tempered with sand, often granitic, and the forms were simple, the ornaments being unlike those of the south. This ornamentation 'consists of cord impressions, incised lines, and implement indentations, arranged in figures peculiar to the district.' This is so marked as to suggest a community of origin. In the paper mentioned, a vessel from Wisconsin is like frequent forms in New York. Pottery found in Pennsylvania and New Jersey has similar forms and ornaments of the simpler kinds, and this is true of a few examples farther south. Even the Pueblos afford fragments with the incised lines and patterns found here, but these are not the prevailing style.

The fineness of the work may depend much on the material, and this varies greatly. That of the southwest is usually finer than in New York, but in many cases here this was selected with care. Mr S. L. Frey, writing in 1885 of an early Mohawk fort in Fulton county, said, 'The pits from which the clay was taken are at the foot of the hill on which the village stood; they are abundant all along a little stream that trickles over the huge boulders and logs, and through a tangle of ferns and wild growths of all kinds. The holes were sunk through the upper soil to a bed of stiff, tenacious clay, which overlies the Utica slate at that point.' We recall no other place where such pits have been observed, but very fine clay was used for many vessels and pipes, some of which have a surface which seems almost polished. The material itself was carefully prepared.

In both pipes and vessels may be found frequent means of identifying or connecting one place or age with another, and we give a simple illustration. Figures of some New York pipes were sent to Mr Francis Parkman in 1884, on account of his mere description of the Huron pipes of Canada. In reply he said, 'Two or three of these have almost exact counterparts in the pipes of Hochelaga, preserved in the museum of McGill college at Montreal. Some I very carelessly mentioned as stemless, because they had a short stem of their own, and did not need a long wooden one.'

In this case the pipes simply confirmed history, the Hurons, the Hochelagans and the New York Iroquois all belonging to the same family. If a village had been isolated or unknown to history, the evidence of the pipes would have been important. That of pottery has proved even more valuable in New York, clearly establishing the connection and relative age of some sites.

Much has been written on the making and ornamentation of aboriginal American pottery in all parts of the land, but we are now concerned only with our local ware. The ruder forms were probably molded by the hands alone, aided by simple implements, and some of the finer examples were made in the same way. Others seem to have been formed on some kind of foundation, in part at least, and a prevalent idea has been that many were formed within baskets, which disappeared in the burning. This was mistaking the theory. Prof. Wyman, in speaking of the cord-marked pottery of Tennessee, said, 'It seems incredible that even an Indian would be so prodigal of time and labor as to make the necessary quantity of well-twisted thread, and weave it into shape for the mere purpose of serving as a mold, which must be destroyed in making a single copy.' To this Mr Holmes replied that the nets were removed before burning or drying; adding that in the case of the great salt vessels of the Saline river, Ill., the fabrics were applied after the vessels were formed. That these were salt kettles is assumed by many, but it remains true that the early historic nations of the northern United States and of Canada used no salt at all. Cords were employed in decorating early earthenware in Great Britain, and the process has been clearly proved in the United States, though less general than has been claimed.

Some stamps were certainly used in adorning much northern pottery, as the impression is very uniform. Corn on the cob has been suggested as one means, and probably other seeds were employed in a few cases. Patterns may have been stitched on birch bark and applied to the surface. Sharp and round pointed tools had their use, either simply cutting or else excavating the soft clay. Besides the grooves or cuts there are usually slightly raised lines caused by pressure, but these do not always appear. Hollow bone was useful, and many a bold rim was pinched between the thumb and finger, or incised by the long and sharp nails of the Iroquois, which they kept in this condition with a double purpose, that of mangling their captives when tortured, and to show that they did not labor themselves. Rarely did they have an industrial use.

One primitive process in forming earthen vessels was building up, often with a long coil of clay, afterwards smoothed, polished and decorated when desired. Large crucibles are still made in this way in some modern manufactories. The coiled and simply decorated ware of the Zunis is well known, and there are rare suggestions of this here. In decoration animal forms are mostly confined to pipes in New York, but the human face and form often appear on earthen Iroquois vessels, early in the 17th century and late in the

16th. It was in vogue for nearly 50 years, and might have led to something higher had it not been displaced by the white man's wares.

Early writers are not agreed on some points. Roger Williams, one of our earliest and best authorities on New England aboriginal life, said that 'the women made all the earthen vessels.' Daniel Gookin wrote, in 1674, of the fragile clay vessels there, saying that 'the clay and the earth they were made of were very scarce and dear. The dishes, pots and spoons are the manufacture of the men.' This showed careful selection of material, whether the men were really the artisans or not. Hutchinson said that the Narragansetts 'furnished the earthen vessels and pots for cookery and other domestic uses.' Such wares were often articles of commerce, when they gained a reputation.

The Iroquois did not make stone pipes when first known, unless rarely, the clay pipe being then in use throughout the various nations of that large family, but for official purposes stone calumets appear quite early. Megapolensis said, about 1650, that each of the Mohawks had 'a long tobacco pipe, made by himself, in his mouth.' Capt. George Weymouth, who visited Long Island in 1605, said 'The heads of their tobacco pipes were sometimes made of clay, and sometimes were only the claw of a lobster; but they were all sufficient to hold as much as 10 or 12 of ours.' Henry Hudson observed among the River Indians, however, 'copper tobacco pipes and pots of earth to cook their meat in.' He mentioned also copper ornaments and pipes in New Jersey, perhaps mistaking the bronze red hue of the clay for the metal.

There are occasional ornaments and other articles of burned clay, but these are rare. Quite rarely, too, inclosures of clay appear in sepulture. An example of this was found on the east side of Canandaigua lake in July 1893, and in a sandy soil. Three skeletons were found near together, one of which was large and had the limbs drawn up in the usual way. Excepting the ribs the bones were sound. Mr E. J. Durant writes, 'They were lying in a stratum of hard burned clay; so hard that it came up in chunks when broken. Plenty of charcoal was in this stratum. Near the skeletons a fireplace was found. This was a hollow in the ground, lined with burned clay, and filled with charcoal.' Another observer described the fireplace as circular and like a deep bowl, 3 feet across. The baked clay was 4 inches thick, and the charcoal about the same. This rare instance of one use of clay here hardly forms a part of our subject now, but is worthy of note. In the west it is more frequent.

Refuse heaps, by village sites, usually contain a great deal of broken earthenware, out of which fine or curious fragments are often taken, and these occur also in the ash beds of the old fireplaces. This is so on some quite recent sites, for while the richer Iroquois obtained brass kettles quickly from the whites, their poorer friends continued the primitive art till the beginning of the 18th century at least. In some places rude pottery is found at a considerable depth, from different causes. In fireplaces this may come from the practice of placing the fire in excavations in the ground. On village sites, also, the same difference will be observed in material, style and finish, as in other articles. Taste, skill and the ability to buy, did not belong to all. The fact that the distinctions of rich and poor are found in savage life is never to be overlooked in the study of aboriginal articles, if we would avoid serious mistakes.

The difference in the forms of eastern pottery when compared with those of the south, has been mentioned. The long-necked vessels of the middle Mississippi valley are never seen in the northern states, nor are depressed vessels often found in eastern earthenware, although frequent in soapstone. Usually the base is rounded, and the swelling sides are constricted below the top, thus giving an expanded rim of various forms. Sometimes the margin is horizontal, but is more commonly angular, with two or more elevations. In section the rim may be angular, circular or elliptic, and is often perfectly straight, or very nearly so, in portions of the circumference. The rim may be simple and narrow, or deep and broadly projecting. It is usually much ornamented outside, often on the top as well, but more rarely within. In a few cases, however, the interior ornamentation is elaborate and deep. As a rule there is little detail below the expanded top.

The inside is commonly black, and the outside of the proper hue of baked clay, varying much according to the material. Means of suspension rarely appear, but a cross piece of wood within, attached to a cord, may have afforded these. Except in cooking an outside cord would have sufficed, but there are no signs of wear from this. How much and how they were used in cooking may be a question. They could have been placed on a fire of coals rather than over it, but show few external signs of such use, the outer surface being usually clean and bright. The blackened interior suggests the placing of hot stones in the water, so common a device among our northern aborigines. Many were probably used merely for holding water, or sometimes grain. Some large vessels were quite thin, and few were adapted for hard usage. There are some which are very small, apparently made on the thumb, and there are occasional examples of toy vessels, about an inch in diameter and neatly finished. These are the shallowest forms of all, and having at times a raised and perforated ear may have been an imitation of the brass kettle. Some of these, however, are from a Mohawk site which seems to have been occupied as early as the end of the 16th century. Very small vessels occur on another site of the same period. In the Toronto collection is a small vessel made on the thumb, and retaining an impression of the thumb nail. This is rude, and the best examples of these small forms are those of the Mohawks.

True Iroquois vessels, with the usual constriction below the deep expanded and ornamented rim, appear in some Canadian earthworks a few miles northwest of Prescott. Figures of these were given in the Smithsonian report for 1856, and they are from 4 to 8¾ inches in inside diameter. Clay disks also occur there, about the size of a quarter of a dollar. These are also found on Iroquois sites in New York, but of a larger size. Perforated specimens come from Huron sites in Canada, and similar disks have often been found at Hochelaga or Montreal. They are usually of secondary use, chipped out of earthenware fragments.

The earthen vessels found on the site of Hochelaga at Montreal, in 1861, held from 1 quart to 4 gallons. Sir J. W. Dawson thought they were ornamented with 'a pointed instrument, with rings made with a stamp, and with impressions of the finger point and nail around the edge.' He points to the practice of pastry cooks for modern examples, and adds that 'Fragments of pottery from a long barrow near West Kennet, in Wiltshire, figured by Lubbock, are remarkably near to a common Hochelagan pattern, and finger prints as an ornament occur on vessels from the pile villages of the Lake of Zurich.' A raised pattern is occasional in Canada and New York, and of this he says, 'One evidently represents the rows of grain in the ear of Indian corn, and may be called the corn ear pattern.' A second class he called 'the basket and bead pattern,' which he thought imitated woven baskets ornamented with beads. In this he distinguished the 'chevron and saltier patterns.' A rude basket pattern appears in some rude early British pottery. To these he added a third pattern of network, found on the round bottoms of some large vessels. This sometimes appears on the sides of New York pottery, and may come from matting.

In a letter to the writer regarding the human faces on the outside of some New York pottery, he said that nothing of the kind appeared on Hochelagan vessels, 'unless three rings, two above and one below, may be taken to represent eyes and a mouth. Perforated clay disks are common.' The pipes and vessels which he figured in *Fossil men* are like those of New York, and detached heads occur here sparingly, as well as the three rings.

A few years since Dr D. S. Kellogg, of Plattsburg, had obtained parts of rims of over 800 different vessels along the west shore of Lake Champlain. These rims were circular or elliptic, and often indented or scalloped along the edge. These vessels were often ornamented from the top nearly to the bottom, and sometimes on the inner surface. The bottoms were plain and never flat, and they varied in capacity from 3 to 8 quarts. None had any representations of animals, or of the human face or figure. In his *History of St Lawrence county*, Mr Hough said that on some fragments of pottery a rude resemblance to a human face is seen. He may have referred to the three rings or indentations found elsewhere near the St Lawrence river. An example of this comes from Springfield, Ohio, closely resembling New York pottery.

Soapstone is common in the New England states, and Mr John J. Alton said, in writing of its ancient inhabitants, 'I have never seen a fragment of baked clay pottery made by these Indians.' This is merely negative testimony, for it is found there in some places, and early writers mention its use and manufacture. In *Gosnold's voyages* it is said of the Indians of Marthas Vineyard, that 'the necks of their pipes are made of clay hard dried, (whereof in the island is great store, both red and white) the other part is a piece of hollow copper, very finely closed and cemented together.' The references to pipes with copper bowls are certainly curious, and there can be no doubt of the occasional use of copper in other ways.

The pottery in some parts of Ohio closely resembles that of New York, and this remark also applies to some earthworks as well. The natural conclusion, confirmed by early maps, is that the Iroquois family held all the country on the south shore of Lake Erie 300 years ago. It is every way probable that nearly all of Ohio was then in the possession of the Eries and their kindred. The inland homes of the former are mentioned in the *Relation* of 1648. 'This lake, named Erie, was formerly inhabited on its southern shores by certain peoples whom we call the nation of the Cat; who have been obliged to withdraw into the lands in order to get away from their enemies, who are more towards the west. These people of the Cat have a number of fixed villages, for they cultivate the ground, and are of the same language as our Hurons.'

Some of the usual types of clay vessels ornamented like those of the Iroquois, have been found in New York city, near the Harlem river, by Messrs Chenoweth, Calver and others. Some of these are quite large. The largest vessel found in 1890 was 2 feet high and 18 inches in diameter, while others were nearly as large. On the other hand, some fragments were very coarse in every way, and had local peculiarities.

Mr W. W. Tooker, of Sag Harbor, said of the earthenware of Long Island, 'It is found wherever we find traces of the Indian's footsteps. Much of it is ornamented by cords, incised lines, by the impression of the thumb, by the finger nail, and in other ways.' He restored one large vessel out of 184 pieces, and found two smaller ones in a grave. These showed basket work. While clay pipes were rare on Long Island, the stems were often found.

West of the Hudson river fragmentary pottery occurs on most important sites. In his *Reminiscences of Saratoga*, 1880, Mr W. L. Stone spoke of the remains of an old Indian pottery kiln, 'within the cavities of which are yet found sun dried and fire baked vases, covered with quaint ornamentation.' This was on the south side of Fish creek, but may have been one of the refuse heaps often mistaken for kilns. Pottery is frequent there.

Dr C. C. Abbott found similar pottery plentiful in many parts of New Jersey, and it seems of general distribution through the northern states and much of Canada.

A fragment of a jar with an open projecting ear or handle has come to our attention in Canada, and one from the country of the Neutrals has an upward projection on one side of the flat rim, probably meant for a handle. Vessels with raised and corrugated bars occur there also, identical with New York specimens of the early part of the 17th century. This is Dawson's corn ear pattern. The flaring angle at one end, suggestive of a pitcher, appears on a well ornamented Canadian vessel, $4\frac{3}{4}$ inches across, and has its counterpart in New York. So many Hurons were adopted by the Iroquois that these national or local forms in vessels and pipes would be expected here at the period of the Huron downfall, even as we find them. Simply as members of one great family there would be strong resemblances.

Thus there is in the Toronto collection a peculiar Huron pipe, with characteristic human head and arms, which is frequent in New York only on Seneca sites, where an entire town was formed of Huron captives. Those with entwining serpents and with a snake-head bowl, are common to both regions. The spiral stem found among the Senecas was occasional among the Hurons, and corded bowls and bird pipes belong to Huron and Iroquois alike. The bold and remarkable pipes of Jefferson county, with a large human face before and behind the bowl, are also found in Canada. Owl pipes were made by the Petuns and by the Oneidas, and the long stems, with lines and elliptic indentations were everywhere popular.

In another material, a stone pipe from Lake Moira, Canada, closely resembles a slender and peculiar clay pipe from Brewerton, N. Y., the very slender stem projecting at but a slight angle from the bowl.

A long bowled pipe, with a thin flaring edge, and horizontal groove in front, has been found in Vermont, and is a frequent New York form. Clay pipes are rare east of Lake Champlain, but some would be expected there, as it was an early Iroquois hunting ground, and their war parties frequently traversed the lake, but usually on the western side. In fact wherever they went the early Iroquois carried some articles of clay. They possibly gained something from captives, but their distinctive achievement at about the end of the 16th century, and during a score or more of years afterwards, was the decoration of the angles of vessels with human faces or figures. About the same time the Onondagas added to these a few curious and unique pipes.

For many years we have made a careful record and comparison of even the ornamented fragments of pottery, placing side by side those from different sites. While there may be a general agreement there will often be suggestive differences, sufficient to show a difference in the people or age. At the same time there may appear a close correspondence in certain unusual ornaments, revealing a close relationship in places far apart. We look for these resemblances and differences in more striking articles or features, but the simple lines, dots and indentations of New York pottery may help us much.

While giving a sufficient number of typical forms of vessels, necessarily much reduced, much attention will be paid to mere ornament in this paper. Representative specimens have been selected from thousands of examples, unique or common, which will give a fair idea of this feature of aboriginal art. Within the proposed limits it can only be representative, but it may lead many to a study which has been too much neglected, and bring about valuable results. In preliminary work of this kind it will happen that some features of interest will not appear, either because unknown or inaccessible. The reader who observes the omission will then understand just what he should report to make our knowledge more complete. Perfect examples of New York aboriginal pottery are specially desired for the state museum, but fragments showing unusual styles of ornament will also be of value and interest. It should always be stated where they were found. In fact articles without a record are shorn of half their value, and become mere curios in many cases. With a good record a simple relic may solve some riddle of history, or bring out truths unsuspected before. This should never be forgotten.

In the general treatment of this subject a word may be said on the antiquity of earthenware in New York. The most careful comparative work has been done between the Hudson river and Lake Erie, and little pottery has been found there to which an age of much over 500 years can be safely ascribed, unless it may be on small hunting camps. The noted double walled fort in Shelby, to which a great antiquity has been given, probably falls far within that limit. With the exception of a pair of Ohio shells, not an article has been found upon it which can not be duplicated on historic Iroquois sites of early days, and this is notably true in earthenware. Many of the earthworks of Jefferson county may be allowed an age of five centuries, though probably more recent, and all are prehistoric in a sense, but some certainly show a knowledge of the white man's arts.

In Chautauqua and Cattaraugus counties the case may prove different. These formed a border land, and while earthenware is abundant there, little has been definitely described. Towards Lake Erie the earthworks were quite recent, and those farther inland are of the ordinary Iroquois type. In these two counties are upwards of 50 defensive works, and the region seems an early center of Iroquois life. A careful study of its pottery might show how closely related this was to other places and later days.

It must be remembered that nations of the Iroquois family occupied northwestern Pennsylvania 300 years ago, as well as the banks of the Susquehanna and partially those of the Delaware. The Andastes of the French, who were the Minquas of the Dutch, were of this powerful family, and waged a fierce warfare against the

Five Nations of New York. The Massawomekes of Capt. John Smith, so dreaded on Chesapeake bay, were probably a southern offshoot of the Eries, so that along the principal rivers of Pennsylvania, somewhat remote from the sea, we may expect to find pottery closely resembling that of this state. In river valleys, however, subject to inundation, any flood may expose or bury still deeper objects of this kind. Their age can not safely be predicated from their depth in the soil. The fairest chronological evidence will come from village sites, and these give no great age to earthenware in New York, while that age is an open question still.

The question of age and probable population is affected by another circumstance. Early Iroquois villages were removed every 10 or 15 years, and a liberal allowance of time would give six or more removals in a century. A dozen sites, and often many more, would thus be required in 200 years for a single village. The Mohawks had from three to four or more towns at a time, and the Senecas never less than four. The latter would thus occupy and abandon nearly or quite 50 places in two centuries. It is thus obvious that for any long period of continuous occupation we must reduce the population to a very small number. On the other hand, if we allow a moderate strength to any people we reduce the time of occupation. When this fact is understood, and the true relationship of the site known, we arrive at a safe basis for estimating the length of time in which much of New York was really occupied as a home by the aborigines. Without discussing the subject farther, attention is called to these facts, for they greatly affect a clear conception of prehistoric times, and their relations to later days. Chronologically most of the articles here described belong to the 17th century, and the larger part of the rest apparently to the 16th.

Most of the first class of illustrations here given are of fragments of vessels, selected out of a large number to show patterns used in ornamenting. All these are of actual size, and being fragmentary there is no need of giving dimensions. Fig. 1 is a rim from Jefferson county, where the style of ornament is often both bold and rich. The vessel must have been quite handsome, as the ornamentation was continued down the sides, below the projecting rim, which is decorated above and within. The curve of the rim and side is very bold, sweeping suddenly outward from the narrow top and almost as abruptly contracting again, to expand once more. A few others have curves almost as well rounded as this, but usually in thinner vessels. On the upper projection are horizontal lines and those sloping both ways. Below is a row of elliptic indentations, and a series of curved and sloping lines. It is remarkable for its wide and almost marginal projection, though a smaller expansion is not rare.

Another rim from Jefferson county has elliptic indentations arranged in curved lines. Fig. 2 has a series of short curved grooves arranged in horizontal lines, and the outer edge of the rim has notches. This comes from an early stockade on the north bank of the Seneca river, where fragmentary pottery is abundant. Fig. 3 has horizontal grooves in which are regular indentations. The grooves are quite broad. Below these are somewhat similar grooves, shorter, sloping in opposite directions, and almost meeting at angles. This frequent pattern is from the Seneca river. A rim ornamented on top has similar broad sloping grooves, and below these are several interrupted grooves which are nearly horizontal. From the same site as the last.

Fig. 4 is a very handsome fragment, which has a curious double curve, suggesting a singular form of vessel. It is moderately thick. There are indented grooves, both horizontal and sloping, and a horizontal line of large circular indentations. The work is quite elaborate and very neatly done; this was found with the last two. Another with these has a straight rim, showing but a little curve to that part of the vessel. This is a frequent feature, so that it must have been somewhat angular. Outside there is a slight projection, less than an inch below the top, sloping back above, so that there is but a slight thickness at the actual rim. There are waved lines below the projection, which are quite shallow and irregular. This simple rim is not common.

Fig. 5. A very plain rim without projection, from the same place. There are very irregular grooves, following no apparent pattern. It is somewhat remarkable in this way. Fig. 6 has deeply incised

horizontal grooves, expanding and contracting, and thus showing a double undulation. This is from the same place. Fig. 7 comes from the same site. There is a plain rim with graceful undulations on top. The horizontal grooves have indentations, and there are cross grooves between these and of the same kind. This fragment suggests an elaborately decorated vessel. Fig. 8 is quite like the last, and from the same place. The undulations above, however, have each three narrow grooves, parallel with the rim, and all the indented grooves slope and cross each other, forming a network of diamonds. It is much thicker than the last.

Fig. 9 is a rare ornamental fragment from the same prolific site on the south bank of the Seneca river. The horizontal groove is broad, deep and obscurely interrupted. Below this are broad sloping grooves, distinctly divided by very sharp and narrow walls. The indentations are deepest and walls sharpest on one side, the divisions rounding and sloping on the other. This may not have been invariable throughout. There are forms approaching this. It is interesting to observe how many styles may be found on one spot.

Fig. 10 is from a fort north of the Seneca river. It is a rim placed at an angle in the plate, the long and straight side being the top. All the indented lines thus actually slope. Part of the divisions in the grooves are angular, and part are slightly rounded. Both these styles of indented grooves are frequent, but not in combination. Fig. 11 is a simple zig-zag pattern of small and shallow circular indentations, from the mouth of Dead creek, on the south shore of Seneca river. These small dots often appear, but rarely thus arranged.

Fig. 12 is a fine and rare rim from Baldwinsville. It has cross grooves above, sloping first in one direction and then in the other below. These are short. Other short diagonal grooves are below these. The fragment is ornamented within. Other fragments of the same vessel are quite different in design, having many elliptic indentations and waving lines. It is not safe to say how a vessel is ornamented throughout from seeing one fragment.

Fig. 13 is from a circular stockade two miles south of the Seneca river. It is a notched and projecting rim, with two narrow parallel grooves above. The projection is rather thin, and below this, all is plain. Fig. 14 is a rim from a stockade on the north side of Seneca river. The rim is simple, and is angularly undulated on top. Below are grooves, both horizontal and sloping. In a plain space inclosed by these, are several long triangular indentations. A basal groove indicates a slight projection.

Fig. 15 is a fine rim from Jefferson county. There are deep sloping notches at the edge, above three broad horizontal grooves. Below these are curved and sloping grooves on one side. On the other are two large indentations above, and several triangular ones below. Then come two horizontal grooves, and a line of deep diamond indentations on the base of the projection. Below this it seems to have been perfectly plain.

Fig. 16 is a handsome rim from Onondaga lake, curving gracefully to the lower part. There are both diagonal and horizontal lines, angularly indented and quite closely arranged. The rim has lines on top, and the whole piece is thin and much curved. Fig. 17 is perfectly straight-sided within. Outside there is a slight projection of the upper part. On the upper part of the fragment, which does not include the rim, though it may nearly have reached it, are shallow and vertical grooves. The indentations at the edge of the projection were formed by pinching the clay between the thumb and finger. This style of ornamenting will frequently be found. The fragment is from a stockade two miles south of the Seneca river. The vessel must have been large or angular, although not thick.

Fig. 18 is a fragment from a stockade on the north bank of the Seneca river. The decoration remaining is a row of large and deep triangles which are not equilateral. All become deeper from the long side to the broad angle. They were made by the inclined pressure of some broad and straight edged implement. Fig. 19, from the Seneca river, is a very fine rim, the upper part of which has a broad and even slope. This has rows of diamond indentations, narrowly divided in the rows. Below the projection are two horizontal rows of diamond indentations, narrowly divided as before. Simple horizontal grooves appear below these.

Fig. 20 has horizontal and vertical lines of oblong angular indentations. The divisions in the lines are narrow, and it comes from the Seneca river. Fig. 21 is a fragment from an early hamlet on another part of Seneca river, and is unique in arrangement and character. Above the usual projection are four short and curved parallel grooves, repeated in a horizontal series. Each series of four is about an inch long, and there are less distinct curved lines below.

Fig. 22 is another fine rim from Fabius, in Onondaga county. The surface is quite flat from the upper edge to the customary projection below, where the deep notches are intersected by the slightly sloping grooves. Below the top are regular diagonal grooves, very neat in detail and about an inch long. Both horizontal and sloping lines appear below these, and in a long open space between them is a row of indented rings, probably made with a hollow bone tool. The general character of the fragment is that of much pottery in Jefferson county, whence many of the early Onondagas may have come. The rings are large and neatly made. Bone implements, suitable for such work, are found on neighboring sites.

Fig. 23 is from Jefferson county. In the fragment there are three horizontal grooves above, with narrow rectangular divisions. There may have been more than these. Below are three similar grooves on each side, the groups sloping in opposite directions. The divisions in these grooves are more rounded than in those above, and resemble a form of what is sometimes called a corn pattern. In the angular spaces inclosed are lines of moderately large circular indentations. All these ornaments are quite widespread. Very little Jefferson county pottery is accurately located, although this is often a matter of importance.

Fig. 24 is a fragment of fine material and neat workmanship, from Onondaga lake, where pottery is quite rare on nearly all sites, showing that it had little Iroquois occupation in early days. The pattern is of small indented circles or dots, arranged in lines, of which some are parallel and others meet at acute angles. Fig. 25 is a neat and thin rim, very slightly thickened at the top. Beneath this slight expansion is a row of small sloping and elliptic indentations, with nearly horizontal grooves beneath, irregularly arranged. These grooves are not continuous, ending abruptly or tapering to a top, and they have angular divisions. The rim is from the same place as the last. Fig. 26 has a curious and unusual pattern, formed by small triangular indentations arranged in curved lines. The long side of each of these is convex, and the others concave. The indentations cause the intermediate lines to seem raised. This is from the Seneca river.

Fig. 27 is a large and finely ornamented fragment from Oneida lake, evidently part of a very large vessel. The pattern is arranged in broad converging bands, and is such as might be used in beadwork on the front of a moccasin. Each broad band is edged with lines of circular indentations, and similar diagonal lines appear across from side to side. The intermediate plain spaces are nearly as wide as these decorations. Fig. 28 is a rim of very common design. There is no great expansion above, but half circular notches appear in the edge, and lower down are both horizontal and diagonal grooves. Rims are often thus notched, but in very many ways, sometimes merely with a knife or the finger nail. This piece is from an Onondaga village occupied about 1670. It may be said that while the richer Indians soon afforded brass kettles, poorer families long continued to make the old earthenware.

Fig. 29 introduces us to a class of ornament quite prevalent from about 1590, or possibly a little earlier, to about 1630, when it completely disappeared. It was the highest achievement of the Iroquois in decorated ware, nor was it found among all of them, the three Elder Brothers, the Mohawks, Onondagas and Senecas alone using it as far as yet known. None has been reported from the Oneida and Cayuga territory, and but little from the Seneca. Its comparative abundance among the Mohawks and Onondagas lends strength to the traditional early intimate relations between these two nations, through Hiawatha and Dekanawida, both reputedly Onondagas by birth, and Mohawks by adoption. In this ornamentation the face or form was molded separately, and then luted on before burning. In consequence the faces are often found detached, or the impressions of the limbs remain when these are gone. The Onondagas reached a higher development in this art than the Mohawks, and many faces have such an individual character, as regards age and expression, that they seem portraits. Two of those grouped here have this individuality. They were often, but not always, placed at an elevated angle of the rim. This is the case in this figure, where a grotesque face appears just below the notched angle. There is a suggestion here of a curved neck, possibly united to a body, but the face may have appeared alone. The fragment is from a stockade in southern Onondaga, occupied perhaps about 1620.

Fig. 30 is another fine face from the same site, a little south of Delphi. It is surrounded with diagonal grooves on the surface of the vessel, and has marked individuality. Fig. 31 is another face of characteristic Indian type, appearing on a plain surface. It is from a stockade west of Cazenovia, occupied by the Onondagas about 1600. These large faces are frequent there, and on neighboring sites.

Fig. 32 is a fine rim of unusual character from the site south of Delphi. There are three neat horizontal grooves above the usual projection, which is formed by deep and graceful curves, edged on the concave part with large elliptic indentations. The design is bold and well carried out. Fig. 33 is from a stockade near Baldwinsville. The figure is simple, pretty and unusual. A row of small circular indentations has rows of elliptic and pointed vertical indentations above and below. Fig. 34 is a rim from a stockade on the south side of Seneca river. The expanded top is deeply notched on both sides, and is somewhat undulated above. Fig. 35 comes from a stockade opposite the last, and north of the river. It is a plain rim, coming to a point above, ornamented just below the top with a row of narrow and diagonal ellipses, beneath which are narrow, irregular and interrupted grooves.

Fig. 36 is part of a rim found east of Wagner's hollow, Montgomery county. The narrow top is undulating, and the sharp grooves are crossed by a horizontal groove near the top. The angular ends of the grooves are sharply defined. The fragment is larger than here represented, and the deep notches at the basal projection are here omitted. This elevated site has some remarkable earthenware, mixed with European articles. Fig. 37 is a neat rim from a stockade west of Baldwinsville. A row of elliptic indentations is arranged diagonally above, where the rim curves over to the inner line of the vessel. Below this the deep grooves are separated by ridges crossed by spiral lines.

Fig. 38 is a fine and rare piece from Brewerton, angular above, and with diagonal zig-zag grooves on the narrow projection above. Below these and under the projection are broad diagonal grooves, broken by cross indentations. Similar narrow grooves appear below, and a handsome decoration is suggested below all. The same style of ornament is seen within. Fig. 39 merely shows the rim of a large fragment, the top of which has convex vertical projections above the side of the vessel. The side is adorned with the common grooves. This is from the recent site east of Wagner's hollow, Montgomery county. Fig. 40 is a thin and very curious notched rim from the same place. The general surface is plain, but at the rim there are long curved or elliptic indentations, interspersed with shorter ones. It is both simple and rude, as well as quite modern.

Fig. 41 is from the same place, and is the most remarkable human figure yet found on an earthenware vessel. One feature is that most of it was molded with the vessel instead of separately, but this does not apply to all parts. There are the usual cross bars on the body, but none appear on the limbs, which is a departure from the type, as in a later Seneca example. It is also the only one yet found which is not symmetrical in arrangement, one hand being raised in this, and the other turned down. The toes are very long. In this and some other fragments, the grooves back of the body suggest plumes, and the maker may have taken a hint from the winged angels and cherubs of the white man. There are other outside grooves variously arranged, with odd features at the basal projection. The face is inferior to those made separately, and there is a great contrast in the two arms. In another from this site, the face and body were molded with the vessel, the body having the usual cross bars. There are no arms, and the legs are gone, but seem to have been carried out from the base of the rim, leaving an opening between them and the vessel. There are notches at the end of the projection, and grooved lines above. The nose is raised, and the eyes are small rings. Altogether it is an interesting fragment.

Fig. 42 shows part of a rim from the double walled fort southeast of Baldwinsville. Deep notches are cut in the edge of the rim, which is ornamented above and within. Fig. 43 is a rim from Rice's woods, a few miles north of Palatine Bridge, which is remarkable for the very great projection of the upper and ornamented part. It is probable that the plain bowl gradually curved out beyond this, as in other examples. A deep undulating groove runs from top to bottom at the angle, which is raised. Notches appear along the basal edge of the projection, with grooves above, and there is a line of pyriform indentations below the rim. The inside is ornamented. Pottery as bold in design as this does not appear farther west.

Fig. 44 is from the same spot, and thus far is unique. It is a very prominent human head on the boldly projecting angle of an earthen vessel, which seems to have been much ornamented. The cross bars on the retreating angle beneath are more ornamental than usual, and the broad face, with its wide and open mouth, is more suggestive of an ape than a man when seen full in front. Above the head it is broken, but may not have risen much higher. This was a recent village site where European articles are frequent. The lateral grooves again suggest plumes, and this feature is hardly rare in these relics of the Mohawks, who may have had it from the Dutch.

Fig. 45 is from the double walled fort near Baldwinsville. The horizontal grooves had their edges neatly smoothed, while the hollow part is divided by small cross indentations. With this was a fragment having a line of large elliptic indentations, above which are diagonal rows of fine lines placed side by side.

Small vessels are sometimes found which were apparently toys. Fig. 46 is a rude example from Brewerton, which is nearly oval, yet somewhat angular. The depth is $1\frac{3}{8}$, and the diameter $1\frac{3}{16}$

inches. It is unornamented, and resembles some found on Huron sites in Canada. The Mohawks made neater ornamented articles of this kind, but they are everywhere rare.

Fig. 47 brings us again to the early Onondagas, being from the site of 1600, at the time when the Iroquois league was probably formed, and while Hiawatha lived there. The rim rises to an angle and near its edge are rows of elliptic indentations placed diagonally above the nearly horizontal grooves which come just below. The broad face is not as artistic as some, but is fairly good-natured, as was proper in the days of Hiawatha the Peacemaker. Some of these Onondaga faces are quite pleasant in expression. There are diagonal grooves on each side of this massive countenance, and the edge of the projection beneath has the notches which are so common a feature. Fig. 48 is another remarkable Mohawk rim from the site east of Wagner's hollow, where the potters were persons of ideas and skill. It has no great beauty, but the notches at the base of the projection are unusually large and deep. The horizontal irregular grooves cross the broad points left, as well as the plain surface above. Another rim much resembles this, but is crossed by diagonal lines on top. The side ornaments are horizontal and sloping grooves with very deep and long notches. In this, however, the projecting points have diagonal grooves, spreading a little as they descend. The fragment suggests the same maker, but hardly the same vessel.

Fig. 49 is a simple but neat, curved and projecting rim from the Onondaga site of 1600. These early sites will be occasionally referred to by their probable dates, the archeologic connection being such as to render these almost a matter of certainty, while the age of any article may be of importance. This pretty rim has two parallel lines on the top, and the edges are notched on both sides. Below these it is perfectly plain. The top is thickened, but the sides are thin and curving. Fig. 50 is a grotesque, good-natured face adhering to a plain surface. It comes from the same site, and is of the largest size, fairly representing one modern form of Onondaga countenance. Fig. 51 is a rim of thin black pottery from an Onondaga fort on the line of Fabius and Pompey, several miles southwest of the last, and occupied but little later. A very few European articles are found there. At the elevated angle is a face, below which is a straight body, reaching to the basal projection. This is grooved across, as usual, and the remaining surface is furrowed with rude diagonal and horizontal grooves. The notched base of the ornamented portion projects beyond the general surface. Pottery from this site is blacker than is usual in Onondaga county, and often thin.

Fig. 52 is from the site west of Cazenovia, and, as well as the next, is from a photograph. They are probably about half the actual length, but preserve their relative proportions to each other. The face is very broad and characteristic, being much like that of some Onondaga Indians now. It is immediately under the narrowly projecting and notched rim. The surface has a few diagonal lines, and the basal projection is notched. Traces of ornamentation also appear far down on the expanding side. Fig. 53 is from the same site, and the face is an excellent representation of an old person, toothless and withered. Above the face and below the notched rim, are several neat grooves. Many faces might be given from this interesting site, the home of the Onondagas at the formation of the Iroquois league.

Fig. 54 is a very curious human figure on a highly elevated and projecting rim. It comes from the fort already mentioned, on the line of Fabius, and is very thin. There is a row of indentations just below the rim, and another at the base of the projection. Irregular sloping lines appear between. The face, which reaches the top, is grotesque. The slender body has angular arms, the hands being clasped below the abdomen. Two legs follow the retreating slope below the projection, and are irregularly barred. The cross bars on the body and arms are neater. Similar specimens of black clay often occur on this elevated site. It was a local fashion, as in the case of the large faces already described.

Fig. 55 is a very small and rude vessel from Brewerton, very shallow and but an inch across. Fig. 56 is a much neater and smaller one from the Wagner's hollow site, north of the Mohawk in Montgomery county. This pretty little cup, or miniature kettle, has raised and perforated ears, as though for suspension, and is ornamented below. Such perforations are sometimes found in larger vessels, but the raised ears are lacking. These suggest the white man's kettle, and there are other Mohawk examples of these tiny and peculiar vessels. This is but $\frac{7}{8}$ of an inch across.

Fig. 57 is a notable rim from an early hamlet on the Seneca river. It is nearly straight, suggesting a very large vessel in every way. There is a slight and rude projection at the top, with cleanly cut diagonal grooves below this. The edges of the usual projection, farther down, have deep and broad indentations, formed by pinching the clay between the finger and thumb. These are quite irregular, as would be expected, and this mode of ornamenting was early used. Fig. 58 is a remarkably beautifully ornamented fragment from Baldwinsville, very much and rather curiously curved. There are broad bands of diagonal lines of small perforations. These perforations are not all alike, but are carefully arranged. Narrower bands of plain surface divide the ornamental portions. The color is black and red.

Fig. 59 is a curved rim, sharply notched on the edge. Below these notches are three horizontal grooves, which encompassed the vessel. Beneath these are diagonal grooves. The lower projection is formed of long and broad points, a little rounded at the ends and an inch apart. Such points are rarely seen, as they extend half an inch below the lower curve of the vessel. This is from the same site as fig. 57. If the curve was regular, the inside diameter of the vessel would have been 14 inches.

Fig. 60 is a frequent style of ornament, sometimes called the corn pattern, from the idea that the indentations were formed by rolling an ear of corn over the vessel, where desired. It is from the same place as the last. Fig. 61 is a neat rim from Jefferson county. It has horizontal lines of elliptic indentations, and sloping lines in a pretty waving pattern. Below these is a horizontal line with angular indentations, and large elliptic grooves are on the edge of the projection beneath. It is ornamented on top and within. A ruder specimen from the same county, is quite straight, with vertical lines of dots above an undulating groove. Below this, on either side, are lines sloping toward the center, which is occupied by four vertical lines, three of which are connected by cross grooves, forming squares.

Fig. 62 shows the edge of a projection, where the hexagonal indentations are both large and deep. There are diagonal lines in opposite directions. Found at Baldwinsville, but rather common in various sizes. Fig. 63 is a fragment of bright red pottery from Seneca county. It is ornamented with hollow squares in curved lines. This is better than most there, it being usually quite coarse.

Fig. 64 is a very bold and angular projection from Jefferson county. It has diagonal lines in opposite directions, with large elliptic indentations at the base of the projection. Underneath this the deep curve makes a sudden sweep outwards. Fig. 65 is a rim with undulated edge, from Plattsburg. It has elaborate decorations, mostly of lines of circular, elliptic and angular indentations. Much pottery has been collected along the western shore of Lake Champlain, on the sites of camps and small hamlets, by Dr Kellogg, who has also restored many vessels. Fig. 66 is also from Plattsburg, and has a series of diagonal grooves arranged in horizontal groups. These grooves have each three indentations slightly divided.

Fig. 67 is a rim from Jefferson county, with grooves in various directions. There are large elliptic indentations below the projection. The striking peculiarity, however, is the central square, two angles of which are above and below. Within this are three elliptic indentations, arranged as though for eyes and mouth. These are more common in that county than elsewhere, and may be the pottery found along the St Lawrence with a rude resemblance to a human face, of which Mr Hough speaks. This came from Watertown. Fig. 68 is another similar rim from Jefferson county. It has a row of elliptic indentations below the top, and another below the projection. The grooves are much like the last, but in one space are three large elliptic indentations, one above another. The face, if it may be so called, is inclosed by five lines, and the indentation for the mouth is circular.

Fig. 69 is a curiously ornamented rim from Oswego Falls. It is quite light in color, and has a double row of large indentations on top. On the edge are vertical and curved notches or grooves. Three lines of ellipses are below these, and then several rows of somewhat arrow-shaped indentations, lapping one on another.

Fig. 70 is the larger part of a vessel from the Otstungo site, near Fort Plain. The lower part is neatly rounded, and the ornamented part now occupies about half the side. This is adorned with horizontal, vertical, and diagonal grooves. This part very slightly projects outside of the rest. It probably was not much higher. Fig. 71 is from the same place. It is a much curved fragment, ornamented by the impressions of finger nails. Such specimens occasionally appear elsewhere. Fig. 72 is from Oneida lake, and shows a frequent ornament, unusually arranged. At the edge of the rim are elliptic notches, and below are horizontal, vertical and diagonal lines, with the small and deeper indentations in them which are so common. These are neatly arranged, but the fragment is somewhat peculiar in having these continued in another series below the projection.

Fig. 73 is a curious rim from the Seneca river, of a type apparently more common in Canada than in New York. The peculiar feature is the raised vertical bars, protruding from the side and passing over the top. These have cross grooves, and come to a point above the rim, making deep notches in it. There are irregular vertical lines between these bars, which latter project $\frac{3}{16}$ of an inch above the general surface. The rim is thickened and ornamented within. The fragment is the projecting upper part of the vessel, which was quite thin below this. The vertical lines pass over the rim and within, making a scalloped edge.

Fig. 74 is from Brewerton, and has diagonal zig-zag grooves above, giving it a rich appearance. Below are horizontal moldings, with lines of diamond indentations. Fig. 75 is a neat, notched rim from Onondaga lake, ornamented on top. The undulating lines give it somewhat the appearance of Zuni ware. Fig. 76 is a fragment from the same place. It has an eccentric pattern of curved and irregular grooves, with some sharp angles, very difficult to describe. It is unique. Fig. 77 shows part of a large fragment from a fort on the north side of the Seneca river. The rim has long and sloping grooves, with horizontal lines below. One of the bars between these lower grooves has deep and regular indentations on the lower side, a very unusual feature.

Fig. 78 shows part of a very fine rim from the Garoga creek fort in Fulton county. It is notched and ornamented within. The indentations on the outside, just below the top, are both ellipses and diamonds. Six horizontal grooves are beneath these, and still lower are diagonal grooves extending into the deep notches which mark the edge of the bold projection. The curve is so slight that the vessel must have been large. A large and fine fragment from the same place shows the impression of the detached human body, and one of the very long arms remains. This site may not date far from 1600, as a tubular brass bead was found there, and it is one of the three oldest known Mohawk forts. Fig. 79 is part of a rim from another of this early trio, the fort near Fort Plain. A small part of this is given to show the vertical double curves which make the upper part of the pattern, and which are sharply indented. Below are diagonal grooves.

Fig. 80 is from a drawing furnished by Mr R. A. Grider, of Canajoharie. It represents a vessel from West Bloomfield, Ontario county, now in the state museum. This, of course, is of Seneca make, and the fact that there are faces at the angles, gives it unusual interest, partly because such vessels are usually fragmentary, and partly as showing that the Senecas also made these peculiar Iroquois vessels. It might be dated between 1600 and 1630. The rim has raised angles, and it is described as half size. Another, from the same district, has a human figure in full relief.

Fig. 81 is a fragment from a stockade on the north side of Seneca river. The pattern is simply of circular indentations, closely arranged in lines which are mostly diagonal. Fig. 82 is a small fragment from Pierrepont manor, Jefferson county. There is a flat projection from the surface above and below. On the upper part of this, and below it, are lines of elliptic indentations. Part of the projecting surface has narrow horizontal grooves finely divided.

Fig. 83 is a fragment from the double walled fort near Baldwinsville. There is a horizontal line of moderate sized crescents, and another of ellipses. Others like this occur, and the grooves, with deeper, rounded indentations, are frequent.

Fig. 84 is a vessel found a mile west of Fort Plain. It is a well-rounded vessel with a moderately projecting rim. There are two moldings at the top, and below these a row of elliptic indentations. The projection is neatly notched, and there are vertical grooves in the plainer surface just below. It is $4\frac{7}{8}$ inches deep, and $5\frac{1}{8}$ in diameter. Fig. 85 is a double cup from the hill east of Wagner's hollow. The base is uniform, but there are two constrictions above, where the two cups open at an angle. This rare article is ornamented with diagonal and vertical lines, and is $1\frac{3}{4}$ inches across. Fig. 86 is also from the bluff near Wagner's hollow. It has deep diagonal grooves, crossed by those which are horizontal, thus forming lines of angular projections. The usual basal projection is deeply notched.

Fig. 87 is a rim from Oneida lake, decorated with horizontal and sloping lines, and with the basal projection notched. Several large rings, with smaller ones inside, are also arranged in a sloping line. This feature is that of the Jefferson county pottery, not much farther north, and it probably came thence. Fig. 88 is a fine rim from the Otstungo site, near Fort Plain. It has notches within and on top. From the top there is a broad slope outward to the prominent projection, which is deeply notched at the edge. This broad surface is divided into checker work by diagonal grooves, sloping both ways at right angles. The work is neat.

Fig. 89 is from the fort west of Cazenovia, and is taken from a photograph. The length was probably double that of the figure. It is part of a very broad and short human body, laid on the ornamented vessel in the usual way. The lower limbs show little more than the feet, and the whole figure may have been grotesque. Fig. 90 is a rim from Henderson Harbor, in Jefferson county. The edge of the rim is finely and neatly notched, the remainder of the surface being adorned with horizontal and diagonal lines of varying width. The prominent feature is two lines of crescents, sloping in opposite directions between the diagonal grooves.

Fig. 91 is made from Mr R. A. Grider's drawing of a Seneca vessel, now in the state museum. It is of full size, and came from West Bloomfield, Ontario county. The same projecting and deeply notched rim appears sometimes farther east, as well as the triangular indentations surrounding the vessel in a single row below. Curved grooves, arranged diagonally, appear on the rim between the top and the graceful notches below. Fig. 92 is a perfect vessel from Cayuga county, of actual size. It has an undulating and expanding simple rim, with two opposite elevations. There are elliptic indentations below the edge, reaching all around, and the whole surface is slightly furrowed from top to bottom. It is from Scipioville, where many of the relics are at least as late as the latter part of the 17th century.

Fig. 93 is a fragment found near the head of Onondaga lake, at a spot known as Kaneenda, and occasionally occupied about 1700, as well as much earlier. Small human faces occur there on vessels, of the type found at the fort on lot 69, Pompey, a place of national residence about the year 1630. This stronghold brought the Onondagas nearer to this lake, and they partially made it a new fishing place. The fragment represented has a small and peculiar ornament on an otherwise plain surface. There is a line of very small rings, with a curved line above each one, coming to an angle behind, much like a representation of the human eye. No age can be assigned to this.

Fig. 94 is a small but finely formed Mohawk vessel, found in a Montgomery county grave, along with iron axes, beads and other modern articles. It is oblong, and the lateral rim is deeply curved, rising into a high and obtuse point at the ends. The rim is notched above and on the sides. A broad groove sweeps along beneath this vertical grooving on the sides of the rim, and grooved lines curve outward to the bold projection beneath. At one end of this projection is another which is vertical and ornamented, and strikingly suggestive of the prow of a ship. Below these projections the vessel is neatly rounded out, but with rather sudden curves. The bottom is flatter than usual.

Fig. 95 is a handsome rim from the early Onondaga fort west of Cazenovia. Near the top a row of vertical points is crossed by a narrow longitudinal groove. There are two horizontal grooves below this, with diagonal grooves below them. Between these is a row of curved lines, apparently finger marks. Most ordinary patterns are found on this site. Fig. 96 is a very neat rim from a stockade on the south side of the Seneca river. The top is nicely rounded as well as notched. Two horizontal grooves are below this, and still lower are parallel diagonal lines arranged in groups with opposite slopes. The basal notches penetrate these.

Fig. 97 is a perfectly plain Seneca vessel from West Bloomfield. There is not even an angular projection. Fig. 98 is a rim from the fort west of Cazenovia, which is of unusual design. The surface above the projection is divided by vertical grooves, and every alternate space between these is divided into squares by transverse grooves. Fig. 99 is a rim from the fort on the east bank of Garoga creek, in Fulton county. The edge of the rim has a spiral fluting, beneath which are horizontal and diagonal grooves. Fig. 100 is a characteristic fragment from Henderson Harbor, showing the three elliptic indentations so common in that region. The rim is slightly notched across and ornamented within. Most of the outside ornamentation is of short dashes arranged in lines.

Fig. 101 is a Mohawk rim with a human figure, which is nearly full length, the usual projection terminating it at the knees. The body and limbs have cross bars, and there is an elaborate array of grooves in almost every direction. This is from the fort in Fulton county, which seems one of the earliest occupied by the Mohawks in New York. At the foot of the hill on which this stood, are the clay pits used in making these vessels. Large fragments are frequent there.

Fig. 102 is a Seneca vessel with a deep rim projecting abruptly from the bowl. There are two elevated angles. The broad projection is ornamented with three encircling grooves, and a row of elliptic indentations. This is from West Bloomfield, like several others figured for this paper. Fig. 103 is a rim from the fort in Fulton county, notched, and with narrow horizontal and diagonal grooves. Below the uppermost of these is a row of fine dots. Fig. 104 is part of a rim found northeast of Canajoharie. The upper part has a row of inscribed chevrons, with horizontal grooves below. The full fragment has also diagonal lines. Fig. 105 is from another Mohawk fort of the same period, that near Fort Plain. It is a plain rim as far as elevation or expansion is concerned, and is ornamented with two lines of circular indentations, separated by a horizontal groove. Fig. 106 is a fine rim of unusual character, found with 104. The undulating upper edge is deeply notched, and below this are three grooves. Then comes a wide and thin projection, with deep and graceful notches, forming a closely sinuous line. Fig. 107 is a rim from the fort near Cazenovia. It has two lines on the top and is notched within and without. Outside is a thin and rather broad projection, with an undulating edge.

Fig. 108 is a rim found near Palatine Church, Montgomery county. It is adorned with various grooves, and has a human figure which has lost its head. The customary projection cuts off the legs at the thighs. The hands and fingers are well defined, and there are the usual cross bars.

Fig. 109 is a rim from Rice's woods, north of Palatine Bridge. It is ornamented with a row of long and vertical ellipses, with broader ones at the projection. Fig. 110 is an angular rim from Jefferson county. The principal ornaments are broad grooves, whose cross divisions suggest the impress of a row of corn, but they are uneven, and sometimes irregularly curved. The style is bold rather than elegant. Fig. 111 is from the same county, as might be inferred from the three rings in the usual position. On either side of these are nearly vertical but curving grooves, and there are notches on the edge of the projection. Fig. 112 is from Montgomery county, north of Palatine Bridge, and has the chevron pattern just below the rim, but this is indented in a different way from the other example given. There are broad horizontal and diagonal grooves, and the base is deeply notched.

Fig. 113 and the next three are Seneca vessels, all from West Bloomfield, and much reduced. This one is broad, and the rather narrow projecting rim has notched edges, and two parallel lines on top. Fig. 114 is plain, but might be called a pitcher form, as the rim has a wide projection in one place. Fig. 115 has a flaring rim, deeply notched on the lower edge. Fig. 116 is proportionately much narrower, but while a smaller vessel the projecting rim is much deeper, and is adorned with diagonal lines and deep notches.

Fig. 117 is taken from a small photograph of one of the finest perfect inland New York vessels, as far as size goes, and belongs to Mr A. G. Richmond, of Canajoharie. The ornamentation is so simple that a small illustration suffices for the general character. It was found by an Adirondack guide, some years since, in a cave in Otter creek valley. The contraction is quite near the rim, and there is a simple ornament around this narrow part. The greatest diameter is below the center, and is 13 inches, being three more than across the top. The hight is 14 inches, and Mr Richmond bought the vessel of the finder some years ago, taking pains to have a certified account of its discovery. Caves have sometimes afforded good examples of New York pottery, and should be carefully examined wherever there are indications of man's former presence, not alone with reference to remains of pottery, but of other things as well.

Fig. 118 is an Onondaga rim, quite broad, and with two parallel lines on top. The edge is indented within and without. Fig. 119 is from a Seneca river stockade, and has lines of large square indentations, a frequent pattern. Fig. 120 is a rim from the same site, deeply notched on the edge, and with diagonal grooves below. Fig. 121 is a rim from Rice's woods, north of Palatine Bridge, and has a row of circular indentations below the moderately elevated angle. At the angle is a shattered face, with a sloping row of large elliptic indentations on either side. Below there are diagonal lines extending to the angular base, which slopes upward on each side from the lower point of the slightly indicated body. This unusual arrangement suggests butterfly wings. Fig. 122 is a rim from the small earthwork on Fort Hill, near Savannah, N. Y. There are two lines of small indentations on the flat top, and vertical interrupted grooves within, similar to the divided grooves without. The latter are diagonal, meeting at an angle.

Fig. 123 is taken from the small figure in Morgan's *League of the Iroquois,* which he considered typical of the pottery of the Genesee valley. It fairly represents some forms. Fig. 124 is taken from a small picture of one of the cave vessels of New York city, and was described at the time as 'of dark red clay, 18 inches in diameter at the mouth, and 2 feet high. It is contracted slightly 3 inches from the rim, and flares a little in the middle. The bottom has the same curious peak as that of the pot found in the knoll. Near the rim are nine roughly executed rows of indentations, evidently made with a sharp stick. Perpendicularly from the lowest row run roughened belts of clay about 2½ inches wide.'

After the above was written Mr W. L. Calver wrote very decidedly in reply to a question about the pointed base. He had not been able to examine closely the vessels in question, the curators of that department of the American museum of natural history being away, but said, 'As far as I can see none have anything like a pointed base, and as I have known them from the first discovery, I can say quite positively that none found hereabouts ever had any other than rounded bottoms. My large pot, from near the Chenoweth cave, has a rounded bottom. Mr A. E. Douglass says that he knows of no New York pottery with pointed base.'

The feature claimed was so improbable that the figure here given was introduced with some hesitation, but the claim was made so confidently that it was thought best to show by one example just what it was. The opinion of so careful an archeologist as Mr Calver, with special experience in local work, settles the question. The vessels from the metropolis are like those from other parts of New York.

A number of vessels have been found in New York city, in the vicinity of Harlem, which are worthy of notice, and perhaps closer study than can be given them now. Illustrations and descriptions were given in the New York papers, at the time they were found in 1890. These prove unreliable, but one of the simplest forms is reproduced here to show one supposed feature of this pottery. The accessible figures of the others differ greatly in outline from common forms. Some were reconstructed from fragments, and the correctness of the restoration is another question. Some were found in caves, and several are of large size. The peculiar feature, if it proves such, is a protuberance at the base, so that the vessel could only have stood in mud or sand. As figured the greatest diameter is below the middle. One of these, from a cave, is described as having a mouth diameter of 5 inches, and a body diameter of 9, an unusual proportion in New York vessels. It was also said to have had a protuberance at the base, and three zig-zag lines encompassed the rim, interrupted by four vertical divisions at regular intervals. A large vessel was also figured, and was taken from a wooded knoll, near the Harlem river, and the ornaments are the same as in Iroquois pottery, but in other ways it differs from that form. It is 18 inches high and 5 inches across the top, and was thus described. ' Around the rim ran a pattern of lines grouped in triangles. The lines are perfectly parallel, and show that they were made with some instrument less primitive than the pointed stick. . . It terminates in a rough little apex that would prevent it from standing upright on anything harder than mud.' 'Some particulars are added not quite consistent with the figure. Several others were described, one having ' a mouth but 5 inches in diameter, with a flaring body almost a foot through, and an almost flat bottom. The rim has a double row of indentations.' These are presumably early articles, but the restoration has been questioned.

Fig. 125 is a small vessel, represented of actual size. It is $2\frac{1}{8}$ inches high, with a diameter of $1\frac{3}{16}$ inches. This is from what is known as the Cayadutta fort, a few miles north of Fonda, being one of the three forts belonging to the three Mohawk clans when they first settled in their New York territory. The site affords faces on pottery, but of a ruder type than usual. This feature connects it with other recent sites, but its age is quite as well shown by a long bead of rolled brass. The vessel figured has an unusual contraction in the center, and the whole work is quite rude.

To illustrate one form of early Iroquois pottery, fig. 126 is given, being a Canadian vessel found about nine miles northwest of Ogdensburg, N. Y. It has the angular rim, fragments of which are so frequent, and the usual expanded bowl with a rounded bottom. With this may be compared Mr F. H. Cushing's figure of an Iroquois vessel in fig. 127, from a report of the Bureau of ethnology. He supposed this form was founded on an earlier vessel of birch bark. If the figure is correct, the pointed base is abnormal rather than typical. All Iroquois vessels here represented have a broadly rounded base. Fig. 129 was found with 126, and is introduced for comparison. It shows the deep and projecting rim, as well as ornaments below this.

Excepting this, fig. 128 to 137 inclusive, are from West Bloomfield, N. Y., with one exception, and belong to Mr Leo Walter Hildburgh, of New York city, who kindly presented photographs of all. Most vessels found there are of the historic period, and it has furnished many. Mr Hildburgh says that these are 'from graves containing articles of Indian and European manufacture.' Fig. 128 has a notched rim, and the greatest diameter is about 1 foot. Fig. 130 has a sloping rim, with widely separated points. The diameter is the same as the last. Fig. 131 is a small, plain and shallow vessel, but little over 6 inches across. Fig. 132 is from Lima, N. Y., and has a broad rim with deep basal notches. Its diameter is 10½ inches. Fig. 133 has a deep and notched rim. This and the next have a diameter of 8½ inches. Fig. 135 is a typical example of the highly ornamented early form, with a broad and angular rim. It is a foot in diameter. Fig. 136 is rather rude in every way, but has a deeply notched rim. The diameter is 8 inches. Fig. 137 is one of the rarest forms of earthen vessels, and it is of unusual size for the kind being on the same scale with all those furnished by Mr Hildburgh. It is a double pot, ornamented, but having one bowl broken.

To this review of early New York pottery a few notes may be added. It will be observed that the vessels found at the Harlem river are of large size, but this is hardly a rare circumstance. They are partly restorations, and the true form is in question still. Many Iroquois vessels must have been quite as large. At the Forks of Fish creek, Annsville, Oneida county, vessels are said to have been found from 2 to 3 feet in diameter. Mr W. W. Tooker writes of one found by him in Sag Harbor, 'The large vessel, which holds about half a bushel, I took from a grave in this village. There was another of nearly the same size, but so badly broken that it could not be restored. It was molded in a grass basket, without ornamentation except on its top edge, where there are cord marks, and it is pierced with two holes for suspension.' This is not a common feature. In Southold he found two smaller vessels in a grave, holding a quart and a pint respectively.

The Rev. O. C. Auringer, of Troy, writes that he has found no earthenware east of the Hudson, while it occurs plentifully west of that river. This must not be taken as a general rule, however, though it certainly is less frequent eastward. In New York it had its highest development among the Iroquois, although they used dishes and vessels of bark and wood, as they still do. Their near kindred, the Hurons of Canada did the same. Each took his bark dish and wooden spoon when invited to a feast. These articles remained long after other changes came. A Huron Christian, named Chihwatenhwa, told his friends in 1639, that they should not reject Christianity because it was brought by the French, 'I ask you, when at the beginning you saw their axes and kettles, after having recognized that they were incomparably better than our axes of stone, and our vessels of wood and of earth, have you rejected their axes and kettles, because this was a new thing in your land, and it was the custom of France to use these, and not your own?'

Something might be said on the aboriginal names of vessels, of whatever material, and it would prove a suggestive theme. They varied even among the Iroquois, and that in a marked degree. The Oneidas and Mohawks, the most recent comers, differed in their usage from the three western nations, as might have been expected, and yet were so related as to sometimes use their names of kettles. Commonly they did not. In other ways the reciprocal influence of New York and Canada forms a curious study, commerce, migration, peace and war, all contributing their part.

The remaining figures of vessels are from those in the state collection, which includes some of the most remarkable specimens now to be found.

Fig. 241 shows a fine vessel adorned with a human figure in bold relief, and not as much conventionalized as in most examples. The head reaches the rim, and the feet are less than half way above the rounded base. The angular rim is adorned, much as usual, with grooves and indentations, and is altogether unique. It is another of the fine articles obtained for the state collection from West Bloomfield, and is 6½ inches high, with a diameter of 5¾ inches. Another illustration of this is given in Fig. 245.

Fig. 242 is a simpler vessel from the same place, and there are others less adorned, some of which have a slight ornamentation at the rim, while others are perfectly plain. This has diagonal grooves below the rim, and a row of large indentations beneath these. It is much reduced in the figure, having a depth of nearly 5 inches and a top diameter of 4¾ inches.

Fig. 243 is also from West Bloomfield, and is 4¼ inches deep, with a diameter of 3⅞ inches. The ornaments of indentations and diagonal grooves are carried farther down the sides than in the last.

Fig. 244, from the same place, is a good example of an Iroquois vessel adorned with a conventionalized human figure. The body and legs have the customary cross marks, while the arms are formed by elliptic indentations. Such vessels are now very rare. This is also reduced, the dimensions being a depth of 6½ inches, and a diameter of 6¼ inches. Vessels of this kind were much in use among the Iroquois about the year 1600, and for a few years later. As far as reported they appear only among the Mohawks, Onondagas and Senecas, but there is no known reason why the Oneidas may not have used similar decorations, but none have yet been found in their territory.

Fig. 245 is a photographic view of a Seneca vessel already figured in a different position, it having a less diameter one way than the other. The human figure does not seem to have been molded separately, nor does it have the cross bars so common among the Mohawks and Onondagas. A perfect vessel with that style of ornament is something much desired.

The number of entire or nearly whole vessels of clay has proved unexpectedly large, but it is to be regretted that so many have been carelessly destroyed. It is hoped that a few early Mohawk and Onondaga sites may yield much of high value in this way, should the state provide means for painstaking research. It is matter of congratulation that so much has been already secured, but this initial work only shows how important is the field, and how much may be done.

CLAY TOBACCO PIPES

In an article on the 'Antiquity of the tobacco pipe in Europe,' by Edwin A. Barber, printed in the *American antiquarian* in 1879, he says, 'It has for some time been a matter of dispute among antiquaries whether the custom of tobacco smoking originated in the eastern or the western continent; but of late years America has been generally accepted as the birthplace of the art.' The great quantities of small clay pipes recently found in Great Britain, known in England as fairy pipes, in Scotland as Celtic or elfin pipes, and in Ireland as Danes' pipes, he said had revived the question. Some had been found close to Roman remains, and thus it had been claimed that they were Roman relics of the second century. Other recent articles found with them disproved this theory. Sir Daniel Wilson, of Toronto, fairly discussed this question in his *Prehistoric man*, and arrived at this conclusion. In Fairholt's *Tobacco; its history and associations*, the subject is also treated, and he sums up by saying, 'We may be certain no authenticated discovery of Celtic or Roman antiquities, where the ground has been entirely undisturbed, includes tobacco pipes.' Mr Barber thought the fairy pipes of Ireland the oldest form known in Great Britain.

There seems little doubt, however, that smoking was known in Europe before Raleigh's time, though perhaps little more than this, for King James, in 1603, said 'It is not so long since the first entry of this abuse amongst us here, as this present age can very well remember both the first author and forms of its introduction.' Capt. John Smith, who loved the weed, gives Ralph Lane credit for its introduction into England. 'More by token that Lane brought with him that blessed herb tobacco, and was the first man that brought it to England; and yet have I heard men say, some that it was Drake, others that it was Raleigh. Nor are they altogether wrong, for if Raleigh had not sent Lane out, and Drake had not brought Lane home, he could not at that time have showed us Englishmen the virtues of that precious herb.' English pipes of the 17th and 18th centuries, were used in trade or as presents to the Indians, and in speaking of New York examples there will be occasion to quote Mr Barber again.

The oldest pipes found in New York are of stone, the Iroquois clay pipes succeeding these early examples, and being followed by those of red pipe stone and some of the fine grained slates. In 1643 Roger Williams said, 'Sometimes they make such great pipes, both of wood and stone, that they are two feet long, with men and beasts carved, so big or massive, that a man may be hurt mortally by one of them, but these commonly came from the Mauguawogs, or the men-eaters, three or four hundred miles from us.' His account sounds like pipes of stone, but he probably never saw a Mohawk Indian or his pipe.

Capt. John Smith described the Susquehanna Indians, who were kindred to the Iroquois, and we get the same impression of stone pipes, though he does not call them such. He tells of 'his tobacco pipe, three quarters of a yard long, prettily carved with a bird or beare, a deare, or some such device at the great end, sufficient to beate out the brains of a man.' In both these cases we would suppose a large stone bowl intended, with a wooden pipe stem inserted, as in the modern pipe of peace. Wood also said that the Narragansetts made large stone pipes, which they sold to other nations. It will suffice to say that such pipes were not made in New York at the time of the Dutch colonization, nor were they then apparently used there, except very rarely.

The usages connected with tobacco are of great interest. It was an acceptable offering to spirits of every kind, and a little bag of it is attached to a large wooden mask lying before the writer, to keep the spirit of the mask in a peaceful mood. It allayed storms, and was grateful to the thunders. It was always used at the burning of the white dog, and was indispensable at councils of peace or war. In digging ginseng a little of it was scattered over the first plant found, which was then left unharmed. How largely it entered into Indian life may be seen in old chronicles, or even on a reservation now.

This native northern tobacco, *nicotiana rustica*, is used in all sacred functions, and grows spontaneously when once introduced. It has a yellow flower, and is smaller than our commercial kinds. In the prosperous days of the Tionontatie, or Tobacco nation of Canada, it was a source of revenue to that ancient people. Loskiel said, 'The species in common use with the Delawares and Iroquois is so strong that they never smoke it alone, but smoke it with the dried leaves of the sumac or other plants.' The Onondagas still cultivate this species sparingly, calling it *oyenkwa honwe*, real tobacco.

On his pipe the Indian exercised his highest taste and skill, nor did he wish to lose his own enjoyment of its beauty. Early clay pipes had the finest features within the smoker's sight, the face on the bowl being usually turned toward him. Later examples often reversed this feature, both in clay and stone. Quite commonly it will be found that the figure on the bowl was molded separately, and then attached. Detached heads occur, broken off, and often beautifully wrought. Symmetrical designs appear, as when two or more heads of any kind are grouped in various ways. Very often the form is both simple and elegant, as in the trumpet pipes with their graceful curves. After a time, however, the cheap and convenient pipe of the white man, or the elegant red stone pipe of the west, displaced the work of the native forest artist.

A very large proportion of the aboriginal clay pipes of New York were made by the Iroquois, and many are very neatly finished, the work on them being much better than that on earthen vessels. Some are so smooth as to suggest a dull glaze. This appearance, however, comes from the careful finish of the surface. They vary much in color, as the vessels do. Some Seneca pipes have almost the appearance of black marble. Those found farther east are much lighter in hue. The ornamental work varies still more, and is often quite artistic. Human heads, with those of quadrupeds and birds often embellish the bowls, and more rarely the stems. Lines and dots are sometimes tastefully arranged. The upturned and open jaws of some animal occasionally form the bowl, while some peculiarities hint at a knowledge of the whites in a few from prehistoric sites. The Algonquins also made pipes of clay.

As a rule stone pipes were earlier than those of clay, but not invariably. A primitive feature appears in most cases; that of having any face toward the smoker. One curious example has the face turned to one side. Apparently at a later day there was sometimes a double symmetrical representation on the back of the bowl, but this is not a common feature. In a very few cases grotesque human faces are interwoven all over the bowl and stem. The so-called trumpet pipes are frequent, but many others have a similar curve between the bowl and stem. Straight pipes are rare, and those with flanges along the stem are local.

Precisely when European pipes began to be used by the New York Indians, we may not be able to decide. Large white stems, carved as ornaments appear on the Onondaga site of 1654, but this was occupied for some years longer. No Dutch pipes have been found, known as such, and it is not likely that English pipes would have been introduced inland, till the English took and retained possession of the province of New York. On some sites of the last quarter of the 17th century, such pipes have been found, and some examples of these will be given. In 1684 duties were laid on tobacco pipes and boxes intended for the Indian trade, amid a host of other things, so that they must then have had an extensive use here and elsewhere. As public gifts to the Indians they first appear in a council held in 1692, but some may have been given before. The older ones have the bowl rather small and barrel shaped, and the maker's initials may appear on the projecting heel below the bowl. A large number of pipes have been found of these and somewhat differing forms, and some are of much interest to the antiquary. More will be said, as we consider each in turn.

In later councils wampum pipes appear as presents, but without any suggestion of their form or nature. They are mentioned in reports for 1702.

Fig. 138 represents one of these English pipes, found on the site of the smaller Onondaga village mentioned by Greenhalgh in 1677. It has no lettering, and is less swollen than most pipes of that period. The heel at the base of the bowl may have been worn off, and with this the letters would disappear, as they were stamped within an ellipse below. Another from the same site has the letters E. B., and this kind is somewhat frequent on Mohawk sites, but those with these initials vary much in form. Mr S. L. Frey found similar pipes with the letters R. T., on such sites, and others were found in an Indian grave in Pennsylvania. Prof. E. A. Barber thought these 'were probably made by Richard Tyler, a celebrated pipe maker in the vicinity of Bath, during the early or middle part of the 17th century.' The Dutch, however, were jealous of their monopoly of tobacco pipes, and there is no likelihood that English pipes found their way to New York Indians till toward the close of that century, after the colony changed owners.

Fig. 139 is another white clay pipe from the Onondaga village of 1677, having the heel and cartouche inclosing a monogram formed by an I above an M. It is singular in having a ribbed elevation about an inch from the bowl and around the stem. To these pipes may be added another found on Mohawk sites, and also on Manhattan island and in the Acadian cellars of Nova Scotia. This lacks the earlier heel, and has the name R. Tippet in raised letters and within a raised circle, on the side of the bowl. The maker is unknown, but the pipes probably belong to the early part of the 18th century, judging from their general character. Mr Richmond has a fine and perfect one from an Indian grave at Canajoharie.

Fig. 140 is a very fine and perfect pipe from a grave in Scipio, Cayuga county. It seems a gull's head, with the beak upturned, the bowl being at the base of this towards the mouth of the smoker. There are grooves and dots on the back of the bowl. It is 6½ inches long, and probably of the early part of the 17th century. All the pipes on this plate are two thirds of the actual length and breadth.

Fig. 141 is a plain pipe, but slightly curved, and much like those of Cayuga. It was found near Rome, and is 3 inches long. There are many of these plain pipes, having the bowl and stem at various angles.

Fig. 142 has a cylindric bowl and no stem. The greatest diameter is at the stem-hole. This form is unusual in clay, though better specimens have been found at Fort Hill, Auburn. This is the only pipe which has been found at Rice's woods, north of Palatine Bridge. It is somewhat rude, and is 1¼ inches broad.

Fig. 143 is quite slender, and has a grotesque face and high head dress, the latter a frequent feature in Cayuga pipes. Behind the face are grooves and dots. It is 5¼ inches long, and is said to have been found at Scipioville, a recent site of considerable extent.

Fig. 144 is a fine and perfect pipe of black clay, in the state collection, and is a good example of this characteristic pipe. An open-mouthed bear's head forms the bowl, and a spiral groove encircles the bowl and stem from end to end. Although this form of pipe is not rare, perfect examples are, and this is accordingly prized. This is a Seneca pipe from West Bloomfield, where many fine pipes and vessels have been found. In fact the populous Seneca country has proved one of the most productive fields for antiquaries, although a large proportion of the relics are recent.

Fig. 145 is a frequent form of Iroquois pipe, most abundant in the 17th century, and two of this type were found with the fine pipe which follows. It seems to have been most in use about the middle of that century, and a pot of French copper coins was among the many modern articles found in the same grave. There were 44 of these coins, dated from 1642 to 1656, and many French articles occur in this and adjoining graves in Cayuga county. It has cords around the top, and is 6¼ inches long.

Fig. 146 was found in a grave at Brewerton, which also contained a gun and European articles. There were two of the long pipes with this, having corded bowls; and also a unique pipe having a panther's head turned to one side. The pipe here figured has lost a part of the eagle's beak, but is otherwise perfect. Both head and tail project, and both are adorned with dots and grooves. It is very smooth, and almost black, and is one of the largest and finest clay pipes yet found in Onondaga county, being 8¾ inches long.

The figures on the succeeding plate are reduced in the same proportion as the last. Fig. 147 is a plain and angular pipe, from Farley's Point, on the east side of Cayuga lake. It is 5¼ inches long, and has the flange on each side of the stem, so often seen in Cayuga pipes.

Fig. 148 is a slender Cayuga pipe, with a very long stem and low bowl, the latter ornamented with dots and moldings. It is 7 inches long, and comes from Scipioville. Although of what is called the trumpet form, it is almost unique in character.

Fig. 149 is a fine turtle pipe from Schoharie county, and was found under a stump. The bowl is raised upon the back, and the feet and projecting head are well worked out. It is a fine example of this form of pipe, $7\frac{1}{4}$ inches long.

Fig. 150 is a pipe bowl from Jefferson county, strongly resembling two from Madison county in its niche-like character, as well as one from the Minden site near Fort Plain. There is a face and a rude figure in a recess, surrounded by a double arch. These pipes apparently belong to the end of the 16th century, but suggest to some a knowledge of Europeans. They are rather rare. One comes from Onondaga.

Fig. 151 is a fine and curious pipe found in a grave at Boughton hill, where the Seneca capital of 1687 stood. There is an upturned human face above, and arms below the rim of the bowl. Below the latter are grooves, and along the stem are grooves and elliptic indentations in the fashion of that century. Another fine pipe was found in the same grave. One has been described from the Huron territory in Canada much like this, and the Senecas had a town almost entirely Huron, after the overthrow of that people. The Huron and Canadian pipes of this form may have come from the same hand. The length is $7\frac{5}{8}$ inches.

Fig. 152 is a large and fine bowl in the form of a human head. It is very well made, and resembles some of the early pipes from Jefferson county. It is $2\frac{1}{4}$ inches wide, and was found in Lenox, Madison county, not far from the site of 1615, but is probably of earlier date. From the latter, at Nichols' pond, Fenner, come some of the high and corded bowls of that century, so frequent elsewhere.

Fig. 153 is a large and heavy pipe, with the abrupt angles neatly rounded. It has a flaring bowl, and is perfectly plain excepting four shallow horizontal grooves midway on the front of the bowl, and two large indentations on the back. This massive pipe is perfect, and is $7\frac{1}{4}$ inches in extent. It was found in Pompey, and thus seems of the 17th century.

The next plate is reduced in the same proportion. Fig. 154 has a wolf's head projecting from the bowl, with grooves around the latter. It is a recent but fine Cayuga pipe, and was found in a grave with European articles. These projecting heads were often broken off, and sometimes had a secondary use as ornaments. Usually they were molded separately, and attached before baking. The form was common in the 17th century and a little earlier. This fine pipe is $6\frac{3}{4}$ inches long.

Fig. 155 shows a fine trumpet pipe from the Seneca river, $3\frac{5}{8}$ inches long. It comes from a fishing hamlet, where there were also camps of uncertain age. A molding at the base of the bowl is an unusual feature in this form of pipe.

Fig. 156 is a plain and angular pipe, with a molding around the rim. It is 4 inches long, and is a Cayuga pipe from Union Springs. The type is frequent there.

Fig. 157 shows a pipe bowl of a pattern found in a number of places. It has an expanded base, divided by vertical ridges and grooves. These ridges are notched across. There are four human faces between these and on opposite parts of the bowl. In some examples a plain surface takes the place of the face. Above these ribs and faces the bowl contracts and then expands toward the rim. This part has horizontal grooves. This bowl comes from Rodman, Jefferson county, and is $1\frac{7}{8}$ inches across the rim. It seems to have been in use late in the 16th century, from the connection of sites.

Fig. 158 is from a camp site a mile east of Skaneateles lake, and is $3\frac{1}{2}$ inches in extent. A human face turns toward the smoker, and much resembles one found in a stockade near Baldwinsville. There are three vertical grooves below the chin. The curved stem is nearly rectangular, but the angles are neatly rounded. The material is quite gritty, and the rim is a little damaged.

Fig. 159 is a thick and coarse bowl, much like a flower pot in form, but it has a slight inward curve at the top. The rim is made with an outward slope all around, and below this are large elliptic indentations. It comes from Fenner, Madison county, and is $1\frac{7}{8}$ inches wide by $2\frac{1}{2}$ deep. But for the location of this at or near Nichols' pond, it would not be thought an Iroquois pipe, and may not have been.

Fig. 160 is a neat and peculiar little pipe bowl from Seneca county, 1 inch wide. It is very angular at the base, and midway the upper half of the bowl projects, and is adorned with vertical and horizontal grooves. The base gradually expands below this abrupt projection, and is decorated with diagonal grooves and dots.

Fig. 161 is a very well made pipe, representing the human knee and foot slightly conventionalized. The stem is a little broken, but it is yet 4 inches long. The sole of the foot forms the rim of the bowl, and the ankle and toes plainly appear. It is from the Otstungo or Minden site, where many fine pipes have been found.

Fig. 162 is a serpent pipe from West Bloomfield. The reptile twines around the pipe from the mouthpiece to the top of the bowl, where the head appears. This gives the whole pipe a spiral appearance, found in some other Seneca pipes where the serpent is not so distinctly seen. This creature was a favorite decoration on many fragmentary pipes. This one is $4\frac{7}{8}$ inches long.

Fig. 163 is a remarkable pipe from Boughton hill, suggesting a Huron maker, and is $6\frac{1}{2}$ inches long. It was taken from a grave with another already described. The human head, with its little cap, is hollow, a remarkable feature, but a hog's head, detached from a pipe and found near Canandaigua lake, resembles it in this respect. This hollow head rises above the bowl, and has seven perforations. Arms and legs appear on the bowl, and there are grooves across the back of the figure. The fashionable lines and indentations follow the stem. The face is less upturned than in a previous example.

In succeeding plates the figures are of actual size.

Fig. 164 is one of the curious many faced pipes found on one or two Onondaga sites only. This is reported from Indian Fort, in Pompey, but may be a mistake for the stockade a few miles south, where they have otherwise only been found. The bowl alone remains of this pipe, which is the largest known of this form, being $2\frac{1}{4}$ inches wide. Six grotesque faces form the rim, and below these are two rows of five faces each, which are divided by spiral lines. Although much larger the general appearance is much less artistic than that of one yet to be represented.

Fig. 165 is another of these, more angular than some in its curves. This is from a photograph, and there seem to be six faces around the top. A fragment of a stem shows that these faces follow the curved and diminishing stem nearly to the mouthpiece, which is neatly rounded and has a molding at the end. This is from the Onondaga site west of Cazenovia, where several have been found. The stockade was occupied about 1600, and this unique type died with the maker.

Fig. 166 is part of a pipe bowl which is encircled by a serpent, the head appearing below. The form is found in many places, but this comes from a circular stockade near Baldwinsville. There are grooves between the scaly folds.

Fig. 167 is an owl's head pipe from Nichols' pond, and is $2\frac{3}{16}$ inches wide. These are often found in a fragmentary condition, and are rarely as perfect as this. It was a favorite design among the Petun nation of Canada, and sometimes is combined with other things in New York.

Fig. 168 is a pipe bowl from Ontario county, which is of simple design. There are six moldings above, and the top is nearly rectangular. Near the base is a large molding around the bowl. The greatest diameter is 2 inches.

Fig. 169 is a handsome fragment of the rim of a pipe bowl, much like a high and pointed cap or miter. This is ornamented with horizontal and diagonal grooves, the latter converging, and most of them notched. The color is a bright red, and it must have been a beautiful article when perfect. It was found on a stockade site a little west of Baldwinsville.

Fig. 170 is a coarsely made pipe, with a barrel shaped bowl, the horizontal lines above and below suggesting hoops, and the vertical lines between, staves. It is 4 inches long, and was obtained near Binghamton.

Fig. 171 is a rare form dating from the middle of the 17th century. It was found in a grave at Brewerton, with an eagle pipe and two others, along with European articles. It has the lines of dots frequent in that day, and its notable feature is that the single, spirited panther's head, forming the bowl is at right angles with the stem. In earlier pipes the face was toward the smoker; a later fashion was to place it on the front of the bowl. There are four grooves under the rear of the head, and the length is 5¼ inches.

Fig. 172 represents a fine pipe from an early Iroquois site in Pompey. Two human faces appear side by side, at slightly different angles with the bowl. This arrangement is somewhat rare, and although the pipe is otherwise simple it may be called unique.

Fig. 173 shows a fine bear's head pipe from Pompey, of the early part of the 17th century. The head and most of the body and bowl project greatly toward the rear. There are undulating and nearly vertical grooves on the sides of the body, and the usual grooves and elliptic indentations along the stem. There is the usual conventional projection of the tail, and the surface is polished. The length is 5¾ inches. There are many fine pipes of this type, but none, perhaps, uniting so many fine features as this.

Fig. 174 is one of a class where the open mouth of some animal forms the bowl. This is from Cayuga county, and is 4½ inches long. The bear's head is upturned, and the jaws are distended. Snake heads were often represented on similar bowls.

Fig. 175 is another of the many faced pipes found on the Onondaga site of 1600, and is the most graceful in its curves of any yet found, though smaller than some, the greatest diameter being less than 2 inches. One face has been broken off at the top, where there should have been five, but 13 remain on the fragment. The faces are grotesque and curiously intertwined, and the surface is as glossy as in some other pipes of that period.

Fig. 176 shows a fine trumpet pipe, widely expanded at the top. The rim has vertical indentations, and there are bands and dots below this on the bowl. It comes from Venice, Cayuga county, and is 4 inches long. From the location it would seem comparatively recent.

Fig. 177 has the general trumpet form, but is very thick as well as short. The low bowl is widely expanded, and there are moldings below the rim. The length is 3¼ inches, and it comes from Kendaia, near the east shore of Seneca lake, where a Seneca village was destroyed in 1779.

Fig. 178 is a miniature clay pipe from Jefferson county, of the trumpet form, 1½ inches long. These little pipes are sometimes met with, both in clay and stone. Many of the Indian pipes, however, held so little tobacco that it was needless to make toy pipes for the boys.

Fig. 179 is a long straight pipe with an expanding bowl, and is much like an inverted long-necked bottle in outline. The stem is almost triangular. The length is 4⅛ inches, and the greatest diameter 1½ inches. It is from Union Springs on Cayuga lake.

Fig. 180 shows an angular pipe of unusual form, from Rutland, Jefferson county. The top is slightly flaring, and there is an expansion in the center of the bowl, which is ornamented with lines and circles of dots. The projecting base takes the form of the heel in early European pipes, though very much wider. There are also three holes in the stem. The length is 4¼ inches. This does not come from a fort, but from an open site.

Fig. 181 is a remarkably fine specimen of a rare type, involving a symmetrical arrangement. The fine pigeon's head on one side of the back of the bowl is balanced by another on the opposite side, and a conventionalized human face appears on the rear between the bills of the birds. This face is an ellipse, with three vertical elliptic indentations. At the top and base of the bowl are broad bands, with elliptic indentations. Between these are 10 horizontal grooves, and there are three rows of long indentations on the flat top of the stem. The bowl is 2⅝ inches wide, and the pipe 5⅛ inches. This came from Indian Fort, Pompey.

Fig. 182 shows another of the open-mouthed pipes, apparently of a fish. The head is upturned as usual, the mouth forming the bowl. Below the bowl are circular grooves and lines of ellipses. It came from East Aurora, Erie county.

Fig. 183 is a pretty pipe from Union Springs, 3½ inches long. The top is hexagonal in outline, contracting in a straight slope to the moldings beneath, and ornamented with diagonal lines. Several moldings form the center of the bowl, which again suddenly expands before contracting into the stem, which is quite slender.

Fig. 184 is a curved pipe with a bowl terminating in a rim which is nearly rectangular, but with slightly convex edges. The top is $1\frac{5}{8}$ inches across, and the full length is $5\frac{5}{8}$ inches. There are grooves on the edge of the flaring rim. This was found in the town of Clay, not far from the Oneida river.

Fig. 185 shows a characteristic pipe from Jefferson county, with a human face on the rear of the bowl. It is much compressed, making the face somewhat thin. The eyes are raised ellipses, and there are small elliptic indentations around the rim. The long diameter of the bowl is 2 inches, and the short $1\frac{1}{2}$ inches. Clay pipes are common and variable in that county, and this is a moderately early form.

Fig. 186 is a fine pipe from the Otstungo or Minden site, and more than half of the stem has been restored. In this form it is $6\frac{1}{4}$ inches long. There are notched lines on the stem, and grooved and beaded lines on the front of the bowl. In a double niche, on the back of the bowl, is a child's bust with uplifted hands. An experienced archeologist, on seeing this, at once exclaimed that it was the niche of a saint, which it certainly suggests.

Fig. 187 is part of the bowl of a handsome red pipe, from a stockade near Baldwinsville. The upper part is rectangular, contracting toward the base, and ornamented with diagonal lines and dots. Below this it is circular, with horizontal moldings. The arrangement is very tasteful.

Fig. 188 is a handsome Mohawk pipe from the early fort on Garoga creek, in Ephratah, Fulton county. The curving stem is mostly lacking. The bowl is $1\frac{5}{8}$ inches wide. Above the bold and well-formed face is a head dress of netting.

Fig. 189 shows a pipe of unusual form from Montgomery county. The rim is slightly notched, and the bowl gradually expands below this for half an inch, as gradually contracting again below the angle thus formed. On this angle is a perforation, and there are five horizontal grooves on the front of the bowl. This is from the Otstungo site, and is highly polished.

Fig. 190 has the bowl square on top, and expanded below the angular contraction, The stem joins the bowl at an abrupt angle, and the bowl is ornamented with grooves. This is $3\frac{1}{4}$ inches long, and comes from Cazenovia.

Fig. 191 is a pretty pipe of the trumpet form, but with a very low bowl, ornamented with circular moldings and dots. It is 4 inches long, and was found a few miles west of Canajoharie.

Fig. 192 shows part of a curious pipe bowl found at Brewerton. It is cylindrical and tapering toward each end, and is ornamented with lines and dots. There is a strong resemblance in this to a stone pipe found in Canada.

Fig. 193 represents a curious pipe bowl found in East Syracuse. The upper part of the front reached above the proper rim of the bowl, and this is partially lost. The front of the bowl represented a human face surmounted by an owl's head.

Fig. 194 is a trumpet bowl, raised on either side of the rim, but this is hardly a rare feature. It is ornamented with lines and dots, both horizontal and nearly vertical, and is $1\frac{3}{8}$ inches wide the widest way. It was found on the Seneca river.

Fig. 195 is of similar form, having the two raised angles. It has circular moldings below the wide band which forms the rim, and is $1\frac{1}{4}$ inches wide. There are two indentations below the rim. This is from a stockade near Baldwinsville, probably of the 16th century.

Fig. 196 is a heavy angular bowl, with diagonal lines and encircling rows of dots. It is $1\frac{3}{8}$ inches wide, and was found on the Seneca river.

Fig. 197 shows a small thick pipe, with expanded bowl, ornamented with diagonal lines and dots. It is $2\frac{5}{8}$ inches long, and comes from Sherman's hollow, Yates county.

Fig. 198 shows a small bowl with expanded base, having vertical ribs, but no faces. Above these an ornamented molding encircles the bowl, and the expanded rim is neatly decorated. The diameter is $1\frac{1}{4}$ inches, and it comes from Cayuga county.

Fig. 199 is an angular pipe from Farley's point, Cayuga lake, which is $3\frac{1}{4}$ inches long. The bowl is encompassed with irregular grooves and dots.

Fig. 200 is another angular pipe, $4\frac{1}{2}$ inches long, and found in Scipioville. The stem expands but slightly till half way between the angle and the top of the bowl, where there is a sudden enlargement. This is adorned with vertical and diagonal lines.

Fig. 201 has a swollen base to the bowl, ornamented with diagonal and vertical lines. It is 3¾ inches long, and was found 2 feet underground in Owego, in 1897.

Fig. 202 is a white clay pipe from Munnsville, where the Oneidas lived. It has no heel, but in the slight cartouche beneath the bowl are the letters E. B. The form is very different from the earlier pipes bearing these initials, which have barrellike bowls and prominent heels. At the same time it differs much from recent pipes. Barrels of pipes were given to the Indians by the English.

Fig. 203 shows a pipe from Hoffman's Ferry, of quite unusual character. It is reduced in the drawing to three-fourths size, the actual extent being now 2¼ inches, but the stem has been broken. It was found on the flats of the Mohawk river, and Mr P. M. Van Epps, the owner, says, 'The dot and line ornamentation has been impressed before baking, but the work representing the mouth, nose and eyes, has been cut in the material after burning. Both sides have the face, which is cut much alike, except that the reverse has two nasal orifices.' It is quite narrow for the length, and seems an early form.

Fig. 204 has an upturned wolf's head on the margin of the bowl. The mouth is not open, and there are other examples of the general form. There are grooves around the bowl, and grooves and elliptic indentations on the stem. This is an Oneida pipe from Munnsville.

Fig. 205 is a frequent form of Cayuga pipe, easily imitated from its simplicity of design.

Fig. 206 is a human faced pipe bowl from Indian Fort, Pompey, having a head dress of dots and lines. The curved stem has been broken. Indian Fort is considered a recent site, but this pipe is of an early Iroquois type, like most relics there now.

Fig. 207 is perfectly plain, and slightly curved, suggesting that stone tubes may well have been used for pipes. It is 4 inches long, and comes from Farley's point, Cayuga lake.

Fig. 208 is a pipe bowl nearly an inch wide, found on the site of a circular stockade near Baldwinsville. The face, with its open mouth, differs little from many others, but there is a neat head dress behind this, made up of dots and lines, suggesting one in actual use.

Fig. 209 is taken from a drawing of a fine pipe found on Fort Hill, Le Roy. It is 4 inches long, and has two raised human heads on the back of the bowl, facing the smoker. The back below these has a plain surface with oblong indentations. This flattened surface is continued on the top of the stem, which is angular throughout. The front of the bowl, with its dots and grooves, is much like some other Seneca pipes. This pipe has now disappeared. From the drawing furnished by Mr Moseley it would seem that one of the heads is that of a white man, not an improbable thing at the time the pipe was made. Unfortunately this can not be determined now, and the drawing is given as made some years since.

A pipe bowl from a Baldwinsville stockade has three narrow and horizontal ellipses within a double triangle, which has the point above. The elliptic grooves represent the eyes and mouth.

A Jefferson county pipe has a beaver on the front and beneath the bowl. The top is contracted, and the marks of molding tools plainly appear. A large and thick angular bowl, with concentric interrupted grooves inclosing a 16 rayed star or flower, comes from Sacket Harbor, from whence comes also a swimming goose on the upper part of a large bowl. The bird's head is broken off. A thick and angular pipe, much like those from Cayuga, also comes from Rutland, in that county. Another from the same place has a slender stem, and an expanding straight-sided bowl with diagonal grooves and dots. It is $4\frac{7}{8}$ inches long, and the bowl is comparatively low. A thick trumpet pipe, $5\frac{3}{4}$ inches long, comes from Dexter, and a similar smaller one from Le Ray. A pipe with a very broad and flat stem, but somewhat convex above and below, is 3 inches long, and was found at Alexandria Bay. A bird pipe from the Thousand Islands, is 3 inches wide, and has grooves on the wings and tail. Some others from this county will be mentioned later.

A pipe from Binghamton has a grotesque face, with a long projecting nose. A perfect pipe has a wolf's head, with vertical grooves behind. A line of elliptic indentations runs from the head far down the stem. It is 6¾ inches long, and comes from Cazenovia. A finely polished and perfect pipe, 6½ inches long, is from Phoenix, on the Oswego river. It has the corded ornament at the top of the bowl, interrupted by two broader grooves. The stem is more gradually curved than in most of this type.

A large pipe of red clay, from Schoharie county, has double moldings at the base of the bowl. The latter expands like open jaws. A trumpet pipe, from Stone Arabia, has grooves and dots, and a rim 2¼ inches wide. A large pipe from the Otstungo site is 6⅞ inches long, and curved. A now headless goose shows its foot. The pipes there have usually long stems. A fine trumpet pipe from this place is 6⅞ inches long, and has moldings. Another angular pipe from this fort, with an expanding bowl, has a raised wolf's head, turned to the front, which is unusual in so early an example. A cylindric bowl, with vertical and horizontal dots and lines, is 1¼ inches wide, and comes from Canajoharie. Another broadly expanded trumpet pipe, with moldings and grooves, is 6 inches long, and comes from Stone Arabia. Quite an odd find in clay pipes is one from Frey's Bush, which is a brown earthenware imitation of European pipes.

Oneida pipes are not rare, and fine examples of them are found in many collections, where they have become widely dispersed. They occur mostly in the vicinity of Oneida creek, and some have been described from Nichols' pond. A bowl, 1⅛ inches wide, and having horizontal and diagonal lines and dots, is from Munnsville. A large bowl, having a large bear's head, with grooves and dots behind the head, is from Madison county, and is 2½ inches wide. Another bowl, with an animal head, and grooves and ellipses on the bowl and stem, is from Munnsville, and a niched pipe comes from near the same place.

Among the odd serpent pipes is the fragment of a large bowl from Baldwinsville. The scaly folds are well worked, but are not parallel, and between them, in one place, is a large protuberance, much like an egg. Another curious bowl from the same place has deep spiral grooves and prominent decorated ridges, suggestive of a serpent but not directly an imitation.

A plain trumpet pipe from South Onondaga is 5 inches long. An upturned bear's head, with open jaws forms the bowl of a pipe from Oneida river. There are grooves around the stem and lower part of the bowl, and vertical grooves below the jaws. Turtle pipes are usually flat, but one from the Seneca river has the head raised above the edge of the bowl, on the sides of which are horizontal and diagonal grooves.

The corded bowls are many in number, and distributed through the entire Iroquois territory, most of them being of the 17th century, and varying in unimportant details. In this, as in other instances, will be seen one great advantage of studying the Iroquois district as such, that of placing so many articles in their proper chronologic position, affording a criterion for work elsewhere. Thus a coarse and heavy clay pipe found in a grave at East Syracuse, to the fertile imagination of the reporter was of vast antiquity, and the grave a substantial structure lined with stone. The stones vanished, on investigation, and an Iroquois pipe appeared of another corded form, having a low instead of a high bowl. These corded pipes are often angular, but the bowl and stem sometimes form a fine curve, and sometimes they are true trumpet pipes.

An example of a type of pipes made in the 16th century comes from the Thousand Islands. It is quite plain, the bowl curving abruptly from the stem, and expanding but little except at the rim. This form is often ornamented with some incised figure, and the bowl is quite high.

A very pretty pipe bowl was found two miles south of Onondaga Hill. The lower half of the bowl is much expanded, and has the usual vertical divisions of this form of pipe, but they are less prominent than usual, and there are no faces between. On the cylindric portion between this base and the four moldings around the rim are grooves and lines of dots.

The simple and almost straight pipes, often with very broad stems are found in many places. A good example comes from Oswego Falls. It is but slightly curved, and is quite thick. The dimensions are $3\frac{1}{2}$ inches long by $1\frac{1}{4}$ wide, and it is broken on one side of the rim. Viewed from the front the sides are nearly parallel. It was little used by the eastern Iroquois.

A fragmentary bowl comes from a stockade site on the Seneca river, having several rare features. There has been a high crest of some kind, above the well-wrought human face, the features of the latter being quite prominent. The eyes have elevated and elliptic rims, and the mouth a similar rim, but more angular. The face seems to have been made separately, standing well out from the bowl. The site is prehistoric Iroquois.

The pipes with flanges on the sides of the stem, are not restricted to the Cayuga district, a fine and ornamented one having been found near the east shore of Cross lake. It is of a simple character, having only grooves and lines of dots below the rim.

Among the niched pipes inclosing human busts or faces, may be mentioned one belonging to Mr A. E. Douglass, of New York, and found in Madison county. The double arches are plain, and the face, which is of a marked character, runs up into a high point, suggesting a fool's cap.

A fine and large turtle pipe is from an Onondaga village, occupied in 1677. The upper shell forms the front of the bowl, which opens about half way down the lower shell, the animal being placed vertically. The claws and tail are well elaborated, but are under the edge of the shell. The whole surface is ornamented with groups of lines.

A curious pipe is from Jefferson county, and represents a fresh-water crayfish, whose tail extends beneath the stem. One of the claws is broken, and the other entirely gone. There are rows of dots along the back. The length is $3\frac{1}{2}$ inches.

Two recent Onondaga pipes are worthy of note, both from a village occupied in 1677. A long-bodied animal encircles the top of the bowl of one, having the head and tail of a bear. Beneath the body are four broad grooves and a chain around the bowl. The head is parallel with the side of the bowl. The other has a well-executed figure of a sitting man, whose feet are on the stem, and whose hands are clasped across the knees. Grooves appear on the man's prominent back, giving it the appearance of a very plump skeleton, but these are but customary ornaments. If it once had a head, as is probable, the fracture has been neatly smoothed and hardly appears.

Many fine examples of pipes, perfect and fragmentary, may be seen in the state collection, which is now rich in articles of this kind, through the energetic efforts of Mr A. G. Richmond, to whose knowledge of aboriginal art we owe so much. In the fine local collection of Mr Twining, made in Jefferson county, in those of Messrs Peck, Crone and Moseley, of Ontario and Genesee counties, will be found specimens which will elicit admiration. A few of these will be shown from photographs, partly because they have features so remarkable, in some cases, that no suspicion of artistic fancy should rest on their reproduction. In all the illustrations in these bulletins accuracy has been aimed at, but a photograph will remove any lingering doubt, should such exist in the minds of any. These plates are reduced.

Fig. 210 is of a pipe from Genesee county, where a combination is occasionally met with in a somewhat different way. A man's head faces the smoker, and above this, on the other side of the bowl, is an uplifted animal's head. There are the usual grooves, and an arm or leg appears below the animal's head. The pipe is black, and quite angular, and is 5¾ inches long.

Fig. 211 is one of the most remarkable pipes in the collection, in some ways, and comes from Mr W. L. Stone's collection, mostly made in Saratoga county, or in that vicinity. It is commonly known as the Washington pipe, and as the full resemblance depends on little things the aid of the camera has been called in that every minute detail might be supplied. The figure of a sitting man forms the bowl, the bust out of proportion to the lower parts, but art requires some conventionalism. The head is fine, the hair full, and gathered into a cue which hangs low down on the back. In some points of view the resemblance to Washington is very striking, but it is a type of pipe anterior to his day by nearly 100 years. The head is characteristically European; the work that of an Iroquois. We need not be surprised at this. If the native artist could imitate one thing, he might another, and that he did figure European animals, articles, and in some instances men, is very plain. The wonder, therefore, is not so much in the European head and hair, as in the suggestive likeness found in this case. Otherwise the style is that of the 17th century, and some French or English officer probably called forth the artist's admiration. It is 7½ inches long.

Fig. 212 is a fine and curious pipe of brown clay from Jefferson county. The rim is broad, contracting beneath. The expanded base of the bowl is handsomely engraved, above the large and plain stem. The general style is rare.

Fig. 213 is a fine and unique pipe from West Bloomfield, and is 7⅛ inches long. It is of black clay, and has grooves around the top of the bowl. Two serpents raise their heads above the front of this, their bodies following the curve of the pipe below the stem, under the bottom of which there is a long groove.

Fig. 214 is a dark colored pipe from Genesee county, of what is known as the Huron type of Canada, but which is also found on early Mohawk sites late in the 16th century, as well as elsewhere. The bowl is angular, with deep elliptic and curved indentations, and long grooves and lines of indentations extend along the curving stem. It is one of the best examples of this well-known form, and is 4⅞ inches long.

Fig. 215 is another pipe from West Bloomfield, and is of a grayish mottled clay. The length is about 4¾ inches. A squirrel occupies the front of the bowl, raising its head above the edge.

Fig. 216 is a spirited pipe from Honeoye Falls, near which were early historic Seneca sites. A man crouches on top of the bowl, with folded arms, facing the smoker. Grooves cross his body and limbs, he wears a small round cap, and might be taken for one of La Salle's sailors rather than an Indian. There are four grooves around the stem near the center. The extreme length of this fine pipe is 6¼ inches.

Fig. 217 is a remarkably long pipe from the same place, being a trifle over 9½ inches in length. It is black, like many other pipes from that region, and has a fine eagle on the top of the bowl, the head being very large, as in all such cases. There are horizontal grooves on the throat, and two rows of flutings on the upper side of the long stem. It is the longest clay pipe yet reported.

Fig. 218 is another unique pipe of reddish clay, from Jefferson county, $5\frac{1}{2}$ inches long. There are grooves and indentations on the front of the bowl, and lying obliquely on the top toward the smoker, is what might be termed a quartered shield, divided by groups of lines running in various directions.

Fig. 219 is another still more remarkable pipe, where the unanswerable testimony of the camera will be found of value in point of detail. This peculiar pipe is from Jefferson county, and is suggestive of many things. What bird is represented? When was it made? Mr Twining, who obtained the pipe from Sandy Creek, thought it a parrot, and the thick, curved beak naturally suggests that bird, but is not sharp enough. It has full as much resemblance to the flamingo. The Iroquois, however, seem to have known nothing of the parrot till they extended their wars southward, after the downfall of the Eries in the middle of the 17th century. Yet they were kindred to the Eries, the Massawomekes, and the Tuscaroras of the south, and thus might have known something of southern birds at an early day. On the other hand, nearer home, this head may have been but an exaggeration of the thick bill of the coot or some other member of the duck family. Accurate likeness of anything it certainly is not, and something is exaggerated, though we can hardly say what or how much. One northern bird might put in a strong claim, the razor-billed auk, which at times frequents the Gulf of St Lawrence and the New England and New York coasts. It comes nearer to this peculiar outline than any bird now recalled, and the early Iroquois reached its haunts.

As to when this pipe was made we have no certain dates. It was found in a region peopled by prehistoric men of the Iroquois family, though it might have have been lost in later days. The character of the pipe, however, suggests the 16th century, at which time the Iroquois lived at peace on the St Lawrence, certainly as low down as Quebec. They went much farther. Thus it is probable they came in contact with a northern bird more exactly filling the requirements than any southern one that can be named. The likeness was not a success. Besides the deep bill this pipe has the raised eyes frequently found in pipes of the 16th century, while the grooves and dots on the front of the bowl attest its Iroquois character, although made before the league was formed. The length is nearly 4½ inches.

Fig. 220 is another curious and probably early Jefferson county pipe. The singular decoration on one side of the face has been called a military hat, and was probably suggested by a head dress of some kind. There are the usual grooves on the front of the bowl, and a face appears toward the rear, on one side of which is a broad half-circular appendage, ornamented with dots and indentations neatly arranged. Dots appear about the face. It is not a large pipe, being about 3 inches long.

Fig. 221 is another odd pipe from Jefferson county, which has lost part of the plain and curved stem, and is now hardly 3½ inches long. The bowl is oblong, having some resemblance to a blacksmith's anvil at the broad and unequally projecting rim. In the center of the bowl is an expansion, with vertical grooves and dots, and faces in relief before and behind. This part varies but little from some other forms, but the projecting rim is a striking feature.

The Iroquoian character of the early inhabitants of Jefferson county, in the main, plainly appears from many of their pipes, and while some of these are of an earlier type, many of them can scarcely be distinguished from those of the 17th century. There are reasons for supposing the early Onondagas came thence about the time of the beginning of the long Huron war, as the Mohawks left the St Lawrence at the same time. About that time, also, several novelties were introduced into pipe-making in New York, as well as in the decoration of earthenware. The evidence for this is clear. One reason for this was in the change of location; another in the new and close contact of the several nations who met to form and perpetuate the Iroquois league; another still in their adoption of foreign captives, who brought new arts to the homes of the victors. The change affected the Cayugas and Senecas less, because they retained their old homes, while the Mohawks, Oneidas and Onondagas began a new life amid new scenes.

The state collection has a very good representation of pipes of clay and stone from Jefferson county, and there are several detached heads from the former, showing that one style, prevalent in other places in the 17th century, was also made there, and probably not long before. The fine owl's head bowl appears, and the trumpet pipe in a simple character. Two raised angles on the rim of some bowls, connect this with Onondaga county. Some massive trumpet pipes, with an abruptly projecting rim, differ from most of this type. The open-mouthed serpent forms a conspicuous and characteristic bowl, and the corded bowl has a less typical representation. One fine clay pipe has a human face turned from the smoker. In general, however, this early feature is preserved by placing such faces on the back of the bowl; and where these are human faces they are usually large and grotesque. There are several fine examples of these, and they are found in other collections. They might be called the typical pipe of that extensive field.

Mr A. E. Douglass did not classify his pipes by material, but out of 375 he had 43 from New York. Ohio came next with 40, and then Tennessee with 39. He gave no list of earthenware.

MISCELLANEOUS

Excepting tobacco pipes and vessels of clay, the articles of earthenware made by the New York Indians were very few in number, and some of these were adaptations from those which had been broken. Most of the small disks or counters were chipped out of potsherds, and some detached heads may have come from broken pipes. This is not always the case, but the number of articles showing original design is so far surprisingly small.

Fig. 222 shows the largest clay disk as yet reported from New York, and it is in the state collection as one of the articles in Mr Twining's fine array of relics from Jefferson county, where most things are of prehistoric date. A large fragment of pottery has been cut into an irregularly circular form, and perforated near the center. From this perforation 11 incisions radiate to the outer edge. The secondary work is clearly seen, as it is in simpler examples. Such disks, perforated or not, but usually smaller, occur sparingly on many early Iroquois sites. They scarcely survived the coming of the white man.

Fig. 223 shows one of several of the more common form, found at Schenck's Gulf, east of Palatine Bridge. The perforated forms, which are more frequent in Canada than here, were called terra cotta beads by Sir J. W. Dawson. He was probably in error, judging from his figure, in saying that 'a cheaper kind of bead was made of clay, molded into ornamental discs and baked.' Molded clay beads, however, do exist, though his example is of a different kind. The large perforated disk, before figured, was probably used like the shell and stone gorget, and secured by a knotted cord drawn through the hole.

Fig. 224 is a neatly cut disk, made from a potsherd, and comes from the Onondaga fort of 1600, west of Cazenovia. Similar specimens are not rare there. This one has the edges smoothly cut, but they are usually less neatly worked.

Fig. 225 is from the same site, and is one of the best examples yet found, being smooth and symmetrical, and apparently the original design. The edges are neatly rounded, and it is thicker than the usual form. It might have been used in some game, but we know of none at that day requiring an article of this kind, though some purpose it would seem to have had.

Fig. 226 is a peculiar terra cotta mask, found at Cold Spring, Putnam county. It is of so marked a character as to have called forth shrewd surmises as to its origin, and presents such a finished appearance in full view as to lead some to think it complete in itself. The owner, however, Mr James Nelson, of Cold Spring, says 'The back shows that it has been attached to something.' It may therefore be placed with those fragmentary figures from pipes so often found. A large number of fine articles of this nature might be figured, both early and recent.

Fig. 227 is an odd relic from the mouth of Canada creek, near Rome. It seems intended for a rude representation of the human face, with circles for the eyes and mouth, and a long groove for the nose.

Fig. 228 is a small terra cotta head, much like the next, and comes from an early historic site south of Delphi. It does not seem to have been part of a pipe, but is much like a curious article described by Sir J. W. Dawson in his *Fossil men*, from Montreal. Of these he said, 'The Hochelagan women, however, had a very ingenious contrivance for hanging their pots over the fire, which deserves notice. They had no doubt found by experience that when an earthen pot was hung over the fire by strings or withes tied to the outside, the flames would sometimes reach the perishable means of suspension, and, burning it, allow the pot to fall, and its contents to be lost. Hence they contrived a mode of fastening the cord within the throat of the vessel, where the fire could not reach it. This hook for suspension was made in the shape of a human head and neck, the hole for the cord being left behind the neck. Many of these heads were found detached, and their use was not known till the fragment illustrated was found.' This Onondaga fragment may be of this kind, but the practice could not have been common. The simpler method of inserting a stick too long to be withdrawn when turned horizontally, as a point of attachment for the cord, would satisfy most Indian housewives. Certainly, in New York, detached heads suitable for such uses are rare.

Fig. 229 much resembles the last, but is larger, and more suggestive of use on a pipe. It is from Jefferson county.

Fig. 230 is much more recent, but comes from the Onondaga town of 1654. During its later occupancy European pipes found their way there, and perhaps even at an earlier day. The material was rare as yet, and the thrifty Onondagas, 'men of business,' as a later French missionary called them, saw a possibility of an ornament in the broken pipe stem of the white man. If slender, it was needful only to smooth the ends; if thick and heavy, it might be carved and made more ornamental still. The white and carved pipe stem here shown is of unusual thickness, but early pipes varied greatly in this. It has been cut in several ways.

Fig. 231 is of a generally rectangular form, though each edge is slightly convex. It is beveled from the central square on each side, and grooves appear on every face. It could hardly have been used as a personal ornament, and there is no game known to which it can be assigned, unless it might be that of the moccasin, where an article is hid in one of three shoes by one party, to be found by the other. It seems most reasonable to infer that similar articles may have been used in some game.

Fig. 232 is unmistakably a complete article, found on the Nellis farm, near Canajoharie. It is a neatly made bird of the hawk family, broad-shouldered and with folded wings. It shows a perforation by which it might be suspended or worn. A conjectural use would be that of a token or amulet, such as we know were sometimes kept by the Iroquois, much like the medicine of other nations.

Fig. 233 suggests a similar use, though of a different kind. It was found on the Oneida river about the year 1840, and represents a recumbent lamb with a raised head, in terra cotta, although the ears suggest an animal of a very different nature. If the first form be allowed, it might be considered the Agnus Dei of some devout Iroquois convert, but both the identification and use are uncertain. It is quite probable that the Iroquois then knew little of living lambs, while quite familiar with their representations. In any case, this figure had probably some sacred use.

Fig. 234 is a fragment of what was apparently a large and pretty disk, ornamented both on the edges and sides in sweeping lines. It is of a light mud color, and was found at Brewerton. So little is left of it that its true form and use can not now be determined, but no secondary work appears on it.

Fig. 235 is a head from a recent Cayuga site near Mapleton, and the projection over the eyes, as well as the general character of the head dress, gives the impression of a helmet of steel. Caps of similar kinds are more common among the Cayugas and Senecas than farther east, as they longer maintained their primitive arts. The cock's and boar's head are among other examples of their terra cotta work.

Fig. 236, *a, b, c, d, e, f*, show Cayuga clay beads and pendants; *a* being a thick disk bead, *d* an oblong one, and *e, f*, two which are spherical. Two clay pendants appear in *b, c*. These are nowhere common.

Fig. 237 is a clay bead from Rice's woods, a recent site east of Stone Arabia. None have been reported from the Onondagas and Oneidas. Shell beads were more to their liking when they could be had. Early antiquaries spoke of them in the Seneca territory, and Dawson says that on islands in the St Lawrence, 'In addition to jars and pipes, the only frequent objects of earthenware are small discs, perforated in the center and crenated at the edge. They may have served as an inferior kind of wampum, or beads, or perhaps for the playing of some game of chance.' It may be added that while there are many disks made from potsherds in the Toronto collection, Mr Boyle says nothing of true clay beads, and Dr Rau mentioned neither in his report on the Smithsonian collection.

Fig. 238 is a clay disk from Tribeshill, perforated, and with the edges of the hole slightly raised. Its form is very near a true circle, and it will be readily seen that this is the original design. The age is uncertain.

Fig. 239 is a very pretty disk of unusual character, found a quarter of a mile above the bridge at Canajoharie. It is not perforated, but there is a circular indentation near the center, whence six grooves radiate like a star. These are connected by concentric grooves, four in number. The edge is crenated, and the whole effect pleasing. Its use is conjectural, but it is quite likely the Indian who made it had seen circles and six-pointed stars laid out with compasses, though he did not use them on this.

Fig. 240 is a wolf's head of clay, having almost a yellowish glaze. It was probably part of a pipe, but is remarkable for its high finish. It was found at the recent stockade south of Delphi. Many pipes of that period have well polished surfaces. It may be added that all these miscellaneous figures are of actual size.

In one detached human head from near the mouth of Oneida creek, where a crest crosses the head longitudinally after the manner of the *Cheveux-relevez,* the small and protuberant eyes are darker and more polished than the face, and have the appearance of inlaid beads. The head, however, probably came from a pipe. The boar's head sometimes occurs, as that animal soon attracted attention, not always favorable. When the Mohawk chief, Kiotsaeton, addressed the French governor, July 2, 1645, urging him to make a settlement in the Mohawk country, he said, 'Leave these stinking pigs, which run among your habitations, which eat nothing but what is filthy, and come and eat of good victuals with us.' A small boar's head from an Iroquois site in the Seneca country is very accurately worked out, and has also the remarkable feature of being hollow. The Senecas alone seem to have made heads in this way.

It will thus be seen that New York aboriginal work in clay took a very narrow range outside of pipes and pots. Small amulets, disks and beads comprise nearly everything that was made, and examples of these are few in number. The reason is obvious. Pots and pipes of necessity being made of clay were often finely adorned; for mere ornament they chose more showy and less fragile materials.

Fig. 147*a* is inserted out of its proper place, and is somewhat reduced, being 2⅛ inches long. It is a curious article, broken at the broad end and sharpened at the other. It is a little wider the other way. In appearance it is precisely like the frequent punches made from sharpened prongs of antlers, but is of clay, the neat pointing having been made before burning. Its purpose, of course, was the same as that of the horn punch, but why clay was used when horn was abundant is a puzzle. The owner thought it the leg of a pot. It was found in the vicinity of Canandaigua lake, and its occurrence suggests how many odd forms may come to our knowledge through closer observation.

A general view has thus been given of aboriginal work in clay in New York. It is necessarily somewhat summary in treatment, leaving out many fine pipes, specially, because these are so many that typical examples alone can be given. In the hard work of cataloguing, Mr Richmond has never lost sight of making notes of place and history, whenever possible, an indispensable feature in study of this kind. Future students will appreciate what has been so faithfully done, and the New York collection will have a value altogether above the beauty and variety of its articles. The aid of all is asked in making it more complete.

ADDENDA

It is expected that additions will be made to the types of articles published in these preliminary bulletins, and these may be occasionally noted. One of interest is an obsidian leaf-shaped knife, 2½ inches long, recently found on the Seneca river, being the first one reported in the state. One had been found in Pennsylvania before this, but otherwise this material is not known in the east. It is thus a notable find.

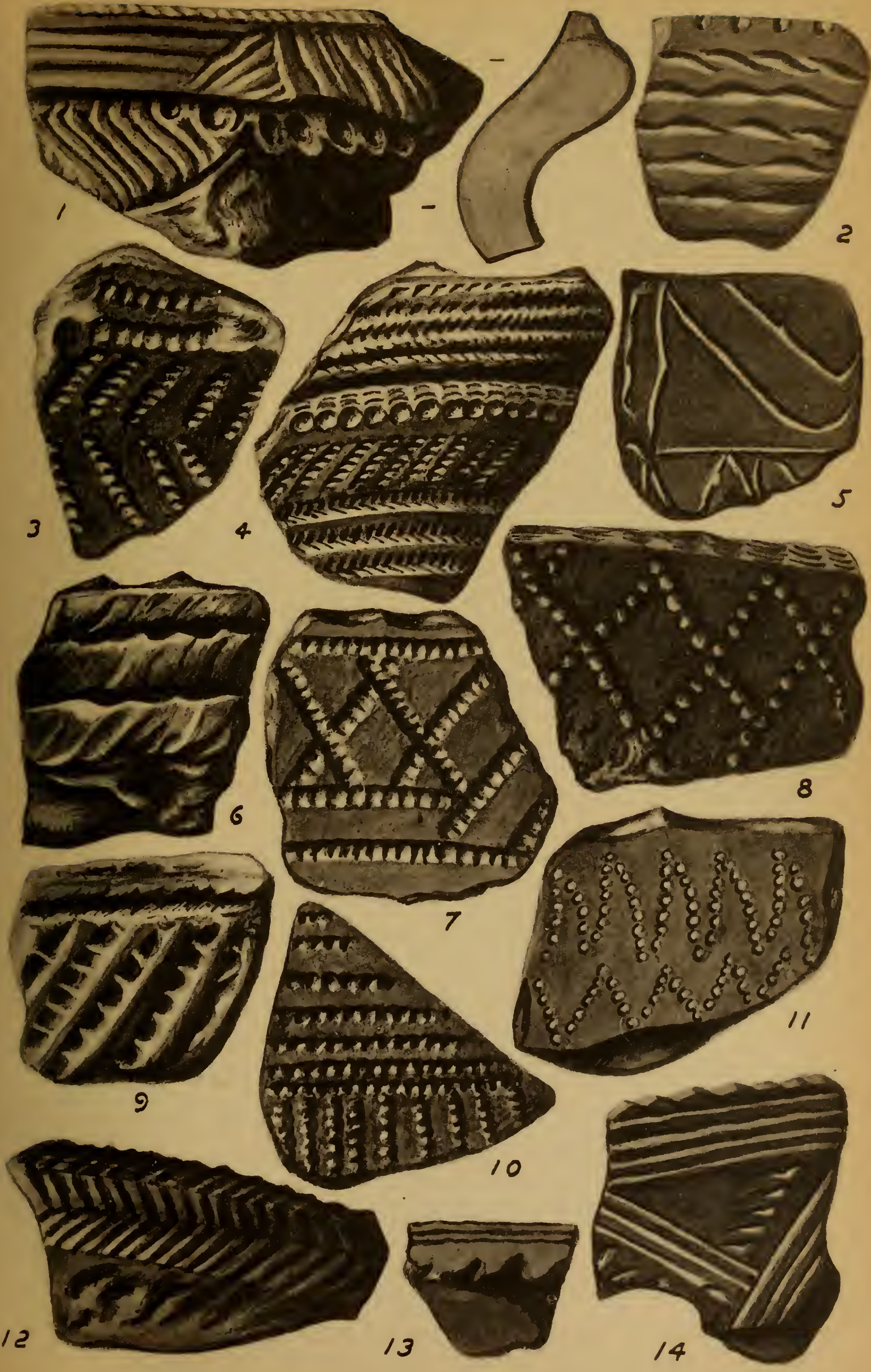
Among articles of polished stone is a rare form of wide distribution in Ohio, one of which has been found in Canada, and now one appears in the state collection at Albany, having been found in Genesee county. It is a spherical piece of striped slate, with a large perforation smallest at one end. In this one the stripes run around the stone, which is a little over 2 inches in diameter. The peculiarity is a longitudinal groove in one side of the stone, the edges being neatly rounded.

Another notable article is a tapering cylindric granite pestle from Canajoharie, belonging to Mr Richmond. It is 26½ inches long, and 2½ thick in the largest part. About 3½ inches from the small end it is perforated. One of Mr Richmond's recent acquisitions is a beautiful and unusually long stone pipe of greenish gray slate, from the town of Palatine. It is 9 inches long.

Two large grooved boulders from Onondaga county have been placed near the cases at Albany. The straight uniform grooves in these are commonly supposed to have been used in arrow making. In one of the cases is a flat pebble similarly grooved, which comes from the Genesee valley. This article has not been reported so far west before, nor are small ones anywhere common. This is 6 inches long by 2¾ broad. Usually they are large stones, not intended to be moved.

From the Cayadutta site Mr Robert M. Hartley, of Amsterdam, has a small ornament of slate, less than 1 inch in extent, of the general figure of the butterfly banner stones, but it probably belongs to a very different class, although strongly suggestive of this. In any case it is of much interest, as are some other small slate ornaments found at the same place.

An examination of a collection in Jefferson county, near Watertown, shows curious forms in pottery. The narrow projecting angles of some vessels extend outward $2\frac{1}{4}$ inches, and may have served for handles. Two examples of open handles occur, but of different forms. There is one small perforated disk. Several pipes of the Jefferson county types have recently been found in Onondaga, and the early relations of the two groups are now more distinct.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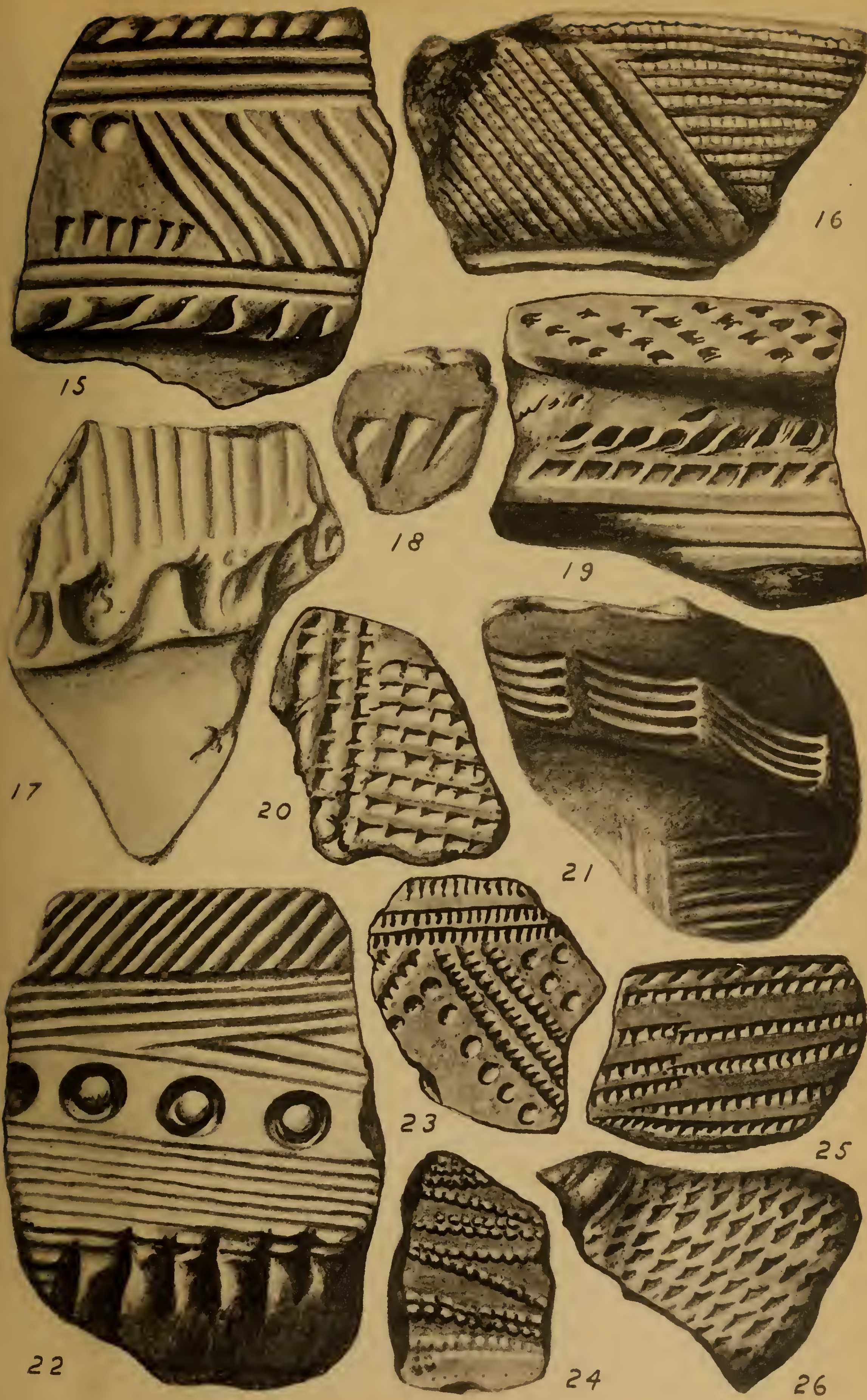
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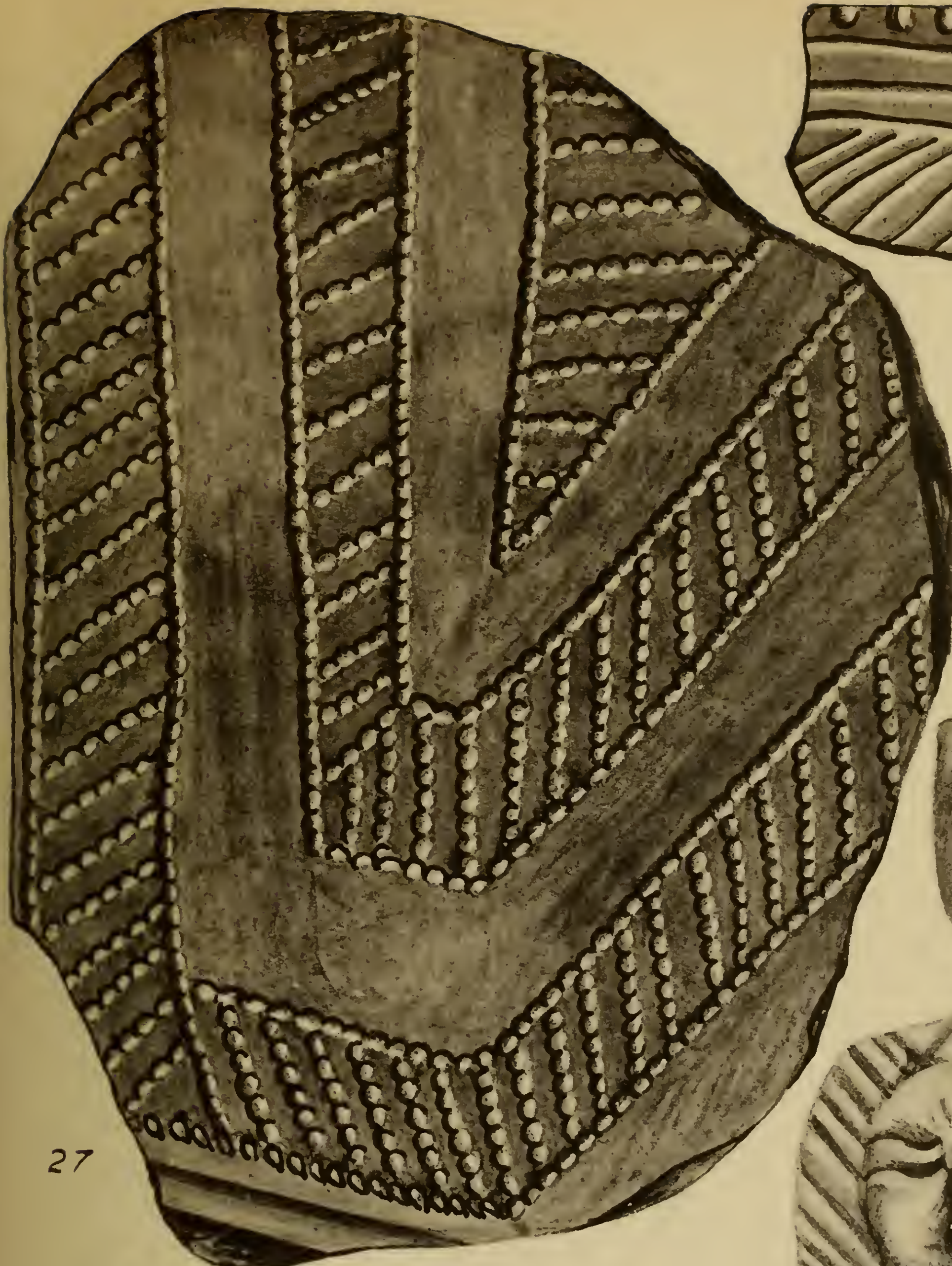

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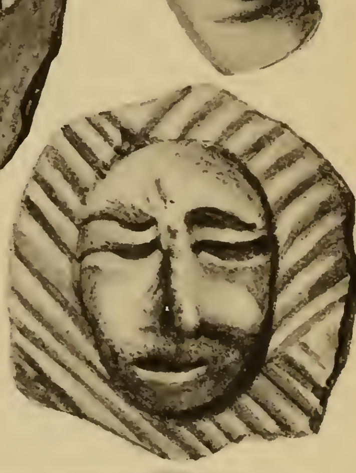

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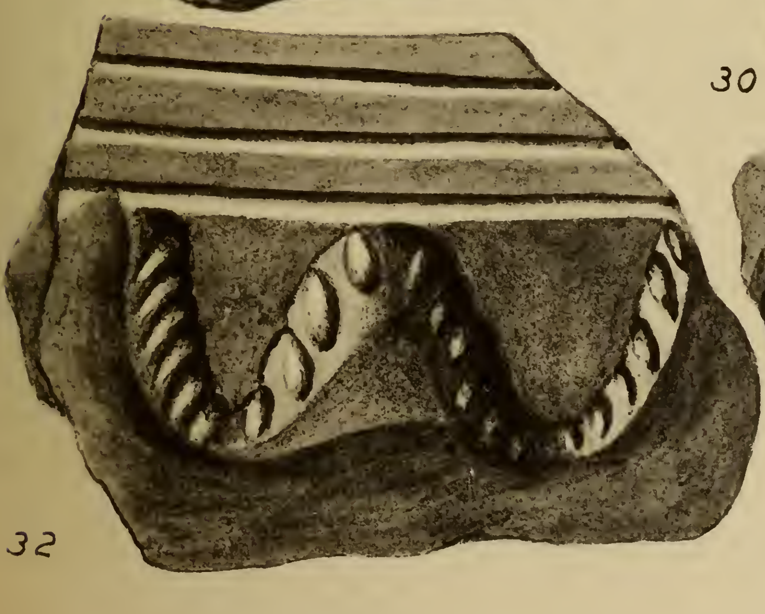

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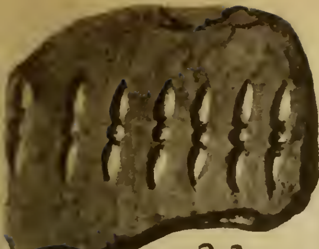
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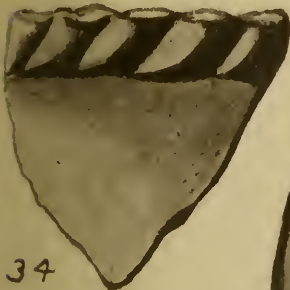
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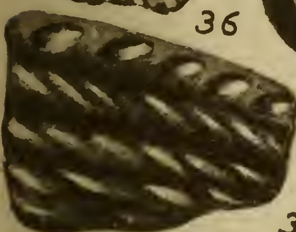
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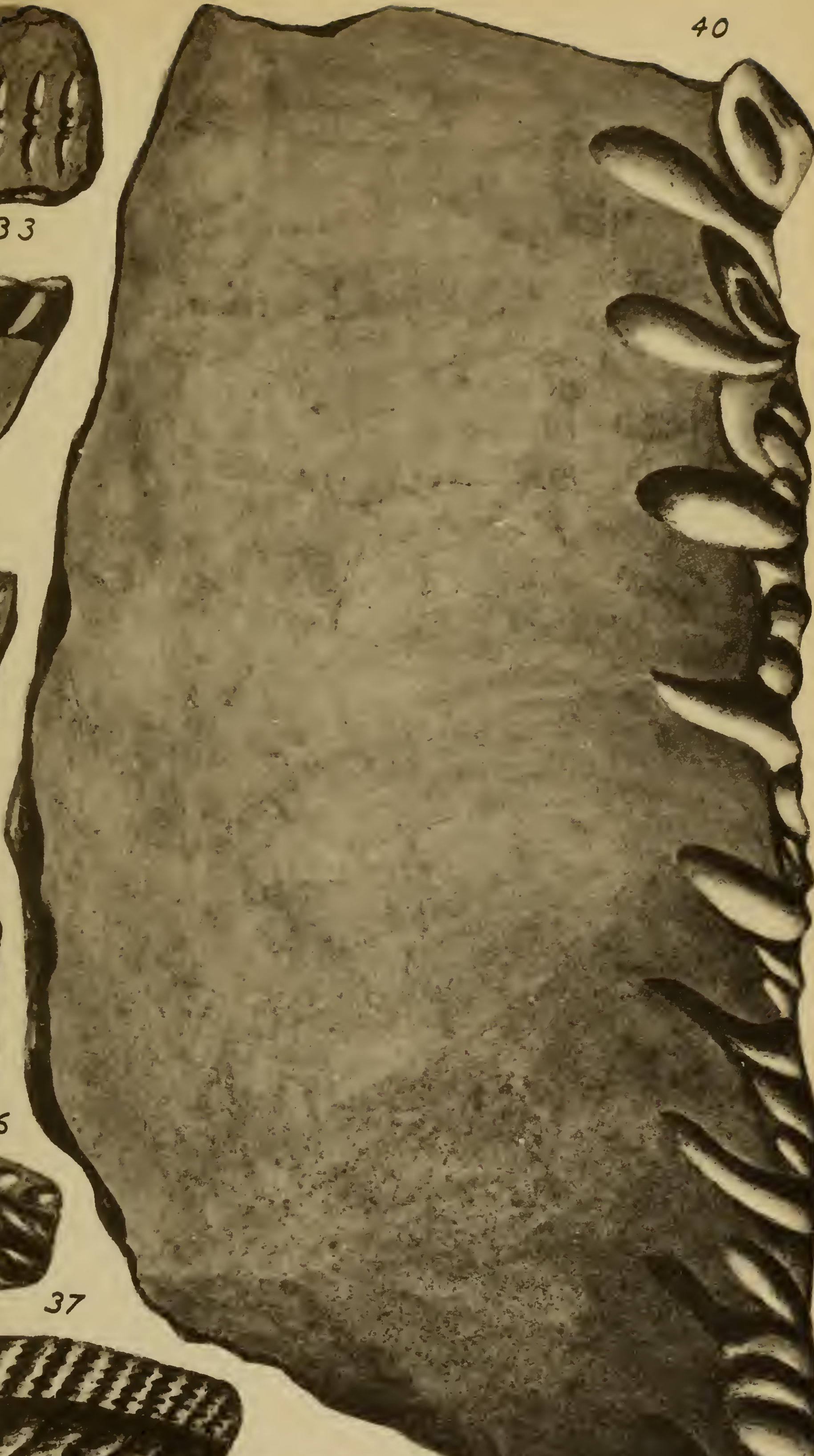
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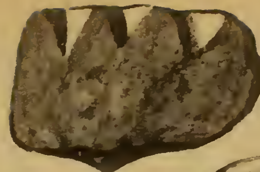

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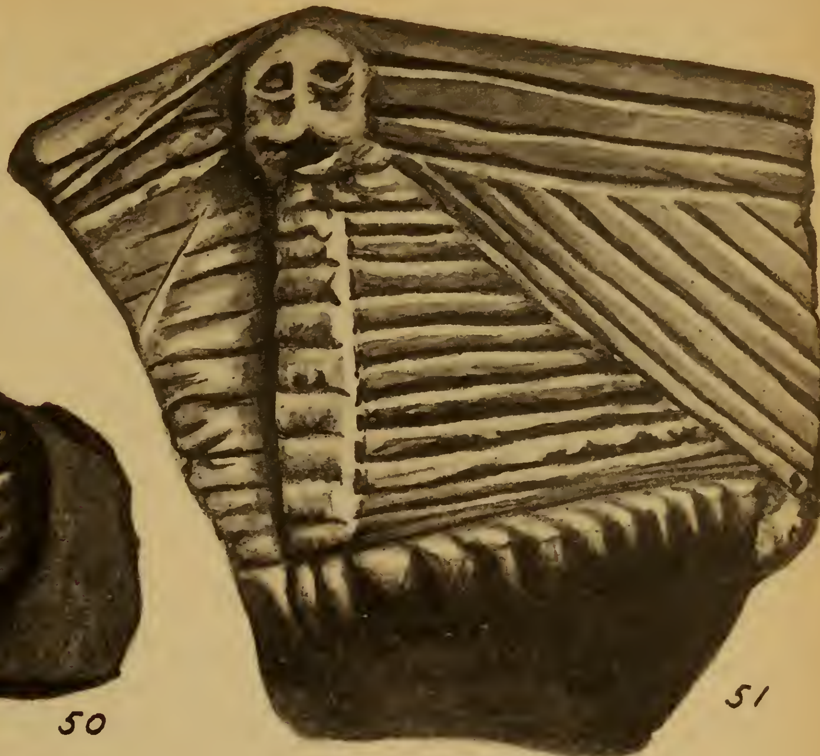

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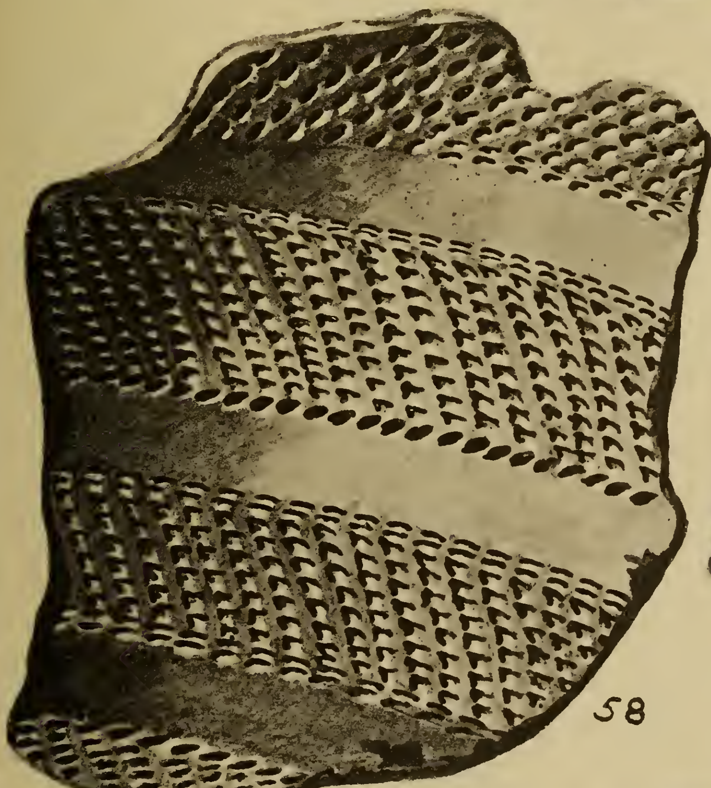

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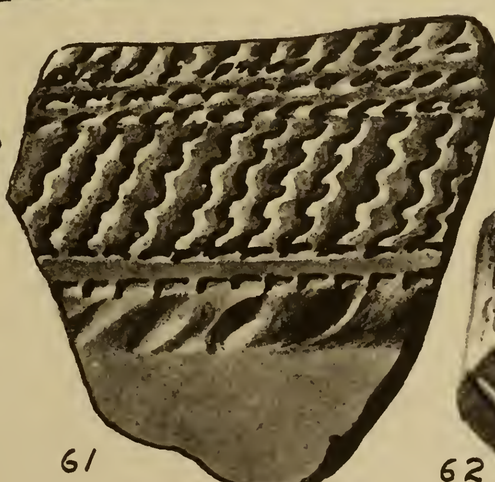

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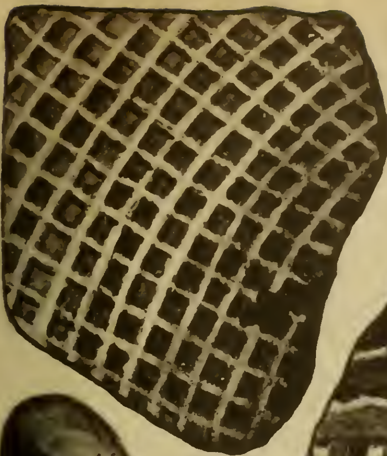

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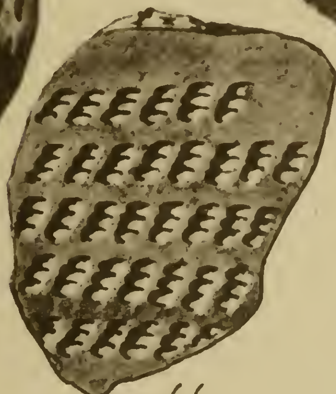

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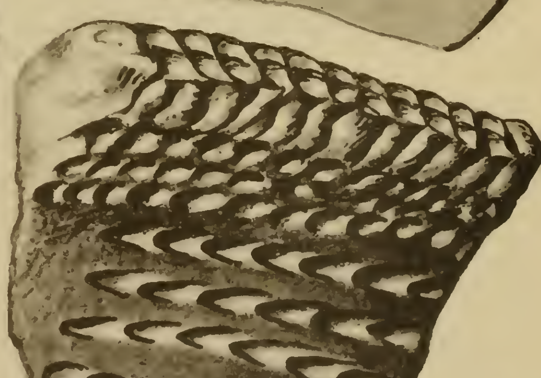

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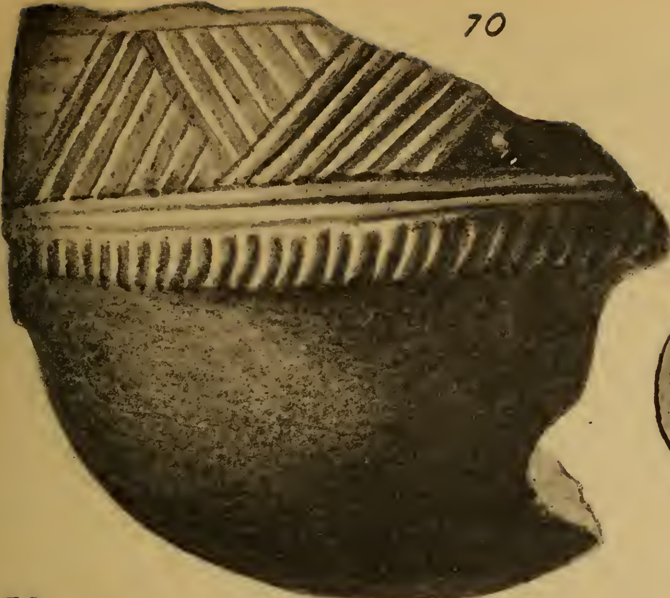
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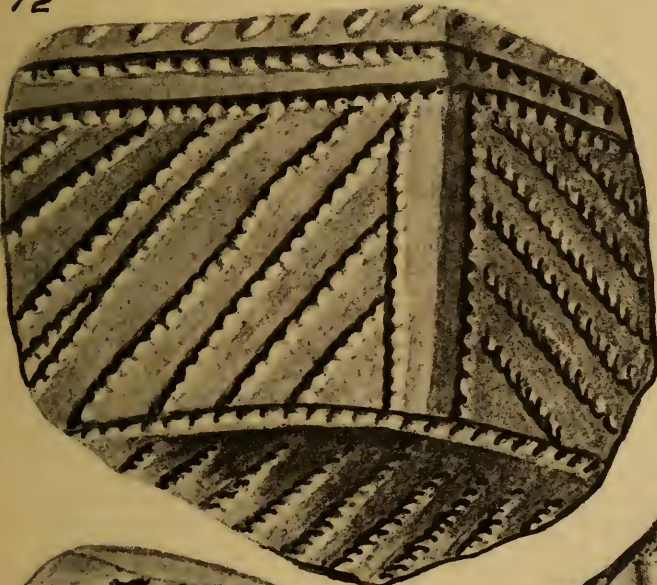

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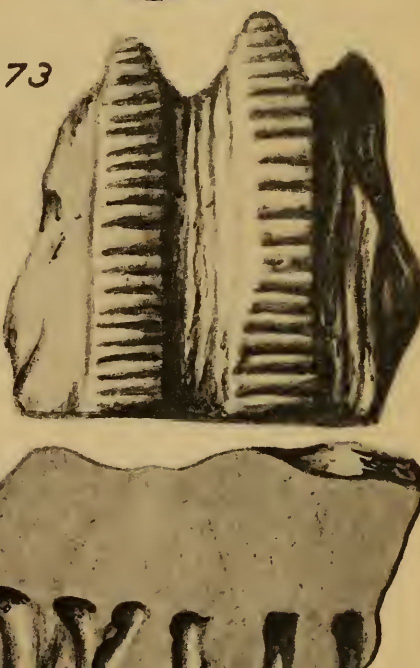


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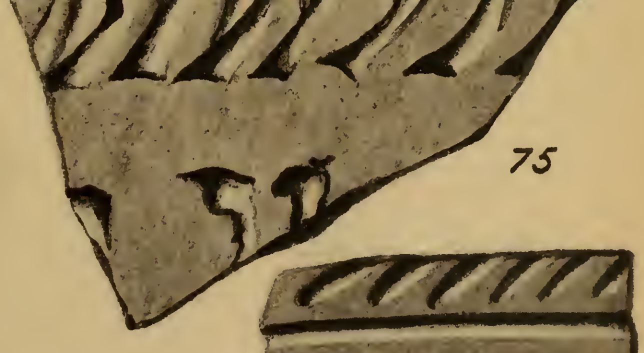
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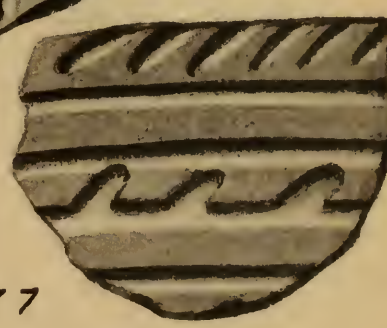
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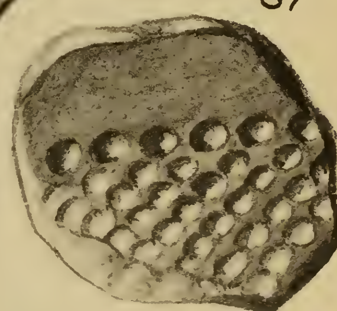

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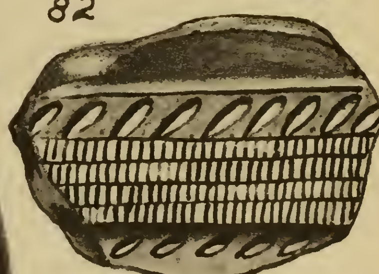

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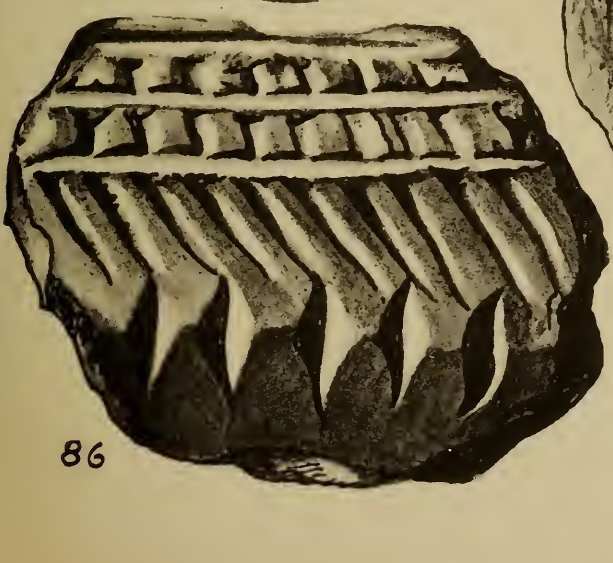

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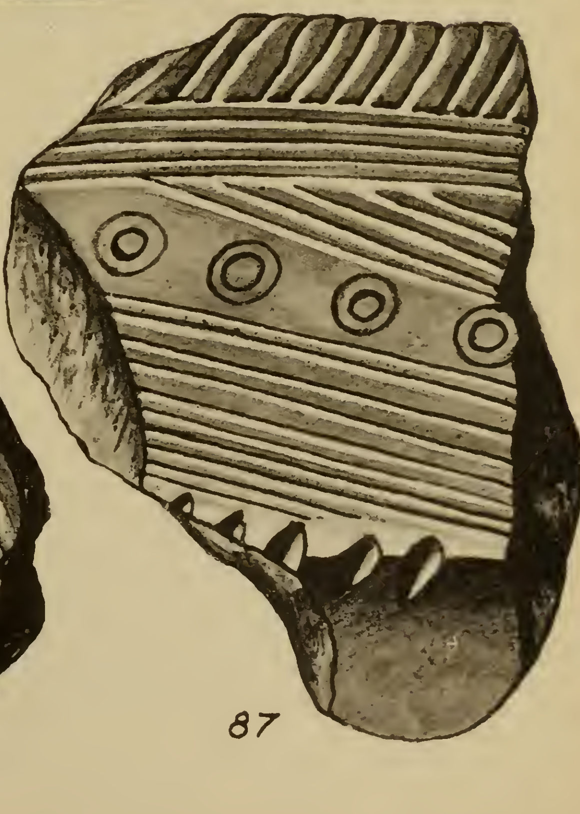

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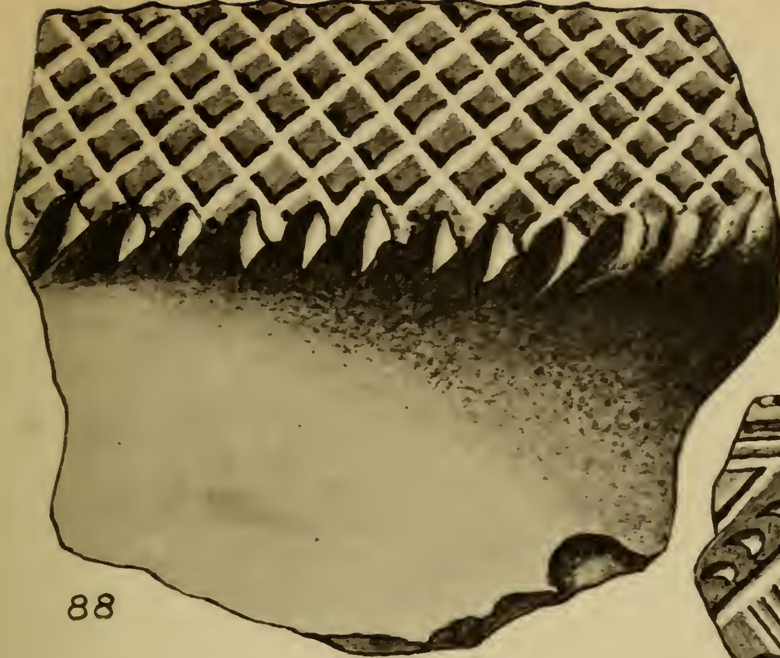

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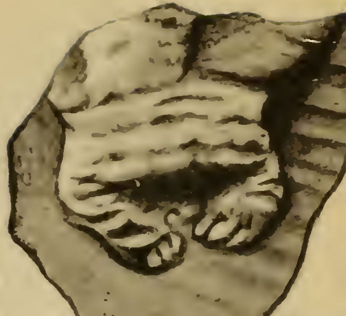

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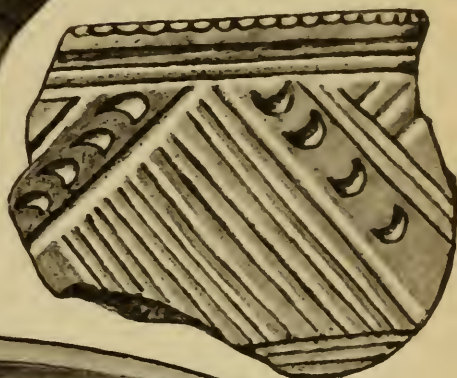

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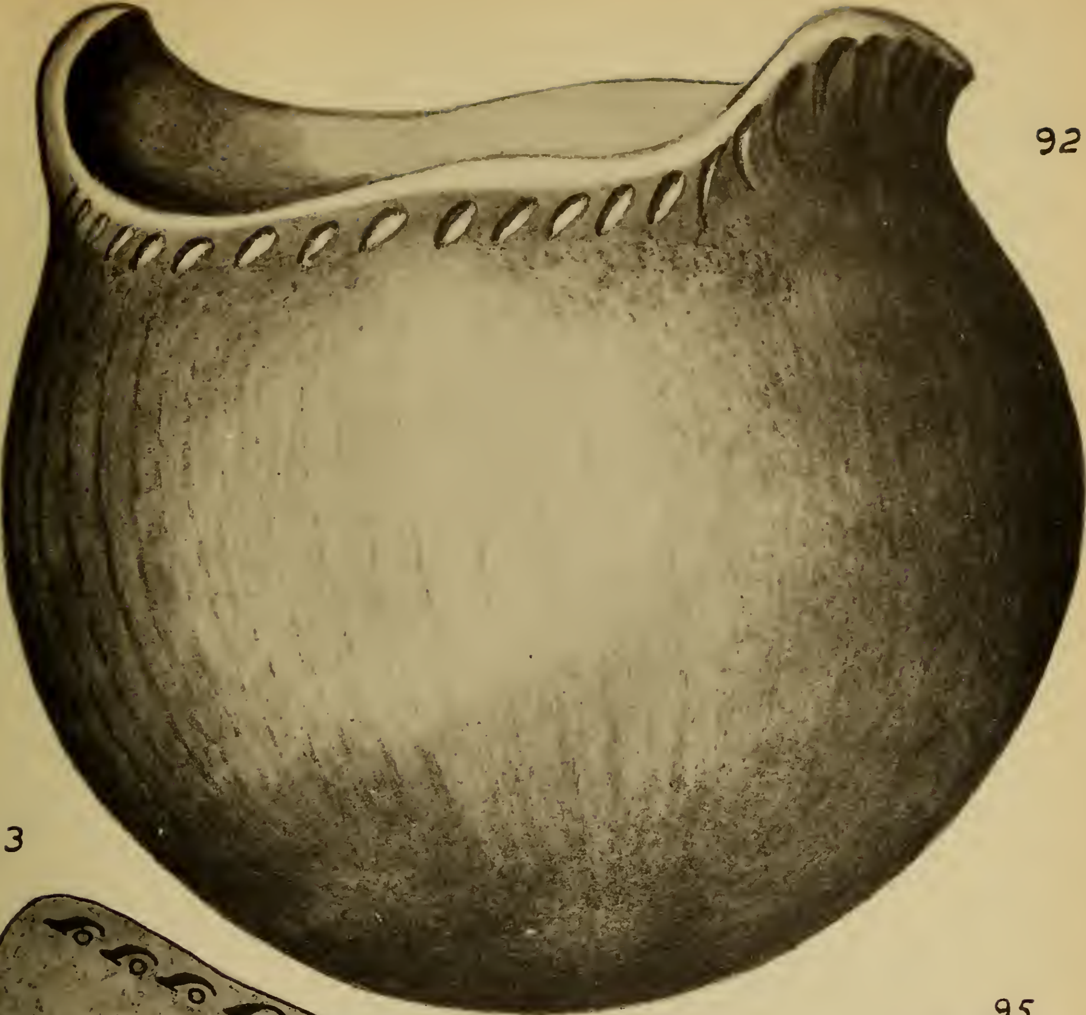
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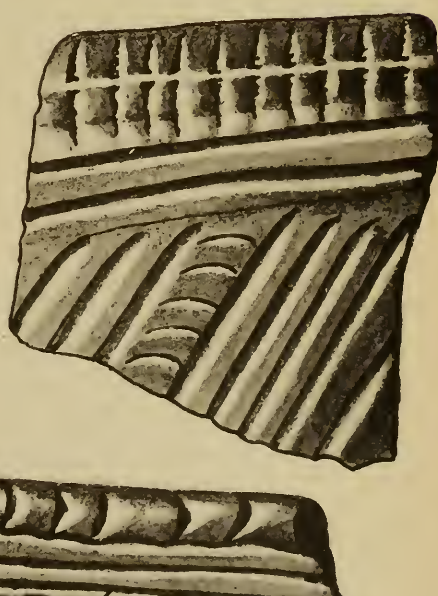

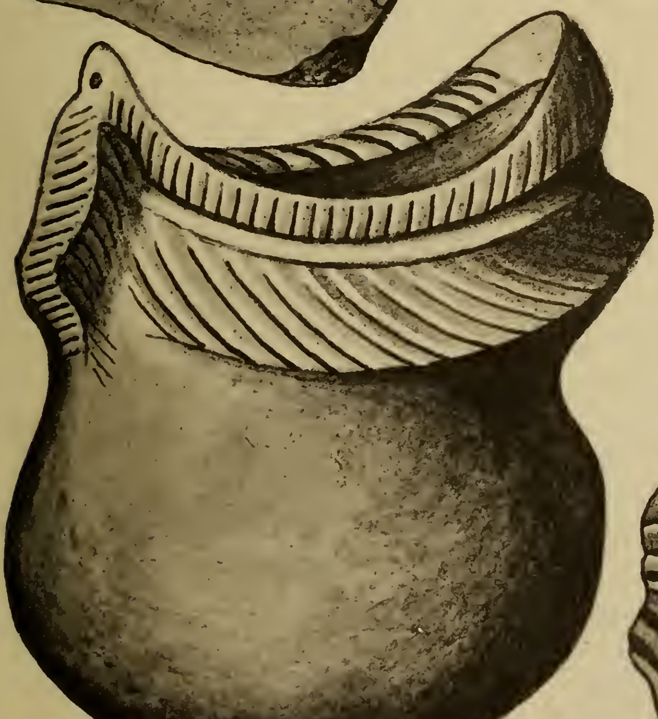
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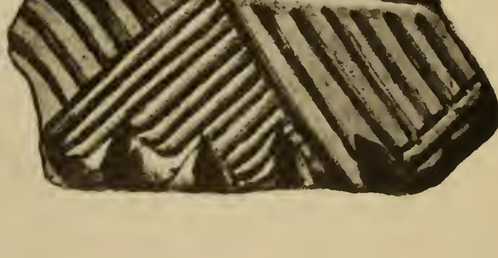
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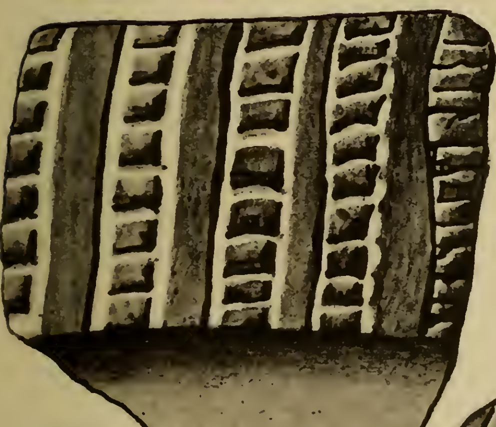

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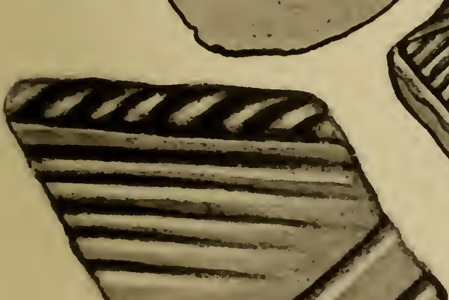

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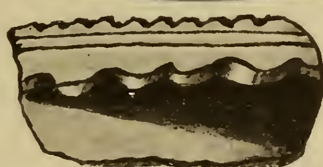

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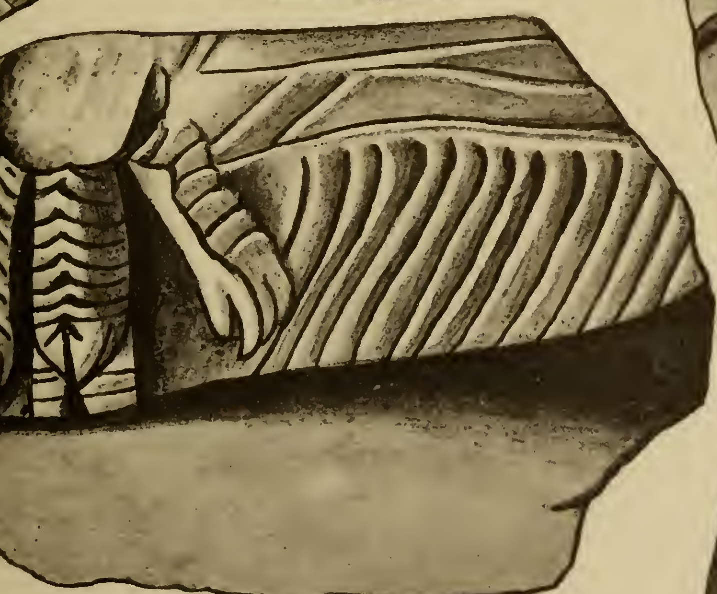

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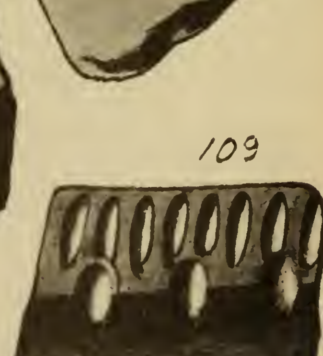

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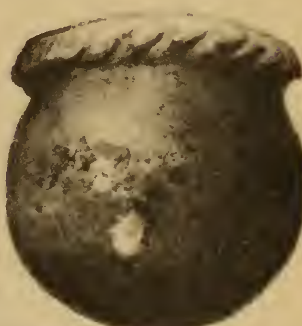

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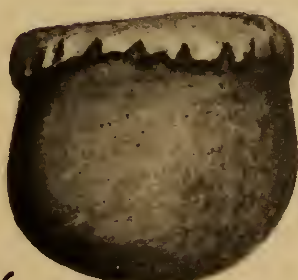

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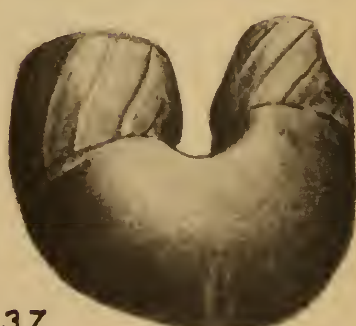

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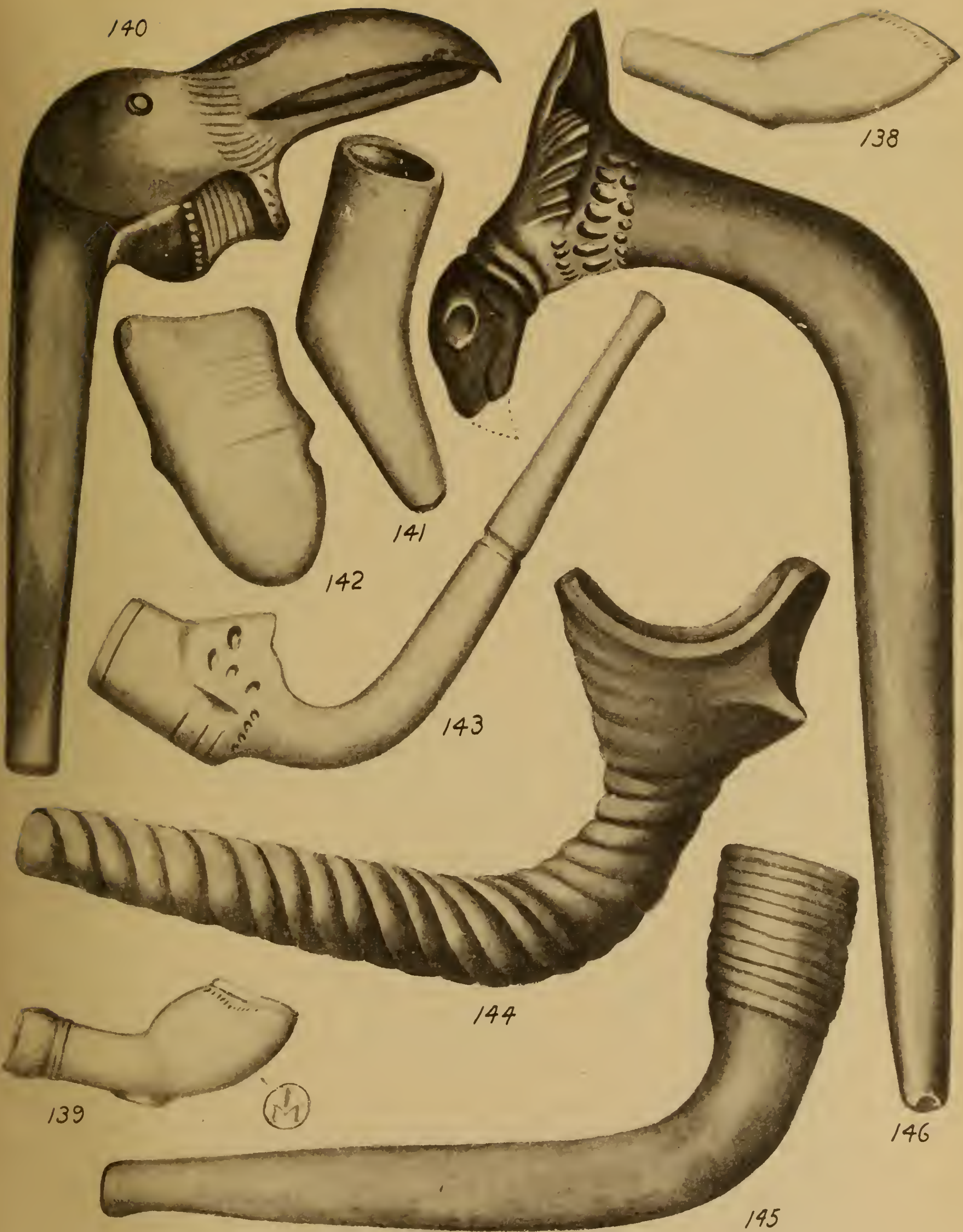
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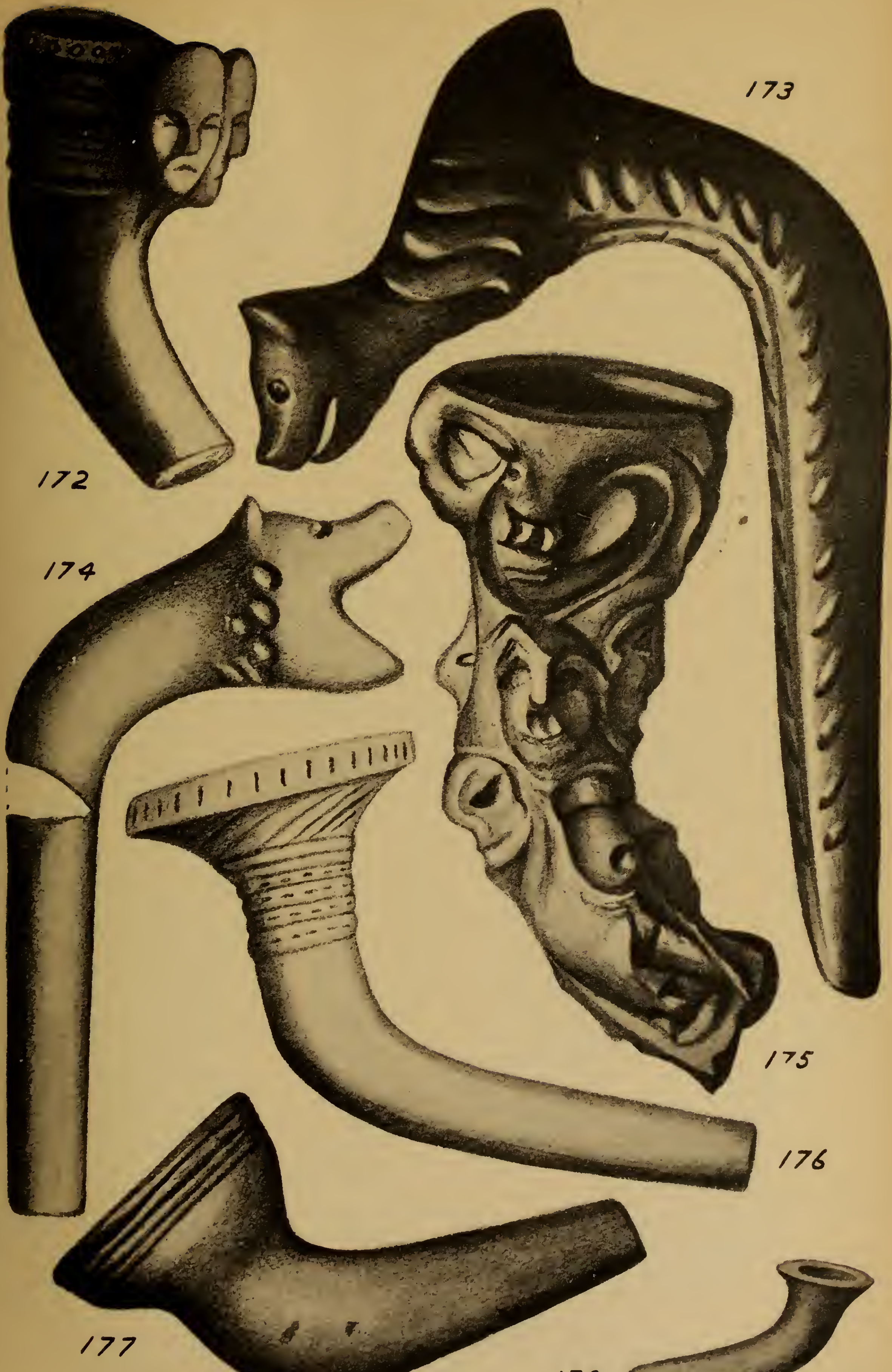

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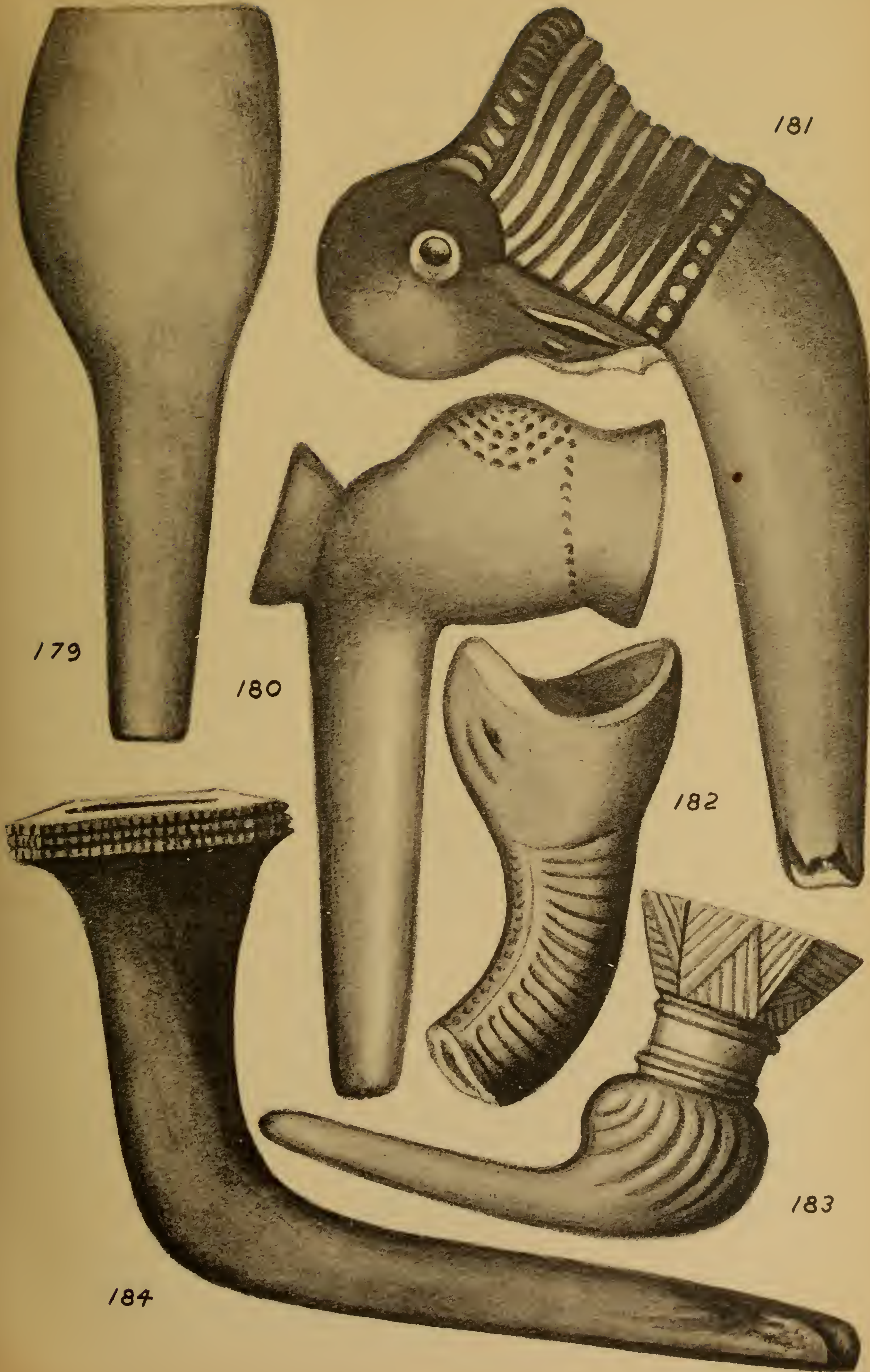
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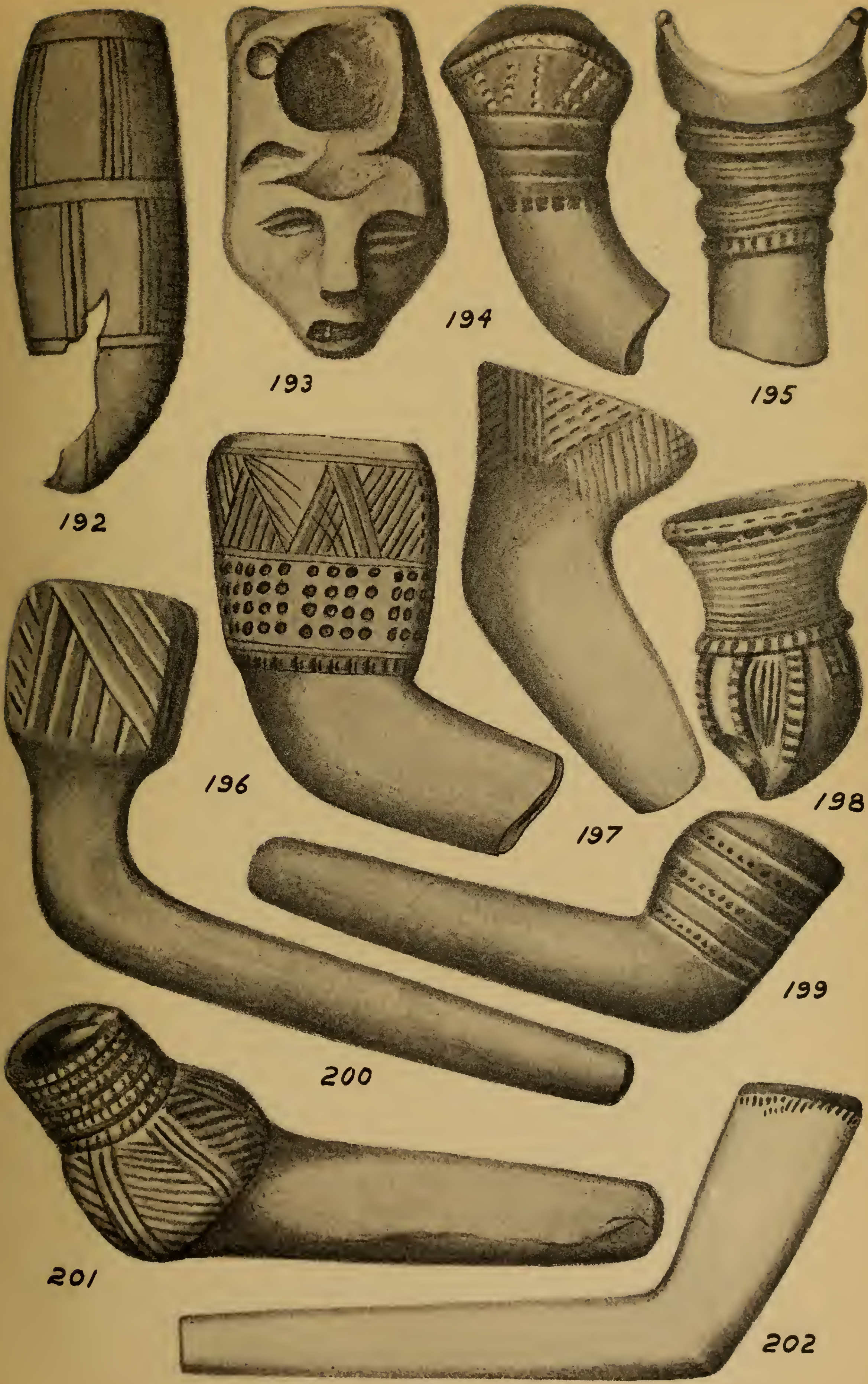

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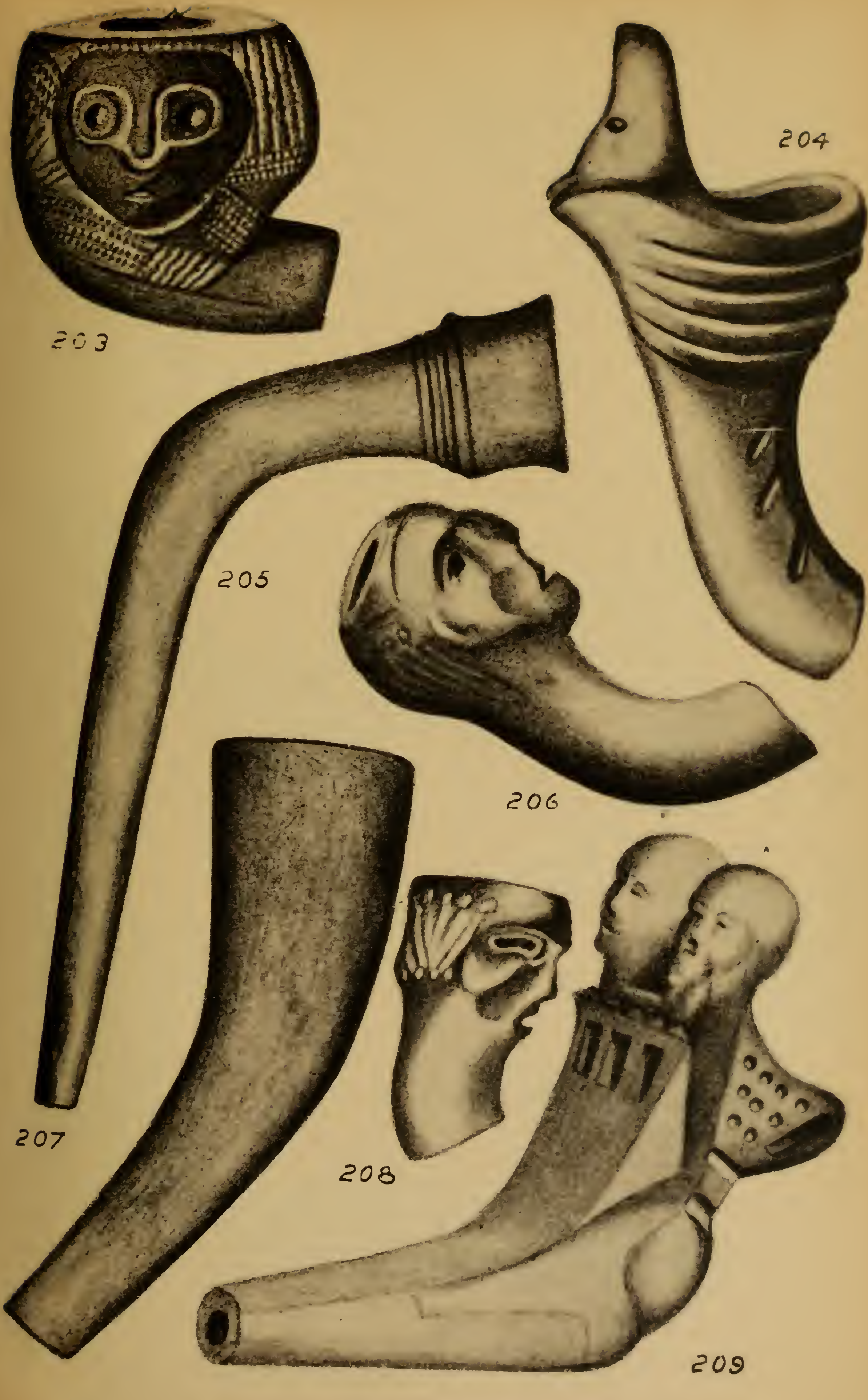
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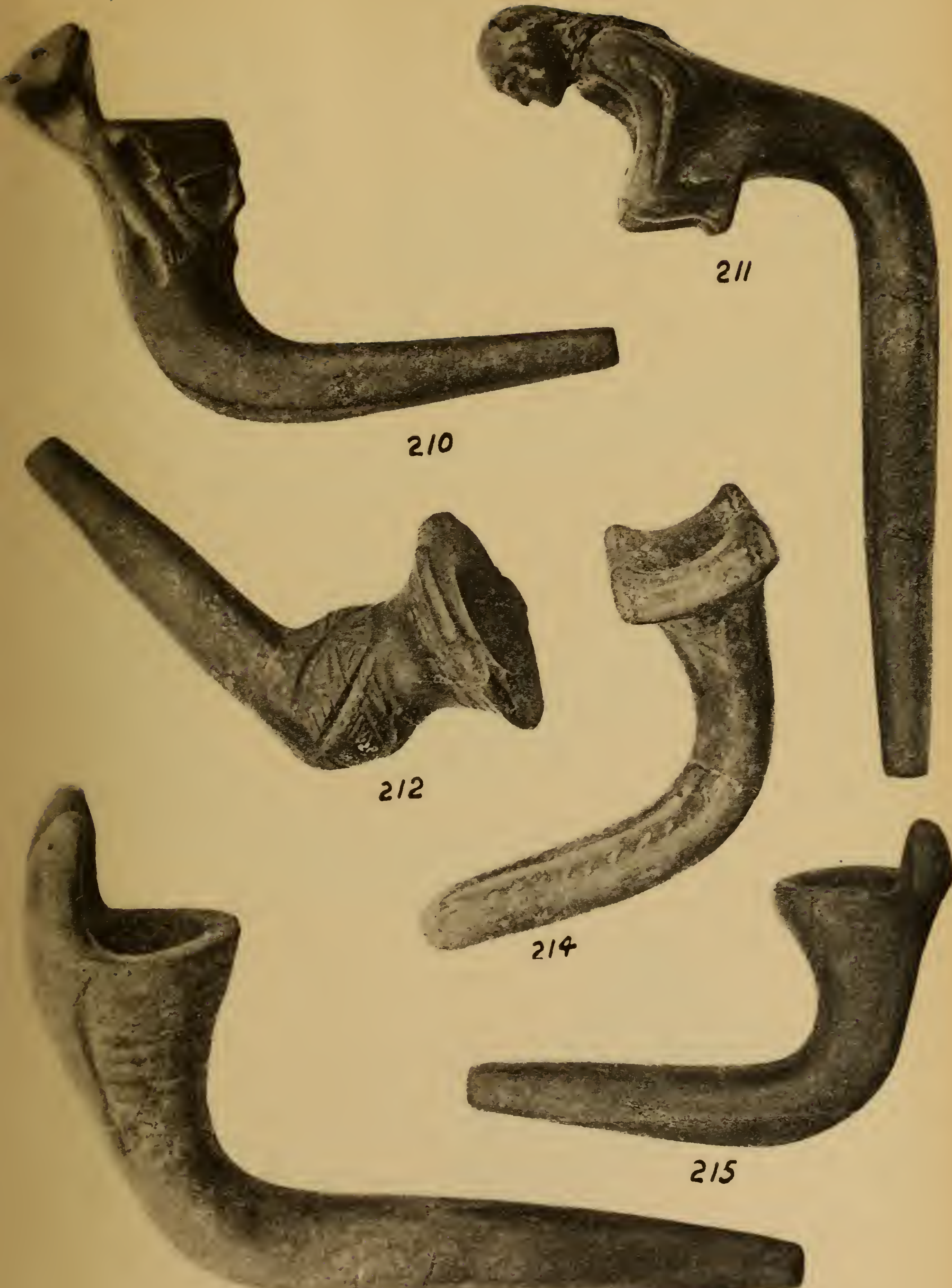

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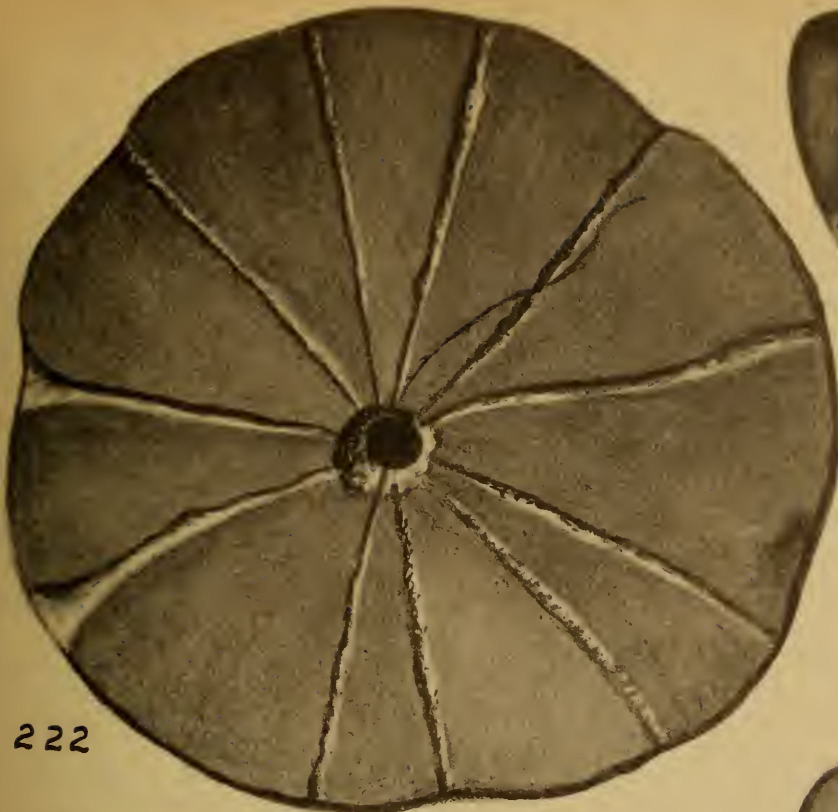

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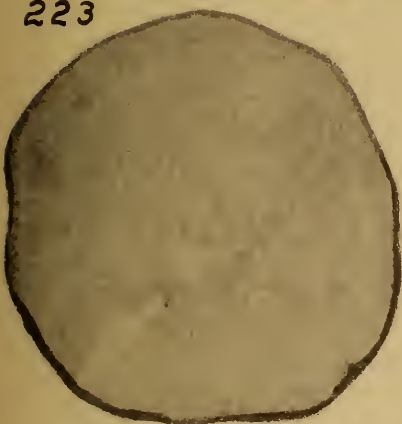

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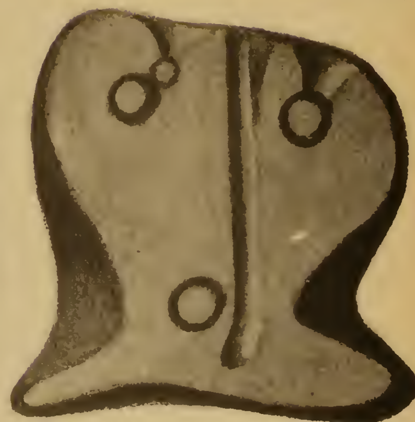

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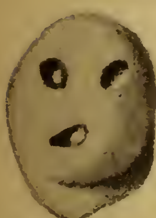

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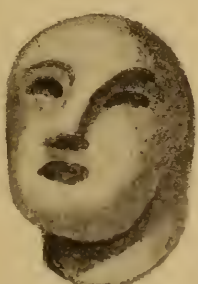

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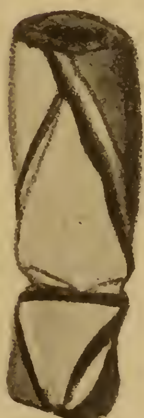

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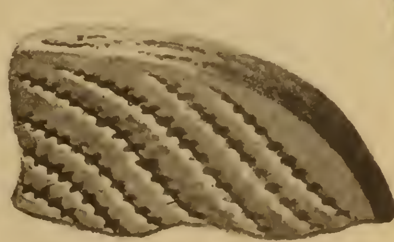

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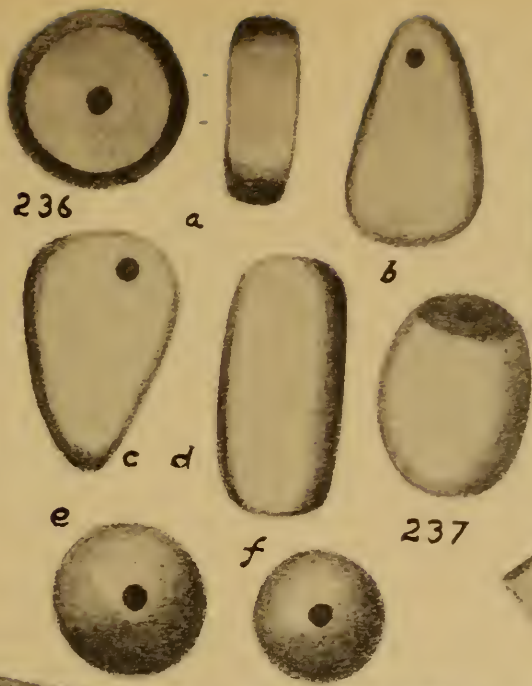

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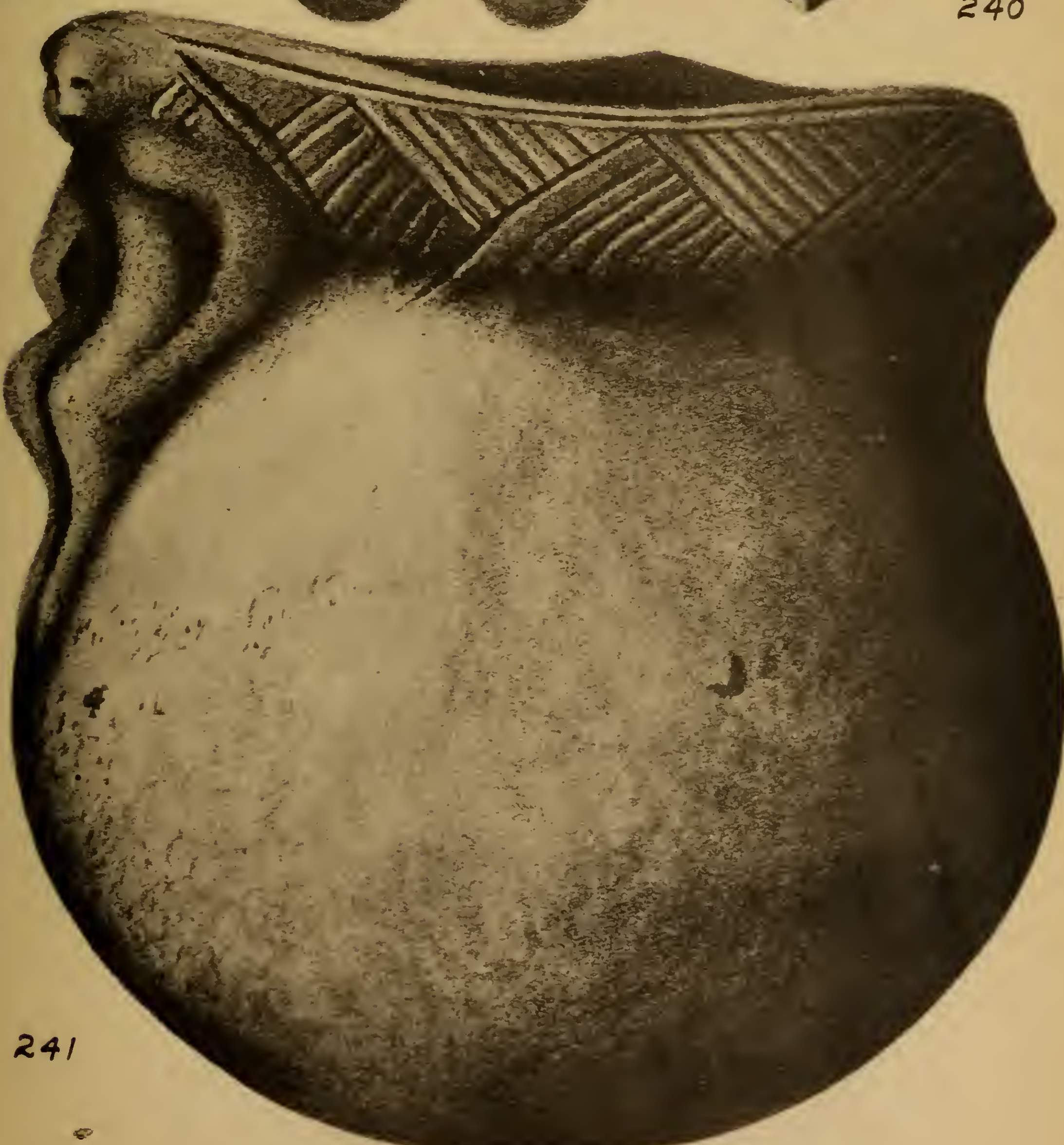

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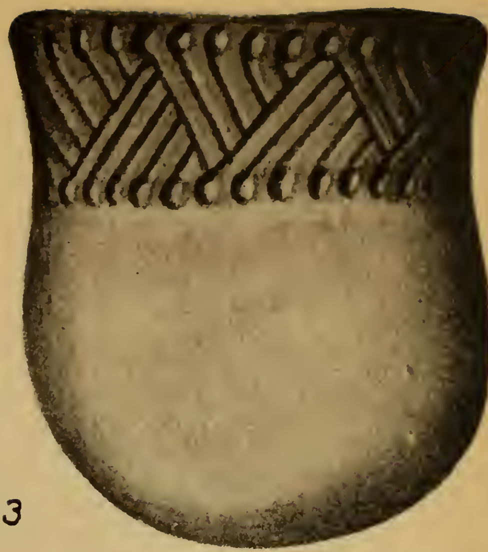

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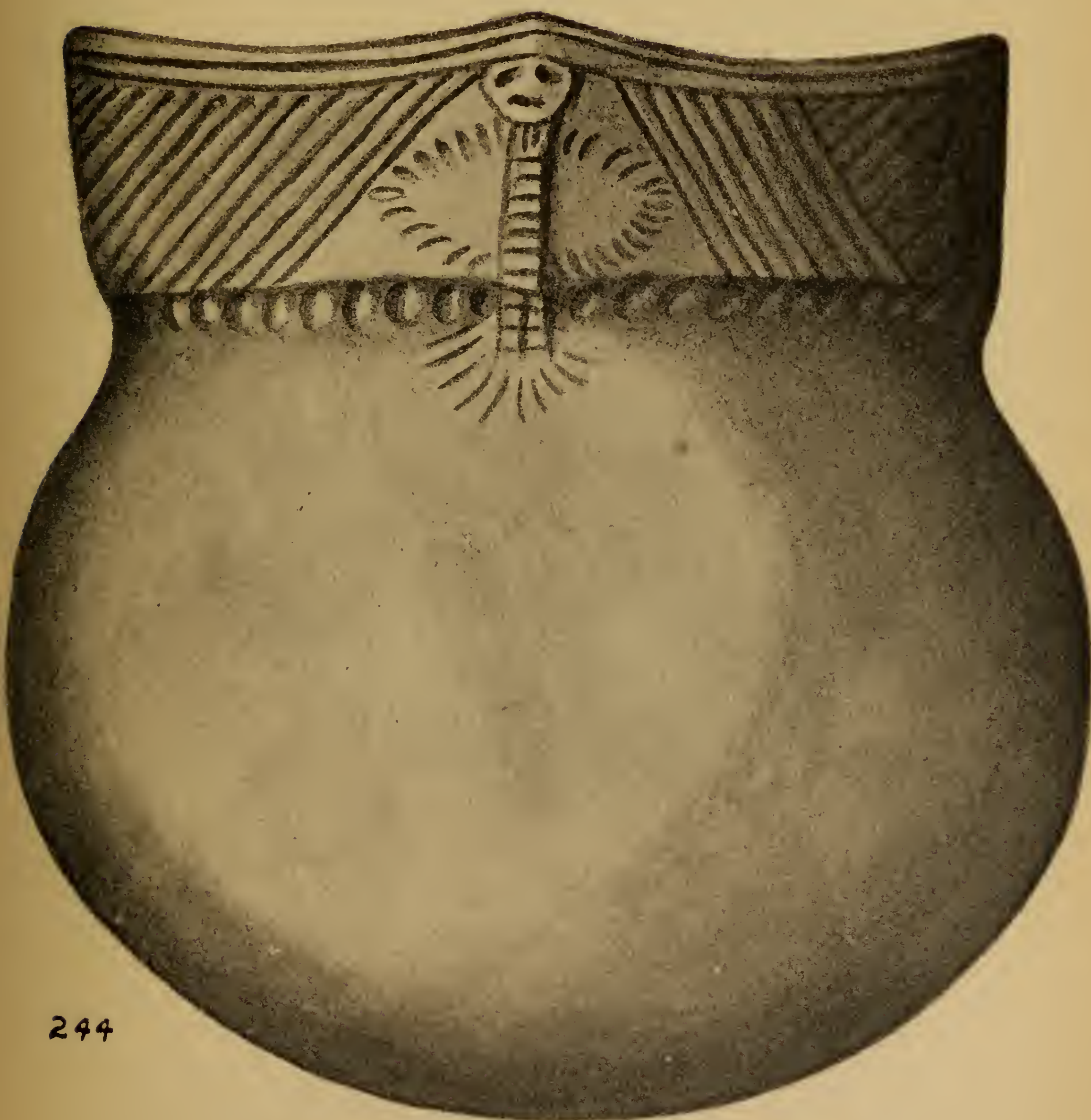

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University of the State of New York

BULLETIN

OF THE

New York State Museum

VOL. 5 No. 23

14th Report

ON THE

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

1898

By

EPHRAIM PORTER FELT, D. Sc.

Acting State Entomologist

ALBANY

UNIVERSITY OF THE STATE OF NEW YORK

1898

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[a] A general account and bibliography is given of each.

14TH REPORT

OF THE

STATE ENTOMOLOGIST

1898

Office of State Entomologist
Albany, October 15, 1898

To the Secretary of the University of the State of New York:

I have the honor of presenting herewith my report on the injurious and other insects of the state of New York, for the portion of the present year ending October 15, 1898.

General entomologic features. The year has been characterized by excessive damages to trees in both city and country. Reports have been received from many localities of widespread injuries by the tent caterpillars, *Clisiocampa americana* Fabr. and *C. disstria* Hübn. The white-marked tussock moth, *Notolophus leucostigma* Sm.-Abb., was reported as unusually destructive to shade trees in various parts of the state, while in Albany its injuries have been greater than for several years. A remarkable outbreak occurred at Schenectady, the light green larvae of *Xylina antennata* Walker appeared in such numbers that a large portion of the many soft maples in that city was defoliated. Such destructive work by this species has never been recorded, and is a striking example of what a comparatively harmless insect can do, provided the conditions are favorable. Another interesting feature was the presence of zebra caterpillars, *Mamestra picta* Harris, in such abundance on recently gathered timothy hay as to literally cover it. Hitherto, this pest has been regarded as an enemy to cabbage and related garden crops, more rarely attacking other plants. The leaves of many elms have been seriously injured by an unknown leaf miner. The cottony maple-tree scale, *Pulvinaria innumerabilis* Rathvon, has been extremely abundant and destructive throughout the state, affecting the soft maples most seriously. The destructive brown apricot scale of California, *Lecanium armeniacum* Craw, was discovered in Erie county on grapevine. Its eradication was recommended, and it is believed that it has been effected.

Elm-leaf beetle. The widespread injuries for the last few years by the elm-leaf beetle along the Hudson river valley, induced the preparation of an illustrated museum bulletin (Museum bulletin 20) on this most pernicious insect, which was issued in the middle of July, at a time when the extremely destructive work of the insect was apparent to all. The demand for this bulletin indicates a general interest in the methods of controlling this species. In addition, a number of articles treating of this pest have been sent to local papers and addresses delivered in adjacent places at several meetings called for the special purpose of considering the best manner of subduing this insect. It is hoped that the agitation of this year will lead to more effective control another season.

San José scale. The recent law placing the inspection of all nursery stock in the state under the direction of the commissioner of agriculture, has emphasized the intimate relations that should continue to exist between this office and his department. While the law was designed primarily to prevent the spread of this scale insect, *Aspidiotus perniciosus* Comstock, it was so drawn as to include 'dangerously injurious insects,' and to the entomologist the commissioner gave the delicate task of determining what species came within the scope of the law. In addition, my opinion has been asked in regard to cases in which appeal from the decision of the inspector had been made to the commissioner of agriculture, and many examples of scale insects were submitted to me for determination. When it is stated, that in order to be positive in regard to the identity of a scale insect, in many cases the creature must first be treated with potassium hydrate and a microscopic preparation made, some idea of the time occupied by this work will be gained.

Office publications. In addition to the bulletin on the elm-leaf beetle, the early part of the year was largely occupied by the work incident to the publication and distribution of the late Dr Lintner's 12th report, for the year 1896, and preparation of his 13th report, for the year 1897, now in press. The prominent place among economic entomologists occupied by Dr Lintner, and the most excellent character of all his work, rendered it very desirable that his numerous publications should be made accessible to all, so far as possible. Therefore, in addition to a short notice of his life, a bibliography of his writings, giving a brief abstract, title, place and date of publication, and a general index of his 13 reports, based on the extended one in that for 1894, have been prepared as a supplement to this report, and will appear in a subsequent bulletin. As much of this work had to be done in the early summer, at a time when field work could most profitably be undertaken, original investigation was necessarily somewhat limited.

Office work. The routine office work of the division during the past summer has been heavier than at any time since my connection with the office. Without attempting any radical innovations, it has been my aim to render services of the greatest practical value to the public. The numerous calls for information from all quarters indicate that my efforts have been greatly appreciated. The demand for press notices, mainly agricultural, has been greater than that recorded any previous year. Abstracts of my principal publications, 72 in number, are given in a subsequent portion of this report. The presentation in agricultural and other journals of reliable information regarding insects should be encouraged, as it brings the recommendations before farmers and others at a time when they are of the greatest value, which is not always true of bulletins and reports. Considerable attention has been paid to this branch of the work with most gratifying results. A large portion of these notices have appeared in the *Country gentleman*, one of the best agricultural weeklies, but in no case has preference been shown to any paper. Every request for information has received due attention. The correspondence has been unusually heavy. The number of letters received since January 1 is 748[a], and the number written is 1199. Most of the queries resulted from a general desire for information, though some were due to excessive ravages by tent caterpillars and other insects.

The work of the division has been greatly facilitated by the assignment to it of a junior clerk, Miss M. I. Bull, whose services, though she had no previous entomologic training, have been a great aid, relieving me of considerable clerical work and thus allowing time for more important duties. The purchase of a good field camera constitutes a valuable addition to the equipment of the office.

Collection of insects. The state collection of insects remains practically as it was at the beginning of the year, with additions as given later in this report. The pressing duties of the office during the past few years have prevented much desirable work being done on the collection. Since my connection with the University, a number of new boxes have been bought, most of the insects referred to their various families, and in a few instances, those of a family have received their generic and specific labels. A beginning has also been made on a biologic collection, something the late Dr Lintner had been laboring to bring about for years.

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a The death of Dr Lintner at the time the 12th report was issued, deterred many from acknowledging its receipt, thus reducing the number of letters received. The cards accompanying the reports were counted, as previously, hence the discrepancy between the letters received and written.

The accommodations provided for the collection are far from adequate. During the past 18 years a vast amount of material has been accumulating, and when properly worked up, will be found a mine of information. The state collection needs more room. At present, part is in wooden trays with glass tops and part in pasteboard boxes. A first class box or tray should be decided on and then the whole collection overhauled, classified and rendered accessible to the public. At present the specimens are threatened with injury on account of dampness, the result of a leaky roof, or they may be destroyed by museum pests, as none of the trays or boxes are as tight as they should be. The work on the biologic collection should be pushed, special attention being paid to the forms of economic importance. An exhibit of this character would prove a most important educational factor, and would be of the greatest practical value to all in the vicinity. If, in addition to this, some plan were devised whereby small biologic collections could be prepared and either temporarily lent to granges or other organizations interested in the advancement of applied science or placed on exhibition at farmers' institutes, fairs and other gatherings, specially if in charge of one competent to explain the salient points in the life history of the various forms, a moderate outlay would not only advance the agricultural interests of the state, but would also bring the office into closer touch with those whom it is designed to serve.

The private collection belonging to the late incumbent is still in the office and would be an invaluable addition to the state collection, containing, as it does, many rare and unique forms.

Division library. To obtain the best results, it is absolutely necessary to have a good library at hand. During his tenure of office, the late Dr Lintner depended for reference very largely on his private library, a collection of books and papers that has few, if any, equals, so far as economic entomology is concerned. Many of the books are rare, and several of the sets of serial publications are supplementary to those belonging to the state. If possible, it should be bought for this division.

J. A. Lintner. In the death of **Joseph Albert Lintner**, Ph. D., the state sustained a great loss and the science of economic entomology was called on to mourn a leader. It is hoped that the grand work begun by him 18 years ago will be carried on, and that the practical side of the science will ever be kept in mind.

Acknowledgments. At this time I wish to acknowledge the many favors and courtesies received at the hands of Dr L. O. Howard, chief of the division of entomology at Washington, and his associates. Every

request, either for the name of an insect or for further information regarding it, has been promptly honored. The advantage of such a central bureau, where a number of specialists are constantly working on certain orders or families, can be appreciated only by those who have some conception of the immense number of insects and of the utter impossibility of identification of all the varied forms by one person. In conclusion, I wish to express my appreciation of the opportunities afforded me by the regents during the past few months, and for the support that has been given my every effort to render this office of greater practical value.

Respectfully submitted

EPHRAIM PORTER FELT

Acting state entomologist

INJURIOUS INSECTS

BYTURUS UNICOLOR *Say*

Pale brown Byturus

Ord. **Coleoptera**: Fam. **Dermestidae**

A number of examples of this small beetle were brought to me May 23, by Dr C. H. Peck, state botanist, with the information that from one to five or more were to be found in the opening buds of his raspberry plants. A little later he informed me that his bushes had been injured to a considerable extent by the work of this species. The attack is of considerable interest, as there is no record of its having proved injurious since 1870, when Dr Fitch noticed briefly the work of its larvae upon the fruit. Lack of record by no means indicates its absence; on the contrary it is more probable that considerable of the unknown injury to raspberry plants, indicated by failure to bear well, has been caused by the work of this insect.

Injuries and distribution. The beetles not only eat into the fruit buds of the plant, thereby destroying the berry at its inception, but, according to Dr Packard, may also eat long strips in the leaves. Dr Fitch states that the white larvae of the insect are very common on the fruit throughout the country, their presence rendering the berries unfit for food. The earliest injuries known are those in Massachusetts and New York in 1870, the former by the beetles to the leaves and fruit buds and the latter by the larvae to the fruit itself. In 1873, William Saunders reported this species as very destructive to the blossoms, presumably in the vicinity of Ottawa, Canada. At Lansing, Mich., much damage was inflicted on raspberry blossoms by this or a closely allied species in 1885, according to Prof. C. P. Gillette. The beetles were again destructive in Canada in 1887, appearing in numbers and doing considerable damage to the buds and flowers (Fletcher). In her 15th report for the year 1893, Miss Ormerod records serious and widespread injuries to raspberries in England by the closely allied *Byturus tomentosus*. The damage done in England may be taken as an indication of the injury that our American form may possibly inflict. Besides feeding on the raspberry, *B. unicolor* was observed by Prof. Webster eating out the blossom buds of a species of *Geum*, either *rivale* or *album*.

LeConte and Horn (see citation) state that but one species, obviously *B. unicolor*, occurs in the Atlantic district. The present record indicates that it is pretty well distributed over the eastern United States and extends north into Canada.

Description. The beetles are about $\frac{1}{7}$ inch long, subcylindric, and of a pale reddish brown color. With a lens, the dense, rather long, pale, tawny hairs covering the entire upper surface are easily distinguished; the vestiture of the under surface is shorter.

The larva has been described by Dr Fitch as follows:

When examined with a magnifying glass, these worms are found to be plump and cylindric, slightly tapered at each end, and nearly $\frac{1}{4}$ inch in length when fully grown. They are white, each segment having on the back a broad, pale, tawny yellow band occupying more than half its surface, and being also furnished with a few short, erect, whitish hairs. The mouth is darker, tawny yellow. On the breast are three pairs of legs, but none on the body back of these, except at the tip, which is prolonged into a single proleg of a short conic form, and blunt at its end; and on the apex of the last segment, above the base of the proleg, are two minute projecting points, appearing like two deep red dots.

Life history. The beetles occur on the raspberries the latter part of May, and in Massachusetts till after the middle of June, as stated by Dr Packard. The eggs are probably laid on the developing fruit, as is recorded by Miss Ormerod of the related *B. tomentosus*. The following notes on its life history are based on records by Dr Fitch. The larvae are usually found lying on the inner side of the cup or cavity in the berry. When full grown they drop to the ground or fall with the fruit and transform to pale, dull, yellowish pupae under leaves or other rubbish, where they remain till the following May. Miss Ormerod states that *B. tomentosus* pupates under the sheltering bark of the raspberry or in some similar place. It is possible that our species also pupates to some extent on the canes.

Remedies. The beetles can probably be controlled by spraying with an arsenite. Hand picking or beating them from the bushes into pans containing water and a little kerosene, has also been recommended. The latter will be more effective if done in the cooler part of the day, as the beetles will be less likely to take flight. There are no effective means of dealing with the larvae. If the insect becomes numerous in a patch, it might be advisable to burn all the trimmings and rubbish, in order to destroy as many of the hibernating individuals as possible.

Bibliography

Say, Thomas. Academy of natural sciences of Philadelphia. Journal. 1823. 3:197[a] (original description); the same in his complete writings. 1883. 2:126.

Packard, A. S. Guide to the study of insects. 1869. p. 448 (mention); Injurious insects, new and little known. Mar. 1870. p. 12, 13, pl. 1, fig. 12 (injuries to raspberries).

Fitch, Asa. N. Y. State agricultural society. Transactions. 1870. 1872. 30:358–360 (brief account of its injuries).

Saunders, William. Entomological society of Ontario. Report. 1873. 1874. p. 10, 11 (brief general account); Insects injurious to fruits. 1883. 1889. p. 310, 311, fig. 322 (brief account).

Jayne, H. F. American philosophical society. Proceedings. 1883. 20:345, 346, pl. 1, fig. 1–4 (description).

LeConte, J. L. & Horn, G. H. Classification of the coleoptera of North America. 1883. p. 141 (distribution).

Gillette, C. P. Rural New Yorker. 1885. 44:561 (injuries by this or a closely allied species).

Fletcher, James. Central experimental farm (Canada). Report of entomologist and botanist. 1887. Separate. p. 31, fig. 21 (injuries and remedies).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 143 (generally distributed); Economic entomology. 1896. p. 180, fig. 159 (brief notice).

Lintner, J. A. Insects of New York. 8th Report. 1893. p. 298 (injuring raspberry leaves and buds at New Haven, Ct.).

Webster, F. M. Ohio Agricultural experiment station. Bulletin 45. 1893. p. 189, 190 (brief general account); Insect life. 1894. 7:204 (feeding on *Geum*).

Comstock, J. H. & A. B. Manual for the study of insects. 1895. p. 541, fig. 649 (brief notice).

Chittenden, F. H. U. S. Dep't agriculture, Division entomology. Bulletin 8 (new series). 1897. p. 14 (mention).

TRYPETA CANADENSIS *Loew*

Gooseberry fruit fly

Ord. **Diptera**: Fam. **Trypetidae**

The small maggot of the gooseberry midge, *Cecidomyia grossulariae* Fitch, has long been known to breed in currants and gooseberries, thus destroying the fruit. This insect and its destructive work was described

[a] Volume and page references are separated by a colon, e. g. 3:197 means volume 3, page 197.

and commented upon by Dr Fitch in 1854. It is only in later years, however, that the maggot of another species of fly was detected injuring the fruit of these plants in a very similar manner, and it is possible that its work in earlier years was confounded with that of the gooseberry midge.

Operations in New York state. The work of this insect was first brought to the notice of Dr Lintner by Mrs H. D. Graves, of Ausable Forks, N. Y., in May 1890, when the trouble was so serious in her locality that some neighbors destroyed their currant bushes on account of the numerous maggots infesting the fruit. Both the white and red varieties were attacked. Again, in 1894, Mr J. G. Collett, of Camden, N. Y., wrote that nearly all of his gooseberries fell off every year before they were fully matured, owing to the presence of 'a small white worm or maggot just under the skin.' This attack could be referred to no other than the above-named species. With such a record in the two places where this insect has established itself in this state, it bids fair to be as serious an enemy to the currant and gooseberry as is the closely related apple maggot, *Trypeta pomonella*, to the apple. Its injuries in other localities where it has been found are so great that it may well be classed as a dangerous insect pest.

Distribution. This insect has been recorded from but a few widely separated localities, and is most probably a native form. It was originally described from Maine or Canada. Prof. Gillette found it abundant in Colorado; it was sent to the U. S. Department of agriculture from West Ferndale, Wash.; it has been reported recently as abundant in that state and Dr Fletcher has long known of injuries to black currants in British Columbia by what is most probably this insect. In New York state it has been very abundant in two localities distant from each other and may be more generally distributed throughout the state than is supposed.

Life history. The following account of the life history and habits of this fly is a résumé of the detailed paper on it by Prof. Harvey (see citation), which should be consulted for farther information. The flies were first observed by him in nature about June 1, though punctures on the fruit at that time indicated an earlier appearance. There is but one generation annually. The imagoes were most abundant June 9–15, all having disappeared by the 25th. The eggs are deposited singly, the female requiring about five minutes for the insertion of each just beneath the skin of the fruit, where they may easily be seen a little to one side of the nearly invisible puncture, which soon becomes surrounded by a brown areola. They are deposited most largely in the earliest berries to appear, i. e. those at the base of the bunch. After emerging from the egg, the young larva works its way along under the skin of the berry, usually leaving a trail, for perhaps a third or half of the circumference, and then in most cases enters one of the seeds. It soon becomes too large for its refuge and may then be found lying between the seeds and feeding upon them. Occasionally two or three larvae are found within a single berry. The injured seeds turn black and become cemented together. Later, the infested currants show a clouded appearance on the side, occasioned by the presence of the larva; soon that cheek turns red, becomes darker and finally black. The infested berries ripen early and drop, often before the larvae have matured, but occasionally the currants on the bushes show the exit hole cut by the matured larva in its escape to the ground. Many, however, remain in the fallen fruit for several days before emerging therefrom for pupation, some for over three weeks, though most of them forsake the berries within a week. The larvae pupate either in the soil or under some convenient shelter on the surface during the latter part of June or early in July, the fly appearing the following spring.

Remedies. About the only satisfactory methods of fighting this insect are the destruction of the infested fruit with the contained insect or killing it while still in the ground. The most practical method of controlling this species is, in most cases, to allow chickens to run among the bushes, as they will devour much of the infested fruit. If the ground is kept cultivated, and the fowls are allowed to scratch, many pupae will be destroyed in this manner. Another remedy that promises to be effective is spraying the ground under the bushes with kerosene emulsion after the insects have pupated. If this was done just before a rain, the emulsion would be washed into the soil and come in contact with the pupae. This treatment should be as fatal to this insect as it has proved in the case of white grubs in the soil.

Bibliography

Loew, Hermann. Monograph of the diptera of North America. 1873. 3 : 235–38 (original description).

Osten-Sacken, C. R. Catalogue of the diptera of North America. 1878. p. 189 (listed).

Saunders, William. Insects injurious to fruits. 1883. 1889. p. 352, 353 (brief mention).

Gillette, C. P. Col. Agricultural experiment station. Bulletin 19. 1892. p. 18–20, fig. 9 (brief account).

Riley, C. V. & Howard, L. O. Insect life. 1892. 4 : 355 (mention).

Snow, W. A. Kansas university quarterly. 1894. 2 : 159 (from Maine, as *Epochra*).

Harvey, F. L. Me. Agricultural experiment station. Report. 1895. 1896. p. 111–24, fig. 7*a*, pl. 1, 2 (extended account, as *Epochra*); the same in separate, p. 1–14; Me. Agricultural experiment station. 13th Report. 1897. 1898. p. 176 (more abundant than usual).

Doane, R. W. Entomological news. 1898. 9 : 72 (abundant in Washington state, as *Epochra*).

NOTOLOPHUS LEUCOSTIGMA *Sm.–Abb.*

The white-marked tussock moth

Ord. **Lepidoptera**: Fam. **Lymantriidae**

The destructiveness of this pest has been so marked and widespread in cities and towns, and inquiries for remedies so numerous, that in spite of the fact that it is, or should be, a well-known insect, it is deemed desirable to notice this species at some length. Though very injurious, it is controlled with comparative ease, and this should be kept before the public, even at the cost of some repetition.

Ravages in 1898. This insect has proved a serious pest in a number of cities within the state. In Albany, most of the horsechestnuts would have been completely defoliated had it not been for the spraying undertaken by the municipal authorities. As it was, a large number were seriously injured, owing to the late application of the poison or to inability to throw the spray to the tops of the larger trees. The leaves were nearly stripped from the lindens, and the numerous white egg clusters give promise of greater injury another year, unless protective measures are adopted. In parts of Troy this insect was even more destructive than in Albany. Reports of serious ravages have been received from other localities. Its cocoons were reported by Chester Young, nursery inspector for the state department of agriculture, as abundant on all kinds of trees at Woodside, L. I., which may well be regarded as an indication of extended injuries already sustained and a sign of worse to come. In Buffalo, this insect has become such a pest that the authorities have been stirred to action. A circular has been issued by the board of public works calling upon the citizens to collect and destroy the egg clusters, and giving directions for the same and also for spraying in the spring. It is expected that this call will be supplemented by the city fighting the pest where it is impossible for land holders to accomplish the desired object.

Injuries to fruit trees. In earlier years this was regarded as a very serious enemy of the apple-tree in Ontario, for Rev. C. J. S. Bethune, writing in 1871, stated that it was a bad pest, and that in the western states it had defoliated some orchards and even attacked the fruit. In his second report, Dr Lintner records several instances of severe injuries to fruit trees by this species. Serious depredations have also been reported by Mr Lowe, entomologist of the agricultural experiment station at Geneva. In 1895 he received many complaints, specially from Yates and Ontario counties, the larvae not only devouring the foliage, but attacking the fruit. In the report of the station for that year, he writes that one fruit grower estimated the loss on his apple crop at 25%.

City pest. Though this insect occurs in the country and occasionally is quite destructive to fruit and other trees, it is in the cities and towns that it flourishes and proves most injurious. The cause for this is found largely in the protection afforded by the English sparrow, which not only fails to feed upon it, but drives away native birds that would. A curious instance of the survival of the fittest and the danger of importing some natural enemy for the purpose of keeping in check an injurious insect, is shown by Dr J. L. LeConte (see citation), who instances the extermination of *Ennomos subsignarius* Hübn. in Philadelphia by this imported bird. After the destruction of *Ennomos*, the larvae of *Notolophus* found abundant food and, being unmolested by the sparrows on account of their irritating hairs, they soon became an even worse pest than the former species.

Description. A casual observer may have his attention arrested by an unusually pretty caterpillar with a coral red head, a pair of long black plumes just over it, a single one at the opposite extremity of the body, four delicate yellowish or white brush-like tufts on its back and just behind them, separated only by a segment, two small, retractile, red elevations. Along the back, except for the tubercles and tufts, there is a broad black band bordered by yellowish subdorsal stripes. Each side is dark gray, except the yellowish tubercles. A black line indicates the position of the spiracles or breathing pores, and below this latter line it is yellow, the legs being paler (fig. 1, *a*). This gives the general appearance of the caterpillar after it has become half or two-thirds grown, and at a time when its depredations begin to be apparent.

The recently hatched larva is a pale yellowish or whitish creature with long, irregular hairs. As it feeds, increases in size, and casts its skin from time to time, one after the other of the characteristics of the full grown larva is assumed.

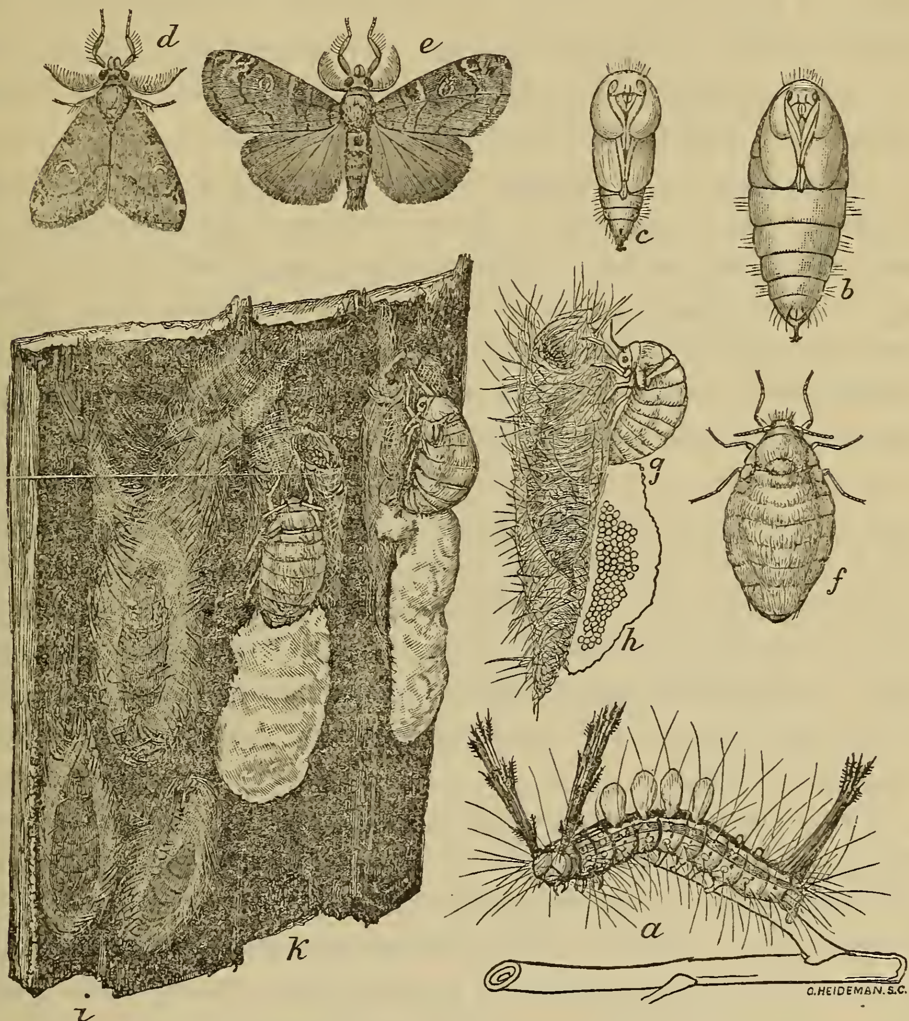

Fig. 1. NOTOLOPHUS LEUCOSTIGMA. *a*, larva ; *b*, female pupa ; c, male pupa ; *d*, *e*, male moth; *f*, female moth ; *g*, same ovipositing ; *h*, egg mass ; *i*, male cocoons ; *k*, female cocoons, with moths laying eggs—all slightly enlarged (after Howard [Division entomology], U. S. Dep't agriculture, year book, 1895).

When maturity is reached, the larvae spin their thin cocoons in the crevices of the bark (fig. 1, *i*), interweaving their long hairs, and within this shelter transform to yellowish white pupae more or less shaded with dark brown or black (fig. 1, *b*, *c*).

The difference between the sexes in the adult stage is strikingly shown by comparing in figure 1, *d* and *e*, illustrations of the male, with *f*, that of the female. The former is a beautiful moth with large feathery antennae, the legs tufted, and the wings and body delicately marked with several shades of gray and grayish white. On the other hand, the female is a nearly uniform gray, with simple antennae, and but rudimentary wings.

The eggs are deposited on the empty cocoon under conspicuous white masses of froth (fig. 1, *h*, *k*), which soon hardens and forms a very effective protection. The individual egg is nearly spherical, about $\frac{9}{10}$ mm in diameter, white or yellowish white, and with a light brown spot surrounded by a ring of the same color.

Life history. The winter is passed in the egg, the young emerging about the latter part of May in this latitude. In his studies of this insect, Dr Riley observed that the larvae molted seven days after hatching, and thereafter every six days till mature, males being produced from those that passed through but four stages and females from those exhibiting five or six. The rearings by Dr Dyar, indicate that the males have six stages and the females six or seven. The growth of the caterpillars occupies a month or a little more, pupation occurring the latter part of June and early in July. In Albany most of the larvae had pupated by July 7 of the present year, and some recently deposited egg masses were to be seen. In New York city the eggs began to hatch May 25, 1883, and the larvae to pupate about June 21, according to Clarkson (see citation). A few individuals spin up earlier than the mass and some do not till numerous egg clusters indicate that most have already completed the round of life.

From 10 to 15 days are passed in the pupa state. At the end of this period, the wingless female emerges and crawls upon her cocoon, pairing takes place, and immediately afterwards deposition of the eggs begins, as stated by Dr Howard. They are laid in a mass as described above, the eggs of a cluster ranging in number from 100 to 500, as given by several writers. In what appeared to be a good sized mass collected in Albany, there were 330 eggs. After her full complement has been discharged, the female dies and usually drops to the ground. In Albany there is normally one annual generation, but in New York city and vicinity and in Boston, Mass., there are two broods, while at Washington, D. C., there are two and probably three broods each year, according to Dr Howard.

Habits of the species. The young larvae feed upon the under surface of the foliage, and as they increase in size more and more holes are eaten, till, when full grown, all but the main ribs of the leaves are devoured. A peculiar habit, recorded by Dr Lintner but not observed by others outside of Albany, is the girdling of elm twigs by the larvae of this insect. This is caused by their eating a portion of the bark around the twig near the beginning of the season's growth. The affected tips soon die, break off, and fall in numbers to the ground. The larvae drop from the trees readily, specially when young, suspending themselves by silken threads, and then may be blown or carried considerable distances. When nearly full grown, the caterpillars travel to a great extent, this is said to be specially true of the larger ones, females, and more likely to occur if they are very abundant. At such times there may be quite a migration to other trees. The cocoons are found very generally on the trunks and particularly on the under side of the larger branches. The wingless females, at the time they emerge from their cocoons, attract large numbers of the opposite sex. Dr Lintner records an instance of one attracting 100 males within an hour. Collections at electric lights in Poughkeepsie, N. Y., by Dr Dyar, show that the males fly during July and into August.

Food plants. Though this insect is commonly destructive to comparatively few trees, it has been recorded as feeding on a number of plants, as the following list will show: Linden,[a] geranium (*Pelargonium*),[a] grape, horsechestnut, buckeye, maples (specially the soft and Norway), box elder, honey locust, apricot, garden plum, wild plum (*Prunus chicasa*), garden cherry, choke cherry, rose, pear, apple, quince, ash, castor-oil plant, elm (several species), hackberry (*Celtis*), sycamore or buttonwood, butternut, black walnut, hickory, oak, birch, alder, willow, poplar, spruce, fir, larch and cypress. Though Dr Howard excludes conifers from the food plants of this insect, the species mentioned above are given on the authority of records by earlier writers. It is probable that farther observation would lead to a much greater extension of this list, and certain ones might have to be thrown out on account of the larvae eating them only under most exceptional circumstances.

Distribution. This native species 'ranges from Jacksonville, Fla., to Nova Scotia on the eastern coast and extends west certainly as far as Keokuk, Ia., and probably farther.' (Howard[b]) It has been recorded as common in Nebraska by McMillan, and Prof. F. L. Washburn (see citation) reports the same from Oregon.

Other forms of Notolophus. There are several other species in the country belonging to this genus, one of which, *N. definita* Packard,

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[a] Not previously recorded to my knowledge.

[b] *Year book. U. S. Dep't agriculture.* 1895. p. 368.

has long been confused with *N. leucostigma*. As an aid to the ready identification of these interesting larvae, the following table by Dr Dyar, is reproduced:

Synopsis of the larvae of Notolophus

Head yellow, colors in general pale .... *definita*
Head red
  A distinct yellow subdorsal band.................. *leucostigma*
  Gray marks predominate, the yellow band not noticeable.. var. *inornata*
Head black
  Warts crimson, brush-like tufts dark along the crest, the yellow lines along the sides broken into spots
    One black tuft in young larva .... *vetusta*
    Two black tufts in young larva.................. var. *cana*
  Warts orange, brush tufts unicolorous, yellow or white, side lines usually continuous
    A lateral black hair-pencil from joint 6........... *antiqua*
    No lateral black pencil........................ var. *badia*

Natural enemies. If the experience of later years is any criterion, certain native birds may well be regarded as most effective natural

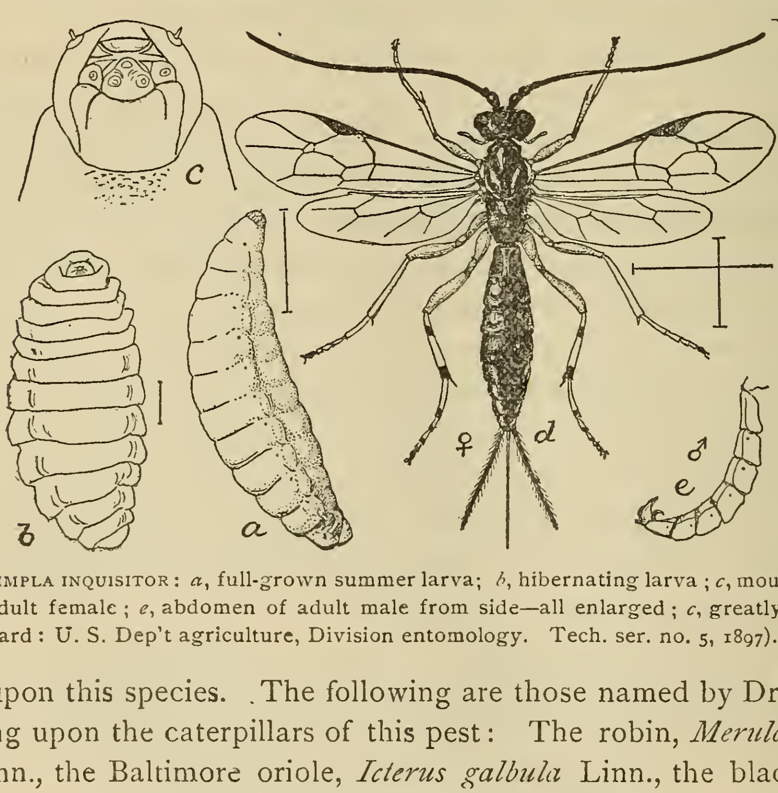

Fig. 2: PIMPLA INQUISITOR: *a*, full-grown summer larva; *b*, hibernating larva; *c*, mouth-parts of larva; *d*, adult female; *e*, abdomen of adult male from side—all enlarged; *c*, greatly enlarged (after Howard: U. S. Dep't agriculture, Division entomology. Tech. ser. no. 5, 1897).

checks[a] upon this species. The following are those named by Dr Lintner as feeding upon the caterpillars of this pest: The robin, *Merula migratoria* Linn., the Baltimore oriole, *Icterus galbula* Linn., the black-billed

[a] Psyche. 1896. 7:342.

cuckoo, *Coccyzus erythropthalmus* Wils., and the yellow-billed cuckoo, *Coccyzus americanus* Linn. It will be found true as a rule, that in cities where these birds are absent or have been driven out by the English sparrows, this pest flourishes, while in the country, where the native birds are more abundant, this insect is rarely injurious.

The insect parasites of this species are extremely valuable allies and should be encouraged in every practical manner. The recent extensive studies of these by Dr L. O. Howard (see citation), have made valuable and very material additions to our knowledge of these interesting forms. He has shown that in Washington, D. C., *Pimpla inquisitor* Say and *Chalcis ovata* Say (fig. 2, 3) are the two species most effective in controlling this pest, and that large numbers of the former insect hibernate as larvae within the cocoons of the host, while in no instance was the latter parasite reared from cocoons of *Notolophus* taken the previous winter. He

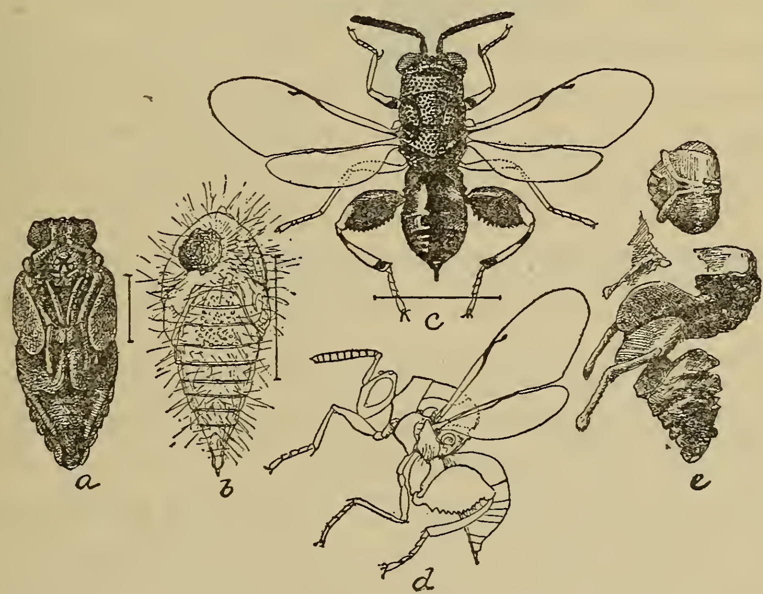

Fig. 3 : CHALCIS OVATA : *a*, pupa ; *b*, parasitized pupa of *Notolophus* ; *c*, adult ; *d*, outline of same from side ; *e*, pupal exuvium — enlarged (after Howard : U. S. Dep't agriculture, Division entomology. Tech. ser. no. 5, 1897).

has also shown that when hymenopterous parasites are comparatively scarce, certain tachinids may destroy large numbers of this pest, the more important being *Tachina mella* Walk., *Frontina frenchii* Will. and *Euphorocera claripennis* Macq. Besides those mentioned above, Dr Howard gives the following as primary parasites of this species : *Pimpla conquisitor* Say, *Pimpla annulipes* Say, *Amorphota orgyiae* How., *Meteorus communis* Cres., *Meteorus hyphantriae* Riley, *Limneria* sp., *Limneria valida* Cres., *Theronia fulvescens* Brullé, *Apanteles* [*delicatus*

How., *Apanteles hyphantriae* Riley, *Apanteles parorgyiae* Ashm., *Pteromalus cuproideus* How., *Cratotechus orgyiae* Fitch, *Telenomus orgyiae* Fitch, *Frontina aletiae* Riley, *Exorista griseomicans* V. d. W. and *Winthemia 4-pustulata* Fabr. At Washington these parasites became so abundant that in the autumn of 1895 about 90% of the larvae were destroyed. In addition to the above named parasites, Dr Howard records that *Ichneumon subcyaneus* Cres., *Ichneumon coeruleus* Cres. and *Allocota thyridopterigis* Riley were all observed investigating recently formed *Notolophus* cocoons and were apparently about to oviposit. The latter, he states, is parasitic upon Pimpla.

In his study of these parasites, Dr Howard found that the conditions were not uniform in all parts of the city of Washington, the parasitism being more general in the vicinity of the grounds of the Department of agriculture, where most of the observations were made, than in other portions of the city. The difference due to locality is also shown by the [a] parasites in the state collection reared by the late Dr Lintner from this species, though his study of them was by no means so extensive as that at Washington. The one occurring most abundantly was *Tachina mella* Walk. *Pimpla hirticauda* Prov., a species not hitherto recorded from this insect, was bred in greater numbers than any other of the larger hymenopterous parasites. Most of the individuals belonging to this species were reared in July, but two appearing in June and a few others in August. *Pimpla inquisitor* Say, *P. conquisitor* Say and *P. annulipes* Brullé occurred in about equal numbers. Of the smaller primary parasites, *Pteromalus cuproideus* How. and an unnamed species belonging to the same genus were about equally abundant.

Though the list of primary parasites is long and includes some very important species, many of these are in turn the victims of enemies. The parasites breeding in those which prey upon injurious forms must be classed as enemies to man, since they protect a species indirectly by destroying large numbers of its parasites. One of the most abundant of the hyperparasites reared by Dr Howard at Washington was *Dibrachys boucheanus* Ratz. (fig. 4), it being present in such force as to almost kill off *Pimpla inquisitor* the latter part of 1896. This species was also reared in large numbers by Dr Lintner in 1883. It is in turn, as demonstrated by Dr Howard, preyed upon by *Asecodes albitarsis* Ashm. The following is a list of the hyperparasites of *Notolophus leucostigma*, as given by Dr Howard: *Hemiteles townsendi* Ashm., *Bathythrix meteori* How.,

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[a] Determined through the courtesy of Dr L. O. Howard.

Bathythrix pimplae How., *Adistola americana* How., *Otacustes periliti* Ashm., *Habrocytus thyridopterigis* Ashm., *Pezomachus insolitus* How., *Spilochalcis debilis* Say, *Eupelmus limneriae* How., *Dibrachys boucheanus* Ratz., *Elachistus cacoeciae* How., *Elasmus atratus* How., *Syntomosphyrum esurus* Riley and *Asecodes albitarsis* Ashm.

A number of scavengers were reared by Dr Howard from the pupae or masses of cocoons. The list is as follows: *Helicobia helicis* Towns.

Fig. 4 DIBRACHYS BOUCHEANUS: *a*, larva; *b*, pupa; *c*, adult female—greatly enlarged; *d*, head of larva; *e*, antenna of adult—still more enlarged (after Howard: U. S. Dep't agriculture, Division entomology. Tech. ser. no. 5, 1897).

Sarcophaga species, *Phora nigriceps* Loew, *Phora incisuralis* Leow, *Phora fasciata* Fall., *Phora agarici* Lintn., *Limosina* species, *Homalomyia scalaris* Fabr., *Gaurax anchora* Loew, *Neoglaphyroptera bivittata* Say and *Diplosis* species. This and the preceding lists illustrate in a remarkable degree the large number of forms that may depend more or less upon one species, and afford interesting examples of the relations that may exist between various insects.

In addition to these, a Eulophid was reared in some numbers from the cocoons of *Notolophus* by Dr Lintner in 1883 and 1884. A dermestid beetle, *Perimegatoma variegatum* Horn, has been recorded in *Insect life* as a very effective destroyer of the eggs of *Notolophus* in California. The wheel bug, *Prionodus cristatus* Linn., is said to prey upon the larvae in the southern states. The present season a mite, a species of [a] *Rhyncholophus*, was observed eating the contents of many eggs.

[a] Determined through the courtesy of Dr L. O. Howard.

Remedies. The simplest and most satisfactory remedy is found in gathering and destroying the egg masses. As the eggs are in a compact mass which is readily torn from the supporting cocoon, either by hand or some form of a scraper, the task is easily and quickly performed. Dr Howard has recommended the use of creosote oil for the destruction of the eggs, since each mass has only to be moistened with the substance. In winter it is necessary to add some turpentine in order to keep the creosote liquid. On account of the female being wingless, a tree once thoroughly cleaned will not become reinfested very soon if larvae are not abundant nearby, and even then a band of loose cotton bound tightly around the trunk will prevent their ascending and a consequent reinfestation. It should be kept in mind that only the eggs must be collected or destroyed, on account of the beneficial parasites which may occur in cocoons not bearing egg masses. This is specially true in the autumn and applies to a certain extent in the spring, since it has been shown that some parasites hibernate as larvae within the cocoons of the host, and if these are collected and destroyed, it means the death of many beneficial forms. The egg masses are more readily seen after the leaves have fallen and in localities like Albany, where one annual generation is the rule, the gathering of the eggs may well be deferred till autumn. In the case of Boston, New York city and more southern localities, it may be necessary to collect in midsummer those laid by the first brood of moths.

In case it is impracticable to collect the eggs, dependence must be placed upon spraying with some arsenical compound. This is satisfactory if properly done early in the season under favorable conditions. In many instances there will be more or less delay and in practice it is very difficult to have the spraying properly done, and then there may be hindrances incident to several days or a week of rain at the time the poison should be applied.

Not a few wait till the trees show signs of serious injury and then ask for some means of stopping the ravages. Resort may be had to spraying with a larger proportion of poison in order to kill the larvae quickly or they may be shaken from the limbs, provided the tree is not too large. The latter means will give a certain amount of relief where practicable and may be made more effective by the use of cotton bands to prevent the ascent of those shaken from the tree.

Bibliography[a]

Smith, J. E. & Abbott, John. Natural history of the rarer lepidopterous insects of Georgia. 1797. p. 157, pl. 79 (original description).

Emmons, Ebenezer. Natural history of New York. Agriculture. 1854. p. 230, 231, pl. 37, fig. 1, *a*, *b*, *c*, *f* (mention).

Fitch, Asa. Cultivator. 1856. 4 : 154–56 (extended account); Insects of New York. 1st–2d Report. 1856. p. 209–20 (general account); the same in Transactions New York state agricultural society. 1855. 1856. 15 : 441–52; — 1856. 16 : 338 (mention); the same in Insects of New York. 3d–5th Report. 1859. paragraph 32, p. 20; New York state agricultural society. Transactions. 1862. 1863. 22 : 675 (mention); the same in Insects of New York. 8th Report. 1863. p. 193.

Morris, J. G. Catalogue of the described lepidoptera of North America. 1860. p. 23 (listed); Synopsis of the lepidoptera of North America. 1862. p. 249 (description).

Harris, T. W. Insects injurious to vegetation. 3d ed. 1862. p. 366–69, pl. 7, fig. 1–5 (general notice); Entomological correspondence. 1869. p. 291 (mention).

Walsh, B. D. Practical entomologist. 1865. 1 : 46 (brief notice).

Walsh, B. D. & Riley, C. V. American entomologist. 1868. 1 : 79, fig. 67 (brief account), 1869. p. 120, 186, 252 (identified).

Packard, A. S. Guide to the study of insects. 1869. p. 288 (mention); U. S. Entomological commission. 5th Report. 1890. p. 217, 262–65, 336, 342, 373, 636, 656, 862, 863, 892, fig. 102, 103, 294, 295 (brief notice, food plants).

Riley, C. V. Insects of Missouri. 1st Report. 1869. p. 144–47, fig. 81–83 (general account); American entomologist and botanist. 1870. 2 : 181 (identified), p. 306, fig. 186 (notice); American naturalist. 1873. 7 : 516, 517 (molts of male and female larvae); Entomologist's monthly magazine. 1887. 23 : 274 (variable molting); U. S. Dep't agriculture, Division entomology. Bulletin 10. 1887. p. 29–33, fig. 13–33 (general account); — Bulletin 31. 1893. p. 17 (listed on apple).

Bethune, C. J. S. Entomological society of Ontario. Report. 1871. 1872. p. 14, 15, figs. 3–5 (severe injuries to apple-trees, brief general account).

LeBaron, William. Insects of Illinois. 1st Report. 1871. p. 13–17, 86, 2 figs. (brief account, parasites).

Rathvon, S. S. Pa. State agricultural society. Report. 1871. p. 566, fig. 28–31 (injuring apple-trees).

Saunders, William. Canadian entomologist. 1871. 3 : 14, 15, fig. 10 (eggs described); Entomological society of Ontario. Report. 1874. 1875. p. 19–21, fig. 14–16 (brief general account); Canadian entomologist. 1883. 15 : 186 (abundance in Canada); same in Report

[a] Previously this insect has been very generally referred to the genus *Orgyia*.

entomological society of Ontario. 1883. 1884. p. 11; Insects injurious to fruits. 1883. 1889. p. 57–60, fig. 50–53 (general account).

LeConte, J. L. Popular science monthly. 1874. 4:381. (*Orgyia* replacing *Ennomos* in Philadelphia); American association for the advancement of science. Proceedings. 1874. 1875. Part 2, 23:44 (*Orgyia* replacing *Ennomos subsignarius*).

French, G. H. Insects of Illinois. 7th Report. 1878. p. 185, 186, 277, 279, 281, 282, fig. 36, 37 (brief account).

Coquillett, D. W. Insects of Illinois. 10th Report. 1881. p. 166, fig. 62 (larva described); U. S. Dep't agriculture, Division entomology. Technical series no. 7. 1897. p. 12, 14, 15, 16, 21, 22, 26 (dipterous parasites); — Bulletin 10 (new series). 1898. p. 71 (*Gaurax anchora* reared from cocoons).

Marten, John. Insects of Illinois. 10th Report. 1881. p. 117, fig. 30, 31 (mention); Prairie farmer. 1890. 62:716, 1 fig. (brief notice).

Coleman, N. Papilio. 1882. 2:164–66 (notes on life history).

Lintner, J. A. Insects of New York. 1st Report. 1882. p. 33, 61, 64, (remedies), p. 72 (reference), p. 98 (additional molt in female); N. Y. State museum of natural history. 37th Report. 1883. 1884. p. 50–52 (girdling of elm twigs); — 38th Report. 1885. p. 76 (notice); Insects of New York. 2d Report. 1885. p. 68–89 (extended account); Country gentleman. 1885. 50:623 (mention); Insects of New York. 4th Report. 1888. p. 7 (mention), p. 15 (girdling young tips of elms), p. 48–51 (brief account); Country gentleman. 1888. 53:911 (mention); Insects of New York. 5th Report. 1889. p. 310, 321 (reference), p. 317 (mention); — 6th Report. 1890. p. 107, 181 (reference); — 7th Report. 1891. p. 216, 331 (reference); — 8th Report. 1892. p. 296 (from Yosemite valley, Cal.); — 9th Report. 1892. p. 295, 437 (mention), p. 429 (on elm), p. 450, 455 (reference); Insect life. 1893. 6:184 (mention); Albany institute. Transactions. 1893. 12:229 (mention); Insects of New York. 10th Report. 1894. p. 481, 495 (reference), p. 515 (cocoons from South Byron, N. Y.); American association for the advancement of science. Proceedings. 1895. p. 156 (girdling of elm twigs by larvae); Albany evening journal. 20 July, 1895. p. 3, col. 1 (reference); Insects of New York. 11th Report. 1895. p. 121 (brief mention), p. 124–126 (girdling elm twigs), p. 264, 279 (reference); American naturalist. January. 1896. 30:74, 75 (girdling elm twigs); Insects of New York. 12th Report. 1896. p. 347, 350, 357 (reference).

Clarkson, Frederick. Canadian entomologist. 1883. 15:168, 169 (ravages in New York city, parasites); Entomological society of Ontario. 14th Report. 1883. 1884. p. 33 (same as preceding).

Cooke, Matthew. Injurious insects of the orchard, vineyard. 1883. p. 87–89, fig. 58–62 (brief notice).

Forbes, S. A. Insects of Illinois. 12th Report. 1882. 1883. p. 100, 101, fig. 20 (brief notice); — 14th Report. 1884. 1885. p. 117 (mention); — Appendix 17th Report. 1891. p. 8 (reference).

Grote, A. R. Canadian entomologist. 1883. 15:235 (replacing *Ennomos*).

Weed, C. M. Mich. State horticultural society. 12th Report. 1882. 1883. p. 188, 189 (brief notice); Psyche. 1888. 5 : 51, 52 (*Pimpla inquisitor* and *P. conquisitor* reared); Ohio agricultural experiment station. 9th Report. 1890. 1891. p. 56, 57, fig. 3, 4 (brief notice); Insects and insecticides. 1891. p. 133–135, fig. 65, 66 (brief account); N. H. Agricultural experiment station. Bulletin 33. 1895. p. 3–6, fig. 1, 2 (brief account).

Dimmock, A. K. Psyche. 1885. 4 : 280 (on birch, bibliography); — 1888. 5 : 29 (molts of larva).

Hulst, G. D. N. J. Agricultural experiment station. Bulletin 46. 1888. p. 10 (mention); — 9th Report. 1888. 1889. p. 204–6, fig. 1 (brief account).

McMillan, Conway. Neb. Agricultural experiment station. Bulletin. v. 1, no. 2. 1888. p. 54–59, fig. 25–27 (general account).

Riley, C. V. & Howard, L. O. Insect life. 1888. 1 : 161 (*Pimpla inquisitor* reared); — 1890. 2 : 281 (parasite); — 1890. 3 : 153, 462 (parasites reared); — 1892. 4 : 222 (a dermestid attacking eggs), 259 (*Apanteles* reared), 346 (*Perimegatoma variegatum* an enemy); — 1893. 5 : 213 (mention).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 63 (bibliography).

Perkins, G. H. Vt. Agricultural experiment station. 3d Report. 1889. 1890. p. 150, fig 3–5 (brief notice); Vt. State board agriculture. 11th Report. 1890. Separate. p. 39–42, fig. 29–32 (brief account).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 294 (listed); N. J. Agricultural experiment station. Report. 1889. 1890. p. 308 (mention); — Bulletin 103. 1894. p. 12–14, fig. 3, 4 (brief account); — Report. 1894. 1895. p. 534–536, fig. 28, 29 (brief account); — Bulletin 111. 1895. p. 9 (raupenleim or dendrolene for); — Report. 1895. 1896. p. 518 (same as preceding); Economic entomology. 1896. p. 268–70, fig. 290, 291 (brief account).

Dyar, H. G. Insect life. 1891. 3 : 390 (mention); Psyche. 1891. 6 : 111, 112, 127 (mention), 1892. p. 324, 325 (larval stages), 1893. p. 420, 421, 438 (larval characters); — 1896. 7 : 341, 342 (larval characters).

Jack, J. G. Garden and Forest. 1891. 4 : 186 (mention); Mass. Horticultural society. Transactions. Pt. 1. 1894. p. 144 (mention).

Kent, G. H. Insect life. 1891. 3 : 338 (mention).

Murtfeldt, M. E. U. S. Dep't Agriculture, Division entomology. Bulletin 23. 1891. p. 50 (on *Platanus*).

Southwick, E. B. Insect life. 1891. 4 : 59, 60 (remedies); — 1894. 7 : 135 (remedies); Garden and Forest. 1895. 8 : 308 (remedies).

Washburn, F. L. Or. Agricultural experiment station. Bulletin 14. 1891. p. 8, 9 (common); — Bulletin 18. 1892. p. 8, 9, fig. 9 (mention).

Kellogg, V. L. Common injurious insects of Kansas. 1892. p. 96, 97, fig. 53 (brief general notice).

Kirby, W. F. Synonymic catalogue of Lepidoptera heterocera. 1892. p. 495 (listed).

Chambliss, C. E. Tenn. Agricultural experiment station. Bulletin. v. 6, no. 1. 1893. p 14–16, fig. 8–10 (brief general account).

Fernald, C. H. Mass. (Hatch) agricultural experiment station. Bulletin 20. 1893. p. 13–16, fig. 11–13 (brief account).

Slosson, A. T. New York entomological society. Journal. 1893. 1 : 4, 151 (mention).

Hancock, J. L. American naturalist. 1894. 38 : 326–28, fig. 1 (popular account of ravages in Chicago).

Neumoegen, Berthold & Dyar, H. G. New York entomological society. Journal. 1894. 2 : 30 (synonymy).

Slingerland, M. V. Insect life. 1894. 7 : 267, 268 (collecting egg masses at Rochester); Cornell agricultural experiment station. Bulletin 133. 1897. p. 255 (*Winthemia 4-pustulata* reared from).

Coleman, W. H. Country gentleman. 1894. 59 : 439 (cocoons collected at Rochester, N. Y.)

Comstock, J. H. & A. B. Manual for the study of insects. 1895. p. 310, 311, fig. 376, 377 (mention).

Lowe, V. H. Garden and forest. 1895. 8 : 314, 315, fig. 43 (injuring apples); N. Y. Agricultural experiment station. 14th Report. 1895. 1896. p. 552, 553 (injuries in western New York).

Taft, L. R. & Davis, G. C. Mich. Agricultural experiment station. Bulletin 121. 1895. p. 27 (mention).

Howard, L. O. U. S. Dep't Agriculture, Division entomology. Bulletin 2 (new series). 1895. p. 46, 47 (injuries, etc.); U. S. Dep't Agriculture, Year book. 1895. 1896. p. 368–375, fig. 86–90 (general account); —Division entomology. Technical series no. 5. 1897. p. 5–56, fig. 1–24 (parasites); — Bulletin 9 (new series). 1897. p. 15–17 (parasites); American association for the advancement of science. Proceedings. 1897. 46 : 230 (mention); Entomological society of Washington. Proceedings. 1898. 4 : 60, 61 (note on parasites).

Burgess, A. F. Mass. Board of agriculture. Report on gypsy moth. 1897. p. 67 (*Calosoma frigidum* fed on larvae).

Comstock, J. H. Insect life. 1897. p. 174, 175, fig. 144, 145 (mention).

Kirkland, A. H. Mass. Board of agriculture. Report on gypsy moth. 1897. p. 56 (*Podisus placidus* feeding on larvae).

Beal, F. E. L. U. S. Dep't agriculture, Division biological survey. Bulletin 9. 1898. p. 13 (cuckoos feeding on).

Felt, E. P. Buffalo news, July 30, 1898. p. 5 (remedies); the same in Commercial, times and inquirer, Buffalo commercial, and Buffalo daily times of that date; Country gentleman. 1898. 63 : 690 (ravages in New York).

CLISIOCAMPA AMERICANA *Fabr.*

Apple-tree tent caterpillar

Ord. **Lepidoptera**: Fam. **Lasiocampidae**

The wide-spread and severe ravages of the tent caterpillar the last two or three years have led to a more general desire for knowledge about this species. Though its life history and habits are well known to entomologists and have been repeatedly published, yet, aside from the occurrence of the larvae in their nests from spring to spring, many seem to have little idea of the insect's habits.

An old and familiar pest. This species attracted the attention of the earliest entomologists. Its conspicuous white nests in the forks of cherry trees along the roadsides and in the neglected orchards of New England were well-known features of the landscape during the spring

Fig. 5 Wild cherry-tree defoliated by tent caterpillars (after Weed, C. M.).

months in the latter part of the 18th century as well as in the 19th. In the latter part of May it is by no means uncommon to see many of the wild cherry-trees beside the country roads practically leafless, and swarming with the caterpillars of this insect, which have issued from the one to 20 or more nests on each of the hapless trees in the search for food. Though this species is easily controlled, as will be shown later, the common practice is apparently to let the caterpillars alone, trusting that natural agents will keep them in control.

Extensive ravages during the past two years. As a result of allowing nature to have her course after the balance between the various forms of life has been disturbed by man, this insect causes more or less damage every year, and frequently commits extensive depredations. The latter has been the case the last two seasons. Complaints were received from many localities of the abundance and destructiveness of these caterpillars. Not only were the native cherry-trees defoliated, but apple orchards suffered severely from the attacks of this insect, specially in the western part of the state where many were stripped of their leaves. Mr S. D. Willard, of Geneva, N. Y., informed me last spring that tent caterpillars had caused him an unusual amount of trouble, though he had kept close watch of them. In some localities the losses were increased by the ravages of the so-called forest tent caterpillar, *Clisiocampa disstria* Hübn., which was also abundant and in some counties excessively injurious. The Weather crop bulletins issued in May and early June of last year give some indication of the widespread abundance of this insect. Such comments as: 'Apple-trees covered with caterpillars,' 'Caterpillars more numerous than ever before,' 'Caterpillars have ruined some orchards,' 'Many trees nearly stripped by worms,' and similar expressions from widely separated localities may all be referred to this insect with comparative certainty, and indicate its destructiveness in neglected orchards. From Cambridge, N. Y., came the report last year that the place was simply overrun by the apple-tree tent caterpillar. In 1898 the Weather crop bulletins contained the following observations: 'Tent worms hatching out thick,' 'Tent worms unusually numerous,' 'Tent worms very thick in places.' The unusual abundance of this familiar pest was patent to anyone traveling in 1897 and 1898, the latter part of May or early in June, either in this or some of the adjacent states. In many portions of Massachusetts leafless trees testified to the work of this enemy, and in Vermont the same conditions prevailed to a greater or less extent.

Description. Though the tent caterpillar is a very common insect and familiar to almost everyone when found in its conspicuous white nests in the spring, many are unable to positively recognize the larva, unless seen near its nest, few can identify its egg belts, while a still smaller number have any idea of the appearance of the parent moth.

The glistening brown egg belts encircling the smaller twigs of the tree are from $\frac{5}{10}$ to $\frac{7}{10}$ of an inch long. Sometimes the mass of eggs does not completely embrace the twig, though usually there is a more or less narrow union on one side. The ends of the egg mass curve gradually down to the twig, the outer eggs inclining and the outermost lying almost flat, in order to permit this shape. The normal egg mass of this insect is so thickly covered with the glutinous secretion that the individual eggs are invisible. The young caterpillars are rarely observed till they have attained some size and their webs on the smaller limbs have become visible. The full grown larvae and their characteristic tents are too well known to need description in connection with the accompanying figure. The yellowish, oblong, oval cocoons with a loose

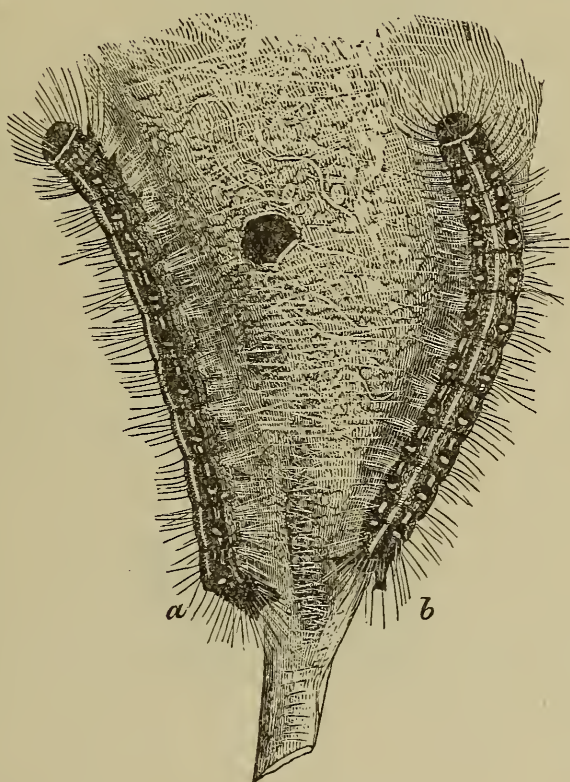

Fig. 6. Tent caterpillars and nest (after Riley).

texture are not generally recognized as being the product of the familiar tent caterpillar. It will be noticed that when these cocoons are handled, a yellow, sulphur-like powder sifts out. This is the dried paste intermingled with the silk at the time the cocoon is spun. The parent moth is buff-colored, with two parallel oblique white lines across the fore wings. The female is about one third larger than the male (see figure 7, *a*, *c*).

A hermaphrodite. Bisexual or hermaphrodite individuals are among the rarities in the insect world and such examples are highly prized by collectors. This specimen was mentioned by Dr Lintner in the transmittal of his 7th Report as a very interesting rarity, and the present opportunity is taken of recording its features in a permanent

Fig. 7. CLISIOCAMPA AMERICANA, *a*, male; *b*, hermaphrodite; *c*, female (original).

form (see fig. 7, *b*). The left wings and antenna show so clearly the characters of the female represented above and the right wings and antenna those of the male below, that farther comment is hardly necessary.

Life history and habits. The young are frequently formed within the eggs in the autumn, and only await warm weather before coming forth. It has even been stated by Mr H. C. Raymond, of Iowa, that the eggs often hatch in the autumn and that the vitality of the larvae enables them to winter successfully in that latitude. According to Riley, the eggs frequently hatch during an early warm spell and before there is anything for the larvae to feed upon, they subsisting for a time upon the glutinous matter surrounding the eggs. At first the nests are very small and afford little protection to their inmates, but as the caterpillars never move without spinning a thread and frequently crawl over their tents, the nests soon become much denser and afford considerable shelter from the weather. Many have probably noticed that the nests or tents are composed of a series of layers of silk with just about room enough between for the caterpillars and they may have wondered how the larvae began a new layer. The explanation given by Dr Fitch is simplicity itself. During fair weather the caterpillars frequently rest in numbers on the outside and stray individuals may be seen crawling over their resting companions, spinning as they go, and at the same time beginning a new layer of silk. Dr Fitch states that on damp or rainy days they remain in their nests, but during fair weather they usually feed for a time in the morning, again in the afternoon and once during the night. These habits are subject to considerable variation, being affected to a great extent by the weather. As the larvae approach maturity, they forsake the nests and wander singly in all directions, feeding on whatever they can. At this stage they will pupate upon the slightest provocation. More than once have I put a caterpillar of this species in a box, only to find a cocoon the next morning. The instinct that prompts them to wander at this time is undoubtedly a wise provision for their safety, for it insures their pupation in widely separated places and renders them less likely to be destroyed. Early in June the cocoons of this species are spun on the trunks of the trees, on the under side of fence rails, under the eaves of buildings and in many similar places promising shelter. An interesting deviation from the general habit the caterpillars have of each spinning a cocoon, is that recorded by Miss Allie C. Simonds, of Fayetteville, Ark., who reported that numbers of individuals spun large irregular cocoons in common, as many as seven or eight pupae being found crowded together in one without any separating partitions (*Insect life*. 1895. 7 : 429). The caterpillars transform within the cocoons to brown pupae and remain in this state for about three weeks, according to Fitch and Riley. Prof. Slingerland, as a result of certain trap lantern experiments, records taking the moths from June 17 to July 18, at Ithaca, N. Y., in 1889, the great majority being taken between June 22 and July 5.

In 1890, Dr Dyar has recorded taking the moths at electric lights in Poughkeepsie, N. Y., from June 14 to July 17, the larger number occurring between June 20 and July 2.

During this period of flight the eggs are deposited in bands or belts around the smaller twigs, the number in a band ranging from 300 to 330 according to Dr Fitch.

Food plants. The wild cherry, *Prunus serotina*, is undoubtedly the favorite food plant of the tent caterpillars, since the examples along the roadsides suffer more or less from year to year and are frequently defoliated by this pest. The apple appears to rank next in the estimation of the caterpillars, judging from the severe attacks made upon it yearly. This insect feeds on a large number of plants, though severe injury is usually confined to those named above, and closely related species. It has been reported by various authors upon the following: barberry, New Jersey tea (*Ceanothus americanus*), sugar maple, plum, peach, several species of cherry, rose, thorn (probably *Crataegus*), shad-bush, pear, apple, mountain ash, witch hazel, elm, oak (probably several species) several species of birch, willow and poplar. Some of these are undoubtedly eaten only under exceptional circumstances, and others sustain serious injury occasionally. Dr C. M. Weed, of Durham, N. H., gives illustrations of a severe attack on a birch and an oak in a recent bulletin.

Distribution. This insect appears to be generally distributed throughout the eastern United States, and extends north into Canada. *Clisiocampa fragilis* Stretch is given by Dr Dyar as the representative of *C. americana* from the Rocky mountains to the Sierras and from Canada to Mexico, and it in turn is represented in the Pacific northwest by *C. pluvialis* Dyar.

Natural enemies. This species is attacked by a number of parasitic and predaceous insects and is also subject to a fungus disease, but in spite of these checks the caterpillars are frequently very abundant. Among the most important true parasites may be mentioned *Pimpla pedalis* Cres., a species which Dr Fernald has bred in great numbers from the cocoons. It was so abundant that he obtained only 25 moths from about two quarts of cocoons. Many examples of *Pimpla conquisitor* Say were reared from the pupae of this insect by Dr C. M. Weed. According to Dr Howard, the latter species is found from California to New Jersey and south to the Gulf of Mexico and has been recorded from Canada. He classes it as one of the most important parasites of the cotton-worm in the south, and as it preys on a number of injurious lepidopterous insects, it may well be regarded as a very beneficial form. Another insect belonging to the same genus, *P. annulipes* Brullé, has been recorded as a parasite of this species, by Bruner. In addition to *P. pedalis*, Dr Fernald reared a few examples of *Theronia melanocephala* Brullé from cocoons. A variety of *Apanteles congregatus*, *rufocoxalis* Riley, was bred from the larvae by Dr Lintner. Dr Fitch reared from the cocoons a parasite to which he gave the name[3] of

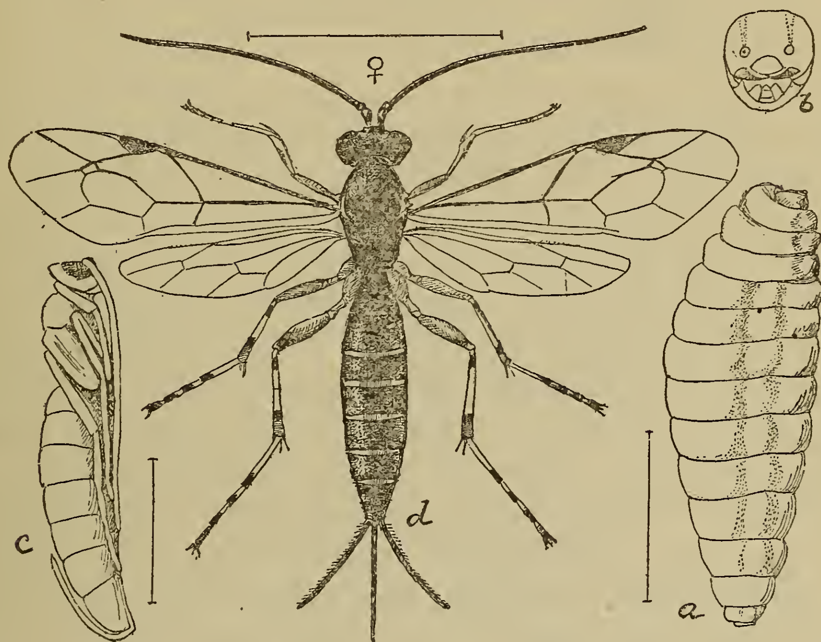

Fig. 8 PIMPLA CONQUISITOR: *a*, larva; *b*, head of same; *c*, pupa; *d*, adult female — all enlarged. fter Howard; U. S. Dep't agriculture, Division entomology. Tech. ser. no. 5).

Cleonymus clisiocampae. Dr Howard states that Mr Ashmead has referred this species to the European *Dibrachys boucheanus* Ratz., which is not a primary parasite, as Dr Fitch supposed his species to be. *Telenomus clisiocampae* Riley, has also been reared from the eggs of this and another species of *Clisiocampa* (*Insect life.* 1891. 4:123). But one parasitic fly, *Frontina frenchii* Williston, has been reared from the tent caterpillar, according to Coquillett.

A number of predaceous insects attack the larvae. Several species of large ground beetles are said to prey on the caterpillars, among them being *Calosoma scrutator* Fabr. As others of the same genus attack *Clisiocampa disstria* Hübn., it is probable that they would not discriminate between the larvae of these closely related forms. Owing to the extended studies of Mr Kirkland, we know more fully the habits of the genus Podisus, several species of which attack the tent caterpillar. The following have been observed preying on *C. americana*: *Podisus placidus* Uhler, *P. modestus* Dallas, *P. serieventris* Uhler, and *Diplodus luridus*

Stäl. As a rule, members of this genus are beneficial and should be protected, since they are mostly predaceous in habit. Professor Bruner states that *Podisus spinosus* Dallas and *Perillus claudus* Say prey upon the tent caterpillar.

Among the more efficient vertebrate enemies may be named the American toad, though its feeding on this species is practically limited to the relatively short period when the larvae are wandering in search of proper places for pupation. Mr Kirkland has found the remains of 37 full grown caterpillars in the stomach of one toad and from 15 to 20 in many others. The value of birds in keeping this and other pests under control is strikingly shown in an experiment conducted by Mr E. H. Forbush, ornithologist of the Massachusetts board of agriculture. In a typical orchard in Medford, Mass., a little trouble was taken to attract the native birds, the nests of the English or house sparrow being destroyed. The results were greatly in favor of protecting our indigenous forms. In neighboring orchards it was evident that canker worms and tent caterpillars were very numerous, but in the orchard in question, the trees were injured seriously in only one or two instances, though no attempt was made to control the insects by spraying or other artificial means. The following is a list of the birds observed feeding on the tent caterpillar in that Medford orchard: Crow, *Corvus americanus* Aud.; chickadee, *Parus atricapillus* Linn.; oriole, *Icturus galbula* Linn.; red-eyed vireo, *Vireo olivaceus* Linn.; yellow-billed cuckoo, *Coccyzus americanus* Linn.; black-billed cuckoo, *Coccyzus erythropthalmus* Wils.; chipping sparrow, *Spizella socialis* Wils.; yellow warbler, *Dendroica aestiva* Gmel. This list includes all the species observed feeding on the tent caterpillar by earlier writers.

Preventive measures and remedies. It will not do to rely entirely on the good offices of native birds for keeping this or other insect pests under control, though they are undoubtedly of great value and richly repay any slight effort that may be made for the purpose of attracting them to orchards. Winter birds are induced to remain in the vicinity of orchards by hanging in the trees pieces of meat or partially picked bones, and will spend much time in searching out and devouring numerous insects or their eggs, relying on the meat only when conditions are unfavorable for obtaining insect food. Migratory birds may be induced to remain in larger numbers near orchards by providing them with suitable nesting places and materials, and by protecting them from cats and cruel boys. Thickets in the vicinity will afford shelter for certain species and if a few mulberry trees are set out their fruit will serve to protect the cherries as the birds are said to eat the mulberries by preference. Most of the preceding suggestions are taken from a very interesting and practical paper by Mr Forbush (see citation). His many years of experience and close observation of our birds entitle his writings to the highest respect. There is much that can be said in favor of protecting and encouraging our native birds and most farmers will find that a little effort along this line will be very profitable. In undertaking any such work, it will not do to judge entirely by the results obtained in one season.

As this species breeds from year to year in large numbers on the wild cherry-trees along the roadsides, in fence corners and other uncultivated places, these trees should either be destroyed or else used as lures and heavily sprayed with poison early each spring in order to destroy the numerous caterpillars hatching from their abundant egg belts. It is probable that the destruction of the cherry-trees would be the wiser plan, for otherwise they would be too often neglected as is the case at present. If but a few wild cherry-trees were allowed to grow near an orchard and they were well sprayed with poison from year to year or the numerous egg belts removed, it is probable that the tent caterpillars would be found on the apple trees in comparatively small numbers.

The exhaustive experiments, conducted by Dr Fernald, on the amount of paris green necessary to kill this species, show most conclusively that the caterpillars can be readily controlled by spraying with poison. The experiments prove that the larvae in any stage can be killed in two or three days with an application of one pound of paris green in from 300 to 400 gallons of water, and that even the extremely dilute mixture of one pound to 1000 gallons is deadlv in two or three weeks after application. While in practice it will be found best to use paris green at the rate of one pound to 200 or 300 gallons or less, the experiments show that this species is much more sensitive to arsenical poisons than is the case with the gypsy moth, *Porthetria dispar* Linn., the spring canker worm, *Paleacrita vernata* Peck, and some other injurious species. In cases where it is desirable to spray the trees early in the spring for the purpose of controlling other insects, the same application should be entirely effective in preventing injury by tent caterpillars.

If for some reason or other, it is not desirable to spray at the proper time to kill this species, recourse may be had either to gathering the egg belts in the winter or early spring and destroying them, or to the destruction of the young when assembled in their recently formed nests. The collecting of the eggs is best done when the trees are leafless and the sky clear or covered with whitish clouds. A little experience will enable one to detect the egg belts very readily. There are several methods of destroying the young caterpillars in their nests. The most effective way is by crushing them with the hands, mittens may be worn if preferred, as suggested by Dr Fitch. If the nests are attended to early in the season, the operation is quickly and thoroughly done, as most of them are within reach of a short ladder. The nests may be torn out with a brush, a dry mullen stalk or other arrangement and their occupants crushed on the ground. This is not so thorough as crushing the caterpillars while on the tree. Another method is burning the nests by the use of rags soaked in kerosene and tied to a pole or other form of a torch. When the flames are brought under the nests, the occupants escape so far as possible by dropping. It is seldom that every caterpillar on the tree is destroyed by this means. Not only do a number escape, but in many cases the trees suffer severe injury, the entire branch beyond the nest being killed by the fire. It would be better to cut off the branches bearing nests, as is done by some, and then destroy the caterpillars either by fire or by crushing them.

Bibliography

Fabricius, J. C. Entomologia systematica emendata et aucta. 1793. 3:433, no. 81 (original description, as *Bombyx*).

Harris, T. W. Insects injurious to vegetation [1841]. 3d ed. 1862. p. 373–75, pl. 8, fig. 13–17 (description, general account).

Gaylord, Willis. N. Y. State agricultural society. Transactions. 1844. 3:152, 153, (brief notice).

Emmons, Ebenezer. Natural history of New York. Agriculture. 1854. p. 235, 236, pl. 45, fig. 1, pl. 47, fig. 6 (brief account).

Fitch, Asa. N. Y. State agricultural society. Transactions. 1855. 1856. 15:413–30, 431–41, 4 fig. (extended account); the same in Insects of New York. 1st–2d Reports. 1856. p. 180–98, 199–209; N.Y. State agricultural society. Transactions. 1856. 16:337 (on apple-trees); the same in Insects of New York. 3d–5th Reports. 1859. sec. 28; N.Y. State agricultural society. Transactions. 1860. 19:595 (mention).

Glover, Townsend. Commissioner of patents. Report. 1860. Agriculture. 1861. p. 321, 322 (brief general account); U. S. Dep't agriculture. Report. 1866. p. 29, 42 (mention); — 1870. p. 83 (brief notice).

Morris, J. G. Synopsis of the described lepidoptera of North America. 1862. p. 236 (listed).

Packard, A. S. Practical entomologist. 1865. 1:14, 15 (parasite); Guide to the study of insects. 1869. p. 207, 238, 301, fig. 232 (brief notice); Rocky mountain locust and other insects. Report. 1877. p.

793, 794, pl. 69, fig. 5, 6 (brief account); U. S. Entomological commission. 5th Report. 1890. p. 121, 531 (mention).

Warder, J. A. Practical entomologist. 1865. 1 : 6 (on peach).

Walsh, B. D. Practical entomologist. 1866. 1 : 46, 78, 101 (food plants, parasites); — 1866. 2 : 22, 72, 92, 112, 117, 119, 121 (mention).

Walsh, B. D. & Riley, C. V. American entomologist. 1869. 1 : 208, fig. 145 (mention); — 1869. 2 : 39 (food plants).

LeBaron, William. American entomologist. 1870. 2 : 143–46, fig. 97, 98 (life history, habits).

Riley, C. V. Insects of Missouri. 2d Report. 1870. p. 7 (mention); American entomologist and botanist. 1870. 2 : 245, 261 (mention); Insects of Missouri. 3d Report. 1871. p. 117–21, fig. 50, 51 (general account): — 5th Report. 1873. p. 56, fig. 29 (eggs figured); American naturalist. 1873. 7 : 516, 517 (mention); U. S. Dep't agriculture, Division entomology. Bulletin 31. 1893. p. 16 (listed).

Bethune, C. J. S. Fruit grower's association of Ontario. Report. 1870. 1871. p. 80–82, fig. 18, 20, 21 (brief account); the same in Entomological society of Ontario. 1st Report. 1871. p. 80–82, fig. 18, 20, 21; Canadian entomologist. 1873. 5 : 140, 141, 142, fig. 17 (brief notice); — 1876. 8 : 4 (mention); Entomological society of Ontario. 19th Report. 1889. p. 71–73, fig. 42, 43 (brief account); — 27th Report. 1897. p. 57, fig. 57 (brief notice).

Saunders, William. Canadian entomologist. 1871. 3 : 12–13 (mention); — 1872. 4 : 134, fig. 9 (mention); Entomological society of Ontario. Report. 1875. 1876. p. 29–30, fig. 7 (brief account); Canadian entomologist. 1878. 10 : 21–22 (hibernating as larvae within eggs); Insects injurious to fruits. 1883. 1889. p. 47–52, fig. 38–42 (general account); Entomological society of Ontario. 20th Report. 1890. p. 32–44, fig. 1, 2, 3, 5 (brief account).

Lintner, J. A. N. Y. State museum of natural history. 26th Report. 1872. p. 147, 155 (mention); Country gentleman. 1881. 46:455 (identified); Insects of New York. 1st Report. 1882. p. 56, 85, 328 (mention); — 2d Report. 1885. p 83 (mention); — 3d Report. 1887. p. 85, 92, 147 (mention); Country gentleman. 1888. 53:511 (brief account); — 1889. 54 : 269 (brief account); Insects of New York. 5th Report. 1889. p. 152, 304, 324 (abundance, mention); — 6th Report. 1890. p. 106, 165, 181 (abundant); Country gentleman. 1890 55 : 329 (remedy); Insects of New York. 7th Report. 1891. p. 215 (ravages), p. 220 (hermaphrodite), p. 331, 359 (mention); Country gentleman. 1892. 57 : 492 (remedies); Insects of New York. 8th Report. 1893. p. 122–23 (mention); — 9th Report. 1893. p. 293, 441, 456 (mention), p. 461 (a parasite); Insect life. 1893. 6 : 184 (mention); Insects of New York. 10th Report. 1895. p. 481, 495 (mention); — 11th Report. 1896. p. 121, 265 (mention); U. S. Dep't agriculture, Division entomology. Bulletin 6 (new series). 1896. p. 54 (mention); Country gentleman. 1896. 61 : 571 (identified); — 1897. 62 : 390 (identified), p. 558 (ravages in Delaware county).

Bessey, C. E. Iowa state agricultural society. Report. 1873. 1874. p. 229–32, fig. 2, 3 (brief account).

Cook, A. J. American naturalist. 1874. 8:368 (birds preying on larvae); Mich. State board of agriculture. 13th Report. 1874. 1875 p. 130–32, fig. 30 (brief account).

Lyman, H. H. Canadian entomologist. 1874. 6:158 (mention).

Kridelbaugh, S. H. Iowa state horticultural society. Report. 1876. 1877. p. 327–28, 329 (brief notice).

Gott, B. Entomological society of Ontario. Report. 1877. p. 41–42, fig. 21, 22, 23 (ravages, remedies); — 1878. 1879. p. 56 (mention).

Thomas, Cyrus. Insects of Illinois. 6th Report. 1877. p. 12, 13 (remedies).

French, G. H. Insects of Illinois. 7th Report. 1878. p. 197, 198 (brief notice).

Perkins, G. H. Vt. State board of agriculture. 5th Report. 1878. p. 257 (mention); Vt. Agricultural experiment station. Bulletin 11. 1888. p. 3–7 (brief account); Vt. State board of agriculture. 11th Report. 1890. Separate. p. 47 (on elm); Vt. Agricultural experiment station. Bulletin 60. 1897. p. 5, 7–9 (mention).

Scudder, S. H. Psyche. 1878. 2:114 (mention).

Smith, E. A. Insects of Illinois. 7th Report. 1878. p. 107, 110, 111, 119 (notes).

Hoy, P. R. Wis. State horticultural society. Transactions. 1879. 9:270–76, fig. 5 (general account).

Coquillett, D. W. Insects of Illinois. 10th Report. 1881. p. 155, fig. 55 (larva described); U. S. Dep't agriculture, Division entomology. Technical series no. 7. 1897. p. 16, 24 (dipterous parasites).

Marten, John. Insects of Illinois. 10th Report. 1881. p. 122, 123, fig. 35 (brief notice).

Stretch, R. H. Papilio. 1881. 1:68 (synonymy).

Goding, F. W. Iowa state agricultural society. Report. 1882. 1883. Separate. p. 6 (brief account).

Claypole, E. W. Canadian entomologist. 1883. 15:38 (mention); Entomological society of Ontario. Report. 1883. 1884. p. 34 (mention).

Cooke, Matthew. Injurious insects of the orchard, vineyard. 1883. p. 83, 84, fig. 52–54 (brief account).

Fernald, C. H. Standard natural history. Kingley's. 1884. 2:454 (brief mention); Mass. (Hatch) agricultural experiment station. Bulletin 12. 1891. p. 22–24, fig. 15, 16 (brief account); — Bulletin 19. 1892. p. 121–27 (experiments with paris green); — Bulletin 20. 1893. p. 7-10, fig. 5, 6, 7 (brief account); — Bulletin 24. 1894. p. 3 (experiment with arsenate of lead); The gypsy moth. 1896. p. 377, 402 (parasites).

Dimmock, A. K. Psyche. 1885. 4:275 (mention).

Fletcher, James. Central experimental farm (Canada). Report entomologist and botanist. 1885. Separate. p. 48, fig. 23 (mention); — 1887. p. 24, fig. 6, 7 (mention); Entomological society of Ontario.

18th Report. 1888. p. 12 (ravages); Canadian entomologist. 1889. 21:74–76, fig. 1 (popular account); Central experimental farm (Canada). Report of entomologist and botanist. 1896. p. 251 (ravages).

McMillan, Conway. Nebr. Agricultural experiment station. v. 1. Bulletin 2 1888. p. 59–63, fig. 28, 29 (general account).

Riley, C. V. & Howard, L. O. Insect life. 1888. 1:161 (parasite); — 1889. 2:27 (in Arkansas), 1890. p. 338 (mention); — 1890. 3:20, 21 (remedies), 1891. p. 462, 483 (parasite, ravages); — 1891. 4:123 (egg parasite); — 1895. 7:429 (communistic cocoons).

Comstock, J. H. Cornell agricultural experiment station. Bulletin 15. 1889. p. 200–2, 1 fig. (brief account); Insect life. 1897. p. 168–71, fig. 137 (popular account).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 77, 78 (bibliography).

Bruner, Lawrence. U. S. Dep't agriculture, Division entomology. Bulletin 22. 1890. p. 101 (food plants); Nebr. Agricultural experiment station. Bulletin 14. 1890. p. 24–32, 33, 36, 100, fig. 14–22 (extended account); Nebr. State horticultural society. Report. 1894. p. 157, 166, fig. 53–55 (listed).

Caulfield, F. B. Entomological society of Ontario. 20th Report. 1890. p. 64 (on oak).

Dyar, H. G. Psyche. 1890. 5:421 (number of molts); — 1891, 6:126, 129 (listed); N. Y. Entomological society. Journal. 1894. 2:155 (synonymy); Psyche. 1895. 7:189 (range).

Hood, L. E. Insect life. 1890. 3:124 (ravages in Mass.).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 304 (listed); American entomological society. Transactions. 1893. 20:36 (synonymy); Economic entomology. 1896. p. 284–86, fig. 314 (brief account).

Maynard, S. T. Mass. (Hatch) agricultural experiment station. Bulletin 13. 1891. p. 4 (mention).

Southwick, E. B. Insect life. 1891. 4:60–61 (mention).

Townsend, C. H. T. N. Mex. Agricultural experiment station. Bulletin 3. 1891. p. 12–13, fig. 5 (brief notice).

Weed, C. M. Insects and insecticides. 1891. p. 42–44, fig. 14, 15 (brief account); N. H. Agricultural experiment station. Bulletin 31. 1895. p. 12 (mention); — Bulletin 38. 1896. p. 47–59, fig. 1–14 (extended account); — Bulletin 40. 1896. p. 90, 91, 92 (chickadee feeding on); — Bulletin 54. 1898. p. 87, fig. 4 (chickadee feeding on).

Kellogg, V. L. Common injurious insects of Kansas. 1892. p. 85, 86, fig. 47 (brief account).

Kirby, W. F. Synonymic catalogue of lepidoptera heterocera. 1892. 1:840 (synonymy).

Ashmead, W. H. Monograph of North American proctotrypidae. 1893. p. 160, 450 (*Telenomus clisiocampae* reared from eggs).

Chambliss, C. E. Tenn. Agricultural experiment station. Bulletin. v. 6. no. 1. 1893. p. 12–14, fig. 6, 7 (brief account).

King, G. B. Insect life. 1893. 6:36 (abundance at Andover, Mass.).

Slingerland, M. V. Canadian entomologist. 1893. 25:81, 82 (taken in trap lanterns).

Garman, Harrison. Ky. Agricultural experiment station. 5th Report. Bulletin 40. 1892. 1894. p. 75-77, fig. 22, 23 (brief account).

Jack, J. G. Mass. Horticultural society. Transactions. Pt. 1. 1894. p. 141, 142 (brief notice).

Neumoegen, Berthold & Dyar, H. G. N. Y. Entomological society. Journal. 1894. 2:154, 155 (synonymy).

Comstock, J. H. & A. B. Manual for the study of insects. 1895. p. 360-62, fig. 442 (brief account).

Harvey, F. L. Me. Agricultural experiment station. Report. 1895. 1896. p. 96 (listed); — 13th Report. 1897. 1898. p. 173, 174, 177 (ravages).

Taft, L. R. & Davis, G. C. Mich. Agricultural experiment station. Bulletin 121. 1895. p, 26, fig. 12, 13 (brief notice).

Forbush, E. H. The gypsy moth. 1896. p. 213 (mention); Entomological society of Ontario. 26th Report. 1896. p. 54, 58, 59, 60 (birds preying on larvae).

Bogue, E. E. Okla. Agricultural experiment station. Bulletin 26. 1897. p. 8-9, fig. 3 (brief account).

Burgess, A. F. Mass. State board of agriculture on gypsy moth. Report. Appendix. Jan. 1897. p. 68 (*Calosoma frigidum* larvae fed with); — Jan. 1898. p. 106 (*Calosoma scrutator* preying on).

Fyles, T. W. Entomological society of Ontario. 27th Report. 1897. p. 39, fig. 41 (mention).

Howard, L. O. U. S. Dep't agriculture, Division entomology. Technical series no. 5. 1897. p. 19, 36 (parasites).

Kirkland, A. H. Mass. (Hatch) agricultural experiment station. Bulletin 46. 1897. p. 22, 25, fig. 22 (eaten by garden toad); Mass. State board of agriculture on gypsy moth. Report. Appendix. Jan. 1897. p. 51, 56, 60 (*Podisus placidus*, *Diplodus luridus* attacking larvae); — Jan. 1898. p. 117, 118, 120, 121, 131 (*Podisus placidus*, *P. modestus*, *P. serieventris*, preying on).

Beal, F. E. L. U. S. Dep't agriculture, Division biological survey. Bulletin 9. 1898. p. 9, 13 (cuckoos feeding on).

Faville, E. E. & Parrott, P. J. Kan. Agricultural experiment station. Bulletin 77. 1898. p. 39-41, fig. 11-15 (brief general account).

Felt, E. P. Country gentleman. 1898. 63:653, 690 (brief general notice).

Gillette, C. P. Col. Agricultural experiment station. Bulletin 47. 1898. p. 8, fig. 4 (figured).

Panton, W. H. Ontario agricultural college and experimental farm. 3d Report. 1898. 2 fig., p. 18 (mention).

CLISIOCAMPA DISSTRIA *Hübn.*

Forest tent caterpillar

Ord. **Lepidoptera** : Fam. **Lasiocampidae**

This species is closely allied to the preceding in structure and habits, as might be inferred from the similarity of their names, and like its congener is frequently very destructive. From the fact that this insect is confined largely to the forests, as indicated by its common name and the scientific one bestowed by Harris, its operations are more rarely brought to notice, and then only when it has committed extensive ravages.

Injuries the past two years in New York state. The ravages of this insect in New York state this year and last have been unprecedented in the annals of our state. In fact, there appears to be no record of injury earlier than 1857, when it was reported to Dr Riley as quite destructive in certain parts of western New York. 10 years later Peter Ferris (see citation) reported that this insect had been troublesome in western New York for 12 years or more. The next serious outbreak was brought to the attention of Dr Lintner in 1889 from Kingsbury, Washington county, N. Y., where about 10 acres were defoliated. These depredations, however, sink into insignificance compared with those reported to Dr Lintner last year and the more wide spread injuries brought to my notice the present season. In 1897 this species was reported by Prof. John Mickleborough as very destructive to maples and other forest trees at Jewett, Greene county. At Andes, Delaware county, its ravages were complained of by Barton Jackson. The most serious injuries reported that year were in the vicinity of Margaretville, in the same county. The following excerpts from a report made by Henry B. Ingram, of Kingston, N. Y., will give an idea of their abundance and the extensive depredations committed:

The cocoons of this insect in the infested district fairly whitened the places where they were attached. Under the eaves of buildings, under the lower edge of every clapboard on buildings, in piles of brush, under every loose stone, piece of bark or board, in the crevices of the bark on trees and every place where a worm could hide and undergo its transformations—all these were found crowded with cocoons.

The part of Delaware county visited by me on Thursday, July 8, 1897, was Arkville and Margaretville along the Ulster and Delaware railroad. The first place I visited was what is known as Ely Swart's sugar bush, one mile and a half east of Margaretville village. This sugar orchard, or rather, sugar maple forest, comprises about 60 acres. Then the maple trees continue in a dense forest through other farms up and over the mountains for several miles. It is about half a mile wide, and begins in the valley near a long siding half a mile from Arkville, where the Ulster and Delaware railroad sometimes side-track freight trains. The caterpillars began their depredations at this railway siding and swept up the hill over an area a mile and a half long by half a mile wide, taking hard maple, apple, pear, plum, beech, birch, poplar and other trees in their destructive course. The nut trees they did not attack and strange to say, they left every soft maple in their track untouched.

The caterpillars were also operating in the village on the shade trees, and the garden fruit trees, but were not plentiful enough to do much damage or cause much comment.

At Clarks Factory, Delaware county, Mr H. O. Van Benscoten owns an extensive sugar orchard of over one hundred acres. It has been stripped of its foliage till not one leaf remains. The maple forests, at Andes, Grand Gorge, Bush Ridge, and Fleischmanns, Delaware county, Prattsville and other points in Greene county have also been stripped of foliage. Wherever the caterpillars have appeared they have defoliated the apple and fruit orchards.

The complete and extensive injury is well shown in plates 1–4, which were taken by Mr Ingram.

This year Mr R. G. Smith reported that 125 acres covered with maples were defoliated at Russell, St Lawrence county. Severe ravages by this species were reported from Lewis county, many timber lots appearing as though fire had run through them, as it was put by a correspondent of the weather bureau. At Trenton Falls, Oneida county, the caterpillars were very numerous in the woods and some trees were nearly defoliated. Several observers reported serious injuries by this insect in Otsego county, Westford, Decatur and Worcester being localities specially mentioned by Mr O. Q. Flint, of Athens, N. Y. A report came to me that the forests were stripped by this species in Exeter, and Mr C: F. Wheelock, head inspector of the University, informed me that he had observed considerable injury to forest trees in the same county. Its ravages were noted in Delaware county by Mr Flint at Roxbury and Stamford. Many trees were defoliated in Greene county, its operations in Lexington and Halcott coming under the observation of Mr Flint and those at Tannersville being reported by Miss K. E. Turnbull. The abundance and destructiveness of this insect at Glens Falls, Warren county, was brought to my attention early in the season by Mr C. L. Williams. At Lake George many of the trees on the islands were defoliated by this insect, the Canoe islands appearing as though swept by fire, according to Mrs J. R. Gilmore. Severe injuries were also reported from Vermont both last year and the present season. That the actual depredator in cases cited above was always this species, could not be determined in every instance by examination of the caterpillars, though an effort was made to secure examples whenever practicable, but it is believed that in every case the evidence justified the identification. In all the localities mentioned above, a number of trees were defoliated, usually oaks and maples, and in most of these the injured tracts could be estimated by acres, in some cases by hundreds of acres. There is certainly ample evidence to justify the conclusion that the forest tent caterpillar has caused a large amount of damage in New York state last year and this, and that the present season the ravages have been more general than in 1897, though in the former year they may have been more severe in certain localities.

Extensive depredations in other localities. This insect has been extremely injurious in a number of other states, in some instances defoliating hundreds of square miles. One of the earliest accounts is the record of Abbot, whom Dr Riley quotes, stating that it 'is sometimes so plentiful in Virginia as to strip the oak-trees bare.' In his 3d report (see citation), Dr Riley credits this species with completely stripping the 'over-cup timber' on the overflow bottoms near Des Arc, Ark., and records extensive injuries by it in many parts of Missouri. In the 8th *Report on the insects of Missouri*, it is stated that this species stripped oak forests over hundreds of square miles in the southern states, and that in the vicinity of Memphis, in 1862, the larvae were so abundant as to frequently stop trains going in and out of the city. In 1889 another instance of trains being stopped was brought to the notice of the Division of entomology, U. S. Department of agriculture (*Insect life*. 1889. 2 : 58). This time the trouble was in Maine and was accompanied by serious injury to forests and orchards. Two years later trains were stopped on the Carolina central railroad near Lumberton (*Insect life*. 1891. 3 : 477). This hindrance to travel was accompanied by the defoliation of many trees over a large area. This species was excessively injurious in the vicinity of London, Ont., in 1877, as recorded by William Saunders in the following words: 'There were millions upon millions of them, and so enormous were their numbers and so persistent their attacks, that after fighting them bravely for a week or two, many gave up the contest in despair, weary of the slaughter. Many an orchard was rendered bare and leafless and in some instances the woods were so void of foliage as to remind one of winter.' In southern Illinois this insect 'made a frightful inroad upon the apple orchard, absolutely defoliating every tree in large districts in 1883' (Forbes, see citation).

Last year the caterpillars committed very extensive ravages along the Ottawa river, stripping the aspen groves of every leaf and seriously injuring other trees (*Ottawa naturalist*. 1898. 12 : 13).

Description. This insect can be distinguished from the preceding by the absence of the conspicuous white tents or nests. The forest tent caterpillars spin a web but it is much thinner than in the case of the species commonly occurring on apple-trees, and usually escapes observation on account of its being attached to the side of a limb, instead of stretched between diverging branches.

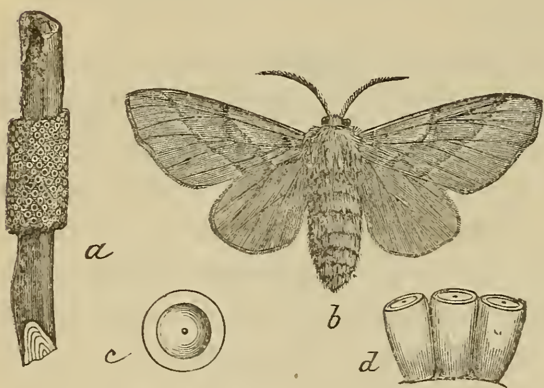

Fig. 9 Forest tent caterpillar: *a*, cluster of eggs; *b*, female; *c*, top view of an egg; *d*, side view of several eggs (after Riley).

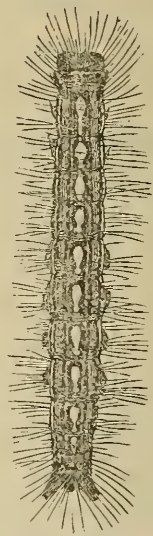

Fig. 10 Larva (after Riley).

The egg belts are similar to those of the preceding species, except that the ends terminate abruptly, all the eggs standing upright (fig. 9). Each mass is composed of about 400 eggs, the number ranging from 380 to 416, according to Dr Riley. The young caterpillars are not often noticed. The recently hatched larvae have been characterized as 'black with pale hairs and are always found either huddled together or traveling in file along the silken paths which they form when in search of food.' After feeding for a time they become 'paler or of a light yellowish brown, with the extremities rather darker than the middle of the body, with the warts which give rise to the hairs quite distinct, and a conspicuous dark interrupted line each side of the back' (Riley). After the second molt the characteristic row of spots along the back appears (fig. 10) and enables one to readily distinguish between them and the apple-tree tent caterpillars. As the larvae increase in size and undergo successive molts, the colors become brighter and more distinct. The cocoon is very similar to that of *C. americana*. The moth is smaller, lighter colored and may be distinguished from that of the apple-tree tent caterpillar by the oblique bands across the fore wings being darker instead of lighter than the ground color.

Life history and habits. The life history and habits of this species are very similar to those of the preceding form. The winter is passed by the fully developed larvae in the egg, as stated by several writers. With the appearance of the first warm weather, the caterpillars emerge and if no food is at hand, await the appearance of the leaves. While small they remain together, but as they approach maturity the individuals scatter in much the same way as the apple-tree tent caterpillars, though nearly full grown larvae, specially when preparing to molt, may be seen in large clusters covering a portion of the trunk as do those of the gypsy moth, *Porthetria dispar* Linn. Such an assemblage is really a pretty sight if one has an eye for the beautiful in nature. The larvae do not become full grown till somewhat later than the apple-tree tent caterpillars. As a general rule they wander everywhere the first part of June and disappear by the middle of the month, though I have observed numbers feeding the latter part of June and have seen them in the early part of July. The cocoons resemble those of *C. americana* very closely, and are found in similar places, except that the habits of this species necessitate the pupation of the larger proportion in forests. The duration of the pupa state is about two weeks. The moths appear the latter part of June and during July. Dr Dyar records taking this species at electric lights in Poughkeepsie, N. Y., in 1890, from June 20 to August 4, the adults being most abundant July 2 and 9.

Distribution. The numerous records of serious injury by this insect in the eastern United States and Canada indicate that it is widely and generally distributed. It has been reported from Mississippi north into Canada and from Maine westward to California. Dr Dyar states (see citation) that *C. disstria* extends throughout the range of *C. americana* and *C. pluvialis* and also into California.

Food plants. Like the apple-tree tent caterpillar, this species can subsist on a large variety of plants. Its favorite species of oak in the southern states, as stated by Dr Riley, are those belonging to the same group as the black oak. In New York and adjoining states this insect is reported more frequently as defoliating the sugar maple than any other tree. This injury may be owing to the fact that large sugar orchards afford the most favorable conditions for the caterpillars in the north, and as the maples are of greater value than forest trees, complaints of attack are more frequent. The caterpillars have been reported by various writers as feeding upon the following trees and shrubs: linden, maples, locust, peach, plum, cherry, rose, strawberry, apple, sweet gum (*Liquidambar* *styraciflua*), dog wood, 'black gum,' sour gum (*Nyssa sylvatica*), ash, elm black walnut, hickory, walnut, oak, black oak, post oak, white birch, gray birch, willow and poplar.

Natural enemies. On account of this insect's depredations being confined mostly to the woods, we must depend largely upon its natural enemies to keep it in check. In 1879, William Saunders records the destruction by a fungus disease of large numbers of larvae belonging to this species. Professor Forbes, state entomologist of Illinois, found a great many of these larvae dead in the southern part of that state. So fatal was the disease that from half to three fourths of the cocoons never yielded the imago. The next year, though enough larvae hatched to do considerable damage, many died when they were little over half an inch long and in some cases whole colonies were killed. Professor Forbes has identified this disease as muscardine, and though so deadly to the larvae, no attempt seems to have been made to cultivate and disseminate the fungus.

Very few true parasites have been bred from this insect. Dr Riley records the rearing of *Limneria fugitiva* Say and William Saunders states that *Pimpla pedalis* Cres. preys on this species. *Pimpla conquisitor* Say was reared from several pupae collected in Delaware county last year, the proportion of the cocoons parasitized indicated that it was very valuable in controlling this caterpillar. The following dipterous parasites have been reported by Mr Coquillett (see citation): *Euphorocera claripennis* Macq., *Frontina frenchii* Will., and *Tachina mella* Walk. A number of predaceous insects prey upon the caterpillars. One of great value is *Calosoma scrutator* Fabr., a species which Dr Riley characterized as most efficient. The beautiful and equally ferocious *Calosoma calidum* Fabr., is another valuable enemy, as stated by William Saunders. Mr Burgess (see citation) records that *Calosoma wilcoxi* LeC. fed readily in confinement upon the larvae of this insect. Two predaceous hemipterons, *Podisus placidus* Uhler and *P. serieventris* Uhler are also known to feed upon the caterpillars (Kirkland, see citation). A mite, ? *Trombidium* sp., was discovered by William Saunders destroying many clusters of eggs. The vertebrate enemies of this species are presumably as numerous, if not more, than those of the apple-tree tent caterpillar. William Saunders cites an instance in which a black-billed cuckoo, *Coccygus erythropthalmus* Wils., was brought to him with its crop filled with the caterpillars. It is quite probable that many other birds feed upon this insect, possibly more than on the apple-tree tent caterpillar, but no such records have come to my notice. The common toad has been recorded by Mr Kirkland as feeding on this species, though from this batrachian being confined to the ground and occurring more abundantly in cultivated fields, it is hardly probably that as a rule it devours many of the caterpillars.

Remedies and preventives. When this species appears in orchards or attacks a few cherished trees on the lawn or elsewhere, most of the methods recommended for the apple-tree tent caterpillar can be employed against it successfully. The difficulty is not so much in controlling this insect in the fruit orchard and on highly valued trees, as in the forests. The ravages in the wood lands and the extensive sugar orchards can rarely be successfully met by the foregoing methods. In these localities the expense attendant upon the collection of the egg belts or spraying the trees with poison would be prohibitive in most instances. In a general way, recourse must be had to preventive measures. Our native insectivorous birds should be protected from hunters and encouraged in every possible manner. Their efficient services alone should do much to abate the nuisance. The insect enemies of this species should be preserved from destruction whenever possible. In case of very severe outbreaks, such as have occurred this year and last, it may be found advisable to burn over the defoliated areas just after the caterpillars have pupated, and before the moths emerge, provided there is not enough inflammable matter on the surface to produce a fire that would seriously injure the trees. The burning would have to be conducted with caution, but wherever practicable, it would result in the destruction of many insects.

Bibliography

Hübner, Jacob. Verzeichniss bekannter Schmettlinge. ? 1822. p. 122 (described, as *Malacosoma*).

Emmons, Ebenezer. Natural history of New York. Agriculture. 1854. p. 240, 241, pl. 37, fig. 2, 4, *a*, *g* (brief notice, as *C. neustria*).

Fitch, Asa. N. Y. State agricultural society. Transactions. 1855. 1856. p. 430, 431 (extended account); the same in Insects of New York. 1st–2d Report. 1856. p. 198, 199; N. Y. State agricultural society. Transactions. 1856. 16: 337 (on apple); — 1859. 18: 820–23 (brief account); the same in Insects of New York. 3d–5th Report. 1859. sections 28, 321 (all as *C. sylvatica*).

Morris, J. G. Catalogue of the lepidoptera of North America. 1860. p. 22 (listed); Synopsis of the lepidoptera of North America. 1862. p. 236 (description, both as *C. sylvatica*).

Harris, T. W. Insects injurious to vegetation. (3d ed.) 1862. p. 375, 376, pl. 7, fig. 18, 19 (described); Entomological correspondence. 1869. p. 292 (larva described, both as *C. sylvatica*).

Ferris, Peter. Practical entomologist. 1867. 2:112, 113 (injuries in western New York).

Walsh, B. D. Practical entomologist. 1867. 2:72 (mention), p. 112, 113 (brief account), p. 121 (mention, all as *C. sylvatica*).

Packard, A. S. Guide to the study of insects. 1869. p. 301 (mention); Rocky mountain locust and other insects. Report. 1877. p. 794, pl. 69, fig. 7, 8 (mention); U. S. Entomological commission. 5th Report. 1890. p. 117, 118, 328, 373, 402, 481, 514, 520, 529, 536, 556, fig. 37 (brief notices on various trees).

Walsh, B. D. & Riley, C. V. American entomologist. 1869. 1:208, fig. 146 (brief account), p. 210, fig. 147 (mention), p. 227 (ravages in Missouri, all as *C. sylvatica*).

Moody, H. L. Canadian entomologist. 1870. 2:176, 177 (tenacity of life in larvae, as *C. sylvatica*).

Riley, C. V. Insects of Missouri. 2d Report. 1870. p. 7, 37, fig. 11 (brief mention); American entomologist and botanist. 1870. 2:245 (mention), p. 261–66, fig. 165–68 (general account); Insects of Missouri. 3d Report. 1871. p. 121–29, fig. 52–54 (general account); — 4th Report. 1872. p. 41 (parasite); — 8th Report. 1876. p. 23, fig. 16, 17 (ravages in the south, larvae stopping trains); U. S. Entomological commission. 3d Report. 1883. p. 89, 101 (mistaken for army worm); N. J. State board of agriculture. 15th Report. 1888. p. 498, 499, fig. 10 (brief notice, all as *C. sylvatica*).

Bethune, C. J. S. Fruit grower's association of Ontario. Report. 1870. 1871. p. 80–82, fig. 19 (brief account); the same in Entomological society of Ontario. 1st Report. 1871. p. 81, 82, fig. 19; Canadian entomologist. 1873. 5:140, 141 (mention); — 1876. 8:4 (mention); Entomological society of Ontario. 19th Report. 1889. p. 73, 74, fig. 44, 45 (brief notice, all as *C. sylvatica*).

Bell, J. J. Canadian entomologist. 1872. 4:199 (ravages, as *C. sylvatica*).

Lintner, J. A. N. Y. State museum of natural history. 26th Report. 1872. p. 147 (mention); Insects of New York. 1st Report. 1882. p. 328 (on apple); — 2d Report. 1885. p. 83 (mention); — 3d Report. 1887. p. 91–93 (brief notice), p. 147 (abstract); — 4th Report. 1888. p. 178 (affected by muscardine); — 6th Report. 1890. p. 106, 166, 186 (ravages at Kingsbury, N. Y.); — 7th Report. 1891. p. 331 (mention, all preceding as *C. sylvatica*); — 10th Report. 1895. p. 495 (mention); — 11th Report. 1896. p. 265, 284 (mention); Country gentleman. 1897. 62:558 (ravages in Delaware county).

Saunders, William. Canadian entomologist. 1872. 4:134, fig. 10 (mention); Entomological society of Ontario. Report. 1875. 1876. p. 30, 31, fig. 8 (brief notice); Canadian entomologist. 1877. 9:158, 159, 183, 184, fig. 6 (unusually abundant); Entomological society of Ontario. Report. 1877. p. 4 (ravages); Canadian entomologist. 1878. 10: 21, 23 (hibernation), p. 183 (ravages, enemies); Entomological society of Ontario. Report. 1878. 1879. p. 5, 28-30, fig. 5, 6 (ravages, habits); Canadian entomologist. 1879. 11:187, 204 (destroyed by fungus); Entomological society of Ontario. Report. 1879. 1880.

p. 7, 8, 22 (destroyed by fungus); Canadian entomologist. 1880. 12: 196 (mention); the same in Entomological society of Ontario. Report. 1880. 1881. p. 9; Insects injurious to fruits. 1883. 1889. p. 52-57, fig. 43-49 (general account, all preceding as *C. sylvatica*); Entomological society of Ontario. 20th Report. 1890. p. 32-34, fig. 4 (brief notice).

Bessey, C. E. Iowa state agricultural society. Report. 1873. 1874. p. 231 (mention, as *C. sylvatica*).

Lyman, H. H. Canadian entomologist. 1874. 6: 158 (abundant, as *C. sylvatica*).

Kridelbaugh, S. H. Iowa state horticultural society. Report. 1876. 1877. p. 329 (mention, as *C. sylvatica*).

Gott, B. Entomological society of Ontario. Report. 1877. p. 41, 42, fig. 24 (mention); — 1878. 1879. p. 56 (mention, all as *C. sylvatica*).

Thomas, Cyrus. Insects of Illinois. 6th Report. 1877. p. 89 (*Calosoma scrutator* preying on, as *C. sylvatica*).

French, G. H. Insects of Illinois. 7th Report. 1878. p. 198 (quotes Harris, as *C. sylvatica*).

Perkins, G. H. Vt. State board of agriculture. 5th Report. 1878. p. 257-59, fig. 5, 6 (brief account); Vt. Agricultural experiment station. Bulletin 11. 1888. p. 7, 8, fig. 1, 2 (brief notice, as *C. sylvatica*); — Bulletin 60. 1897. p. 5-9, fig. 1, 2 (ravages in Vermont in 1897).

Williams, Joseph. Entomological society of Ontario. Report. 1878. 1879. p. 41 (*Calosoma scrutator* preying on, as *C. sylvatica*).

Hoy, P. R. Wis. State horticultural society. Transactions. 1879. 9: 276-78, fig. 6 (brief notice, as *C. sylvatica*).

Marten, John. Insects of Illinois. 10th Report. 1881. p. 123, 124, fig. 36 (brief notice, as *C. sylvatica*).

Stretch, R. H. Papilio. 1881. 1: 68, 69 (synonymy, notes).

Claypole, E. W. Canadian entomologist. 1883. 15: 38 (mention); Entomological society of Ontario. Report. 1883. 1884. p. 34 (mention, all as *C. sylvatica*).

Cooke, Matthew. Injurious insects of the orchard, vineyard. 1883. p. 85-86, fig. 55-56 (brief account, as *C. sylvatica*).

Forbes, S. A. Insects of Illinois. 13th Report. 1884. p. 10 (ravages in southern Illinois); Ill. State laboratory of natural history. Bulletin. v. 2. art. 4. 1886. p. 315-17 (muscardine disease, all as *C. sylvatica*); Insects of Illinois. 17th Report. 1891. p. 13 (mention).

Dimmock, A. K. Psyche. 1885. 4: 275 (on birch, as *C. sylvatica*).

Fletcher, James. Central experimental farm (Canada). Report of entomologist and botanist. 1885. p. 48, fig. 25 (mention); —1887. p. 24, 25, fig. 9, 10 (brief account); Canadian entomologist. 1889. 21: 75-76, fig 2 (mention).

Harrington, W. H. Entomological society of Ontario. 17th Report. 1887. p. 27 (on maple, as *C. sylvatica*).

McMillan, Conway. Neb. Agricultural experiment station. v. 1. Bulletin 2. 1888. p. 63–64 (brief notice, as *C. sylvatica*).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 78 (bibliography).

Riley, C. V. & Howard, L. O. Insect life. 1889. 2 : 58 (stopping trains); —1890. 3 : 157 (parasite, both as *C. sylvatica*), 1891. p. 477, 478 (stopping trains in North Carolina); —1891. 4 : 167 (not in California, as *C. sylvatica*).

Bruner, Lawrence. U. S. Dep't agriculture, Division entomology. Bulletin 22. 1890. p. 101 (food plants); Neb. Agricultural experiment station. Bulletin 14. 1890. p. 33–38, fig. 23–26 (general account, both as *C. sylvatica*); Neb. State horticultural society. Report. 1894. p. 156 listed).

Caulfield, F. B. Entomological society of Ontario. 20th Report. 1890. p. 64 (on oak).

Hargitt, C. W. Insect life. 1890. 3 : 8 (mention, as *C. sylvatica*).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 304 (listed); American entomological society. Transactions. 1893. 20 : 36 (synonymy).

Dyar, H. G. Psyche. 1891. 6 : 129 (listed), 1892. p. 326, 364 (mention); N. Y. Entomological society. Journal. 1894. 2 : 154 (synonymy); Psyche. 1895. 7 : 189 (range).

Fernald, C. H. Mass. (Hatch) agricultural experiment station. Bulletin 12. 1891. p. 24–26, fig. 17, 18 (brief account).

Townsend, C. H. T. Psyche. 1891. 6 : 83–85 (parasites, as *C. sylvatica*).

Kirby, W. F. Synonymic catalogue of lepidoptera heterocera. 1892. 1 : 840 (synonymy).

Neumoegen, Berthold & Dyar, H. G. N. Y. Entomological society. Journal. 1892. 2 : 154 (synonymy).

Comstock, J. H. & A. B. Manual for the study of insects. 1895. p. 362 (mention).

Burgess, A. F. Mass. State board of agriculture. Report on gypsy moth. Appendix. Jan. 1897. p. 68 (mention); — Jan. 1898. p. 107, 108 (*Calosoma scrutator*, *C. wilcoxi* preying on).

Comstock, J. H. Insect life. 1897. p. 172 (mention).

Coquillett, D. W. U. S. Dep't agriculture, Division entomology. Technical series no. 7. 1897. p. 11, 16, 21, 24 (dipterous parasites).

Kirkland, A. H. Mass. (Hatch) agricultural experiment station. Bulletin 46. 1897. p. 22, 25, fig. 23 (eaten by garden toad); Mass. State board of agriculture. Report on gypsy moth. Appendix. Jan. 1897. p. 56 (*Podisus placidus* attacking); —Jan. 1898. p. 118, 131 (*Podisus placidus* and *P. serieventris* preying on).

Felt, E. P. Country gentleman. 1898. 63 : 450, 551, 567, 690 (ravages in New York).

Fletcher, James *and others*. Ottawa naturalist. Ap. 1898. 12 : 13 (ravages along Ottawa river).

Harvey, F. L. Me. Agricultural experiment station. 13th Report. 1897. 1898. p. 173, 174, 177 (ravages).

Panton, J. H. Ontario agricultural college and experimental farm. 23d Report. 1898. p. 18 (mention, as *C. sylvatica*).

MAMESTRA PICTA *Harris*

Zebra caterpillar

Ord. **Lepidoptera**: Fam. **Noctuidae**

The larva of this species has gained for itself a very unsavory reputation among agriculturists on account of its numerous depredations on various garden crops, it being particularly fond of cabbage and related plants, sometimes proving very destructive to them. The present season its previous records appear to be outdone by its occurrence in large numbers on timothy hay put into the barn the previous day.

Remarkable demonstration. The following inquiry was received from a correspondent of the *Country gentleman:*

I have just finished cutting a 20-acre lot of timothy hay, and put it in the barn yesterday. This morning on going into the barn we found the hay literally covered with caterpillars, say from $1\frac{1}{2}$ to $1\frac{3}{4}$ in. long, of a very bright yellow color, with a black stripe from head to tail; head red. Can you tell me what they are? Would you use the hay? We did not see them in the field, but the barn is alive with them.

Alexandria Bay, N. Y. W. C. B.

The following reply to the question in regard to the value of the hay for feeding purposes was made:

It is most probable that the caterpillars observed had been feeding on the grass and were accidentally taken up with the hay. Their appearance in such large numbers on the mow indicates that the majority will work their way out and leave the hay, since it is probably too hard and dry to be acceptable provender. So long as the hay retains its normal sweet odor, even though a dead caterpillar be seen here and there, it would be perfectly safe to feed out; but if the dead bodies are numerous enough to contaminate it, and impart a foul odor, it would be safer to use it for some other purpose.

In a subsequent letter with the examples requested, in order that the identity of the species might be established, Mr Browning stated that last year these larvae entirely destroyed his crop of oats on the 20 acres above mentioned, and that so far as his observation went, they were confined entirely to that one field. While it may be very proper to question whether it was the larvae of *Mamestra picta* that caused this enormous damage to the oats, still the weight of evidence indicates that this species was the depredator. The well known, almost omnivorous habits of the larvae and their abundance at the present season in the same field throw a very strong suspicion on these caterpillars.

Description. The eggs are deposited in patches on the under surface of the leaves, according to Prof. Davis. He also states that a moth usually lays from 125 to 150 eggs, though he obtained one cluster of 452. The young larvae probably vary somewhat in appearance. Dr Packard describes them as pale greenish, with four dark stripes on each side. Dr Riley states that at first they are almost black, though they soon become pale and green, while Prof. Davis found them to be 'hairy, speckled, white caterpillars, with a black head and black crescent on the thorax.' After the first molt, the appearance of the larvae is much the same as when matured, according to several writers. In the earlier stages, the black dorsal stripe is divided by a median white line and the proportionate amount of black is much less than when the larvae are nearly mature. The brilliantly colored larva is from 1½ to 2 inches

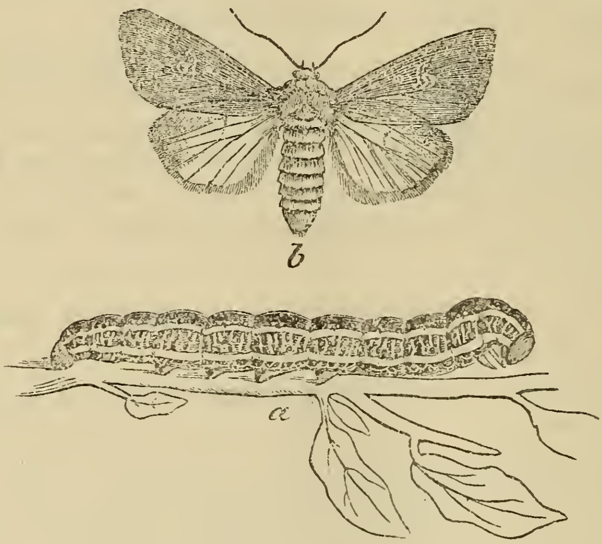

Fig. 11 MAMESTRA PICTA: *a*, larva; *b*, moth (after Riley).

long when full grown, and may then be recognized by its broad, jet-black dorsal stripe. The two bright yellow stripes on each side are separated by a broader black area, which is broken by numerous transverse, irregular, white lines (fig. 11 and pl. 5). In Dr Lintner's detailed description of this larva (see citation), he compares the broken, black stripe to a series of letters: IVNW. Beneath the lower yellow line there is more or less black, broken by irregular white lines, somewhat as in the lateral black stripe above. The head and legs are brick red.

The pupa has been described by Dr Riley as about '$\frac{3}{4}$ of an inch long, deep, shiny brown, and thickly punctate, except on the posterior border of the joints, and specially on those three immediately below the wing sheaths, where it is reddish and not polished; it terminates in a blunt point ornamented with two thorns.' Pupation occurs underground, in a rude earthen cell, which is lined with particles of soil interwoven with silken threads.

The front wings of the moth are of a beautiful, rich purple-brown, blending with a delicate lighter shade of brown in the middle. The ordinary spots in the middle of the wing, with a third oval spot, more or less distinctly marked behind the round one, are edged and traversed by white lines so as to appear like delicate net work; a transverse, zig-zag, white line, like a sprawling W, is also more or less visible near the outer edge, on which edge there is a series of white specks; a few white atoms are also sprinkled in other places on the wing. The hind wings are white, faintly edged with brown on the upper and outer edges. The head and thorax are of the same color as the front wings, and the body has a more grayish cast (Riley).

Life history. The young larvae may be found in clusters on their food plants. As they increase in size, they disperse, till when full grown they are found singly here and there. When disturbed, they curl up and drop to the ground as do many cut-worms. In confinement they have been observed to eat with great rapidity, resting frequently from their feeding. The first brood of larvae mature in this latitude the last of June or in July. Those received from Alexandria Bay, July 19, were about full grown, while Dr Lintner records pupation of some reared examples on the 27th of June. The moths from these pupae emerged August 11 to 18, and deposited eggs, the earliest of which hatched August 20. Thus it will be seen that there are two broods in this state. Adults emerging from pupae the latter part of May, lay eggs which produce the brood of larvae usually destructive. The moths of the second generation fly in August, the larvae from their eggs attaining full growth in September or October and wintering as pupae. Like cabbage, one of its favorite food plants, the larva can withstand a considerable degree of cold, as recorded by Walsh.

Food plants. The larvae of this species have been previously recorded as feeding upon the following plants by various writers: Cabbage, cauliflower, turnip, rutabagas, mignonette, sweet pea, orange, clover, bean, pea, apple, currant, carrot, celery, white berry or snowberry (*Symphoricarpus racemosus*), honeysuckle, burdock, aster, cranberry, potato, beet, spinach, lamb's quarters (*Chenopodium album*), smartweed, buckwheat, willow, spruce, asparagus and corn.

Though the insect is not abundant on all the plants mentioned above, and probably feeds on certain of them only under exceptional conditions, yet the list is so extended, including 29 species or varieties and representing 18 natural orders, that it is very difficult to say what the caterpillars will not attack. It is probable that farther study would show that the larvae feed on a number of other grasses besides those recorded at the beginning of this notice.

Distribution. This insect appears, from the record of its injuries, to be widely and generally distributed over the United States and the southern part of Canada. Its depredations have been reported from most of the eastern states from Massachusetts to Florida, in many of the central and western states, and in southern California and the state of Washington.

Natural enemies. Several parasites have been reared from this insect. *Ophion purgatum* Say has been bred from this species by Mr Caulfield. As this parasite is one which has been found attacking the army worm, *Leucania unipuncta* Haw., in numbers, it is of importance to know that it also preys on this species. *Limneria annulipes* Cres. has been reared from this Mamestra (*Insect life.* 1890. 3:17). Another parasite which has been bred by several observers, is *Microplitis mamestrae* Weed. It has the peculiar habit of attaching its brown, ribbed cocoons between the anal prolegs of its victim. *Telenomus heliothidis* Ashm. has been reared from the eggs of this insect by Prof. Davis, who found that it destroyed from two thirds to three fourths of most clusters. Dr James Fletcher has reared two egg parasites, a *Trichogramma* and another black Proctotrypid, in large numbers. Prof. Davis also records an attack on the eggs of this species by two insects. The adult of *Megilla maculata* DeGeer devours the eggs, shell and all, while the tarnished plant bug (probably *Lygus pratensis* Linn.) sucks out the contents and leaves the shell nearly entire. The common toad is reported by Mr Kirkland as feeding on the caterpillars.

Remedies. The gregarious habits of the young caterpillars render their destruction by hand picking comparatively easy. They can be killed by spraying with paris green and water, at the rate of one pound to 150 or 200 gallons. In cases where it is undesirable to poison their food plants, the caterpillars can be controlled by the use of fresh pyrethrum, hellebore or kerosene emulsion.

Bibliography

Harris, T. W. Insects injurious to vegetation [1st ed. 1842]. 3d ed. 1862. p. 451, 452, fig. 223, 224 (description, life history, habits); Entomological correspondence. 1869. p. 317, 318 (larva described).

Guenée, Achille. Species général des Lepidoptères. Noctuélites. 1852. 1:344, pl. 5, fig. 9 (moth described, as *Ceramica exusta*).

Morris, J. G. Catalogue of the lepidoptera of North America. 1860. p. 29 (listed).

Walsh, B. D. Practical entomologist. 1866. 2:21 (withstanding frost).

Grote, A. R. & Robinson, C. T. American entomological society. Transactions. 1868. 2:77 (*Mythimna contraria* Walk. referred to *Ceramica exusta* Guen.).

Packard, A. S. Guide to the study of insects. 1869. p. 312 (mention); Rocky mountain locust and other insects. Report. 1877. p. 753, 754. fig 26 (brief general account); American naturalist. 1884. 18: 1266, 1267 (larval stages described).

Riley, C. V. Insects of Missouri. 2d Report. 1870. p. 112, 113, fig. 82 (brief general account); U. S. Dep't agriculture. Report. 1883. p. 124, 125, pl. 1, fig. 3, 3*a*, pl. 12, fig. 2*a*, 2*b* (brief account, as *Ceramica*); U. S. Dep't agriculture, Division entomology. Bulletin 31. 1893. p 56, 61 (feeding on clover, cabbage); Md. Agricultural experiment station. Bulletin 23. 1893. p. 81, 83, fig. 12 (on cabbage).

Bethune, C. J. S. Entomological society of Ontario. Report. 1871. 1872. p. 85, 86, fig. 92 (brief general account); — 17th Report. 1887. p. 61, fig. 41 (mention); — 23d Report. 1893, p. 8, fig. 4 (brief notice).

Grote, A. R. Buffalo society of natural sciences. Bulletin. 1874. 2:22, 123 (as *Ceramica*); Check list of North American moths. 1882. p. 26, no. 343 (synonymy); Papilio. 1882. 2:99 (larva described).

Lintner, J. A. Entomological contributions. 1874. 3:137, 138 (larva described, as *Ceramica*); the same in N. Y. State museum. 26th Report. 1872. 1874; N. Y. State agricultural society. 40th Report. 1880. 1881. p. 14. Separate. p. 5 (on clover, as *Ceramica*);—Transactions. 1877–82. 1884. 33: 192 (on clover); Insects of New York. 2d Report. 1885. p. 1, 2 (ravages in St Lawrence co.);—4th Report. 1888. p. 16, 206 (on currant bushes); N. Y. State museum of natural history. Bulletin 6. 1888. p. 21, fig. 24 (mention); Insects of New York. 5th Report. 1889. p. 206–10 (general account);—9th Report. 1893. p. 455 (reference); Country gentleman. 1893. 58: 539 (brief general notice); Insects of New York. 10th Report. 1895. p. 492 (reference);—11th Report. 1896. p. 265 (on apple).

Thomas, Cyrus. Insects of Illinois. 6th Report. 1877. p. 60 (brief notice); — 9th Report. 1880. p. 51, 52 (brief account, both as *Ceramica*).

French. G. H. Insects of Illinois. 7th Report. 1878. p. 226 (brief notice, as *Ceramica*).

Coquillett, D. W. Insects of Illinois. 10th Report. 1881. p. 185, fig. 79 (larva described, as *Ceramica*).

Fletcher, James. Canadian entomologist. 1883. 15: 205 (abundant at Ottawa); Insect life. 1892. 5: 125, 126 (injuries, food plants and parasites); Central experimental farm (Canada). Report of entomologist and botanist. 1892. Separate. p. 3 (mention).

Osborn, Herbert. Iowa state horticultural society. Transactions. 1882. 1883. p. 217 (injuries near Ames).

Bruner, Lawrence. U. S. Dep't agriculture. Report. 1884. p. 401 (mention); U. S. Dep't agriculture, Division entomology. Bulletin 23. 1891. p. 13 (feeding on beets).

Caulfield, F. B. Canadian entomologist. 1884. 16: 122, 123. (*Ophion purgatum* a parasite); the same in Entomological society of Ontario. 15th Report. 1885. p. 41.

Fernald, C. H. Standard natural history. Kingsley's. 1884. 2: 452 (brief notice); Mass. Agricultural college. 32d Report. 1895. p. 19 (feeding on cranberry leaves).

Webster, F. M. Ind. State board of agriculture. Report. 1885. 1886. Separate. p. 18 (mention, as *Ceramica*); Insect life. 1890. 3: 149 (feeding on silk of growing corn).

Forbes, S. A. Ill. State laboratory of natural history. Bulletin. v. 2. art. 4. 1886. p. 305–12 (experiments with contagious diseases).

Weed, C. M. Ill. State laboratory of natural history. Bulletin. v. 3. art. 1. 1887. p. 2, 3. (*Microplitis mamestrae* reared); Ohio agricultural experiment station. Bulletin. v. 1. no. 1 (tech. ser). 1889. p. 23 (listed as clover insect, bibliography); Insects and insecticides. 1891. p. 194-96. fig. 103 (life history, remedies); Ohio agricultural experiment station. Bulletin. v. 4, no. 2. 1891. p. 50, fig. 4 (brief notice).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 86 (bibliography).

Orcutt, I. H. Dak. Agricultural experiment station. Bulletin 13. 1889. p. 20 (brief notice, as *Ceramica*).

Riley, C. V. & Howard, L. O. Insect life. 1889. 1: 382 (in Colorado, as *Ceramica*); — 1890. 3: 17, 157 (*Microplitis mamestrae* and *Limneria annulipes* parasites); — 1893. 5: 287 (range, food plants).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 310 (listed); U. S. National museum. Proceedings. 1891. 14: 231 (synonymy, description, distribution); — Bulletin 44. 1893. p. 120 (synonymy, distribution); N. J. Agricultural experiment station. Report. 1894. 1895. p. 448 (injuring cabbages.)

Howard, L. O. Insect life. 1892. 5: 99 (injuries to cabbage).

Weed, H. E. Miss. Agricultural experiment station. Bulletin 21. 1892. p. 7, fig. 9 (brief notice).

Davis, G. C. Mich. Agricultural experiment station. Bulletin 102. 1893. p. 24–27, fig. 15 (injuring celery).

Sirrine, F. A. N. Y. Agricultural experiment station. Bulletin 83. 1894. p. 684 (mention)

Comstock, J. H. & A. B. Manual for the study of insects. 1895. p. 305, fig. 369, 370 (brief notice).

Garman, Harrison. Ky. Agricultural experiment station. 7th Report. 1894. 1895. p. 36 (listed).

Piper, C. V. Washington state agricultural experiment station. Bulletin 17. 1895. p. 53, 54 (brief notice).

Taft, L. R. & Davis, G. C. Mich. Agricultural experiment station. Bulletin 121. 1895. p. 61, fig. 45 (mention).

Hopkins, A. D. & Rumsey, W. C. W. Va. Agricultural experiment station. Bulletin 44. 1896. p. 295 (mention).

Lugger, Otto. Minn. Agricultural experiment station. Report 1895. 1896. p. 174, 240 (mention); — 1st Report of entomologist 1895. 1896. p. 78 (the same).

Quaintance, A. L. Fla. Agricultural experiment station. Bulletin 34. 1896. p. 290 (mention).

Kirkland, A. H. Mass. (Hatch) agricultural experiment station. Bulletin 46. 1897. p. 23, 25, fig. 25 (larvae eaten by toad).

Chittenden, F. H. U. S. Dep't agriculture, Division entomology. Bulletin 10 (new series). 1898. p. 61 (on asparagus).

Barrows, W. B. & Pettit, R. H. Mich. Agricultural experiment station. Bulletin 160. 1898. p. 425, fig. 20 (brief account).

Felt, E. P. Country gentleman. 1898. 63 : 586 (abundance in timothy and probably in oats).

Harvey, F. L. Me. Agricultural experiment station. 13th Report. 1897. 1898. p. 173, fig. 3 on plate (injuries in Maine).

XYLINA ANTENNATA *Walker*[a]

Ord. Lepidoptera : Fam. Noctuidae

The extensive defoliation of soft maples by the larvae of this species at Schenectady and presumably at other places in the state, is another instance of how destructive comparatively unknown species may become, provided conditions are favorable.

Recent injuries. The numerous soft maples at Schenectady were practically stripped of their foliage by hordes of light green caterpillars. On June 20, many were to be seen on the affected trees, not infrequently 50 to 100 on a single trunk. On the sidewalks, along the curbing and in the roadway, larvae were crawling hither and thither. Even were one

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a Determined by Drs H. G. Dyar and J. B. Smith.

deprived of sight, the peculiar odor arising from the thousands of larvae gave ample evidence of their presence, and the abundance of the caterpillars called to mind, forcibly, the numerous fields swarming with army worms in 1896. At Albany, only 17 miles distant, there was no sign of injury to the soft maples. A search at that time was not rewarded by a single caterpillar. As far west as Herkimer, on the Mohawk river, on the Raquette river in St Lawrence county, and in Schoharie county, many soft maples were defoliated. In some cases this was probably the work of Xylina larvae, though the forest tent caterpillar, *Clisiocampa disstria* Hübn., was abundant and may have caused the mischief. In Massachusetts a green larva was quite destructive to soft maples, as stated by Mr R. H. Cooley. This depredator may be the same species that proved so destructive in New York. In a letter referring the larvae to *Xylina*, Dr Dyar states that in 1897 they were quite common on maples at Bellport, L. I., but less abundant, though plenty, the present season.

Comparatively unknown. An examination of the literature relating to this insect shows that it is comparatively unknown to economic entomology. specially as a defoliator of maple or other trees, though Dr Riley, in his 3d report on the insects of Missouri, states that for several years he had known the larvae to be common on apple, poplar, hickory and some other trees, the leaves of which they devour. This species, in conjunction with *Xylina laticinerea* Grote and *X. grotei* Riley, was reported in 1896 by Prof. Slingerland of the Cornell agricultural experiment station, as quite injurious to fruits in the state, more specially in the western part. Extensive injuries to apples in Orleans county, N. Y., were also reported to Dr Howard the same year. Previous to that, there had been but one record of injuries in New York by this species and that was in 1877. In other states there have been, a few instances of these insects attacking fruits. In 1870, Dr Riley received several complaints of injury by the larvae of this insect to peaches and apples. In 1888, it was somewhat injurious to apples and a bulletin by Prof. F. H. Hillman, of the Nevada agricultural experiment station, records serious injuries in 1890 to roses by the same insect.

Description. The larvae of this species are stout, smooth, light green, cutworm-like caterpillars measuring from 1 to 1½ inches in length when full grown. The head is pale yellowish green. There is a rather broad yellowish white or white dorsal stripe along the body, a narrower white sub-dorsal stripe, a broken, faint lateral stripe of the same color and an irregular white stigmatal stripe. The tubercles are rather large and white, and the skin is minutely spotted with the same color. Prof. Slingerland (see citation) states that in the larvae of *X. grotei* both edges of the stigmatal stripe are well defined, while in those of *X. antennata* the upper edge is much broken or indented. He finds that the sub-dorsal stripe is more continuous in the latter, it being composed of three or four irregular spots on each segment in *X. grotei*. He separates the larvae of *X. laticinerea* from those of *X. antennata* by the position of the stigmatal stripe, which is just above the spiracles, except the one at each extremity, in the former species, while in the latter it is mostly below the spiracles.

Fig. 12 XYLINA ANTENNATA (original).

The moth (fig. 12) is ashy gray with indistinct, rather variable markings. Sometimes it resembles *X. laticinerea* so closely that only an authority on the family can separate the species. So close is the resemblance between these forms, that at first the larvae depredating on the maples were referred by Dr Dyar to *X. grotei* and *X. laticinerea*, the determination being based on examples named by Dr Smith some years ago. The subsequent studies of the latter have somewhat modified his views as to the limitation of these species, and have led to a renaming of those at the U. S. National Museum. These forms are undoubtedly very close to each other, though Prof. Slingerland has found differences in the male genitalia of *X. antennata* and *X. grotei*.

Definition of the species. In opposition to this view, Dr Riley regarded the above-named forms as but varieties of the species under discussion.

Writing of this family in 1871, he states that great variability is characteristic of these moths, that only the more strikingly marked should be described, and adds that no doubt many of the so-called species will turn out to be but varieties. In a communication from Prof. G. H. Hudson of the State normal school at Plattsburg, N. Y., he writes: 'After some years of trial and with over 800 specimens for comparison, I have come to the conclusion that *Xylina antennata*, *X. laticinerea* and

X. grotei are one and the same species.' Differences in the time of flight have been observed by Prof. Hudson in the case of closely related species, as, for example, *Eyprepia virgo* Linn. and *Eyprepia parthenice* Kirby, their periods being well separated except for a few stragglers. The same he found true in the case of *Feltia herilis* Grote and *Feltia subgothica* Haw., but not so with the species under discussion. During several years of collecting, Prof. Hudson has taken these moths (*X. antennata*, *X. laticinerea* and *X. grotei*) from Sep. 25 into early November, they being most abundant from the last of September throughout October, and from March 2 to May 2, occurring in the spring in greatest numbers from about March 20 to April 13. He also writes: 'I have taken specimens at sugar while the grass and pools of shallow water were freezing at my feet. The moths probably kept in the warmer upper layers. I have taken them when the temperature 6 feet from the ground was but 3 degrees Centigrade but never below this. On one of these occasions, a very light snow was falling, yet I found a single specimen feeding at sugar at 6.30 p. m. This was on April 2, 1889.'

Life history. Usually the larvae are not observed till May or June. They complete their growth by the middle of the latter month, enter the ground and pupate an inch or more below the surface. They remain in the quiescent stage till September, when most of them emerge. Though some hibernate as pupae, the majority pass the winter as adults. It has been stated that in the south, the eggs are deposited on the under surface of the leaves. No record of the oviposition in the north has been made.

Food habits. Though comparatively little is known about the food habits of this species, it is probably a somewhat general feeder. Dr Riley records attacks by the larvae of *X. antennata* on apples, peaches, oak galls, hickory leaves and those of other forest trees. Their feeding upon rose buds and maple foliage has already been mentioned. The extensive defoliation of the soft maples would indicate, however, that the species becomes abundant only when climatic and other conditions favor its rapid development upon some favorite food plant like the soft maple. In his bulletin, Prof. Slingerland adds peas, plums, currants and quinces to the list of fruits injured and states that one grower had to watch the buds on grafted pears to prevent their being destroyed.

Farther observations may greatly extend the list of known food plants.

Natural enemies. Two hymenoptera, *Mesochorus agilis* Cres. and *Meteorus hyphantriae* Riley, were reared from *X. laticinerea* by Prof. Slingerland. They would probably attack *X. antennata* with equal readiness.

The latter parasite is a very efficient enemy of the fall web worm, *Hyphantria cunea* Drury. In addition to these, I have reared examples of the red-tailed tachina fly, *Winthemia 4-pustulata* Fabr., a species which has frequently rendered most valuable aid in controlling the army worm, *Leucania unipuncta* Haw.

Remedies. In most cases the parasites and the native birds will keep this species under control. The outbreak chronicled in the preceding pages is out of the usual order and may not occur again for years. In such event, resort may be had to spraying the infested trees with the arsenites. If the application is made before the caterpillars are more than half grown, serious injury to the trees may be averted. If the spraying is impracticable, many of the descending caterpillars can be killed by inclosing the trunks of the infested trees with a low overhanging barricade and then treating the collected larvae with hot water, kerosene emulsion or other contact insecticide. Small trees can be protected by jarring the caterpillars from them, and if sticky bands are placed around the trunk no larvae can ascend to continue their destructive work. In fruit orchards, as pointed out by Prof. Slingerland, spraying before the fruit appears or jarring are about the only measures that can be relied upon in combating these pests.

Bibliography of Xylina antennata *Walker*

Riley, C. V. American entomologist and botanist. 1870. 2 : 245 (injuring fruits, etc., as *Xylina* sp.) ; Insects of Missouri. 3d Report. 1871. p. 134–36, fig. 57 (larva and moth described, as *Xylina cinerea*) ; U. S. Entomological commission. Bulletin 6 [Index to the 9 Missouri Reports]. 1881. p. 74, 75 (descriptions as in preceding) ; Papilio. 1882. 2 : 101, 102 (*grotei* and *laticinerea* regarded as varieties).

Grote, A. R. Peabody academy of science. 6th Report. 1874. p. 34 (brief notice, as *Lithophane cinerea*) ; U. S. Geological and geographical survey of the territories. Bulletin. 1879. 5 : 201 (*cinerea* referred to *antennata*); Papilio. 1881. 1 :127 (*cinerea* = *antennata*); Canadian entomologist. 1894 26 : 79 (*cinerea* = *antennata*).

Thaxter, Roland. Psyche. 1877. 2 : 37 (common in Newton, Mass., at light, Mar., Ap., May, Sep., Oct., as *Lithophane cinerea*).

Fernald, C. H. Papilio. 1882. 2 : 63 (*cinerea* Riley = *antennata* Walker).

Saunders, William. Insects injurious to fruits. 1883. 1889. p. 138, 139, fig. 145 (brief notice, as *Lithophane*).

Harvey, F. L. Me. Agricultural experiment station. Report. 1888. 1889. p. 176, fig. 26 (injuring apples, as *Lithophane*).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 92 (bibliography, as *Lithophane*).

Hillman, F. H. Nev. Agricultural experiment station. Bulletin 9. 1890. p. 1–4 (burrowing in rose buds, as *Lithophane*).

Webster, F. M. Insect life. 1890. 2 : 383 (early appearance, as *Lithophane*).

Smith, J. B. Catalogue of the insects of New Jersey. 1890. p. 319 (listed); U. S. National museum. Bulletin 44. 1893. p. 228 (synonymy); Economic entomology. 1896. p. 300, fig. 338 (mention).

Slingerland, M. V. Cornell Agricultural experiment station. Bulletin 123. 1896. p. 509, 514 and following, pl. 1 (general account).

Howard, L. O. U. S. Dep't agriculture, Division entomology. Bulletin 7. 1897. p. 84 (extensive injuries to apples in Orleans county).

Felt, E. P. Schenectady daily union. June 20, 1898. p. 2 (notice of ravages); Albany evening journal. June 21, 1898 (mention); Country gentleman. June 23, 1898. 63: 491 (mention, all the preceding as ?*Nadata gibbosa*); Schenectady daily union. July 8, 1898. p. 5 (corrects reference); Country gentleman. July 14, 1898. 63: 551 (corrects reference, ravages in the state, both as *X. cinerea* or *X. laticinerea*).

Since both *Xylina grotei* and *X. laticinerea* are closely related to, if not varieties of, the preceding form, their bibliographies are also given.

Bibliography of Xylina grotei *Riley*

Grote, A. R. U. S. Geological and geographical survey of the territories. Bulletin. 1879. 5 : 202 (original description); New check list of North American moths. 1882. p. 33 (listed, both as *Lithophane cinerosa*); Canadian entomologist. 1887. 19 : 54 (mention, as *Lithophane grotei* Riley).

Riley, C. V. Papilio. 1882. 2 : 102 (*grotei* proposed for *cinerosa*).

Smith, J. B. U. S. National museum. Bulletin 44. 1893. p. 229 (synonymy).

Slingerland, M. V. Cornell agricultural experiment station. Bulletin 123. 1896. p. 509, 518, pl. 3, fig. *a-f* (general account).

Bibliography of Xylina laticinerea *Grote*

Grote, A. R. Buffalo society of natural sciences. Bulletin. 1874. 2 : 27 (original description); Check list of noctuidae of America, north of Mexico. 1875. 1 : 15 (listed); New check list of North American moths. 1882. p. 33(listed, all as *Lithophane*).

Thaxter, Roland. Psyche. 1877. 2 : 80 (taken at Newton, Mass., common at sugar, Sep., Oct., as *Lithophane*).

French, G. H. Insects of Illinois. 7th Report. 1878. p. 227 (mention, as *Lithophane*).

Riley, C. V. Papilio. 1882. 2 : 102 (var. of *antennata*).

Edwards, Henry & Elliot, S. L. Papilio. 1883. 3 : 135 (food plant, larva described, as *Lithophane*).

Edwards, Henry. U. S. National museum. Bulletin 35. 1889. p. 92 (bibliography, as *Lithophane*).

Packard, A. S. U. S. Entomological commission. 5th Report. 1890. p. 526 (reared from wild cherry, as *Lithophane*).

Smith, J. B. U. S. National museum. Bulletin 44. 1893. p. 229 (listed); Catalogue of the insects of New Jersey. 1890. p. 319 (listed).

Lugger, Otto. Minn. Agricultural experiment station. Entomologist. 1st Report. 1895. 1896. p. 146 [p. 242 of the station report] (dates of capture).

Slingerland, M. V. Cornell agricultural experiment station. Bulletin 123. 1896. p. 509, 516, 517, pl. 2, pl. 5, fig. *a*, *d* (general account).

Howard, L. O. U. S. Dep't agriculture, Division entomology. Technical series no. 5. 1897. p. 23 (parasite mentioned).

LECANIUM TULIPIFERAE *Cook*[a]

Tulip-tree scale

Ord. **Hemiptera** : Subord. **Homoptera** : Fam. **Coccidae**

The tulip-tree is commonly unaffected by insects, but in this large species of *Lecanium* it finds an enemy that occasionally causes considerable injury. Several twigs from a tulip-tree, showing a very bad condition of affairs (fig. 13), were received on October 11, from Mr Alfred Pell, of Highland Falls, N. Y., with an inquiry as to the nature of the attack. The insects were so crowded on portions of the bark, that the old scales were huddled together and badly deformed. Under a lens it was seen that thousands of young had established themselves in the immediate vicinity of their parents, almost covering the bark in many places (fig. 14), while a few occurred along the veins of the leaves. The young were still issuing from the parents, as a number of paler individuals were to be seen crawling over the twigs. Branches of *Magnolia soulangeana* badly infested by this species have also been received recently from Fishkill-on-the-Hudson.

Earlier injuries by this species. In 1878 this scale insect was mentioned by Prof. Cook as one that frequently destroys tulip-trees in

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[a] Referred to *L. tiliae* Fitch by some authors.

Michigan. He states it was so abundant in 1870 on the college grounds at Lansing, Mich., that some of the trees were killed outright and others much injured. In the *Rural New Yorker* of May 10, 1890, a more

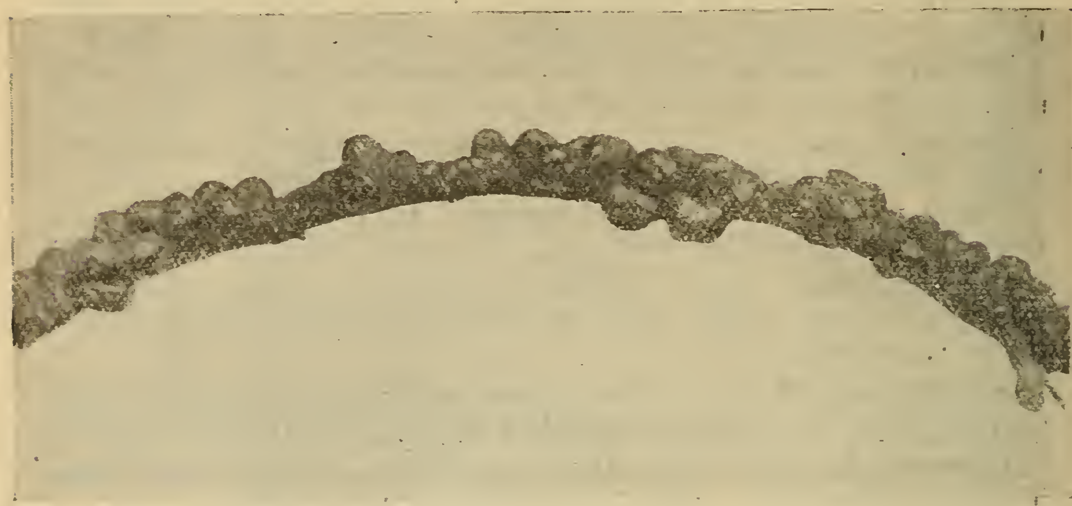


Fig. 13 LECANIUM TULIPIFERAE (original).

serious outbreak of this species is recorded at River Edge, Bergen county, N. J. Three years before, the tulip-trees in that vicinity were attacked by this scale insect, and at the time the notice was written, not only had trees in front yards been rendered worthless, but the lower branches of those growing wild had been killed. Serious injuries to tulip-trees in 1896 at Hartford, Ct., have been reported by Dr Sturgis, of the Connecticut agricultural experiment station, and Dr J. B. Smith, of the New Jersey agricultural experiment station, the same year observed a serious attack by this insect in his state.

Description. The adult females are among the largest of those belonging to the genus. Some received measured $\frac{3}{10}$ inch in diameter. The scale is light brown, mottled with dark brown, and very convex. The under surface is concave, and in the examples before me, there are two pairs of ventral, transverse, white lines composed of short cottony filaments, one on each side near the middle and the oblique pair nearer one extremity, probably the anterior. Both are interrupted in the middle. The young at this time (October) range in color from a light brown to almost black. The abdominal segments are sharply defined, the caudal extremity is notched, and from the tips of the last segment there extends a pair of delicate filaments. The young have a general resemblance to tiny trilobites.

Life history. No signs of eggs were to be seen, though Prof. Cook describes them as small, yellow and oval. On examining the adults, a number of young were found underneath. Apparently the species is viviparous in this latitude, as recorded of it farther south by Dr Riley. In Florida all stages have been observed during the winter and it hibernates as larvae at Washington, D. C., according to Dr Riley. The numerous young on the branches and those still issuing would indicate that the larvae must hibernate in this stage. The only observed difference in October between those which had issued some time before and those emerging, was in the color. The older ones still retained the larval form, but they had turned black, were closely applied to the bark and attached by a slender thread. In this condition they were apparently ready for hibernation, since upon being disturbed there was no effort to move off, as in the case of younger individuals.

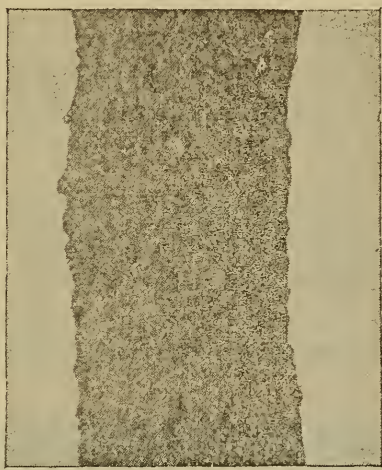


Fig. 14 Young of LECANIUM TULIPIFERAE, much enlarged (original).

In this latitude there is probably but one annual generation, as there is little chance that young would be produced earlier here than in Michigan. Prof. Cook states that they appear late in August.

This insect produces a large amount of honey dew, which has a nauseating odor. It has also been observed on clover by Prof. Cook. A parasite, *Coccophagus flavoscutellum* Ashm., has been reared from this scale insect (Howard, see citation).

Remedies. In case of a bad infestation, it would be well to scrape all the old insects from the branches in the autumn, and then treat the infested limbs with either whale oil soap or kerosene emulsion. If this is undertaken before many young have emerged, the trees should be nearly freed from the pest.

Bibliography

Cook, A. J. Canadian entomologist. 1878. 10: 192–95, fig. 1 (life history, remedies, original description); the same in Entomological society of Ontario. Report. 1878. 1879. p. 20, 21, 1 fig.; the same in American naturalist. 1879. 13: 324–26, fig. 1–6; Grasses of North America (Beal, W. J.). 1887. 1: 374 (on clover).

Comstock, J. H. Cornell agricultural experiment station. 2d Report. 1883. p. 136 (*L. tiliae* and *L. tulipiferae* listed, the latter probably a synonym).

Weed, C. M. Ohio agricultural experiment station. Bulletin 1. (tech. ser.) 1889. 1: 39 (on clover, as *L. tiliae*).

Carman, E. S. Rural New Yorker. 1890. 49: 298, fig. 90 (serious injuries to lindens).

Riley, C. V., & Howard, L. O. Insect life. 1890. 3: 28, 29 (mention).

Cockerell, T. D. A. Canadian entomologist. 1894. 26: 32, no. 50 (listed); Ill. State laboratory natural history. Bulletin. 1896. 4: 333, no. 533 (listed); U. S. National museum. Proceedings. 1897. 19: 726, 730, 731 (on linden, as *L. tiliae*).

Riley, C. V. Entomological society of Washington. Proceedings. 1894. 3: 69 (viviparous).

Howard, L. O. U. S. Dep't agriculture, Division entomology. Technical series no. 1. 1895. p. 12, 13, 37 (*Coccophagus flavoscutellum* Ashm. reared).

Lintner, J. A. N. Y. State museum. Bulletin 13. 1895. 4: 292 (viviparous); the same in Insects of New York. 11th Report. 1895. 1896. p. 221.

Smith, J. B. N. J. Agricultural experiment station. Report. 1896. 1897. p. 441 (injuries).

Sturgis, W. C. Ct. Agricultural experiment station. 19th Report. 1895. 1896. p. 193 (injuries in Hartford, Ct., as *L. tiliae*.)

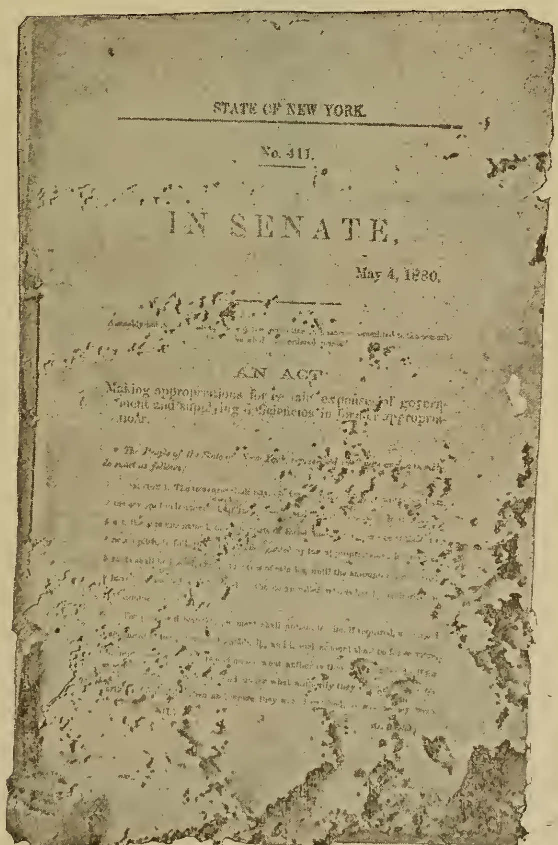
Felt, E. P. American gardening. Oct. 29, 1898. 19: 742 (remedies).

LEPISMA DOMESTICA *Packard*

Bristle-tail: Fish-moth

Ord. **Thysanura**: Subord. **Cinura**: Fam. **Lepismidae**

The so-called bristle-tail, fish-moth, silver-fish, etc., *Lepisma saccharina* Linn., is a rather common insect about houses, though it is rarely seen. The work of this insect and the allied *Lepisma domestica* Packard is often seen among books and papers that have been allowed to remain undisturbed for a number of years. These insects have a liking for paper, specially the heavier grades, starch, paste, etc. They have even been known to cause the wall paper in a house to scale off by feeding on the starch paste. In museums they are frequently troublesome on account of their habit of eating away the surface of the labels. In one case coming under my observation at Fort Plain, N. Y., the labels were so badly eaten as to be illegible in a number of instances, and in one or two cases the fragments dropped from the blocks to which they had been tacked. These insects even worked their way into wooden boxes containing microscopic preparations and attacked the labels gummed on the glass slips. Another instance of their destructiveness is shown in the accompanying reproduction from a photograph of a senate bill, which had been undisturbed in the office for about 16 years (fig. 15). It is most probable the work of *Lepisma domestica*, as it has subsequently been taken in the office. Both of these species


STATE OF NEW YORK.

No. 411.

IN SENATE,

May 4, 1880.

AN ACT

Making appropriations for the ... expenses of government and supplying deficiencies in former appropriations.

Fig. 15 — Work of Lepisma (original).

are small and shun the light, running very rapidly to a place of concealment on the slightest alarm. They are slender, silvery gray, wingless insects, belonging to the lowest order, Thysanura. Their long, fragile antennae and delicate anal filaments render it very difficult to capture a specimen unbroken. *Lepisma domestica* is represented very much enlarged in the accompanying figure. This insect is found so generally distributed over houses that it is difficult to use insecticides against it successfully. Fresh pyrethrum kills it readily and may be used wherever

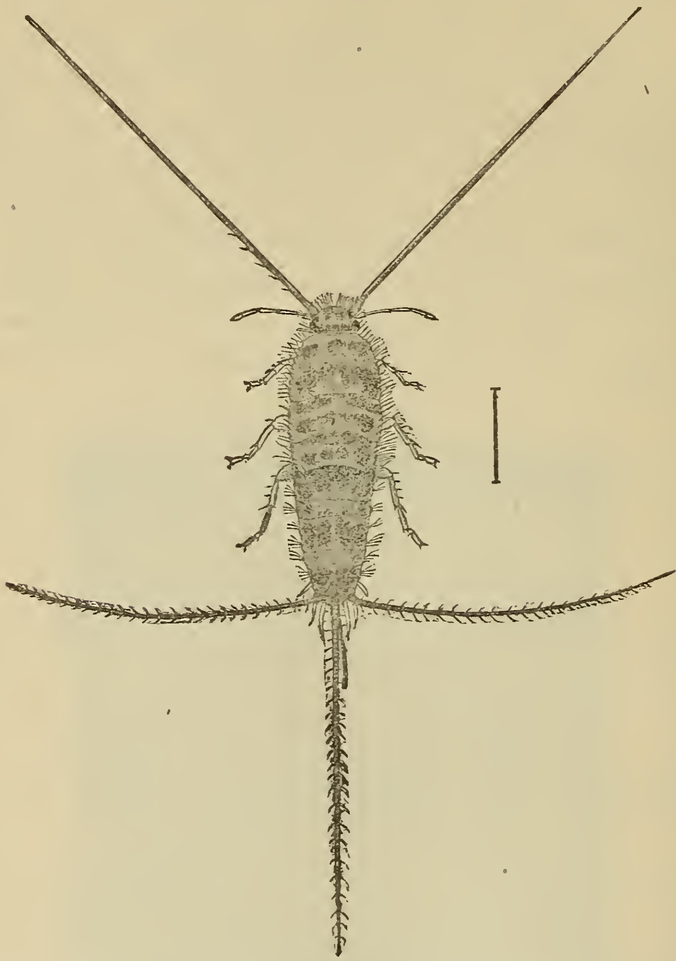


Fig. 16 LEPISMA DOMESTICA (After Marlatt: U. S. Dep't agriculture, Division entomology, Bulletin 4).

practicable. As a rule not much damage is done except in rather moist situations or where objects are undisturbed for a series of years, as in the case of the senate bill illustrated above.

The following are the principal references to this species.

Packard, A. S. Peabody academy of science. 5th Report. 1873. p. 48 (original description).

Lintner, J. A. Insects of New York. 4th Report. 1888. p. 179 (injuring labels, etc., as *Lepisma domestica*); — 6th Report. 1890. p. 190 (eating lace, paper boxes, as *Lepisma domestica*); — 10th Report 1895. p. 519 (mention).

Bergroth, Evald. Entomologica americana. 1890. 6: 233 (referred to *Thermobia*).

Marlatt, C. L. U. S. Dep't agriculture, Division entomology. Bulletin 4 (new series). 1896. p. 76–78, fig. 77 (general account, as *Lepisma*).

EURYPELMA HENTZII *Girard*

Molting of a Tarantula

Class **Arachnida**: Ord. **Araneida**: Fam. **Theraphosidae**

Though not of economic importance and a native of the southern states, this spider has excited so much popular interest that it is deemed worthy of a brief notice.

This large female tarantula, a gift to the division by Dr J. M. Bigelow of Albany, came into my custody last January. For the preceding two years, she had been kept as a pet by her owner, he having secured her from a dealer in bananas and other fruits. At the time the spider came into the doctor's possession, she was nearly half grown. About the latter part of 1896, she molted or cast her old skin, which is in the state collection.

Habits. Though this and related species are said to prey upon insects and other small creatures, this specimen attacked none of the cockroaches and other forms put into her cage or manifested any interest in them during the early part of the year. Meat placed in her cage was apparently untouched. A banana skin excited some attention, but there were no signs of her feeding upon it. Apparently, she had taken only large quantities of water during the first half of the year, though much that was put into her cage must have evaporated. Sometime after molting, she devoured a large piece of fresh meat with great eagerness and subsequently has taken it readily every few days.

Molting. On July 21, the tarantula shed its skin for the second time since it has been in captivity. Those familiar with insects, spiders and related creatures, are aware that they are incased in a hard, more or less unyielding integument. Increase of size is permissible only when the old skin is shed and one that has been newly formed beneath expands to the requisite degree. This is a process constantly occurring in nature and ever excites interest in the beholder. When a large spider, three inches long, throws off the old integument, it is a thrilling sight. In the present case the tarantula had evidently been feeling unwell for some days, a condition frequently preceding this process among insects, and that morning she was found lying on her back and apparently dead, but moved a little upon being disturbed. She lay thus till about quarter past twelve when the rustling her movements made excited attention. The old skin had then ruptured around the thorax in such a manner that the top could be removed entire and through this opening the giant spider was literally working out of her old skin (see plate 6.) This was accomplished by the aid of the eight legs and the two leg-like palpi. At the end of an hour the change had been effected. The spider lay upon her back, beside the perfect skin, resting from the severe exertion.

Some idea of the perfect condition of the skin may be obtained from plates 6, 7, which is a reproduction from photographs of the dorsal and ventral surface of the exuvia. The dorsal aspect (see plate 6) shows very plainly the coxal cavities (*c*) and the line of rupture of the cephalo-thoracic dorsal piece (*a*), which was laid back and to one side in order to give a fuller representation of other parts. The more delicate abdominal covering (*e*) was torn a little during the process of molting and more when the skin was mounted. The position of the eyes (*b*) is shown very nicely on the dorsal covering of the cephalo-thorax. The poison fangs can be seen distinctly between the palpi (*p*) in the view of the ventral aspect (see plate 7). Their shiny black surface reflected so much light that they appear nearly white.

This tarantula was unusually large before she molted and is now of still greater size. An idea of the increase in size attendant upon molting may be gained by comparing the dimensions of the dorsal piece of the skin shed about the latter part of 1896 when under the care of Dr Bigelow and the one cast in July. The first measures 1 inch and the second measures $1\frac{1}{4}$ inches in length. Therefore, the present dorsal piece will probably be proportionately larger when fully expanded.

HINTS ABOUT INSECTICIDES

A knowledge of the life history and habits of most of our insects is at present limited to comparatively few species and the number of well-known forms will probably ever remain relatively small. In spite of this drawback, destructive insects must be controlled or crops will be ruined. In many cases very precious time is wasted if the owner of a field must submit examples of the depredator to an expert at the experiment station or elsewhere, in order to ascertain the proper remedy. While establishing the identity of an insect is extremely important, the farmer, whose corn is being devoured at the rate of an acre a day by the army worm, is more concerned to know the best methods of fighting the pest than to learn its scientific name. Though the injuries by insects are not always so striking as in the case of the army worm, the great advantage in controlling them at the inception of the attack can not be overestimated. It is a well-known fact that many insects succumb more readily to insecticides when young than later. This is not only true of scale insects, but applies to certain caterpillars and other forms. Though insecticides and their action have frequently been explained, the facts show, most conclusively great need of instruction in their use.

How insects feed. Before attempting to control an insect, we must first ascertain how it can be affected. The large amounts of paris green and similar substances used, at once suggest the idea of poisoning its food. But can the insect under consideration be killed in that manner? As paris green is effective only when taken internally, and is practically insoluble in water, it must be eaten with the food before the depredator can be killed. In other words paris green and similar poisons can be employed successfully against those insects only which bite off and swallow their food, and even then it is limited to cases where the poison can be applied to parts eaten. It is not enough to ascertain merely that the pest is one that devours, but the portion of the plant consumed must be known and the application made where it will be eaten. In the case of the apple-tree tent caterpillar, which devours the entire leaf, it makes little difference whether the poison be applied to the upper or under surface of the foliage, except that when on the latter it is less likely to be washed off by rains. It is a very important matter in the case of the elm-leaf beetle, whose larvae feed only on the under side of the leaves, rarely rupturing the upper epidermis, and for this reason poison applied to the upper side of the leaf would have little or no effect on them. Other biting insects are found in places where it is practically impossible to poison their food. Such are the leaf miners, tiny larvae that obtain all their sustenance between the upper and lower epidermis of one leaf, the larvae tunneling apples and other fruits, or the borers in the trunks of trees,

The practical farmer or fruit grower soon learns that another class of insects is not affected by such internal poisons as have been mentioned. Each season several reports are received at my office stating that paris green has no effect when sprayed on trees infested with aphids or plant lice. The simple reason for this is, that these forms belong to a large class known as sucking insects, because they extract the fluids upon which they live through a delicate beak inserted into the tissues. Consequently particles of internal poisons lying upon the surface of a food plant have no effect, as the tip of the tiny beak is beneath the surface when the insect draws its fill. It is not difficult to recognize these sucking insects by their work, and one soon becomes familiar with their general aspect. They never devour portions of plants. The most common evidence of injury is the withering or wilting of either entire leaves or limited portions. A small lens will readily show whether the injury is due to a biting or sucking insect. Some of the more common species falling in this latter class are all plant lice, scale insects and the larger forms like the squash bug, the four-lined leaf bug and their allies.

Operation of contact insecticides. As a rule it is best to protect a plant by applying paris green or other poison to its foliage, provided the insect is one that devours. Otherwise, recourse must be had to contact insecticides, that is, to substances that will kill an insect when brought into contact with it. None of those commonly used are so deadly to insect life, that they will kill by simply touching the victim, at a single point. They operate by closing or choking the breathing pores or spiracles, along the sides of the caterpillar, or they may exert a paralyzing influence through these orifices. Therefore it will be seen at once that success will be in proportion to the thoroughness with which the treatment is performed. Insects not hit by the contact insecticide are unharmed, those barely touched, if affected at all, may recover, Only those well covered with the substance succumb. It is by no means easy to secure the desired results, even with the aid of a good spraying apparatus. Some insects take flight so quickly that it is practically impossible to hit many with a spray. Among these are the small leaf hoppers which are sometimes very injurious to certain plants, and about the only way they can be killed is by catching them on sticky fans or screens carried between the rows. Many plant lice secrete a woolly substance which serves to protect them from the action of insecticides. The drop of honey dew on the young pear psylla and the hard covering of many scale insects serve the same purpose. The attacks of some plant lice cause the leaves to curl and thus they are protected from deadly sprays.

It will be readily seen that the correct application of an insecticide involves a number of considerations. If it is not done properly the effort is useless, and money is lost in the labor wasted and on the poor crop resulting.

Useless remedies. Avoid patent remedial preparations, specially those that are advertised to kill most, if not all insects, and act as a fertilizer in the bargain. A large corps of trained workers in experiment stations and other public positions are at present engaged in searching for new insecticides and in determining the best methods of applying them. Recommendations from such sources can usually be relied upon. Some of the preparations sold in the markets undoubtedly are of value, but they owe their efficacy to well-known substances and not to certain secret compounds. The great objection to this class of insecticides is that the farmer pays several times the value of the article, because it is in a disguised form, and he is usually ignorant of its nature. There are other remedies which are totally worthless, having no intrinsic value of themselves. One of the most persistently advertised of these is the old trick of plugging a tree with sulfur or other substance in order to render the sap distasteful to insects of all kinds. This is a fascinating theory, but has absolutely no basis in fact. The safest way is to disregard all innovations till they have been duly tested at experiment stations or by other known authorities.

Preventives. The old proverb, 'An ounce of prevention is worth a pound of cure,' is most emphatically true in controlling insects. Unfavorable weather, a rush of work or other causes may enable an insect to commit serious injuries before it can be stopped. Repeated rains frequently cause postponement of spraying. It is well known that the period of greatest insect activity is also the time when farmers have the most work on their hands. Another noticeable fact is that the man who practises a wise rotation of crops, keeps his orchard clean and allows no rubbish and brush along the fences, is the one who seldom bemoans loss from insects. It has also frequently been observed that healthy, vigorous plants suffer less from insects than those in a sickly condition. In other words, clean culture with abundant plant food, and a rotation of crops are the best checks upon the undue increase of insect pests.

Need of experiment. The following formulas comprise what are regarded as the most reliable, but must be modified under varying conditions, to meet the demands of the occasion. It should be borne in mind that in many cases it is not so much the insecticide used as the manner of its application, though in some cases the difference is due to a variation in composition. For example, one man will use paris green and not london purple and another the reverse. Yet both have been the object of considerable experimentation and are of nearly equal value, though the latter is said to be more variable in composition. The same may be said of kerosene emulsion and a whale oil soap solution. In the case of these preparations, it is always advantageous to make a few tests. To a certain extent a man may depend upon the experience of others, but he should also ascertain by trial what proportions, with his own apparatus and under the conditions at hand, will give the best results.

Arsenical compounds. These are effective against insects which devour portions of a plant and of value only when placed where they will be eaten. The following formulae are commonly employed:

Paris green	1 pound
Quicklime	1 pound
Water	100–300 gallons

London purple	1 pound
Quicklime	2–3 pounds
Water	100–300 gallons

The more common proportion is at the rate of 1 pound of the poison to 150 or 200 gallons of water, and less should be used on the more tender foliage like that of the peach or there may be serious injury. The addition of lime is not necessary, specially with paris green, but is a wise precaution as is neutralizes any free arsenic acid and thus prevents burning. Paris green can be applied with the bordeaux mixture,[a] at the rate of 4 ounces of the poison to 50 gallons of the fungicide, and in this preparation both fungi and many insects find an effective check.

If desired, paris green or london purple can be dusted on low plants, such as potatoes and asparagus, when they are wet with dew, provided the poison is diluted with from 50 to 100 parts of flour or land plaster.

Another substance which has received high praise and may come into general use after its good qualities become better known, is the arsenate of lead. The value of this compound as an insecticide has been

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a The following formula is taken from *Bulletin 114, Cornell university agricultural experiment station:*

Normal or 1.6% Bordeaux mixture:
Copper sulfate, 6 pounds
Quicklime, 4 pounds
Water, 40–50 gallons.

Dissolve the copper sulfate by putting it in a bag of coarse cloth and hanging in a vessel containing at least 4 gallons of water, so that it will be just covered. Use an earthen or wooden vessel. Slake the lime in an equal amount of water. Then mix the two and add enough water to make 40 gallons. It is then ready for immediate use. If the mixture is to be used on peach foliage it is advisable to add 2 pounds of lime to the above-formula.

brought out by numerous experiments, made in the extensive work against the gypsy moth. One advantage is that it can be applied in very large quantities without injuring the foliage. When properly prepared, it remains for some time suspended in the water, imparting a milky color, and also adheres to the leaves much longer than either paris green or london purple. Its whiteness is another advantage, because of which, it is readily detected upon green foliage.

In order to obtain the best results, the poison should be prepared just before using, by dissolving 11 ounces of acetate of lead (sugar of lead) in 4 quarts of water in a wooden pail, and 4 ounces of arsenate of soda (50 %) in 2 quarts of water in another wooden pail. As the acetate or sugar of lead dissolves rather slowly in cold water, the process can be hastened by using warm water. The resulting solutions should then be poured into the spraying tank containing enough water to give the desired proportions. In most cases this will mean turning them into 100 or 150 gallons of water.[a]

Experiments by those connected with the gypsy moth work and others show that it can be applied in almost any proportion without injuring even the most delicate foliage. In cases where the insect is able to resist the action of considerable poison, as the gypsy moth and canker worm, or where the insecticide must remain on the trees for a considerable length of time in order to be most effective, as in the case of the elm-leaf beetle, or where the delicate foliage prohibits the use of sufficient paris green or london purple, the arsenate of lead will be found invaluable.

One objection to this substance, is the variable composition of the chemicals from which it is prepared. If either is in excess, it should be the lead salt, because that will not injure the leaves. A simple test[b] for soluble arsenic acid, is the addition of a few drops of lead acetate (sugar of lead) solution to a filtered portion of the arsenate of lead solution. A white precipitate indicates the presence of soluble arsenic and more lead acetate (sugar of lead) should be added, or the foliage will be burned by the arsenic.

Compounds of arsenic can not only be sprayed upon foliage, but they can also be used most successfully in the preparation of poisoned baits, specially for cut worms, the army worm and grasshoppers. Fresh clover or other attractive food is dipped in water and paris green, using considerably more poison than when spraying, and bunches of it are distributed over the infested fields. Some form of a mash as, for example, one composed of 1 pound of paris green to 50 pounds of bran, well

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a Proportions recommended by Dr C. H. Fernald.

b Smith, F. J. *Mass. Board of agriculture on gypsy moth. Report*, Jan. 1898, p. 67.

moistened, has been found very effective against cut worms. Some prefer to sweeten it with cheap sugar or molasses, specially for grasshoppers. The disadvantage of the mash is that it soon dries and then is of no value. In experiments against cut worms in onion fields, Mr Sirrine found that either dry bran and paris green in equal parts or 20 pounds of middlings to 1 pound of poison was a very effective bait.

Internal and contact insecticides combined. Hellebore and tobacco may act either internally or kill by contact. One ounce of fresh white hellebore thoroughly mixed in 3 gallons of water is a proportion recommended by Lodeman and Gould,[a] while Dr Smith gives 1 ounce to 2 quarts of water. It may be applied pure or mixed with plaster or flour if desired. It is used largely against currant worms, specially when the presence of nearly mature fruit prohibits the application of paris green.

A strong decoction of tobacco may be prepared by boiling stems and other refuse till a deep brown extract is obtained. A few trials will enable one to ascertain how much this can be diluted and still be effective. It may be used successfully as a contact insecticide against soft bodied insects like plant lice, saw fly larvae and others, and it may also serve as a repellant or poison when applied to plants for the purpose of protecting them from attacks by flea beetles, and many other insects. If in the form of a fine dust, it is a very effective contact insecticide, and may be used with great advantage on the surface or worked into the ground around trees infested with root lice and other subterranean insects. In greenhouses it is very valuable, when stems or leaves are laid around, specially on the heating pipes, as its odor seems to be unfavorable to insect life. There is no easier method of keeping plant lice under control in a conservatory than by fumigation with tobacco smoke.

Contact insecticides. The most important of those commonly used are kerosene emulsion, whale oil soap solution and pyrethrum.

The standard kerosene emulsion is prepared as follows:

Hard soap	½ pound
Water	1 gallon
Kerosene	2 gallons

Dissolve the soap in boiling water and while still hot add the kerosene and emulsify by passing it rapidly through a force pump till it assumes a creamy consistency and oil does not rise to the surface. Dilute with 9 to 15 parts of water. In limestone regions where hard water is the rule, better results will probably be obtained by using the sour milk emul-

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a *Bulletin 114, Cornell university agricultural experiment station.*

sion, which is simply 2 gallons of kerosene and 1 gallon of sour milk emulsified by churning or passing through a pump. Besides being effective against exposed insects on plants, successful experiments on white grubs infesting the lawn around the capitol at Washington, D. C., indicate that kerosene emulsion may also be used against subterranean insects. Though the usual strength recommended is 1 part of the standard kerosene emulsion to 9 parts of water, Mr Marlatt has shown that it may be applied diluted with but 4 parts of water with almost no injury to growing plants (*Insect life*. 1894. 7:116, 117).

Machines now on the market are said to give a reliable water and kerosene emulsion, the two constituents being taken from separate tanks in the desired proportions and emulsified mechanically as they pass through the nozzle. Pure kerosene is also being recommended by some as an insecticide that can be applied to trees in a fine spray on a bright drying day, without serious injury. The results heretofore obtained by different experimentors have been so contradictory that this treatment can hardly be indorsed without qualification. The safest way, as stated by Dr Howard, is for each man to experiment in a small way before he sprays many trees with this substance.

For scale insects, whale oil soap may be applied in winter at the rate of 1½ to 2 pounds in 1 gallon of water, as recommended by Dr Howard. For summer use the extreme strength is given by Dr Smith as 1 pound to 4 gallons of water.

Pyrethrum, Dalmatian or insect powder, when fresh, is a valuable contact insecticide. It is usually applied in the powdered form, is not poisonous to man or the higher animals, and is largely used for household insects, in greenhouses and small gardens. If desired, it can be diluted with flour, in which event it should be mixed and allowed to stand several hours before it is wanted, or it may be used in water at the rate of 1 ounce to 2 gallons of water, it either being boiled or allowed to remain some hours before application. If moistened and molded into cones, it may be burned with very satisfactory results, for the fumes, while not disagreeable to man, paralyze and kill many insects.

Sulfur is a valuable insecticide, specially against mites. In greenhouses it is often strewed on the heating pipes or scattered about the house, and in this way a mild fumigation is obtained that is quite effective in keeping the red spider under control. It is frequently used in poultry houses and applied to stock. Bisulfid of lime[a] is said to be an even better remedy for mites. This is easily prepared by boiling together in a little water equal parts of sulfur and lime, till a brownish liquid results. Use at the rate of 5 pounds of sulfur and 5 pounds of lime to 100 gallons of water.

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a Marlatt, C. L. *Farmer's bulletin* 19. 1897. p. 11.

Fumigation. Carbon bisulfid and hydrocyanic acid gas are the two substances most frequently employed for killing insects within tight inclosures, though the fumes of burning sulfur or pyrethrum are also used to a slight extent. The proportion of carbon bisulfid recommended by Dr Howard, is 1 pound to every thousand cubic feet of space. The grain or other substance to be fumigated must be in a tight vessel or building and the chemical placed in shallow vessels near the top of the inclosure, because the heavy, poisonous vapor from this liquid descends rapidly. As carbon bisulfid is inflammable and its gas explosive, great care must be exercised that no fire is brought near during fumigation. The period of exposure to this insecticide should vary somewhat according to the mass treated. Grain in large bins should be subjected to its action for a day or two. As carbon bisulfid evaporates rapidly, treatment with it does not injure grain for food purposes and unless unduly prolonged, will not affect its germination to an appreciable extent.

This substance is also very effective against root-inhabiting forms. In the case of trees and vines, holes should be made with an iron bar about 1½ feet apart and 1 foot deep over the area occupied by the roots, but no hole should be within a foot of the trunk. Use ½ ounce[a] of carbon bisulfid to each hole and close the top at once with soil. In the case of cabbage plants make a small hole ⅔ inch from the plant and pour in a teaspoonful of the insecticide, closing as before. This chemical may be used against ants, it being advisable, as recommended by Dr Lintner, to cover the nest with a damp blanket, and at the expiration of a few moments the accumulated vapor under the blanket should be exploded by a light on the end of a pole. The explosion drives the fumes deeper into the nest.

The treatment of trees infested by scale insects with hydrocyanic acid gas has been carried on for some years in California. The introduction of the San José scale into many states east of the Rocky mountains, has led to fumigation being used to a greater or less extent in this region. By some it has been reported entirely effective and others have had different results. In most cases it will be found advisable to destroy young trees infested with the San José scale, though when large numbers are but slightly infested, thorough fumigation with hydrocyanic acid gas may be preferred. This treatment is also recommended for nursery stock showing the presence of other pests, as the more common scale insects, plant lice or aphids, pear psylla, apple-leaf *Bucculatrix* and other forms that are

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[a] The quantities and distances are those recommended by the Division of entomology, U. S. Dep't agriculture.

known to be injurious. Aside from the additional handling and the initial cost of the apparatus, the expense is but little. The value of the chemicals used has been estimated by Professor Johnson at not over 2 cents per 1000 nursery trees. The following formula is one commonly recommended[a]:

Fused cyanide of potassium, 98% pure	1 oz. by weight
Commercial sulfuric acid	1 oz. by measure
Water	3 oz. by measure

The amounts given can be safely used on dormant nursery stock for each 100 cubic feet of space, as reported by W. R. Gunnis, chairman of the San Diego county board of horticultural commissioners (Howard, Bull. 3, U. S. Dep't Agr., Div. Ent. 1898, p. 60). Prof. Johnson states that repeated fumigation will not injure nursery stock and that if necessary the above amounts may be safely used to every 75 cubic feet of space.

If no San José scale is present, the above quantities should be sufficient for 150 cubic feet. Expose the stock to the action of the gas for one hour. It will be found necessary to construct some form of a receptacle in which to conduct the treatment. This may be simply a tight box that can be inverted and its edges banked with earth, or one with covers, or even a building or portion of one, as circumstances may dictate. It must be practically air tight, easily and quickly ventilated and the stock should rest on a grating or other support that will permit ready access of the fumes on all sides. The earth should be removed from the roots of the stock so far as practicable before fumigation. The gas should be generated as near the center of the lot to be treated as possible and in case of large amounts, several generators should be used and so placed that a rapid and uniform distribution of the gas will be insured. The cyanide must be kept in tight bottles in a safe place, as it is a volatile, deadly poison. The cubical contents of the fumigating chamber should be estimated, the cyanide weighed out in amounts sufficient for a treatment and put in paper bags. Pour the acid slowly into the water, stirring the mixture constantly, otherwise drops may fly and burn those in the vicinity. After the stock is properly arranged, pour the necessary amount of dilute acid into a glazed earthen vessel, place the cyanide while still in the paper bag into the acid and water, and close the fumigator. The advantage of putting the cyanide into the acid and water while still in the paper bag is that it prevents sputtering, which is

[a] Prof. W. G. Johnson, state entomologist of Maryland, as a result of a large series of experiments performed last year and the present season, recommends a slightly different formula. He advises the use of 1 ounce of cyanide of potassium, 1½ ounces of the best grade of commercial sulfuric acid and 2¼ ounces of water to 113 cubic feet of space. In his experience, a more perfect reaction between the chemicals is obtained by modifying the formula as given above.

specially liable to occur when large amounts are used. Great care should be exercised in handling the cyanide, the acid, and in opening after fumigation. The substances used are deadly. Even a slight burn from sulfuric acid is very painful.

Recent experiments by Prof. Johnson show that in Maryland growing trees can be treated with this gas and every scale insect killed. The results obtained in some other eastern states are not so favorable, and, as an outfit for trees of any size is quite expensive, it is hardly probable that it will come into general use, unless it is undertaken by experienced persons who would go from place to place and fumigate wherever desired. It can be used to very good advantage in freeing greenhouses from animal pests of all kinds, and when it becomes better known may be more generally employed. In treating the various plants in greenhouses, the amount of gas necessary would not be so great as in the case of the San José scale. The formula given above would produce enough gas for at least every 150 cubic feet of space, and the action should not be continued over 30 minutes. Dr Jabez Fisher, of Fitchburg, Mass., recommends the use of this amount in greenhouses for from 1,000 to 2,000 cubic feet of space, allowing the gas to act all night (*American gardening*. 1898. 19 : 741).

NOTES ON SOME OF THE INSECTS OF THE YEAR IN THE STATE OF NEW YORK[a]

The present season has been characterized by the scarcity of plant lice, only one or two complaints being received, whereas in 1897, reports of injuries by these insects came from all quarters. The foliage of the forest and shade trees appears to have suffered more than usual. In Albany and other cities and towns in the state, the white marked tussock moth, *Notolophus leucostigma* Sm.-Abb., and the elm-leaf beetle *Galerucella luteola* Müller, have been more injurious than usual. In the rural districts the tent caterpillars have wrought havoc in orchard and forest.

Eriocampoides limacina *Retzius.* The cherry or pear-tree slug causes more or less injury from year to year in New York state, specially is this true of nursery stock. During the inspection of nurseries last autumn, indications of its presence on pear-trees was the rule and in some cases the foliage had been materially injured. Last June Thomas Tupper, of Corning, N. Y., reported a serious injury by this insect to both his cherry and pear trees.

Saw toothed grain beetle.[b] The following interesting case of longevity in the adults of this species, *Silvanus surinamensis* Linn., is deemed worthy of record. May 26, 1896, examples of this minute beetle were brought into the office by Mr S. C. Bradt of Albany. After killing a few examples, the remainder were placed in a box with some flour in the hope that they would continue to breed. On August 26 of that same year, three individuals were transferred to clean flour in another box for the purpose of closer observation. Every few days or a week, the box was examined to see whether breeding had commenced, but no signs of increase were visible. Two were accidentally crushed July 31, 1897, which was over a year from the time they had been received and 11 months after they had been isolated. The remaining individual continued bright and active and finally disappeared between June 15 and 25, 1898. It had probably been allowed to escape by accident. This latter example had been under close observation for nearly 22 months, and since it was an adult when placed with its two companions in a separate box, it may have been several months older.

As a check upon this series of observations, seven beetles were confined with some samp in a tightly corked vial, Sep. 4, 1896, and notes were made of their condition. During the entire time there were no signs of

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a Read before a meeting of the Association of economic entomologists held at Boston, Mass., August 19, 1898. A few additions have been made.

b Added subsequently.

breeding. On Aug. 30, 1897, but two of these beetles were alive and active. Between November 15 and December 9, one of these two died, but the remaining one is still bright and active at this date, Nov. 18, 1898, and has therefore lived for over 26 months under close observation with no better food than dry samp. The above record shows beyond doubt that these beetles can maintain life for long periods of time under comparatively unfavorable conditions.

Byturus unicolor *Say.* The latter part of May Dr Peck, state botanist, brought me several beetles belonging to this species, with the statement that from one to five were to be found in many of the opening buds of his raspberry plants where they were evidently feeding. This insect does not appear to have been noticed in the state since Dr Fitch gave a brief account of it in his 14th report for 1870, though Dr Lintner records in his 8th report for 1891, its receipt from New Haven, Ct., where it had been injuring leaves and buds of the raspberry.

Elaphidion villosum *Fabr.* Complaints of injuries by the oak or maple-tree pruner have come from several localities the present season. Serious injuries were reported to me from Lake George and also from Oakes, Ulster county, where its operations had been observed for several years past.

Galerucella luteola *Müller.* The prolificacy of the imported elm-leaf beetle was brought very forcibly before me by certain studies made in connection with the preparation of *State museum bulletin 20.* The last day of May, I captured two beetles well distended with eggs and determined to ascertain for myself the number they would produce. One was confined in a small, corked vial, and the other in a jelly tumbler. As might be expected, there was considerable difference in the number of eggs deposited, the former producing 431 and the latter 623. A portion of the discrepancy was probably due to disparity of conditions and the remainder must be attributed to a variation in capacity. In order to bring out certain points clearly, I have tabulated the record.

Record of eggs deposited by two elm-leaf beetles

	FEMALE IN VIAL		FEMALE IN TUMBLER	
DATE	CLUSTERS OF	TOTAL	CLUSTERS OF	TOTAL
June 1	(2)	29	(4)	42
June 2	....	....	....	....
June 3	9, 9, 14	32	18	18
June 4	....	....	....	....
June *5*	....	....	....	....
June 6	18	18	26, 21	47
June 7	....	....	....	....
June 8	15	15	4, 26	30
June 8 (2 p. m.)	20	20	....	....
June 9	....	....	27	27
June 10	20	20	(3 p. m.) 3, 31	34
June 11	23	23	....	....
June *12*	....	....	....	....
June 13	11, 13	24	3, 7, 8, 11, 15, 19	63
June 14	31	31	....	....
June 15	16, 5	21	14, 27	41
June 16	28	28	30	30
June 17	....	....	32	32
June 18 (absent)	....	....	....	....
June *19*	26, 30	56	10, 26	36
June 20	2, 6	8	36	36
June 21	3, 18	21	6, 25	31
June 22	2, 20	22	4, 31	35
June 23	27	27	1, 2, 11, 7, 13	34
June 24	....	....	....	....
June 25	....	....	....	....
June *26*	....	....	....	....
June 27	5, 7, 9, 15	36	13, 21, 32	66
June 28 (dead)	....	....	(dead) 4, 17	21
		431		623

It will be seen that from June 1 to 11 there were usually deposited between 15 and 47 eggs every other day. The 12th being Sunday, I did not attend to the beetles, but from there being two or more clusters found with each on Monday, it is probable that one or more were deposited the preceding day. The record shows that from either the 12th or 13th there was a marked increase in the number of eggs laid till the 23d, there being, as a rule, from 8 to over 40 deposited daily. In the case of the one confined in the vial, the record shows a discrepancy, which is greater than the facts warrant. I was unable to attend to the insects on the 18th, consequently it appears as though two days during this period had been skipped by one beetle and one by the other, whereas it is probable that but a day passed without the beetle in the vial depositing eggs and that the other really presents an unbroken record in this respect. During this short period of 10 or 11 days there were deposited over half of the total number of eggs produced during the 28

a The examinations were made as a rule, between 8.30 and 9 a. m., though occasionally, when eggs were seen in the afternoon, they were recorded at the time indicated in the table. The dates falling on Sunday are in italics and as a rule no observations were made then.

days a record was kept, the figures being 238 and 338, or an average of over 21 and 30 eggs per day respectively. The average numbers deposited during the first 11 days of the month are 14 and 18 respectively, which shows there was an increase of one-half or more in the case of each beetle after June 11. Those deposited after the 25th were apparently the last efforts of the insects to provide for the perpetuity of their kind, though the quality of the eggs had not deteriorated.

During the whole period the beetles were under observation, they consumed large quantities of foliage, comparatively speaking. Many leaves of the trees outside were also badly riddled by their feeding. If we consider for but a moment the relatively large bulk of eggs produced by the beetles, it is not surprising that they require a large amount of food. Without attempting to make precise measurements, it would seem that a cluster of 30 eggs would present, after deposition, a bulk about equal to that of the parent insect. If this be a fair estimate, they produced on the average from nearly one-half to nearly two-thirds of their bulk in eggs daily during the first 11 days in June and from the 12th to the 23d the daily average was from over two-thirds to an equal bulk. This rapid elaboration of eggs must make a large demand upon the system and require an abundant food supply.

Lest it be thought that the period of oviposition was abnormally prolonged, I would state that recently deposited eggs were to be found on the trees up to July 9. This record indicates most emphatically the value of spraying to kill the beetles, specially before they have reached the more prolific period mentioned above.

A few notes confirmatory of previous records concerning the life history of this insect in Albany and Troy will undoubtedly be of interest. The last of the overwintered beetles were seen early in July. On the 16th, recently transformed adults were easily found, and fresh eggs a few days later, either singly or in small clusters, indicated the beginning of oviposition by the second brood. On 12 August, Mr P. C. Lewis, who had charge of the spraying in Albany, informed me that the second brood of larvae had been quite injurious in certain parts of the city and that the beetles, ever on the watch for tender foliage, riddled the leaves very quickly. A visit to Troy on the 13th showed that practically the same conditions prevailed there. Soon after the foliage appeared it was attacked by the beetles and by the time the leaves were about half grown many larvae were to be found upon them. The injury to the elms in Troy by the first brood of larvae exceeded that of the preceding two years, because it was not only much more extended but the skeletonizing of the leaves was more thorough. As a rule all the European elms were practically defoliated. The same would have been true of Albany were it not for the spraying done.

An interesting feature in the latter city was the more extended injury sustained by the American elms. In Troy comparatively few of this species appear to have suffered much. The same was true of Albany two years ago. Last year considerable injury was inflicted and the present season much more in spite of the spraying. It should be stated that rainy weather just after the larvae hatched marred the efficiency of the work seriously. A few of the American elms in Albany have lost nearly every leaf and hundreds have been so affected that they present a more or less browned appearance. In Watervliet, where American elms abound, the ravages have been frightful, including practically all the elms.

Galerucella cavicollis *LeC.* In his 11th report Dr Lintner noticed this insect briefly and gave its earlier history. The species is one that is apparently changing its habits and becoming destructive. Mr Tupper, of Corning, N. Y., submitted examples of this insect and leaves from his cherry-trees, with the statement that they were injuring the trees seriously and might kill them. This is the second record of a recent attack on cherry in New York state by this species.

Notolophus leucostigma *Sm.-Abb.* The larvae of this species were unusually destructive in Albany this season. Not only were a large number of horse chestnuts defoliated, as frequently occurs from year to year, but many of the maples and lindens were seriously injured. On some trees the caterpillars were so abundant as to cause an unpleasant odor. It appears nearly impossible to secure adequate protection for trees along the streets, unless it is undertaken by the municipal authorities. The private individual who inquires what he should do to protect his trees after two-thirds of the foliage is destroyed, usually neglects to take proper precautions to prevent trouble another season.

The injuries by this species in Buffalo have been so general as to excite considerable attention from the public and have led to the issuing of a special circular by the board of public works, giving directions for controlling the insect. It was also reported as very abundant at Flushing, L. I.

Ravages by tent caterpillars. In early spring a number of reports came to me of the extraordinary abundance and destructiveness of the apple-tree tent caterpillar, *Clisiocampa americana* Fabr. In many localities the larvae stripped the trees and nearly covered the naked limbs with their webs. Such work was clearly the result of neglect and yet Mr S. D. Willard, of Geneva, who cares for his trees each year, informed me that this insect caused him considerable trouble last spring, notwithstanding his efforts to keep it under control.

Last year the so-called forest tent caterpillar, *Clisiocampa disstria* Hübn., was very injurious in certain parts of the state, stripping the foliage from hundreds of acres of maples and other trees in Delaware county and in other portions of the state. It was hoped that the ravages by this species would not be repeated the present season, but such was not the case. Examples of this caterpillar were received from Glens Falls, N. Y., on June 2, with the statement that they were very numerous and injuring the maples seriously. At Trenton Falls, N. Y., the caterpillars were very abundant, and injurious in the woods, though the trees were only partially defoliated. At Russell, St Lawrence county, the leaves were stripped from 125 acres of maple-trees, most probably by this species. It was also reported to me as very injurious this year in Otsego, Delaware and Greene counties.

Mamestra picta *Harris*. A remarkable abundance of larvae in timothy hay was brought to my notice on July 13. Mr W. C. Browning, of Alexandria Bay, states that he had been putting in hay from a 20-acre lot and the next morning found the surface of the mow literally alive with caterpillars, identified from examples sent as those of this species. Large numbers must have been present in the field, as they had probably been gathered up with the hay accidentally. In response to an inquiry, Mr Browning informed me that the caterpillars had not been observed except on this field. Last year they had entirely destroyed his crop of oats, and this season they were much more numerous than before.

Xylina antennatta *Walker*.[a] One of the most interesting and remarkable outbreaks of the year occurred at Schenectady, N. Y., when hundreds of silver maples were defoliated by the caterpillars belonging to the species named above. My attention was called to the insect by a young man bringing me about ½ pint of larvae with a story of their destructiveness. On visiting the city, it was found that the reports were true. The soft maples were practically stripped. Numerous larvae were seen on the trunks, in some cases 50 to 100 on a single tree. Many were seen along the walks and in the roadways bordered by the maples. Even were one deprived of sight, the olfactory organs could easily detect their presence from the peculiar odor emanating from the hosts of caterpillars. There were no indications of the insects' work in Albany, though only 17 miles distant, but along the Mohawk river as far west as Herkimer, on the Raquette river in St Lawrence county and in Schoharie county many soft maples were defoliated, indicating the work of the same insect, possibly, though the species could not be determined because no examples were submitted. The

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a Determined by Drs H. G. Dyar and J. B. Smith.

ravages in some of these localities may have been caused by the forest tent caterpillar, *Clisiocampa disstria* Hübn.

I have found no record of serious injury to maples by this species, though Dr H. G. Dyar, in a recent letter identifying the insect, informs me that it is somewhat injurious to soft maples at Bellport, Long Island, but that they were less common than usual the present season. This insect, or closely allied species, has been known for a number of years as injurious to apples and pears, and in 1896 and 1897 it caused considerable damage in this state to these fruits, but this appears to be the first record of serious injury to soft maples by a species of *Xylina.*

An elm-leaf miner. This insect has been unusually destructive in Albany and Troy the present season. For the past three years the Camperdown elms in Washington park, Albany, have suffered rather severely from this species. The present season the miner not only seriously injured the Camperdown elms but extended its ravages to the

Fig 17 Work of the elm-leaf miner (original).

English, Scotch and American species. From half to two-thirds of the leaves on certain English elms in Troy were nearly destroyed by this insect (fig. 17), and many others presented a sorry appearance on account of the numerous mines.

Chermes strobilobius *Kalt.*[a] The form of this species[b] which occurs on the larch has been under observation for the last three years in Washington park, Albany. On May 3 the larches were alive with females and eggs. Large masses of eggs were to be found at the base of nearly every fascicle of leaves on some limbs. Over 200 were counted in an egg mass of moderate size, while around the base of other fascicles two to three times this number were to be found. At this time the young were beginning to hatch and some had settled on the larch needles, where they presented a close resemblance to black grains of gunpowder. In the course of a few weeks, these young increase in size and excrete an abundant white woolly matter. They were so thick on the trees in 1897, that the latter part of June the larches appeared as though dusted with flour or starch.

The life history of this species, as worked out by European investigators, is most interesting, comprising, as it does, a life cycle of two years' duration, and passing through five generations. Briefly, it is as follows: 1) Wingless female lice pass the winter at the base of young pine buds, produce galls in the spring and in them winged 2) females develop, part of which migrate in August to the larches and lay eggs upon the needles. From these eggs emerge 3) young which hibernate in the crevices of the bark and the following spring attack the base of the buds and produce the eggs which attract attention on the larches, and from which the black 4) young emerge, a portion eventually developing into winged females, and returning to the pines the latter part of May (probably later in this latitude, as this generation is abundant upon larches till the last of June), where they lay eggs producing 5) males and females, which in turn are parents to the hibernating form first mentioned and thus the life cycle is completed.

So far as known, this is the first record of the occurrence of this species in America. The following synonyms are those given by Dr Cholodkovsky[c]: *Chermes coccineus* Ratz.? in part; *C. laricis* Ratz., Koch in part; *C. geniculatus* Ratz., in part; *C. hamadryas* Koch; *C. atratus* Buckton?; *C. lariceti* Altum?

Pemphigus tessellatus *Fitch.* This insect, the alder blight aphis, has been abundant the past two years on a cut leaved alder in Washington park, Albany, and eventually injured it so much that the tree was removed. It occurs in masses on the under side of the twigs, sometimes being so numerous as to be 'hanging in strings' from the limbs. The

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a Added subsequently.
b Identified by Dr N. Cholodkovsky, of St Petersburg, Russia.
c *Beiträge zu einer Monographie der Coniferen-Läuse.* 1 Theil, Kapitel 5–7, 1896. p. 46.
d Added subsequently.

abundant secretion of waxy threads renders it very prominent. The photograph of the adult colony represented in fig. 18*a* was taken July 1. About this time the young (fig. 19) appear in large numbers and found colonies near the tips of the smaller branches. Fig. 18*b*, of a young colony, is from a photograph taken July 16. This insect occurs not only on species of alder but also attacks birch. It has an enemy in the little orange butterfly, *Feniseca tarquinius* Fabr., the larva of which lives in the colonies and devours the aphids.


a b

Fig. 18 Adult females and young of PEMPHIGUS TESSELLATUS (original).

Pulvinaria innumerabilis *Rathv.* This destructive scale insect is being constantly brought to notice here and there in the state, though during the past few years it appears to have been less destructive than usual. On July 5 this scale was reported as injuring the elms seriously at Sandy Hill, N. Y., and affecting the maples to a less extent. At that time the young had not left the protecting filaments of the mother, though they were numerous in the cottony secretion. A few days later twigs of maple were received from Baldwin, L. I., their condition revealing a very serious attack. One side of each twig was nearly covered by the adults while the young fairly swarmed over everything (fig. 20). I have also received twigs badly infested with this scale from Batavia, Patchogue and Flushing, N. Y., and Arlington, N. J.

Fig. 19 Young of PEMPHIGUS TESSELLATUS (original).

Lecanium armeniacum *Craw.* One of the interesting features of the year was the detection of this scale, identified by Mr Pergande, in Erie county, N. Y. In response to inquiry about its introduction, Mr Hayes stated that he could not account for it in any manner. The vine upon which the species was found had been planted 10 years. His neighbors had not set out any Californian stock and he had used no fruit from that state for several years. A possible source of introduction is the sending to this state in 1896 of examples of this scale infested with *Comys fusca*, by Mr Ed. M. Ehrhorn, Horticultural commissioner of Santa Clara county, California. This was done, it was stated, in the hope that the parasite would attack the New York plum scale.

Lecanium cerasifex *Fitch.* This scale, identified as probably this species by Mr Coquillett, has been very injurious to several soft maples in Albany the past two or three years. The trees have been dwarfed by the attack and each summer are more or less blackened by the copious honey dew secreted by the insects. Many of the limbs were nearly covered with the scales on their under surface and during a portion, at least, of July and early in August the young swarmed over branches and leaves

San José scale. This pest, *Aspidiotus perniciosus* Comst., has demonstrated its ability to thrive in the Hudson river valley as far north as Albany, at least. Just across the river at East Greenbush, an infested fruit garden has been under my eye for over a year. The scale has spread in spite of the efforts of the owner, who used whale oil soap to some extent. It has ruined many currant bushes, and badly stunted a number of pear trees, besides infesting to a certain degree peach and apple-trees. On the 9th of last July, numerous young were to be found on the more tender shoots, some appearing as though dusted with pollen on account of

Fig. 20 Young of PULVINARIA INNUMERABILIS on maple leaf (original).

the larvae clustered at their tips. Developing scales were found in small numbers on the leaves and abundantly on the fruit. At its present rate of multiplication, most of the young trees in that garden will be ruined iu a few years. Only this spring, I found the scale at Lebanon Springs, some 20 miles from the Hudson river, and at an elevation of 900 feet — 29° below zero being known in that locality. Even when exposed to such extremes of temperature, and probably outside the limits of the upper austral life zone, the insect had been able to not only hold its own but had increased some, as the few trees infested were badly covered with the scale. It had spread very little, though the trees had been set out since 1895. This is evidently near the limit where climatic conditions are too severe to permit of its becoming a very injurious pest. The known distribution of this scale in the state is very interesting, since it has been found in localities here and there throughout most of the area lying within the limits of the upper austral life zone. It has been reported from localities in every county in the state east of the Hudson river, except Westchester and Washington and from those on its west bank south of Warren county, except Greene and Rockland. The following are the localities: Rensselaer county, East Greenbush; Columbia county, Lebanon Springs, Kinderhook and Germantown; Dutchess county, Poughkeepsie; Putnam county, Brewster; New York county, New York; Saratoga county, Burnt Hills; Albany county, Loudonville; Ulster county, Boiceville; Orange county, Middletown. Besides localities on Long Island, it has been found in Tompkins county at Ithaca; in Seneca county at Farmer and in Cayuga county at Union Springs.

LIST OF PUBLICATIONS OF THE ENTOMOLOGIST

The following is a list of the principal publications of the entomologist during the year 1898, 73[a] are named, giving title, place and time of publication and a summary of the contents of each.

Corn-root worms. (Country gentleman. Feb. 10, 1898. 63: 107, col. 1, 2—16 cm)

From reading an account of the life history and habits of *Diabrotica longicornis* Say, a correspondent is led to inquire as to the identity of an insect which operated destructively on corn at Colora, Md., in 1895. In reply it is stated that the author of the attack is most probably the southern corn-root worm, *Diabrotica 12-punctata* Oliv., and preventive measures are given.

Kerosene emulsion. (Country gentleman. Feb. 17, 1898. 63: 126, col. 4—10 cm)

Directions are given for the preparation of the standard kerosene emulsion, and its proper dilution for use against several insects indicated. Continual experimenting to find the best strength for different insects and plants is recommended, and the method of application given.

Scurfy bark louse. (Country gentleman. Feb. 17, 1898. 63: 127, col. 1—10 cm)

A small piece of apple-tree bark from a correspondent in Babylon, N. Y., was found to be infested with *Chionaspis furfurus* Fitch. The scale is briefly described and the application in June of kerosene emulsion or whale oil soap solution recommended for its destruction.

A very different bug. (Country gentleman. Mar. 3, 1898. 63: 166, 167, col. 4, 1—11 cm)

A correspondent in Wyncote, Pa., sends an example of the two-spotted lady-bird, *Adalia bipunctata* Linn., and inquires if it is the Buffalo carpet beetle. The chief characters of this *Adalia* and of the Coccinellidae in general are given, and their beneficial habits mentioned. The carpet beetle, *Anthrenus scrophulariae* Fabr., is briefly described.

Two bad insects. (Country gentleman. Mar. 17,1898. 63: 206, col. 3, 4—19 cm)

Apple twigs infested with the apple-tree bark louse, *Mytilaspis pomorum* Bouché, and others with the San José scale, *Aspidiotus perniciosus* Comst., were received from Brewster, N. Y. The climate of this state is congenial to the latter scale, as is shown by its large numbers at East Greenbush, N. Y., and its known distribution in the state is given. Badly infested trees should be burned— reference is made to the directions for using kerosene and remedies given for the apple-tree bark louse.

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[a] This includes also Dr Lintner's 12th report, which was issued the present year.

Codling moth. (Country gentleman. Mar. 24, 1898. 63 : 226, col. 1, 2—14 cm)

A correspondent from Beaver Creek, Col., communicates a larva of the codling moth, *Carpocapsa pomonella* Linn., and inquires if it is the insect causing patches of dead bark on his apple-trees. It is stated that this species is not a wood borer and farther search for the cause of the trouble is recommended.

Bees injuring grapes. (Country gentleman. Mar. 24, 1898. 63 : 226, col. 2, 3 — 14 cm)

Complaint is made from Dutchess county that bees injure sound fruit and inquiry is made of their habits in this respect. In reply, it is stated, that there is no reliable evidence of bees attacking uninjured fruit, but that species of *Vespa*, 'yellow jackets,' are known not only to attack sound fruit but even kill honey-bees. The exposure of a mixture of honey and sugar or glucose is advised as a palliative of the evil.

Not San José. (Country gentleman. Mar. 24, 1898. 63 : 226, col. 3—5 cm)

Limbs of an apple-tree from Ulster co., believed to be infested with the San José scale, show no traces of that insect, only a few examples of the woolly aphis of the apple, *Schizoneura lanigera* Hausm., being found on the twigs.

Aphids in greenhouse. (Country gentleman. Mar. 31, 1898. 63 : 247, col. 1—8 cm)

In response to a brief inquiry of how to rid a house of the green-fly, the method of smoking for aphids with moistened tobacco stems is described. Pyrethrum, hellebore, kerosene emulsion or a whale oil soap solution is also recommended.

Eel worms in clover. (Country gentleman. Ap. 7, 1898. 63 : 266, col. 1, 2—33 cm)

Dead clover roots, received from Seal, Pa., showing a spongy texture and with the interstices filled with a pale brownish powder, have most probably suffered from the attack of eel-worms. Their general characteristics and life history are given, and the work in England of *Tylenchus devastatrix* Kuhn. is briefly described.

[The elm-leaf beetle] (Troy daily times. Ap. 7, 1898.—13 cm)

Responding to an inquiry, it is stated that the ravages of the elm-leaf beetle in Troy will probably be greater the coming season than last year. Spraying the trees with arsenites and destroying the larvae and pupae on the trunks and about the infested trees are recommended.

It is San José. (Country gentleman. Ap. 14, 1898. 63 : 286, col. 3—5 cm)

Scales abounding on pieces of Japan plum bark received from Woodstown, N. J., are identified as the San José scale, *Aspidiotus perniciosus* Comst. Destroying the infested tree and watching others in the vicinity is recommended.

Probably not efficient. (Country gentleman. Ap. 14, 1898. 63 : 286, 287, col. 4, 1—14 cm)

In response to an inquiry from a Long Island correspondent, the manner of preparing and using the lime, sulfur and salt wash for the San José scale is given, though it has little or no value in the eastern states.

Bag or basket worm. (Country gentleman. Ap. 21, 1898. 63: 307, col. 1, 2—17 cm)

Examples of the larval cases of this insect, *Thyridopteryx ephemeraeformis* Haworth, were received from New-Dorp, N. Y., with an inquiry as to their nature. The insect is briefly described and its life history given. Hand picking and spraying with paris green are the remedies recommended.

[a] Twelfth report on the injurious and other insects of the state of New York, for the year 1896. Albany. University of the State of New York. 1897. [Issued Ap. 22, 1898] 242p. 15pl. (In 50th report on the New York state museum, for the year 1896. Albany. University of the State of New York. 1898) [Issued June, 1898]

CONTENTS

[a] By J. A. Lintner

[The city's shade trees] (Troy daily times. Ap. 25, 1898—18 cm)

The ravages of the elm-leaf beetle, *Galerucella luteola* Müller, in Troy are referred to and the necessity of prompt action in order to save the elms emphasized. The appearance of the beetles in the early spring and the method of spraying is described. Action by the civic authorities is about the only method affording adequate protection to the trees.

[Elm-tree beetle] (Argus [Albany] May 15, 1898. p. 7, col. 2—20 cm)

Popular misapprehension concerning the value of cotton bands around the trunks of elms as a preventive of injury by the elm-leaf beetle, *Galerucella luteola* Müller, is corrected Spraying with arsenites is recommended, or, if that can not be done, the destruction of larvae and pupae around the base of the trees is a check upon the insect.

The punctured clover-leaf weevil. (Country gentleman. May 26, 1898. 63: 406, col. 3, 4—31 cm)

Greenish larvae with a white dorsal stripe injuring clover in Monroe county are identified as those of *Phytonomus punctatus* Fabr. Its earlier record, distribution and life history are given briefly. A fungus disease, *Empusa sphaerosperma*, is frequently very destructive to the larvae of this insect. Plowing infested fields is about the only satisfactory remedy for this pest.

Codling moth. (Country gentleman. May 26, 1898. 63: 406, col. 4—9 cm)

In response to an inquiry from Ilion, N. Y., brief directions are given for spraying to prevent the ravages of *Carpocapsa pomonella* Linn.

To destroy ant hill. (Country gentleman. June 9, 1898. 63: 446, col. 2—8 cm)

Method of treating ant hills with carbon bisulfid is briefly detailed.

Forest tent caterpillar. (Country gentleman. June 9, 1898. 63: 450, col. 4—5 cm)

Short notice of the ravages of *Clisiocampa disstria* Hübn. last year and reference to its abundance this season.

Certain destructive scale insects. (Country gentleman. June 9, 1898. 63: 453, 454, col. 3, 4, 1—70 cm)

Gives a few general remarks on scale insects and their detection, which is followed by the life histories and remedies in brief for the apple-tree bark louse, *Mytilaspis pomorum* Bouché, and the scurfy bark louse, *Chionaspis furfurus* Fitch. The resistance of the San José scale, *Aspidiotus perniciosus* Comst , to the severe climate 20 miles back from the Hudson is commented upon. The characteristics, life history and remedies for this scale are briefly given.

Apple-tree bark louse. (Country gentleman. June 9, 1898. 63 :454, col. 1, 2 — 15 cm)

Mytilaspis pomorum Bouché and *Dolerus sericeus* Say are identified. Some observations are given on insect legislation, and the scope of a practical law indicated.

Cut worms. (Country gentleman. June 16, 1898. 63:470, col. 2, 3—14 cm)

In response to an inquiry from Columbia county requesting remedies for cut worms injuring cauliflower and cucumbers, digging them out or the use of poisoned baits of several kinds is recommended.

Black ants. (Country gentleman. June 16, 1898. 63:470, col. 3—5 cm)

A complaint from Broome county states several means found of no avail against black ants. Reference is given to directions in the preceding number of the *Country gentleman* for treating the nests with carbon bisulfid.

Cherry-leaf beetle. (Country gentleman. June 16, 1898. 63:471, col. 3—5 cm)

Records an attack by *Galerucella cavicollis* LeC. on cherry-trees in Steuben county.

Brown apricot scale. (Country gentleman. June 16, 1898. 63: 474, col. 1, 2—23 cm)

Scales on a grapevine from Erie county, N. Y., are identified as *Lecanium armeniacum* Craw, and briefly described. It is stated that possibly in attempting to transport its parasite, *Comys fusca*, the scale was also brought into the state. It would be well to stamp the insect out at once if possible. The remedies given are treatment with kerosene emulsion or a whale oil soap solution. Farther information respecting its introduction is requested.

[See page 239 of this report]

[Destructive maple caterpillar] (Schenectady daily union. June 20, 1898. p. 2—37 cm.)

Gives briefly the injuries to silver maples in Schenectady, N. Y , by a caterpillar which is probably *Nadata gibbosa* [since identified as *Xylina antennata* Walker]. Its life history is briefly summarized and a second brood stated to be a possibility. It is unlikely that it will be injurious another season, but it is advisable to destroy all the larvae possible around the trees with hot water or kerosene emulsion. A caution is given about cutting back the defoliated trees.

[See pages 207–13, 235, 236 of this report]

Address delivered before the Dana natural history society, at the field meeting held at Trenton Falls, N. Y., June 17, 1898. (Albany evening journal. June 21, 1898. p. 8, col. 4, 5—46 cm)

The incentives to entomological study, as shown by the large number of insects and the many unknown forms, are briefly given. The necessity of an army of observers is indicated by the magnitude of the field. The method of studying the life history of insects is described and its advantages mentioned. After the introduction, observations during the trip were given — the following being briefly mentioned: spittle insects, *Xylina antennata*, tent caterpillars, *Crambus agitatellus*, predaceous aud parasitic insects, etc.

Insects on honeysuckle. (Country gentleman. June 23, 1898. 63: 490, col. 1—4 cm)

Records the beneficial work of *Adalia bipunctata* in reducing the numbers of plant lice on honeysuckle.

Pests–Virginia creeper. (Country gentleman. June 23, 1898. 63: 490, col. 2—9 cm)

Apple-tree aphis, *Aphis mali* Fabr., is identified, the remedy given and the statement made that the species will probably not cause farther injury the present season. The plum curculio is identified by its work. The Virginia creeper is thought to be of but little injury to old trees.

Maples defoliated. (Country gentleman. June 23, 1898. 63: 491, col. 3—8 cm)

Hundreds of silver maples were defoliated by a species of *?Nadata* [*Xylina antennata* Walker] in Schenectady. The outbreak is probably due to a dearth of parasites or favorable climatic conditions, and illustrates the destructive powers of many insects if unchecked.

[See pages 207–13, 235, 236 of this report]

Elm-leaf beetle. (Country gentleman. June 30, 1898. 63: 513, col. 3, 4—49 cm)

A brief general account of *Galerucella luteola* Müller, giving ravages in Albany and Troy, its description, life history, habits and best methods of controlling the pest.

Harlequin cabbage bug. (Country gentleman. June 30, 1898. 63: 514, col. 1, 2—33 cm)

This insect, *Murgantia histrionica* Hahn., received from Mason county, W. Va., is figured, described, its distribution given and the additional territory it may be expected to invade indicated. The destructiveness of the insect is mentioned, and the use of rows of radishes or mustard as lures, where the bugs may be destroyed, is recommended. Its two egg parasites, *Trissolcus murgantiae* and *T. podisi* are mentioned.

Gall on white oak. (Country gentleman. June 30, 1898. 63: 514, col. 2 — 18 cm)

Galls on white oak, from Columbia county, N. Y., are identified as those of *Andricus seminator* Harris and briefly described. The general characters of galls produced by insects are given and some interesting facts noted about the *Cynipidae* or gall flies.

Pear-leaf blister-mite. (Country gentleman. July 7, 1898. 63: 526, 527, col. 4, 1 — 14 cm)

The work of *Phytoptus pyri* Scheuten is identified, described, and the importance of fumigating nursery stock in order to prevent the distribution of such pests emphasized. Destroying the infested leaves or spraying in winter with kerosene emulsion diluted with five to seven parts of water is recommended.

Fleas and how to kill them. (Country gentleman. July 7, 1898. 63: 537, col. 2 — 17 cm)

Though the cat and dog flea, *Ceratopsyllus serraticeps*, is usually termed the flea, there are 47 species known to occur on animals. The life history of the dog flea is briefly given. Benzine, pyrethrum, sticky fly paper and cleanliness are the means recommended for controlling these pests.

[Xylina not Nadata] (Schenectady daily union. July 8, 1898. p. 5, col. 4 — 9 cm)

Corrects the first reference to *Nadata* of the caterpillars devastating the maples and states that they are either *Xylina laticinerea* or *X. antennata*. There is but one brood in a season. Spraying with paris green in the early spring is recommended.

[See pages 207–13 of this report]

Cucumber beetle — cabbage worms. (Country gentleman. July 14, 1898. 63 : 546, col. 2 — 21 cm)

Gives briefly the habits and life history of the striped cucumber beetle, *Diabrotica vittata* Fabr., and recommends protecting the young plants with netting. Planting of beans between the cucumbers, dusting the vines with land plaster, ashes or even road dust are preventives of serious injury. Clean culture is advised. If the roots are badly infested with the grubs, carbon bisulfid is the best remedy.

Fresh hellebore, one ounce to three gallons of water, is recommended for the cabbage worm, *Pieris rapae*. Paris green may be used if the cabbages have not headed.

Destructive rose bug. (Country gentleman. July 14, 1898. 63 : 546, col. 3 — 20 cm)

This insect, *Macrodactylus subspinosus* Fabr., is identified and its injuries in New England and New Jersey mentioned. Its life history is briefly given. Paris green or kerosene emulsion is usually not very satisfactory, owing to the beetle's resistance to insecticides. Collecting the insects by some mechanical contrivance or protecting plants by netting are the most satisfactory means of preventing serious injury.

Hessian fly in Pennsylvania. (Country gentleman. July 14, 1898. 63 : 546, 547, col. 4, 1 — 38 cm)

In response to an inquiry from Adams county, Pa., where this insect, *Cecidomyia destructor* Say, has been very injurious, a general account of the species is given as follows: Immense losses caused by it in New York and Ohio. Its life history. Characteristics of an attack. Its parasites and their value. Its abundance another season can not be forecast, as it may be injurious for a series of years. As preventives of injury, late planting supplemented by the early sowing of narrow strips to act as decoys, the burning of stubble and chaff, clean culture, rotation of crops and the growing of resistant varieties of wheat, so far as possible, are recommended.

Work of Xylina. (Country gentleman. July 14, 1898. 63 : 551, col. 2 — 6 cm)

Corrects the reference of this insect on page 491 of the current volume of the *Country gentleman*, from *Nadata* to *Xylina* — it being either *X. laticinerea* or *X. antennata*. Its identity with the species seriously injuring apples last year is thus rendered probable. A note is given of the defoliated soft maples along the Mohawk river, presumably by this species.

[See pages 207–13 of this report]

Forest tent caterpillar. (Country gentleman. July 14, 1898. 63 : 551, col. 2, 3 — 11 cm)

Records serious injuries the present season by *Clisiocampa disstria* Hübn. in St Lawrence, Oneida, Otsego, Delaware and Greene counties. As the cost of spraying or collecting the eggs would be too great in woods. it is advisable to burn over the ground soon after the insects have pupated, provided there is not so much fuel on the surface as to produce a fire injurious to the trees.

[See pages 191–201 of this report]

[Periodical Cicada] (Argus [Albany]. July 15, 1898. p. 4, col. 6 — 10 cm)

A brief review of Bulletin 14, U. S. Dep't agriculture, Division of entomology, commending a few of the many excellent features of this work.

Elm-leaf beetle in New York state. (Bulletin New York state museum. v. 5, no. 20, 1898 [Issued July 15]. 43 p. 6 pl.

CONTENTS

Forest tent caterpillar. (Country gentleman. July 21, 1898. 63:567, col. 2 — 6 cm)

Caterpillars from Exeter, N. Y. are identified as those of *Clisiocampa disstria* Hübn., and reference is given to an earlier notice of the insect.

Work of the oak pruner. (Country gentleman. July 21, 1898. 63:573, col. 4 — 16 cm)

Larvae boring in oak from Ulster county, N. Y., are those of *Elaphidion villosum* Fabr. Notes on their habits, injuries along Lake George and transformations are given. Collecting and burning the fallen twigs is recommended.

Molting of a tarantula. (Argus [Albany]. July 23, 1898. p.3 — 15 cm; *also in* Country gentleman. Aug. 4, 1898. 63 : 616, col. 3 — 16 cm; Worcester [Mass.] telegram. Aug. 14, 1898)

States why molting is necessary for spiders and insects and describes briefly the process in this instance. This female spider, *Eurypelma hentzii* Girard, was under the care of Dr J. M. Bigelow for two years. Its previous molt was about the latter part of 1896.

[See pages 219, 220 of this report]

Zebra caterpillar. (Country gentleman. July 28, 1898. 63 : 586, col. 2, 3 — 26 cm)

Caterpillars swarming on recently gathered timothy hay from a 20-acre lot at Alexandria Bay, N. Y., are identified as those of *Mamestra picta* Harris. The larva is briefly described, figured and the life history of the insect given. As oats on the field were destroyed the previous year by caterpillars, the larvae were probably abundant in the field this year and were accidentally gathered up with the hay. The destruction of those in the barn is recommended.

[See pages 201–7 of this report]

[Suggestions in regard to nursery inspection] (Country gentleman. July 28, 1898. 63 : 586, col. 3 — 12 cm)

In compliance with a request from the commissioner of agriculture, it was recommended that nursery stock infested with San José scale, *Aspidiotus perniciosus* Comst. and closely allied forms, the black peach aphis, *Aphis prunicola* Kalt., or badly infested with the more common destructive scale insects be destroyed or adequately treated. Those slightly infested with scale insects, badly infested with the pear psylla or aphids, or bearing cocoons of *Bucculatrix pomifoliella* Clem. should be fumigated before shipment. Plants showing injury from insects should not be pronounced clean till the cause has been ascertained.

[A plea for the elms] (Troy daily times. July 29, 1898 — 17 cm)

Excessive ravages of the elm-leaf beetle, *Galerucella luteola* Müller, are described and a plea made for the proper protection of the elms. If no action is taken, it is stated that most of the European and many American elms in the city will be ruined within three years.

[Remedies for the white-marked tussock moth] (Buffalo news. July 30, 1898. 36 : 5 — 22 cm; *also in* Commercial, times and inquirer [Buffalo]. July 30, 1898. 55 : 5; Buffalo commercial. July 30, 1898. p. 11; *and part in* Buffalo daily times. July 30, 1898. 39 : 5)

Gives objections to spraying with paris green, recommends collecting the egg clusters, and states the advantages of delaying the work till winter or early spring. Several methods of collection are briefly considered.

[Brown patches on the lawn] (American gardening. July 30, 1898. 19 : 549, col. 1 — 8 cm)

Brown patches on a lawn are identified as most probably the work of white grubs and directions for spraying with kerosene emulsion given.

Asparagus beetle in Albany county. (Country gentleman. Aug. 4, 1898. 63 : 614, col. 2 — 18 cm)

Notes the occurrence of the beetle at Menands. The insect is figured and briefly described in its different stages. Land plaster or paris green is given as the best remedy.

Sulfur not a remedy. (Clinton [Mass.] courant. Aug. 6, 1898. 50 : 5, col. 3 — 6 cm)

Replying to an earlier notice, it is stated that plugging trees with sulfur is not a remedy for caterpillars.

Maple-tree scale. (Country gentleman. Aug. 11, 1898. 63:630, 631, col. 4, 1—13 cm)

This scale insect, *Pulvinaria innumerabilis* Rathv., is briefly described and the localities mentioned where it has been reported as abundant. Its prolificacy and destructiveness are noticed and spraying with kerosene emulsion or a whale oil soap solution recommended.

A butterfly caterpillar. (Country gentleman. Aug. 11, 1898. 63:633, col. 4—13 cm)

The larva of *Jasoniades glaucus* Linn. is identified, briefly characterized and its means of protection by a peculiar scent organ described. The markings of the parent and its transformations are briefly given.

A walking stick. (Country gentleman. Aug. 18, 1898. 63:647, col. 1—12 cm)

A strange insect from Amboy, N. Y., is identified as the walking stick, *Diapheromera femorata* Say. It is briefly described, its injuries to forests in 1877 alluded to and its life history given.

Apple-tree tent caterpillar. (Country gentleman. Aug. 18, 1898. 63:653, col. 3—33 cm)

In an inquiry from Duluth, Minn., the writer describes the extensive ravages of a pest and gives its habits. The insect is identified from a nest as *Clisiocampa americana* Fabr. Its life history is given and collecting egg belts, destroying the young in their nests, or spraying with poisons recommended. Encouraging the native birds is stated to be very profitable on account of securing their aid in controlling insect pests.

[Save the elm trees] (Troy budget. Aug. 21, 1898. p. 12, col. 4, 5—82 cm)

The ravages of the elm-leaf beetle in Troy and adjacent places are described in detail and spraying recommended. The remainder is largely a reprint of portions of *Museum bulletin 20* on this insect.

About the hellgramite. (Country gentleman. Aug. 25, 1898. 63:673, col. 4—31 cm)

In response to an inquiry about its transformations, this large neuropterous insect, *Corydalis cornuta* Linn., is figured, briefly described and its life history given. The difference between this insect and a butterfly is pointed out.

[Whale oil soap and fumigation] (State of New York, Dep't agriculture. Formulas, 1898. [Issued Aug. 26] p. 5–7—27 cm)

Gives formula and direction for using the whale oil soap solution, also the method of fumigating nursery stock and the proportions of chemicals found most effective.

[Abstract of a paper read before the Association of economic entomologists, at Boston, Mass., Aug. 19] (Country gentleman. Sep. 1, 1898. 63:690, col. 3, 4—14 cm)

Gives a brief abstract of 'Notes on the insects of the year in the state of New York.'

[See pages 230–41 of this report]

Asparagus beetles. (Country gentleman. Sep. 1, 1898. 63 : 693, col. 3, 4 — 19 cm)

Records the occurrence of *Crioceris 12-punctata* Linn. in the vicinity of Buffalo, N. Y., and its present distribution is outlined. The distribution along the Hudson river valley of *Crioceris asparagi* Linn., as ascertained by Dr L. O. Howard, is given and its presence at Maynard, Oneida county, noted.

Killing insects through plant roots. (Country gentleman. Sep. 1, 1898. 63 : 694, col. 1 — 17 cm)

In response to an inquiry in regard to the possibility of controlling insects through the roots of plants, it is stated that owing to the selective action of the roots and other causes success could not be expected, though it would do no harm to experiment provided extreme caution was exercised in drawing conclusions.

Plague of flies. (Country gentleman. Sep. 8, 1898. 63 : 712, col. 2, 3 — 17 cm)

In response to an inquiry from Cortland county, it is stated that the abundance of flies in any locality is proportionate to the number and extent of favorable breeding places in the vicinity. Keeping manure where flies can not obtain ready access to it and the use of chlorid of lime, darkening of stables and the application to the stock of fish oil and tar, or axle grease, are measures recommended.

Notes on the Boston meeting. (Country gentleman. Sep. 8, 1898. 63 : 713, 714, col. 4, 1 — 44 cm)

In response to a request, some brief notes are given on the meeting of the Association of economic entomologists, held at Boston, August 19–20. After mentioning the value of meeting fellow workers from all parts of the country, certain differences in the behavior of insects and insecticides in several states are noticed. The magnificent work of the Massachusetts state board of agriculture against the gypsy moth, *Porthetria dispar* Linn., and the brown-tailed moth, *Euproctis chrysorrhoea* Linn., is noticed at some length and several of the improved devices and methods described. The importance to the country at large of this attempt to exterminate these insects is discussed and mention made of the hearty indorsement of the work by the visiting entomologists.

Insects on chrysanthemums. (American gardening. Sep. 10, 1898. 19 : 639, col. 1, 2—8 cm)

Identifies the tarnished plant bug, *Lygus pratensis* Linn., and the insidious flower bug, *Triphleps insidiosus* Say, and gives their habits and remedies.

A katydid. (Country gentleman. Sep. 15, 1898. 63 : 726, col. 3 — 12 cm)

Identifies eggs found on the belt of a sewing machine at Marietta, Ga., as probably those of *Microcentrum laurifolium* Linn. The method of oviposition is briefly described and several curious places where katydid eggs were found mentioned. The life history of this species is outlined.

[Insect for name] (American gardening. Sep. 17, 1898. 19 : 653, col. 2 — 10 cm)

The larva of the hag moth, *Phobetron pithecium* Sm.–Abb., is identified, briefly described and a résumé of its life history given.

[Ponds and mosquitoes] (Country gentleman. Oct. 6, 1898. 63 : 794, col. 1 — 20 cm)

In response to questions, it is stated that mosquitoes breed only in still water, and are more likely to be abundant where plants supply plenty of food. Remedies mentioned are: artificial agitation of the water, the introduction of fish to their breeding places and applying kerosene to the surface of the water.

Preventives of insect depredations. (Country gentleman. Oct. 13, 1898. 63 : 813, 814, col. 4, 1 — 28 cm)

A general article recommending the clearing up and burning rubbish in the gardens, going over the orchards for various insects, preparing for canker worms, and protecting and encouraging the native birds during the winter.

[Attacked by joint worms] (Country gentleman. Oct. 13, 1898. 63 : 814, col. 1 — 23 cm)

In response to an inquiry from Frederick county, Md., the depredator on wheat is identified from examples sent as probably *Isosoma grande* Riley. The characteristics of the attack, life history of the insect and its earlier ravages are given. Burning the stubble in infested fields and the screenings from the wheat is recommended.

CONTRIBUTIONS TO THE COLLECTION IN 1898

Hymenoptera

Honey bee, *Apis mellifica* Linn., 29 July. From Mrs **L. A. Millington,** New Russia, N. Y.

Sphex ichneumonea Linn., 9 Sep. From Mrs **E. B. Smith,** Coeymans, N. Y.

Tarantula killer, *Pepsis formosa* Say, female, 25 July. From Miss **E. S. Torrey,** San Diego, Cal.

The wheat joint worm, *Isosoma ?grande* Riley, 3 Oct. From **A. D. Thomas,** Frederick county, Md.

Gall, from which 235 adults were reared, of *Andricus seminator* Harris on oak, 25 June. From **R. R. Livingston,** Cheviot-on-Hudson, N. Y.

Lunate long-sting, *Thalessa lunator* Fabr., 14 Sep. From Prof. **C: H. Peck,** Menands, N. Y.

Pigeon tremex, *Tremex columba* Linn., 19 May. From **S. C. Bradt,** Albany, N. Y.

Dolerus sericeus Say on apple trees, 19 May. From **G: H. Brackenbury,** Auburn, N. Y.

Coleoptera

Six-spotted tiger beetle, *Cicindela sexguttata* Fabr., 16 Aug. From **M. F. Adams,** Buffalo, N. Y.

Fiery ground beetle, *Calosoma calidum* Fabr., 20 Aug. From **J: A. Otterson,** Berlin, Mass.

Pterostichus lucublandus Say, 4 July. From Mrs **E. B. Smith,** Coeymans, N. Y.

Harpalus pennsylvanicus DeGeer in coition, 19 Sep. From **E. T. Schoonmaker,** Cedar Hill, N. Y.

Carrion beetles, *Silpha americana* Linn., and *Silpha inaequalis* Fabr., 16 Aug. From **M. F. Adams,** Buffalo, N. Y.

Two-spotted lady-bird, *Adalia bipunctata* Linn., 16 May. From Miss **Mary R. Hyde,** Binghamton, N. Y.

Pale brown Byturus, *Byturus unicolor* Say, in raspberry buds, 23 May. From Prof. **C: H. Peck,** Menands, N. Y.

Numerous rose beetles, *Macrodactylus subspinosus* Fabr., injuring snowball, 27 June. From **T. H. L.,** Loudonville, N. Y.

Western ten-lined June bug, *Polyphylia decemlineata* Say, 12 Sep. From Miss Margaret Torrey, San Diego, Cal.

Spotted grapevine beetle, *Pelidnota punctata* Linn., 19 May. From S. C. Bradt, Albany, N. Y. Same, 16 Aug. From M. F. Adams, Buffalo, N. Y.

Green June beetles, *Allorhina nitida* Linn., 29 July. From Chester Young, Flushing, N. Y.

Indian cetonian, *Euphoria inda* Linn., 16 Aug. From M. F. Adams, Buffalo, N. Y.

Osmoderma scabra Beauv., 28 July. From Mrs E. B. Smith, Coeymans, N. Y.

Oak limbs burrowed by the oak pruner, *Elaphidion villosum* Fabr., 11 July. From C. H. Roberts, Oakes, Ulster county, N. Y. A larva of same, 2 July. From Mrs James R. Gilmore, Lake George, N. Y.

Maple borer, *Plagionotus speciosus* Say, 16 Aug. From M. F. Adams, Buffalo, N. Y.

Cloaked knotty horn, *Desmocerus palliatus* Forst., 16 Aug. From M. F. Adams, Buffalo, N. Y.

Round-headed apple-tree borer, *Saperda candida* Fabr., and the elm borer, *Saperda tridentata* Oliv., with infested wood and numerous larvae, 20 Aug. From J: A. Otterson, Berlin, Mass.

Red milkweed beetle, *Tetraopes tetraophthalmus* Forst., 16 Aug. From M. F. Adams, Buffalo, N. Y.

Numerous examples of the asparagus beetle, *Crioceris asparagi* Linn., 23 July. From Prof. C: H. Peck, Menands, N. Y. Same, 16 Aug. From M. F. Adams, Buffalo, N. Y. Same, 19 Sep. From E. T. Schoonmaker, Cedar Hill, N. Y.

12-spotted asparagus beetle, *Crioceris 12-punctata* Linn., 16 Aug. From M. F. Adams, Buffalo, N. Y.

Chrysochus auratus Fabr., 16 Aug. From M. F. Adams, Buffalo, N. Y.

Chrysomela multiguttata Stäl. on elm, 31 May. From J. W. Olmstead, Northville, N. Y.

Cherry-leaf beetle, *Galerucella cavicollis* LeC. on cherry-tree, 8 June. From Thomas Tupper, Corning, N. Y.

Golden tortoise beetle, *Coptocycla bicolor* Fabr. on morning glory, 16 July. From J. G. Linsley, Oswego, N. Y.

Chelymorpha argus Licht. 16 Aug. From M. F. Adams, Buffalo, N. Y.

Beans infested with bean weevil, *Bruchus obtectus* Say, 17 Feb. From M. Ames, Glens Falls, N. Y.

The meal worm, *Tenebrio molitor* Linn., 4 July. From Mrs **E. B. Smith**, Coeymans, N. Y.

Fungus beetle *Boletotherus bifurcus* Fabr., 29 Sep., in fungus at Rome, N. Y. From **A. W. Wright**, Albany, N. Y.

Cryptorhynchus lapathi Linn., 16 Aug. Also mines of same, dated 5 June. From **M. F. Adams**, Buffalo, N. Y.

Number of larvae of the clover leaf weevil, *Phytonomus punctatus* Fabr., 10 May. From **J. Hannam Clark**, Moreton Farm, N. Y. Imago of same, 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Diptera

House fly, *Musca domestica* Linn., infested with *Trombidium muscarum* Riley, some of which had transformed to the hypopus form, 29 July. The same with *Trombidium* and *Chernes*, 12 Oct. From **J. G. Linsley**, Oswego, N. Y.

Blow fly, *Lucilia caesar* Linn., 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Examples of *Psilopus sipho* Say, 12 Aug. From Mrs **C. McDougall**, Plattsburg, N. Y.

Bee slayer, *Promachus ?fitchii* O. S., 29 July. From Mrs **L. A. Millington**, New Russia, N. Y.

Large black horse fly, *Tabanus atratus* Fabr., 19 May. From **S. C. Bradt**, Albany, N. Y.

Lepidoptera

Thecla species, near *T. calanus*, 6 July. From Prof. **C: H. Peck**, Menands, N. Y.

Cabbage butterfly, *Pieris rapae* Linn., 4 July. From Mrs **E. B. Smith**, Coeymans, N. Y.

Larva of the swallow tail butterfly, *Jasoniades glaucus* Linn., 1 Aug. From **S**, Altamont, N. Y. Same, 9 Aug. From **F. B. Southwick**, Rockroyal, N. Y. Imago, 9 Sep. From Mrs **E. B. Smith**, Coeymans, N. Y.

Several larvae of *Epargyreus tityrus* Fabr. on honey locust, 29 Aug. Also others, 9 Sep. From Mrs **E. B. Smith**, Coeymans, N. Y.

Larvae of *Thyreus abbotii* Swain., 7 July. From **J. G. Linsley**, Oswego, N. Y.

Larva, dark variety, of *Deilephila lineata* Fabr. on sugar beet, 19 Sep. From **E. T. Schoonmaker**, Cedar Hill, N. Y.

A larva of *Alypia octomaculata* Fabr. on Virginia creeper, 16 July. From **W. H. Coleman**, Albany, N. Y.

Halisidota tesselaris Sm.-Abb., 20 Aug. From J: A. Otterson, Berlin, Mass.

Hickory tussock caterpillar, *Halisidota caryae* Harris on locust, 20 Aug. From Miss R. Thompson, Ballston Spa, N. Y. Same, 9 Sep. From Mrs E. B. Smith, Coeymans, N. Y.

Several larvae of the white-marked tussock moth, *Notolophus leucostigma* Sm.-Abb., on wisteria, 10 June. From James Goold, Albany, N. Y. Same, 29 June. From Mrs W: M. Griffith, Albany, N. Y. Larvae and pupae of same, 1 July. From Miss J. J. Forqurean, Albany, N. Y. Cocoons and egg clusters of same, on plum trees, 16 July. From W. H. Coleman, Albany, N. Y. Female, cocoons and egg masses of same, 29 July. From Chester Young, Woodside, N. Y.

Larvae of *Euclea indetermina* Boisd. on azalea, 25 Aug. From O. F. Zollikoffer, New Rochelle, N. Y.

Larva of the hag moth, *Phobetron pithecium* Sm.-Abb., 5 Sep. From Leonard Barron, New York. Same, 14 Sep., pupated the 16th. From J. M. Dolphe, Port Jervis, N. Y.

Bag worm, *Thyridopteryx ephemeraeformis* Haw., on Crataegus, 9 Ap. From T. L. Meinikheim, New York.

Red-humped apple-tree caterpillar, *Oedemasia concinna* Sm.-Abb. on blackberry and rose bush, 20 Aug. From Miss Alice Young, Clinton, Mass. Same on plum, 10 Sep. From J: A. Otterson, Berlin, Mass.

Cecropia moth, *Samia cecropia* Linn., 4 June. From W. C. Hitchcock, Cropseyville, N. Y. Larva of same, 27 Aug. From S. C. Bradt, Albany, N. Y.

Male, female and eggs of the luna moth, *Tropaea luna* Linn., 12 May. From W. E. Wetmore, West Salamanca, N. Y.

Larva of the American silk worm, *Telea polyphemus* Linn., 23 Sep. From J: A. Otterson, Berlin, Mass.

Female io moth, *Automeris io* Fabr., 20 Aug. From J: A. Otterson, Berlin, Mass.

Egg belts of the apple-tree tent caterpillar, *Clisiocampa americana* Fabr. on peach, 29 July. From Geneva, N. Y., through State department of agriculture.

Forest tent caterpillar, *Clisiocampa disstria* Hübn., 2 June. From C. L. Williams, Glens Falls, N. Y. Cast skins of same, on maple leaves, 8 June. From Mrs Elizabeth Benedict, Glens Falls, N. Y. Larvae of same, 13 July. From Moses Daly, Exeter, Otsego co., N. Y.

Feltia jaculifera Guen., 9 Sep. From Mrs E. B. Smith, Coeymans, N. Y.

Three larvae of the zebra caterpillar, *Mamestra picta* Harris, 19 July. From **W: C. Browning**, Alexandria Bay, N. Y. Same on sugar beets, 19 Sep. and 8 Oct. From **E. T. Schoonmaker**, Cedar Hill, N. Y.

Examples of *Xylina antennata* Walker defoliating maples, 15 June. From Dr **M. G. Planck**, Schenectady, N. Y. Numerous larvae of same, from Schenectady, through state department of agriculture.

Catocala parta Guen., 4 July, *Catocala cara* Guen., 9 Sep. From Mrs **E. B. Smith**, Coeymans, N. Y.

Larva of *Cacoecia rosaceana* Harris on elm, 31 May. From **J. W. Olmstead**, Northville, N. Y.

Codling moth, *Carpocapsa pomonella* Linn., from under the bark of an apple tree, 7 Mar. From **D. Woodriff**, Beaver Creek, Col.

Mecoptera

Two females of a scorpion fly, *Panorpa maculosa* Hagen, sucking the fluids from wounded gypsy moth larvae, *Porthetria dispar* Linn., 1 July. From **A. H. Kirkland**, Malden, Mass.

Neuroptera

Dendroleon obsoletum Say, 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Ant lion, *?Myrmeleon* sp., from the Indian Ladder, New Scotland, 1 Aug. From Dr **F: J. H. Merrill**, Albany, N. Y.

Hemiptera

Spined soldier bug, *Podisus spinosus* Dallas, observed feeding on larvae of *Crioceris asparăgi* and also one trying to insert its proboscis into a beetle, 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Nymphs of *Cosmopepla carnifex* Fabr. on asparagus, 25 July. From Prof. **C: H. Peck**, Menands, N. Y.

Euschistus fissilis Uhler on asparagus, 20 Aug. From **J: A. Otterson**, Berlin, Mass. The same, 19 Sep. From **E. T. Schoonmaker**, Cedar Hill, N. Y.

Euschistus tristigmus Say, 4 Sep. From Mrs **E. B. Smith**, Coeymans, N. Y.

Nezara hilaris Say, adults and young feeding on asparagus, 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Squash bug, *Anasa tristis* DeGeer, 19 Sep. From **E. T. Schoonmaker**, Cedar Hill, N. Y.

Calocoris rapidus Say on asparagus, 19 Sep. From **E. T. Schoonmaker**, Cedar Hill, N. Y.

Tarnished plant bug, *Lygus pratensis* Linn., on chrysanthemums, 30 Aug. From **Leonard Barron**, New York. Same on chrysanthemums, 20 Aug. From Mrs **C. McDougall**, Plattsburg, N. Y.

Insidious flower bug, *Triphleps insidiosus* Say, on chrysanthemums, 30 Aug. From **Leonard Barron**, New York.

Phymata wolffii Stäl., 20 Aug. From Miss **Alice Young**, Clinton, Mass. The same, 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Masked bed bug hunter, *Opsicoetus personatus* Linn., 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Harvest fly, *Cicada tibicen* Linn., 9 Sep. From Mrs **E. B. Smith**, Coeymans, N. Y.

Cast skins of nymphs of *? Ceresa bubalus* Fabr. on locust trees, 1 July. Miss **J. J. Forqurean**, Albany, N. Y.

Diedrocephala coccinea Forst., 28 Sep. from Ct. From **Leonard Barron**, New York.

Gypona angulata Spang., 20 Aug. From **J: A. Otterson**, Berlin, Mass.

Chermes abietis Linn. on black spruce at North Elba, N. Y., 2 July. From Prof. **C: H. Peck**, Menands, N. Y.

Woolly aphis of the apple, *Schizoneura lanigera* Hausm., on apple twigs, 17 Mar. From **M. H. Davis**, Boiceville, N. Y.

Numerous examples of a woolly plant louse, *Schizoneura rileyi* Thos., on elm, 31 May. From **J. W. Olmstead**, Northville, N. Y.

Apple aphis, *Aphis mali* Fabr., on apple at Norwich, Ct., 14 June. From **P. C. Lewis mfg. co.**, Catskill, N. Y.

Examples of the cottony maple-tree scale, *Pulvinaria innumerabilis* Rathv., on elm, 3 July. From **Marcus C. Allen**, Sandy Hill, N. Y. Same badly infesting soft maple, 9 July. From **John Woltz**, Baldwin, L. I. Same badly infesting twigs of sugar maple, 28 July. From Miss **Kate Fisher**, Batavia, N. Y. Same on soft maple, 29 July. From **Chester Young**, Flushing, N. Y. Same on maple, 5 Aug. From **A. H. Stratton**, Arlington, N. J. Young of same infesting silver maple leaves, 30 Aug. From Geneva, N. Y., through state department of agriculture. Same on maple, 20 Aug. From **M. F. Tiger**, Patchogue, N. Y. Young and adults of same on maple, 5 Oct. From **M. F. Adams**, Buffalo, N. Y.

Lecanium hesperidum Linn. on leaves of English laurel, 30 Sep., through state department of agriculture.

Brown apricot scale of California, *Lecanium armeniacum* Craw, on grape, 6 June. From **A. H. Hayes**, Erie county, N. Y.

Tulip-tree scale, *Lecanium tulipiferae* Cook, 11 Oct. From **Alfred Pell**, Highland Falls, N. Y.

Numerous examples of the New York plum scale, *Lecanium prunastri* Fonsc. on cherry trees, 31 Jan. From **James Hendrick**, Albany, N. Y. Same on *Ardisia crenulata*, 29 July. From **Chester Young**, Flushing, N. Y.

Lecanium cerasifex Fitch on oak, 29 July. From Geneva, N. Y. through state department of agriculture. Same on maple at Menands, 16 Sep. From **Chester Young**, nursery inspector.

Lecanium hemisphaericum Targ. on mistletoe, 9 Mar. From **D. S. Martin**, Columbia, S. C.

San José scale, *Aspidiotus perniciosus* Comst., 9 Ap. From **James B. Jessup**, Woodstown, N. J. Same badly infesting pear twigs and fruit, 9 July. From **H. A. Unger**, East Greenbush, N. Y. Same on pear, 29 July. From Flushing, N. Y. Same infesting several species of trees, 13 Aug. From Farley's, Cayuga county, N. Y. Same on pear, 29 Aug. From Geneva, N. Y. Same on pear, 16 Sep. From Troy, N. Y. Same on white lilac, 22 Sep. From Montrose, N. Y. From the last five localities through the state department of agriculture.

Numerous examples of *Aspidiotus ancylus* Putnam on currant, 21 May. From **C. H. Stuart**, Newark, N. Y. Taken at Palmyra, N. Y. Same on willow, 2 Aug. From Fredonia, N. Y. Same on maple, 2 Aug. From Far Rockaway, N. Y. Same on American elm, 2 Aug. From Brighton, N. Y. Same on *Prunus* and pear twigs, 8 Aug. From Geneva, N. Y. Same on apple, 29 Aug. From Penfield, N. Y. Same from Medina, N. Y., 16 Sep., all but first through state department of agriculture.

English walnut scale, *Aspidiotus juglans-regiae* Comst., on European mountain ash, 2 Aug. From Brighton, N. Y., through state department of agriculture.

Numerous examples of *Aspidiotus dictyospermi* Morgan on *Areca lutescens* in an Ohio greenhouse, 16 May. From **T. D. A. Cockerell**, Mesilla Park, New Mexico.

Apple-tree bark louse, *Mytilaspis pomorum* Bouché, on apple twigs, 5 Mar. From **G: W: Horton**, Brewster, N. Y. Same on apple, 17 Mar. From the **H. E. Hooker co.**, Rochester, N. Y. Numerous examples of same on apple twigs, 19 May. From **G: H. Brackenbury**, Auburn, N. Y. Same badly infesting twigs of privet and lilac, 29 July. From **Chester Young**, Flushing, N. Y.

Twig of apple infested with the scurfy bark louse, *Chionaspis furfurus* Fitch, 29 Aug. From Penfield, N. Y., through state department of agriculture.

Juniper scale, *Diaspis carueli* Targ., on irish juniper, 9 Sep. From Sing Sing, N. Y., through state department of agriculture.

Numerous examples of the rose scale, *Aulacaspis rosae* Sandberg, on black-cap raspberry vines, 11 Mar. From H. G. Chatham, Elkin, N. C.

Aulacaspis boisduvalii Sign., on an orchid, 14 Jan. From Mrs E. C. Anthony, Gouverneur, N. Y.

Parlatoria pergandii Comst. on orange, 9 Sep. From Sing Sing, N.Y., through state department of agriculture.

Orthoptera

White flower cricket, *Oecanthus niveus* De Geer, 9 Sep. From Mrs E. B. Smith, Coeymans, N. Y. The same on asparagus, 20 Aug. From J: A. Otterson, Berlin, Mass.

Small striped ground cricket, *Nemobius fasciatus* De Geer, 20 Aug. From J: A. Otterson, Berlin, Mass.

Xiphidium brevipenne Scudd., 9 Sep. From Mrs. E. B. Smith, Coeymans, N. Y.

Cone-headed katydid, *Conocephalus ensiger* Harris, 23 July. From Mrs H. Bull, Albany, N. Y.

Eggs of a katydid *Microcentrum laurifolium* Linn., from belt of sewing machine, 10 Sep. From W. A. Whitmore, Marietta, Ga.

Katydid, *Amblycorypha oblongifolia* De Geer, 9 Sep. From Mrs E. B. Smith, Coeymans, N. Y.

Red-legged grasshopper, *Melanoplus femur-rubrum* De Geer. From Mrs E. B. Smith, Coeymans, N. Y.

Female and eggs of the walking stick, *Diapheromera femorata* Say, 9 Aug. From A. C. Armstrong, Amboy, N. Y.

Oriental cockroach, *Periplaneta orientalis* Linn., 19 May. From S. C. Bradt, Albany, N. Y. Same infested with a hair snake, *Gordius* sp., over 4 inches long, 9 Aug. From Mrs E. L. Strong, Ogdensburg, N. Y.

Odonata

Gomphus exilis Selys, 9 Sep. From Mrs E. B. Smith, Coeymans, N. Y.

Arachnida

Living female tarantula, *Eurypelma hentzii* Girard, and its cast skin, 10 Jan. From Dr J. M. Bigelow, Albany, N. Y.

Trombidium muscarum Riley on house fly, 29 July and 12 Oct. From J. G. Linsley, Oswego, N. Y.

Pear leaves infested with the pear blister mite, *Phytoptus pyri* Scheuten, 26 June. From E. P. Wentworth, Portland, Me.

Three examples of *Chernes ?sanborni* Hagen, from a fly, species not given, 25 July. From **G: B. Simpson**, Albany, N. Y. A specimen of the same on house fly, 12 Oct. From **J. G. Linsley**, Oswego, N. Y.

Myriapoda

Household centipede, *Scutigera forceps* Raf., 19 May. From **S. C. Bradt**, Albany, N. Y.

EXPLANATION OF PLATES

Plate 1. Sugar orchard of Ely Swart, near Arkville, Delaware co., showing extensive defoliation by the forest tent caterpillar.[a]

Plate 2. Nearer view of a portion of the same.

Plate 3. Single tree on same place.

Plate 4. Maples and birches near Margaretville, Delaware co., showing work of same insect.

Plate 5. Larvae of *Mamestra picta* on portion of beet leaf.

Plate 6. *Eurypelma hentzii.* Fig. 1, dorsal aspect of cast skin: *a*, dorsum of cephalo-thorax; *b*, location of eyes; *c*, empty coxal cavities; *e*, loose skin of abdomen; *f*, palpi.

Plate 7. *Eurypelma hentzii.* Fig. 2, ventral aspect of cast skin: *d*, poison fangs; other lettering as in the preceding.

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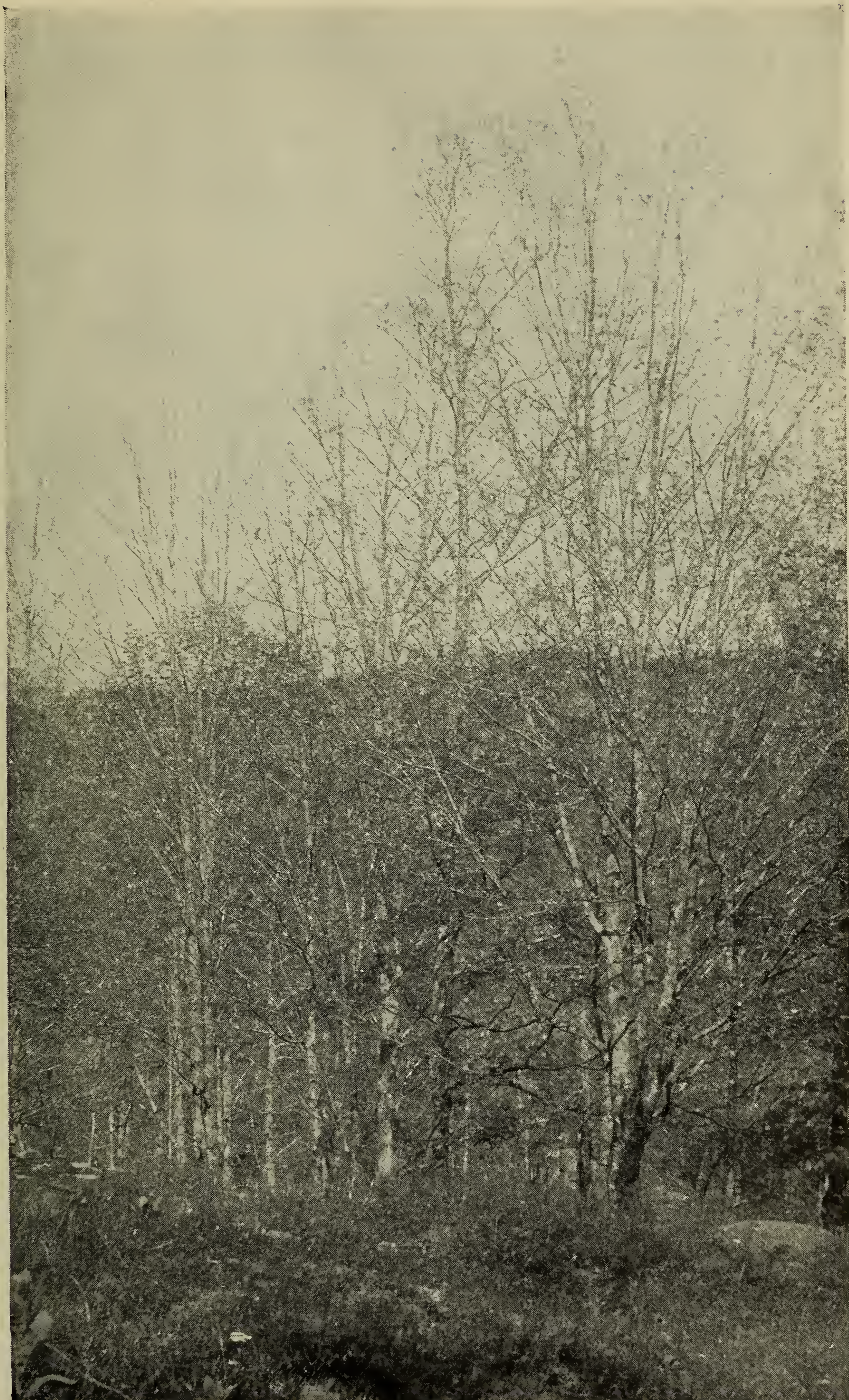
a Plates 1–4 are from photographs taken by H. B. Ingram, of Kingston, N. Y., July 8, 1898.

Sugar orchard defoliated by forest tent caterpillars, Arkville, Delaware county.

Portion of sugar orchard defoliated by forest tent caterpillars, Arkville, Delaware county.

Maple defoliated by forest tent caterpillars.



Defoliated maples and birches, Margaretville, N. Y.

Zebra caterpiliars.

Plate 6

Cast tarantula skin—dorsal aspect.

Plate 7

Cast tarantula skin—ventral aspect.

(These supplementary plates are added on account of poor text figures)

Plate 8

Fig. 7 CLISIOCAMPA AMERICANA, *a*, male; *b*, hermaphrodite; *c*, female (original).

Fig. 12 XYLINA ANTENNATA (original).

Fig. 14 Young of LECANIUM TULIPIFERAE, much enlarged (original).

(These supplementary plates are added on account of poor text figures)

Plate 9

Fig. 17 Work of the elm-leaf miner (original).

Fig. 20 Young of PULVINARIA INNUMERABILIS on maple leaf (original).

INDEX

The superior figure points to the exact place on the page in ninths; e. g. 173^1 means one ninth of the way down page 173.

ERRATA

Page 168, line 3, for Dyar, read Dyar^a,

Page 173, line 3, for *Abbott* read *Abbot.*

(Pages 297–8 were bulletin cover pages)

Very truly yours
J. A. Lintner

University of the State of New York

BULLETIN

OF THE

New York State Museum

FREDERICK J. H. MERRILL, *Director*

VOL. 5 No. 24

May 1899

SUPPLEMENT

TO THE

14TH REPORT OF THE STATE ENTOMOLOGIST, 1898

MEMORIAL

OF

LIFE AND ENTOMOLOGIC WORK

OF

Joseph Albert Lintner, Ph.D.
State entomologist, 1874–98

BY

EPHRAIM PORTER FELT, D. Sc.
State entomologist

ALBANY
UNIVERSITY OF THE STATE OF NEW YORK
1899

CONTENTS

JOSEPH ALBERT LINTNER

In the sudden death of this prominent entomologist at Rome, Italy, on May 5, 1898, the scientific world sustained a great loss. Joseph Albert Lintner, Ph. D., was born in Schoharie, N. Y., Feb. 8, 1822, of German parentage. He attended Jefferson academy and was graduated from the Schoharie academy in 1837. For 10 years he was in business in New York city, and at the same time continued his studies under the Mercantile library association, also contributing scientific articles to the *New York tribune*. Returning to Schoharie in 1848, he engaged anew in business till 1860, when he removed to Utica and there manufactured woolen goods for some years. His scientific studies were continued unremittingly. His large collection of insects was begun in 1853 and in 1862 his first article on entomology was published. In 1868 he became zoological assistant in the state museum, and was put in charge of the entomologic work in 1874. He was appointed state entomologist by Governor Cornell in 1880, a position held till his death, and in 1883 was made by the regents a member of the scientific staff of the state museum.

This long and faithful service in his chosen field made him a valued and respected leader among economic entomologists. The last 36 years of his life were devoted almost entirely to entomology, and he wrote during that time over 900 independent articles, besides his 13 reports and the four numbers of *Entomological contributions*. In 1871 he began to contribute articles on economic entomology to the *Cultivator and country gentleman*, a leading agricultural paper now known as the *Country gentleman*, and was its entomological editor during the last 25 years. He has also written many notices for a number of other agricultural and horticultural papers. Although his publications were numerous and varied, it was their writer's ambition to make his communications of practical value to all. It was his delight to include something new or of more than ordinary interest in every notice of an insect. For the past 18 years he was widely known as a most earnest and conscientious state entomologist. His reports, replete with valuable and practical information, are enduring monuments to their author. In simplicity of language, dignity of expression, conciseness and thoroughness of treatment, they are models.

The high appreciation won from his colaborers is strikingly shown in the following extract[a] from an address delivered in 1894 before the Association of economic entomologists by the president, Dr L. O. Howard,

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a *Insect life*. 1894. 7 : 63

now chief of the division of entomology, of the United States department of agriculture:

The movement which resulted in the passage of this law[a] was started by the regents of the University of the State of New York at their annual meeting in 1877, and the person appointed to fill the office was Dr J. A. Lintner, a well-known worker in entomology, who, up to that time, had been connected with the state museum of natural history. Dr Lintner has held office continuously since 1881. He brought to bear upon his duties a ripe experience and a mind trained in scientific methods. He has published nine reports, the last one covering the year 1892, and only recently distributed. These reports are in many respects models. The great care and thoroughness of the author have hardly been equalled by any other writer upon economic entomology. The form of the reports is most admirable, and the account of each insect forms almost invariably a complete compendium of our knowledge concerning it down to the date of publication. His accounts are also arranged in the most convenient form for reference, a full bibliography precedes the consideration of each species, and the frequent subheadings enable the most practical use of the report. The reports are replete with sound and ingenious practical suggestions, and are written in a straightforward, simple style, which possesses great literary merit. They abound in illustrations, and are made available by most complete indices and tables of contents. Aside from these reports, Dr Lintner has published a great deal in the newspapers, particularly the *Country gentleman*, on the subject of economic entomology, and another valuable feature of his reports is the comprehensive list which he publishes each year of his unofficial writings.

Without the magnificent opportunities our universities are offering today, this life shows in the highest degree the results of patient effort supplemented by untiring perseverance. Although prohibited by circumstances from devoting his whole time to scientific pursuits till late in life, his great love for nature enabled him to attain one of the highest positions in his chosen work. In 1884 the honorary degree of doctor of philosophy was conferred on him by the regents of the University of the State of New York. He was president of the Entomological club of the American association for the advancement of science and the Association of economic entomologists, two years each, and was president of the department of natural science of the Albany institute from 1879 till his death. He was elected to membership not only in learned societies in this country, but many of those abroad were proud to enroll his name on their books, as may be seen by the appended list of memberships held at the time of his decease. A short time before his death he was granted a six months' leave of absence by the regents in recognition of his long and faithful services.

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[a] Laws of 1881, ch. 377. The original appointment was made by Governor Cornell in 1880, under authority of ch. 549 of the laws of that year.

Modest and unassuming, gentle, yet never yielding to imposition, kind and loved by all, the name of Joseph Albert Lintner shines with a luster that places it beside those of Harris, Fitch, Walsh, LeBaron and Riley.

MEMBERSHIPS IN LEARNED SOCIETIES HELD BY J. A. LINTNER

American entomological society, Philadelphia, Pa.
Corresponding member: elected, Nov. 10, 1862.

Albany institute, Albany, N. Y.
Resident member: elected, Nov. 2, 1869.

West Virginia historical society, Morgantown, W. Va.
Corresponding member: elected, Dec. 30, 1869.

Entomological society of Ontario, Canada. London, Ont.
Member since 1872.[a]

Lyceum of natural history of the city of New York: Now, New York academy of sciences, New York, N. Y.
Corresponding member: elected, Feb. 27, 1872.

Buffalo society of natural sciences, Buffalo, N. Y.
Corresponding member: elected, Mar. 2, 1872.

Cambridge entomological club, Cambridge, Mass.
Honorary member: elected, Aug. 10, 1875.

Dana natural history society: Albany, N. Y.
Honorary member.

Academy of natural sciences, Davenport, Iowa.
Corresponding member: elected, Ap. 27, 1877.

American association for the advancement of science, Salem, Mass.
Member: elected, Aug. 21, 1873; Fellow: elected, 1874.

Société entomologique de Belgique, Brussells, Belgium.
Member effectif: elected, Aug. 4, 1877.

Oneida historical society, Utica, N. Y.
Corresponding member: elected, July 1, 1879.

Meadville society of natural history, Meadville, Pa.
Corresponding member: elected, July 2, 1880.

New York entomological club, New York, N. Y.
Corresponding member: elected, Nov. 15, 1880.

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a The society has no record accessible which indicates the date of election or the character of the membership, though since 1888 he had been regarded as an honorary member.

Musée royal d'histoire naturelle de Belge, Brussells, Belgium.
Corresponding member: elected, July 30, 1877.

Société imperiale des naturalistes de Moscou, Moscow, Russia.
Honorary member: elected, Nov. 20, 1886.

Linnaean scientific association of New Jersey state normal school.
Honorary member: elected, March 1887.

Société entomologique de France, Paris, France.
Member effectif: elected, Nov. 9, 1887.

Kansas state horticultural society, Lawrence, Kans.
Honorary member: elected, Dec. 14, 1887.

New York state agricultural society, Albany, N. Y.
Consulting entomologist: elected, January 1889.

Trinity historical society, Dallas, Texas.
Honorary member: elected, Jan. 14, 1891.

Association of economic entomologists.
Active member since its organization in 1889.

LIST OF NEW SPECIES DESCRIBED BY J. A. LINTNER

This list is arranged systematically and cites also the place and date of the original description.

Lepidoptera

Apatura [*? Chlorippe*[a]] *cocles*...... Papilio. 1884. [b]4: 141–42.
Lycaena lotis....... .... Entomological contributions.[c] 1878. 4: 57–58.
Kricogonia lanice .... Papilio. 1884. 4: 138–39.
Pamphila osceola................ Entomological contributions. 1878. 4: 58–59.
Nisoniades [*Thanaos*] *icelus* ...... Entomological contributions. 1872. 1: 30–32.
Nisoniades [*? Thanaos*] *somnus* .... Papilio. 1881. 1: 73–74.
Nisoniades [*Thanaos*] *lucilius* ..... Entomological contributions. 1872. 1: 32–34.
Nisoniades [*Thanaos*] *ausonius* .... Entomological contributions. 1872. 1: 34–36.

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a The preferred generic name has been inserted in brackets.

b Volume and page references are separated by a colon, e. g., 1: 286-93 means volume 1, pages 286 to 293.

c Entomological contributions, 1, 2, 3 and 4 were published respectively in the 23d, 24th, 25th and 30th *Annual reports* of the New York state museum of natural history.

Nisoniades [*? Thanaos*] *afranius* . . Entomological contributions. 1878. 4 : 63–64.

Nisoniades [*? Thanaos*] *petronius* . . Papilio. 1881. 1 : 70–71.

Nisoniades [*? Thanaos*] *naevius* . . Papilio. 1881. 1 : 69–70.

Nisoniades [*? Thanaos*] *pacuvius* . . Entomological contributions. 1878. 4 : 60–61.

Eudamus [*Thorybes*] *electra* . . . . . . Canadian entomologist. 1881. 13 : 63–65.

Sphinx insolita . . . . Papilio. 1884. 4 : 145–46.

Ellema pineum . . . . Entomological contributions. 1872. 1 : 37–39.

Cerura occidentalis . . . . Entomological contributions. 1878. 4 : 82–83.

Anisota [*Sphingicampa*] *bisecta* . . . . Canadian entomologist. 1879. 11 : 10–12.

Cossus centerensis . . . . Canadian entomologist. 1877. 9 : 129–30.

Cossus undosus . . . . Entomological contributions. 1878. 4 : 131–33.

Xylina unimoda . . . . Entomological contributions. 1878. 4 : 96–97.

Xylina lepida . . . . Entomological contributions. 1878. 4 : 95–96.

Calocampa nupera . . . . Bulletin Buffalo society natural sciences. 1874. 2 : 188–89.

Cucullia laetifica . . . . Check list of the noctuidae of America, north of Mexico. 1875. p. 24–25.

Cucullia speyeri . . . . Entomological contributions. 1874. 3 : 168–74.

Cucullia serraticornis . . . . Entomological contributions. 1874. 3 : 174–76.

Plusia culta . . . . Insects of New York. 2d Report. 1885. p. 97.

Hypocala hilli . . . . Entomological contributions. 1878. 4 : 105–7.

Catocala pretiosa [var. of *C. crataegi* Saund.] Canadian entomologist. 1876. 8 : 121–22.

Acidalia [*Eois*] *lacteola* . . . . Entomological contributions. 1878. 4 : 112.

Diptera

Phora agarici..................Insects of New York. 10th Report. 1895. p. 401, 402.

Chortophila [*Pegomyia*] *betarum*....Insects of New York. 1st Report. 1882. p. 208-9.

Pegomyia vicina.................Insects of New York. 1st Report. 1882. p. 209-11.

Sciara caldaria.................Insects of New York. 10th Report. 1895. p. 398.

Sciara coprophila...............Insects of New York. 10th Report. 1895. p. 394-96.

Diplosis cucumeris..............Insects of New York. 11th Report. 1896. p. 166-67.

Diplosis setigera...............Insects of New York. 11th Report. 1896. p. 168-69.

Cecidomyia balsamicola..........Insects of New York. 4th Report. 1888. p. 60-63.

Cecidomyia trifolii [*leguminicola*]...Canadian entomologist. 1879. 11: 44-45.

Thysanura

Achorutes diversiceps.............Insects of New York. 11th Report. 1896. p. 253-54.

Myriapoda

Leptodesmus falcatus..............Insects of New York. 12th Report. 1897. p. 300-1.

BIBLIOGRAPHY OF THE ENTOMOLOGIC PUBLICATIONS

OF

Joseph Albert Lintner, Ph. D.

The highly commendable practice of the late Dr J. A. Lintner in giving lists of his papers together with place, date of publication and summary of contents, has reduced to a minimum the labor of preparing this bibliography of his writings. In bringing these titles together, it has been my aim to render the greatest value with the least repetition. The extended summaries included in the original lists have been abridged, only the names of the more important species being retained.

The synonymy indicated is based largely on that adopted by Dr Lintner in his index of reports 1–10, which was published in 1896.

Metamorphoses of *Ceratomia quadricornis* Harris [*amyntor* Hübn.] (Entomological society of Philadelphia. Proceedings. 1862. 1: 286–93) Also, separate, with cover and half title page, December 1862.

Extended account of its life history, describing the egg, larval stages, pupa, pupal cell and its construction.

Notes on some of the diurnal lepidoptera of the state of New York, with descriptions of their larvae and chrysalides. (Entomological society of Philadelphia. Proceedings. 1864. 3: 50–64) Also, separate, with cover and title page, May 1864.

The following species are noticed: *Papilio turnus* Linn.[a] [*Jasoniades glaucus* Linn.], *Papilio asterias* Fabr. [*polyxenes* Fabr.], *Papilio* [*Euphoeades*] *troilus* Linn., *Pieris oleracea* Harris, *Colias* [*Eurymus*] *philodice* Godt., *Grapta* [*Polygonia*] *comma* Harris, *Grapta* [*Polygonia*] *faunus* Edw., *Grapta* [*Polygonia*] *progne* Fabr., *Grapta* [*Eugonia*] *j-album* Godt., *Vanessa* [*Euvanessa*] *antiopa* Linn., *Vanessa* [*Aglais*] *milberti* Godt., *Limenitis* [*Basilarchia*] *arthemis* Drury, *Limenitis disippus* Godt. [*Basilarchia archippus* Cram.], *Pyrameis* [*Vanessa*] *huntera* Sm.-Abb. Also notes of comparative abundance and capture of some of the diurnals.

Description of the larva of *Dryocampa* [*Anisota*] *rubicunda* Fabr. (Entomological society of Philadelphia. Proceedings. 1864. 3: 426–27)

Mature larva taken from sugar maple is described.

Notes on some Sphingidae of the state of New York, with descriptions of their larvae and pupae. (Entomological society of Philadelphia. Proceedings. 1864. 3: 645–72) Also, separate, with cover and title page. December 1864.

The immature stages of the following species are noticed: *Sesia* [*Hemaris*] *thysbe* Fabr., *Sphinx quinquemaculata* Steph. [*Phlegethontius celeus* Hübn.], *Sphinx* [*Phlegethontius*] *cingulata* Fabr., *Sphinx* ——— ? [*eremitus* Hübn.], *Sphinx cinerea* Harr. [*chersis* Hübn.], *Sphinx kalmia* Sm.-Abb., *Sphinx drupiferarum* Sm.-Abb., *Philampelus satellitia* Harr. [*pandorus* Hübn.], *Philampelus achemon* Drury, *Deilephila chamaenerii* Harr. *Deilephila lineata* Fabr., *Darapsa* [*Ampelophaga*] *myron* Cram., *Ceratomia quadricornis* Harr. [*amyntor* Hübn.], *Smerinthus* [*Paonias*] *excaecatus* Sm.-Abb.. *Smerinthus* ——— ? [*Paonias excaecatus* Sm.-Abb.], *Smerinthus* [*Cressonia*] *juglandis* Sm.-Abb., *Ellema harrisii*

a In the bibliography the names used in the text are given and the preferred terms inserted in brackets.

Clem., Sphinx larvae on poplar [*Pheosia dimidiata* H.-S.]; list of undescribed larvae of N. Y. state Sphingidae.

A hundred fold return for a trifling expenditure. (Utica morning herald. May 11, 1866)

Brief article on the value of entomologic study, and recommending the *Practical entomologist* to the public.

Description of a new species of *Grapta*, and Notes on *G. interrogationis*. (American entomological society. Transactions. 1869 2:313–19) Also, separate, May 1869.

Description of *Grapta umbrosa* [*Polygonia interrogationis* var.]

First observation of *Pieris rapae* in New York. (Sunday morning press [Albany]. Aug. 7, 1870, p. 4)

Notice of the capture of this cabbage butterfly in Albany.

'The poisonous cabbage worm.' (Argus [Albany] Oct. 20, 1870)

Refuting the statement that the larva of the cabbage butterfly, *Pieris rapae*, is poisonous.

The recently imported cabbage butterfly—*Pieris rapae*. [Read before the Albany institute, Nov. 2, 1870] (Argus [Albany] Nov. 2, 1870. Albany institute. Proceedings. 1873. 1:199–201)

General account of its introduction, life history and probable spread in this country.

On *Graptae interrogationis* and *fabricii* Edw. [*interrogationis* var.]. (American entomological society. Transactions. December 1870. 3:197–204) Separate with cover and title page.

Discussion of *Grapta* [*Polygonia*] *interrogationis* Fabr, and its varieties.

Spectrum [*Diapheromera*] *femoratum*. (Country gentleman. Aug. 13, 1871. 36:552[34][a])

Identification of this 'walking stick' from Columbia, Missouri.

Dryocampa [*Basilona*] *imperialis* Drury. (Country gentleman. Sep. 27, 1871. 36:600[26])

Description of the moth and note on its transformations and habits.

Pieris rapae parasites. (American naturalist. 1871. 5:742; Canadian entomologist. November 1871. 3:197)

Notice of an attack by *Pteromalus*, probably *P. puparum*, on the larvae of the cabbage butterfly.

Cabbage butterfly. (Country gentleman. Nov. 16, 1871. 36:728[16])

Pieris rapae in Delaware, and discovery of its parasite, *Pteromalus puparum*, in Albany, N. Y.

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a The superior figures point to the column and the exact place on the page in ninths; e. g. 552[34] means page 552, column three, four ninths of the way down.

Cut worms in corn. (Country gentleman. May 30, 1872. 37:339[21])

Notice of young cut worms in corn, probably those of *Mamestra* [*Xylophasia*] *arctica* Boisd.

Apple twig borer on pear trees. (Country gentleman. June 13, 1872. 37:375[21])

General notice of *Amphicerus bicaudatus* Say.

Spindle worms. (Country gentleman. June 13, 1872. 37:376[18])

Caterpillars attacking corn are thought to be a species of *Gortyna* [*?Hydroecia*].

Hessian fly. (Country gentleman. June 13, 1872. 37:376[26])

Insect is identified from Franklin co., Ohio.

Bark louse. (Country gentleman. July 11, 1872. 37:440[28])

Notice of a species of *Coccus* infesting a thorn hedge in Windsor, Canada.

Owl beetle. (Country gentleman. July 18, 1872. 37:456[14])

Description and habits of *Alaus oculatus* Linn.

Revision of some of the American butterflies. (American naturalist. 1872. 6:354–59)

Review of a paper under the above title published by Samuel H. Scudder, in the report of the Peabody academy of science, 1871, p. 24–82.

Entomological contributions—no. 1 1872. p. 5–90, pl. 7–8. New York state cabinet of natural history. 23d annual report, 1869. p. 135–222.

Contents

Entomological contributions—no. 2. 1872. p. 5–66. New York state museum of natural history. 24th annual report, 1870. 1872. p. 109–70.

Contents

Hypena scabra Fabr. and *H. erectalis* Guen. [*scabra*] (Canadian entomologist. May 1873. 5 : 81–82)

The synonymy of these two species and of *Depressaria ontariella* [*D. heracliana* De Geer]

Entomology: [Remarks on Myrmeleon, Termes, etc., at a field meeting of the Albany institute at Schoharie, N. Y., June 7, 1873] (Albany evening times. June 9, 1873. 17 : 3; Albany institute. Proceedings. 1878. 2 : 48–50)

Remarks upon the ant lion. Myrmeleon sp., the white ant *Termes flavipes*, the cabbage butterfly *Pieris rapae*, etc.

Economic entomology, etc. [Remarks made at a field meeting of the Albany institute at Watkins Glen, N. Y., June 27, 1873] (Albany evening times. June 30, 1873. 17 : 3, col. 3, 4, 62 cm; Albany institute. Proceedings. 1878. 2 : 65–69)

General remarks on insects, their injuries, parasites, etc.

Caterpillar [on apple-tree]. (Country gentleman. July 17, 1873. 38 : 456^{25})

Caterpillars from Ottumwa, Iowa, prove to be *Notodonta* [*Schizura*] *concinna*. Sm.-Abb.

Coccus insect on the pine. (Country gentleman. Aug. 21, 1873. 38 : 535^{14})

Features of *Coccus* [*Chermes*] *pinicorticis* Fitch, its operations, and remedies.

Entomological contributions—no 3. May 1874. 3 : 117–92. New York state museum of natural history. 26th annual report, 1872 1874. p. 117–92, fig. 1–14.

Contents

Three lined leaf beetle. (Country gentleman. July 23, 1874. 39: 471^{13})

Brief general notice of *Lema trilineata* Oliv.

Soldier bug. (Country gentleman. July 23, 1874. 39: 471^{17})

Arma [*Podisus*] *spinosa* Dallas, is noticed as an enemy of the Colorado potato beetle.

A timothy eater. (Country gentleman. July 23, 1874. 39: 471^{22})

Subsequently proved to be the larva of *Leucania* species.

Raspberry borer. (Country gentleman. July 30, 1874. 39: 487^{16})

Description of *Oberea tripunctata* Fabr. [*bimaculata* Oliv.] and its girdling the canes of the raspberry.

Insect on the potato. (Country gentleman. July 30, 1874. 39: 488^{17})

Notice of *Cosmopepla carnifex* injuring potato vines.

Joint worm. (Country gentleman. Sep. 10, 1874. 39: 584^{17})

Galls and transformations of *Isosoma hordei* Harris are described.

Cimex [*Acanthia*] *lectularius*. (Country gentleman. Sep. 24, 1874. 39: 615^{43})

General account of the bed bug, *Acanthia lectularia* Linn.

Maple leaf cutter. (Country gentleman. Oct. 1, 1874. 39: 631^{14})

General account of *Ornix* [*Incurvaria*] *acerifoliella* Fitch destroying maple forests in Pittsford, Vt.

Cattle tick. (Country gentleman. Oct. 1, 1874. 39: 631^{22})

Appearance and habits of *Ixodes* [*Boophilus*] *bovis* Riley.

Oil beetle. (Country gentleman. Oct. 15, 1874. 39: 663^{43})

Short notice of the habits and vesicating properties of *Meloë angusticollis* Say.

Mr Otto Meske's collection of Lepidoptera. (Albany evening times. Oct. 27, 1874. Albany institute. Transactions, 1876. 8: 215–20)

Notice of the valuable features of this collection.

Description of a new species of *Calocampa*. (Buffalo society of natural sciences. Bulletin 2. October 1874. p. 188–89)

Calocampa nupera is described as a new species.

Record of collections of New York Heterocera for the year 1873. (New York state museum of natural history. 27th annual report, 1875. p. 144–48)

Lists 135 species, with localities and dates of capture.

New apple worm. (Albany evening times. Ap. 12, 1875. 19: 2, col. 3–4; New York state museum of natural history. 30th report, 1878. p. 117–21, with additional matter, p. 121–26; Entomological contributions. June 1878. 4: 5–14)

General account of *Mermis acuminata* Leidy with special reference to its being a parasite of *Carpocapsa pomonella* larvae.

New apple worm. (Country gentleman. Ap. 29, 1875. 40: 262^{42}–63^{11})
Mermis sp. [*acuminata*], a parasite on *Carpocapsa pomonella*.

Insect on the cabbage. (Country gentleman. June 24, 1875. 40: 392^{17})
Identification and notice of *Murgantia histrionica*, from Charlotteville, Va.

Blister beetles. (Country gentleman. July 1, 1875. 40: 407^{15})
Account of *Lytta murina* [*Macrobasis unicolor* Kirby] on potato vines.

Cocoons on oats. (Country gentleman. July 8, 1875. 40: 424^{21})
Cocoons are of some parasite which could not be determined.

Worm on wheat. (Country gentleman. July 15, 1875. 40: 440^{28})
Caterpillar is that of *Leucania harveyi* [*albilinea* Hübn.].

Insects on potatoes. (Country gentleman. July 22, 1875. 40: 472^{28})
Notice of an attack on potatoes by *Lygus lineolaris* [*pratensis* Linn.].

On *Lycaena neglecta* Edw. [*Cyaniris pseudargiolus* var.]. (Canadian entomologist. July 1875. 7: 122–23)
Reasons for differing from Mr W. H. Edwards in his belief of the identity of *L. neglecta* with *L. lucia* [vars. of *Cyaniris pseudargiolus*] based on observations made at Center, N. Y.

On *Orthosia ralla* Gr.–Rob (Canadian entomologist. July 1875. 7: 128–29)
Orthosia ralla is not identical with *O. ferruginoides* Guen. [*bicolorago* Guen. var.]

Carpocapsa deshaiziana [*saltitans*] in seed-vessels of Euphorbia. [Read before the Albany institute Oct. 5, 1875] (Argus [Albany] Oct. 11, 1875; Albany institute. Proceedings. 1878. 2: 264–67)
General account of *Carpocapsa deshaiziana* [*saltitans*] and notice of a Podurid [*Achorutes diversiceps* Lintn.] at Center, N. Y.

Cucullia laetifica Lintn. (*n. sp.*) (Check-list of the Noctuidae of America, north of Mexico, by A. R. Grote, November 1875. 1: 24–25)
This species is described from a specimen from Bastrop, Texas, in the collection of Mr O. Meske.

List of Catocalas occurring in the state of New York. (New York state museum of natural history. 27th annual report, 1875. p. 137–40)
Contains 43 species, with references and synonyms.

List of new species of New York Lepidoptera published in 1873. (New York state museum of natural history. 27th annual report. 1875. p. 141–43)
Contains 80 species, mainly by A. R. Grote, in the *Noctuidae* and *Deltoidae* [the latter family united with the former by recent writers].

On *Catocala pretiosa* n. sp. [*C. crataegi* Saund. var.] (Canadian entomologist. July 1876. 8: 121–22)

Described from examples taken at sugar in Schenectady, N. Y., and compared with *C. polygama* Guen. [*C. grynea* Cram.]

Destructive caterpillar. (Country gentleman. Aug. 10, 1876. 41:504[27])

Caterpillar eating apple leaves in a young orchard at Manlius, N. Y., is probably *Notodonta* [*Schizura*] *concinna* Sm.-Abb.

Cabbage eating insect. (Country gentleman. Sep. 7, 1876. 41:565[37])

Brief account of *Strachia* [*Murgantia*] *histrionica* Hahn as a cabbage pest at Nashville, Tenn.

Grape seed fly. (Country gentlemen. Sep. 21, 1876. 41 : 599[14])

Isosoma [*Evoxysoma*] *vitis* Saund. is the insect infesting grapes received from New Jersey. Its operations are described and remedies for its attack given.

New carpet bug pest—*Anthrenus scrophulariae*. [Read before the Albany institute, Oct. 17, 1876] (Argus [Albany] Oct. 21, 1876; Schenectady daily union. Oct. 21, 1876; Buffalo courier. Oct. 29, 1876; Albany institute. Proceedings, 1878. 2: 313–15)

Notice of the introduction and spread of the carpet beetle, *Anthrenus scrophulariae* Linn.

Insects in flour. (Country gentleman. Oct. 26, 1876. 41 : 683[35])

Wheat flour swarming with *Tyroglyphus farinae* [*siro* Linn.] was received, and a brief account of the mite is given.

Scale insects. (Country gentleman. Feb. 1, 1877. 42 : 69[22])

The following on pear and apple trees are noticed briefly: *Aspidiotus harrisii* Walsh [*Chionaspis furfurus* Fitch] and *Aspidiotus conchiformis* Gmel. [*Mytilaspis pomorum* Bouché].

Bark lice. (Country gentleman. Mar. 8, 1877. 42 : 151[41])

Notice of Harris' bark louse [*Chionaspis furfurus* Fitch] and description of the oyster shell bark louse.

Apple tree insects. (Country gentleman. Ap. 12, 1877. 42 : 235[43])

Oviposition of some tree hoppers, and of the flower cricket, *Oecanthus niveus* DeGeer, is identified.

Insects of 1876 — 1. (Country gentleman May 31, 1877. 42 : 347[23])

Army worm, *Leucania unipuncta* Haw., Colorado potato beetle and grape seed fly, *Isosoma* [*Evoxysoma*] *vitis*, are treated of to some extent.

Insects of 1876 — 2. The new carpet bug. (Country gentleman. June 7, 1877. 42 : 363[21])

Notice of *Anthrenus scrophulariae* and a new potato insect.

Insect on peach trees. (Country gentleman. June 7, 1877. 42 : 363[36])

Unknown caterpillar infesting the twigs of peach trees [probably *Anarsia lineatella* Zeller] can not be identified.

Parasitic insect. (Country gentleman. July 12, 1877. 42 : 448[21])

Young hemipterous insect from Cecil co., Md., are probably *Prionotus* [*Prionodus*] *cristatus* Linn.

Gooseberry fruit worm. (Country gentleman. July 12, 1877. 42 : 448[26])

Brief notice of *Pempelia* [*Zophodia*] *grossulariae* Pack. infesting gooseberries.

Tree hoppers. (Country gentleman. July 19, 1877. 42 : 463[42])

Identifies the egg deposit of one of the tree hoppers [probably *Ceresa bubalus*] in apple twigs.

Eastern grasshopper. (Country gentleman. July 26, 1877. 42 : 475[42])

Destructive work of *Caloptenus* [*Melanoplus*] *femur-rubrum* DeGeer in Virginia.

Blistering beetles. (Country gentleman. July 26, 1877. 42 : 476[27])

Brief notice of *Epicauta cinerea* Foerst and *Lytta* [*Cantharis*] *nuttalli* Say, on potatoes and beans.

On a new species of Cossus. (Canadian entomologist. July 1877. 9:129–30)

Description of *Cossus centerensis* Lintn.

Carpet bug. (Country gentleman. Aug. 2, 1877. 42:491[27])

General account of *Anthrenus scrophulariae* Linn.

Grape vine hog caterpillar. (Country gentleman. Sep. 6, 1877. 42:571[32])

Short notice of *Darapsa* [*Ampelophaga*] *myron* Cram

Pernicious corn insect—the Indian Cetonia. (Country gentleman. Sep. 13, 1877. 42:585[38])

Injuries by *Cetonia* [*Euphoria*] *inda* Linn. to corn and fruit.

Aphis in wheat. (Country gentleman. Dec. 6, 1877. 42:779[21])

Aphis infesting the stalks of young wheat can not be *Aphis avenae* Fitch [*Nectarophora granaria*].

Pea weevil. (Country gentleman. Dec. 6, 1877. 42:780[25])

Bruchus scutellaris Fabr. [*chinensis* Linn.] is identified as the weevil infesting peas in Virginia.

Hessian fly. (Country gentleman. Jan. 24, 1878. 43:55[35])

Gives a brief account of *Cecidomyia destructor* Say.

Aquatic worm. (Country gentleman. Jan. 31, 1878. 43:72[35])

'Animalculae' sent from a well in Winsted, Ct., are described briefly but can not be identified.

Grain aphis (Country gentleman. Ap. 11, 1878. 43:232[24])

Aphis avenae [*Nectarophora granaria*] is identified from Bellbuckle, Tenn.

Insect for name. (Country gentleman. Ap. 18, 1878. 43 : 248[22])

Flat oval eggs of *Phylloptera* [*Amblycorypha*] *oblongifolia* on grapevine are identified.

Insects for name. (Country gentleman. Ap. 25, 1878. 43 : 264[25])

Beetles plowed up in hundreds are the common June bug, *Lachnosterna fusca* Frohl. and *Phyllophaga pilosicollis* Knoch [*Lachnosterna tristis* Fabr.]

Raspberry cane borer. (Country gentleman. May 23, 1878. 43 : 328[16])

Girdling of raspberry canes is referred to *Oberea tripunctata* [*bimaculata* Oliv.].

Two beetles. (Country gentleman. May 30, 1878. 43 : 344[23])

Brief notice of *Chrysomela trimaculata* [*Doryphora clivicollis* Kirby] and *Coptocycla guttata* Oliv. [*signifera* Herbst].

Insects for name. (Country gentleman. June 13, 1878. 43 : 376[24])

Bibio albipennis, Dermestes lardarius, Aphis avenae [*Nectarophora granaria*] are identified.

Peach twig moth. (Country gentleman. June 27, 1878. 43 : 407[19])

General account of *Anarsia lineatella* Zeller.

Grape vine coccus. (Country gentleman. July 4, 1878. 43 : 423[36])

Brief mention of a scale on grape vines.

Insects in Illinois. (Country gentleman. July 4, 1878. 43 : 425[28])

Insects sent from Champaign co., Ill., are identified as *Lecanium acericola* [probably an erroneous reference of *Pulvinaria innumerabilis* Rathv.].

Apple bark and pear blight beetles. (Country gentleman. July 18, 1878. 43 : 455[14])

Notice of *Xyleborus pyri* Peck [*dispar* Fabr.] and *Crypturgus* [*Monarthrum*] *mali* Fitch.

Cockscomb elm gall. (Country gentleman. July 18, 1878. 43 : 455[25])

Brief account of *Byrsocripta* [*Glyphina*] *ulmicola* Fitch.

Apple tree insect. (Country gentleman. July 25, 1878. 43 : 471[12])

Larvae in crevices of a limb, apparently hymenopterous, can not be identified.

Maple bark scale insect—*Lecanium acericorticis* [*Pulvinaria innumerabilis*]. (Country gentleman. July 25, 1878. 43 : 471[17])

General account of this insect, giving previous history, habits and remedies.

Preface and notes to the genera of the Hesperidae of the European faunal region, by Dr Speyer. (Canadian entomologist. July, August and September 1878. 10: 121, 122, 123–24, 125, 126, 146, 151, 163, 169)

Introduction and corrections to the above paper.

Phylloxera. (Country gentleman. Aug. 1, 1878. 43 : 488[23])

Brief notice of *Phylloxera vastatrix* [*vitifoliae*].

Burrowing beetle — *Cebrio bicolor*. (Country gentleman. Aug. 8, 1878. 43: 507[35])

Beetle is identified and its habits given.

Ugly bee slayer. (Country gentleman. Aug. 29, 1878. 43: 551[14])

Account of *Phymata erosa* [*wolfii*] capturing butterflies, bees, etc.

Squash vine borer. (Country gentleman. Aug. 29, 1878. 43: 571[24])

Notice of *Melittia cucurbitae* Har. [*satyriniformis* Hübn.] attacking squash vines.

Phylloxera. (Country gentleman. Aug. 29, 1878. 43: 551[34])

Galls on grape leaves are identified as those of *Phylloxera vastatrix* [*vitifoliae*].

New carpet beetle—*Anthrenus scrophulariae*. (Entomological contributions. June 1878. 4: 15–23, figure. American naturalist. August 1878. 12: 536–44. New York state museum of natural history. 30th annual report. 1878. p. 127–35)

General account of the discovery and life history of this insect, with remedies.

Report on the insects and other animal forms of Caledonia creek, N. Y. (New York fishery commission. 10th annual report, 1877 and 1878. p. 12–36, pl. 1–2. Also, separate, with title page and cover, p. 1–25, pl. 1–2, August 1878)

Extended report of the forms of life inhabiting the waters of the creek with special reference to their value as food for fishes.

Annual address of the president [of the Entomological club of the American association for the advancement of science, at St Louis, Mo., Aug. 20, 1878]. (Canadian entomologist. September 1878. 10: 171–76)

Review of progress and the present status of entomology.

Turnip flea beetle. (Country gentleman. Sep. 12, 1878. 43: 583[24])

Larvae destroying turnips are identified as those of *Haltica striolata* [*Phyllotreta vittata* Fabr.].

Carpet beetle. (Country gentleman. Sep. 12, 1878. 43: 583[28])

Brief general notice of *Anthrenus scrophulariae*.

Harlequin cabbage bug. (Country gentleman. Sep. 26, 1878. 43: 616[16])

An insect destroying cabbages, *Murgantia histrionica* Hahn, is noticed briefly.

Cabbage aphis. (Country gentleman. Nov. 14, 1878. 43: 727[18])

Aphis attacking turnips, *Aphis brassicae* Linn., is indentified and remedies indicated.

Economic entomology during the year 1877. (New York state agricultural society. 37th annual report. 1878. p. 37–39. — Transactions. 1877–82. 1884. 33:17–20)

Importance of economic entomology with notices of *Nephopteryx* [*Pinipestis*] *zimmermani* and *Cossus centerensis*.

Contribution to the economical entomology of the year 1876. (New York state agricultural society. Transactions. 1872–76. 1878. 32:236–43) [Paper presented at the annual meeting of the state agricultural society, Jan. 17, 1877] (Country gentleman. May 31, June 7, 1877. 47 : 347[23], 363[21])

Notices army worm, *Leucania unipuncta*, Colorado potato beetle, grape seed fly, new carpet beetle, *Anthrenus scrophulariae*, and an unknown insect tunneling potatoes.

Description of a new species of *Anisota*. (Canadian entomologist. January 1879. 11 : 10–12)

Anisota [*Sphingicampa*] *bisecta* is described.

Peach tree borer. (Country gentleman. Mar. 27, 1879. 44 : 199[26])

Notice of the peach tree borer and plum curculio.

Clover seed fly — a new insect pest. (American naturalist. March 1879. 13 : 190)

Notice of a paper treating of *Cecidomyia trifolii* [*leguminicola*].

Clover seed fly — a new insect pest. (Canadian entomologist. March 1879. 11 : 44–45 ; Entomological society of Ontario. Annual report. 1879. p. 28–30)

Account and description of *Cecidomyia trifolii* [*leguminicola*].

Poduridae (spring tails) in a cistern. (Country gentleman. May 22, 1879. 44 : 327[21])

Notice of *Lipura fimetaria* [*Aphorura armata*] and an allied species [probably *Achorutes diversiceps*] observed at Center, N. Y.

Two spotted lady bug. (Country gentleman. June 26, 1879. 44 : 407[19])

Beetle mistaken for the carpet bug, is *Coccinella bimaculata* [*Adalia bipunctata* Linn.]

Strawberry borers. (Country gentleman. June 26, 1879. 44 : 407[24])

'Worms' infesting strawberry roots are identified as the strawberry crown borer, *Anarsia lineatella*.

Golden tortoise beetle. (Country gentleman. June 26, 1879. 44 : 407[26])

Beetles on potato vines, *Cassida aurichalcea* Fabr. [*Coptocycla bicolor* Fabr.] are identified.

Grape vine galls. (Country gentleman. June 26, 1879. 44 : 407[27])

Galls on grape vine are those of *Lasioptera vitis* Osten Sacken.

Entomological contributions — no. 4. New York state museum of natural history. 30th report. 1879. p. 117–254. Separate, in advance of the report, with title page, table of contents, index and cover, June 1878. 144 p.

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Army worm—*Leucania unipuncta* Haw (Country gentleman. July 3, 1879. 44: 422[44]–23[19])

General account of the insect, giving description, life history and parasites.

Corn curculio—*Sphenophorus zeae* Walsh [*sculptilis* Uhler]. (Country gentleman. July 10, 1879. 44: 439[21].)

Brief general notice of this insect.

Clover seed fly. (Country gentleman. July 17, 1879. 44: 455[13])

Cecidomyia leguminciola proposed, as *C. trifolii* is preoccupied.

Grape vine bark louse—*Lecanium vitis* Linn. [*Pulvinaria innumerabilis* Rathv.]. (Country gentleman. July 17, 1879. 44: 455[18])

Scale insect on grape vine is identified and briefly noticed.

Striped blister beetle. (Country gentleman. July 31, 1879. 44: 487[16])

Epicauta vittata Fabr. is briefly treated as a potato pest.

Inquiries about ants and beetles. (Country gentleman. July 31, 1879. 44: 487[27])

The following are noticed: *Formica novaeboracensis* Fitch [*Camponotus herculaneus* Linn.], *Coptocycla aurichalcea* Fabr. [*bicolor* Fabr.] and *Melanotus fissilis* Say.

On *Cecidomyia leguminicola*. (Canadian entomologist. July 1879. 11: 121–24)

C. leguminicola proposed for *C. trifolii* which is preoccupied.

Stalk borer — *Gortyna* [*Hydroecia*] *nitela* Guen. (Country gentleman. Aug. 7, 1879. 44: 503[28])

General notice of this insect, giving its life history and remedies.

Two carpet bugs. (Country gentleman. Aug. 7, 1879. 44: 503[42])

Larvae from beneath carpets are *Anthrenus scrophulariae* Linn. and *Attagenus megatoma* Fabr. [*piceus* Oliv.]

Wheat stem maggot—*Meromyza americana* Fitch. (Country gentleman. Aug. 21, 1879. 44: 535[32])

General notice of the insect and its allies.

Carpet beetle. (Country gentleman. Aug. 21, 1879. 44: 535[49])

Anthrenus scrophulariae received from Poughkeepsie, N. Y.

Earth worm—*Lumbricus terrestris* Linn. (Country gentleman. Sep. 4, 1879. 44: 567)

Gives life history and habits so far as known.

Annual address of the president [of the Entomological club of the American association for the advancement of science, at Saratoga, N. Y., Aug. 26, 1879]. (Canadian entomologist. September 1879. 11: 163–75; Entomological society of Ontario. Annual report, 1879. p. 11–18; American entomologist. January, February 1880. 3: 16–19, 30–34)

Mainly a notice of the principal publications and investigations in entomology during the preceding year.

Two pests of the clover plant. (Country gentleman. Oct. 2, 1879. 44: 631[35])

Notice of the injuries to clover by *Hylesinus* [*Hylastes*] *trifolii* Mull, and *Cecidomyia leguminicola* Lintn.

Apple tree insect. (Country gentleman. Oct. 9, 1879. 44: 648[18])

Coleopterous larva on an apple tree can not be identified.

Coccus on peach trees. (Country gentleman. Oct. 23, 1879. 44: 679[27])

Short notice of *Lecanium persicae* Modeer [*nigrofasciatum* Perg.]

Grape insect. (Country gentleman. Oct. 23, 1879. 44: 679[31])

Brief mention of a caterpillar (*Procris* [*Harrisina*] *americana* Guer. See below)

Dung beetle. (Country gentleman. Oct. 30, 1879. 44: 695[45])

Brief account of the tumbler bug, *Aphodius inquinatus* Herbst, and allied species.

Five spotted sphinx. (Country gentleman. Oct. 30, 1879. 44: 696[16])

Tobacco worm, *Sphinx quinquemaculata* Haw. [*Phlegethontius celeus* Hübn.] identified and its habits given.

Apple tree insects. (Country gentleman. Nov. 6, 1879. 44: 711[35])

Treats of two larvae infesting apple trees, one is probably a *Chrysobothris*.

Grape insect—*Procris* [*Harrisina*] *americana* Guer. (Country gentleman. Nov. 6, 1879. 44: 711[45])

Brief general account.

Coccus on peach trees—*Lecanium persicae* [*nigrofasciatum* Perg.] (Country gentleman. Nov. 6, 1879. 44: 711[46])

Identified and synonymy given.

Fitch biological collection of the New York state agricultural society. (Psyche. September—December 1879. 2: 275–76)

Describes the arrangement and character of the collection made by Dr Fitch and states that the Homoptera alone have escaped destruction.

Pickled fruit fly—*Drosophila ampelophila*. (Country gentleman, Jan. 1, 1880. 45: 7[38])

Life history and habits with notice of other species.

Rat tail larva of a syrphus fly. (Country gentleman. Jan. 22, 1880. 45:55[17])

Larvae taken from decaying mold are probably those of *Merodon bardus* Pack. [*Mallota posticata* Fabr.].

Report on some injurious insects of the year 1878. [Address delivered at the annual meeting of the New York state agricultural society, Jan. 22, 1879] (New York state agricultural society. 38th annual report. 1880. p. 61–72—Separate, with title page and cover, p. 14 [January] 1880. Also, in (New York state agricultural society, Transactions. 1877–82. 1884. 33:97–112)

Importance of the study of insects; *Cecidomyia trifolii* n. sp. [*leguminicola*] is described, *Anthrenus scrophulariae, Pulex irritans, Euryomia* [*Euphoria*] *inda* and *Anarsia lineatella* are noticed.

Poduridae (spring tails) in a well. (Country gentleman. Feb. 12, 1880. 45:103[22])

Species identified as *Lipura fimetaria* [*Aphorura armata*] and briefly noticed.

New wheat pest. (Country gentleman. Feb. 19, 1880. 45:120[29])

Cicadula [*Limotettix*] *exitiosa* is recorded as an insect injurious to wheat.

Entomology in America in 1879. (American entomologist. January and February 1880. 3: 16–19, 30–34)

Presidential address before the Entomological club of the American association for the advancement of science. Gives a review of progress during the year.

Apple curculio—*Anthonomus* [*Tachypterus*] *quadrigibbus* Say. (Country gentleman. Mar. 4, 1880. 45: 150[47]–51[15])

General account of the insect, including life history, distribution and remedies.

Worms in rose pots — Larvae of *Bibio albipennis*. (Country gentleman. Mar. 11, 1880. 45: 167[12])

Larvae are indentified as probably those of *Bibio albipennis*.

New wheat pest. (Country gentleman. Mar. 11, 1880. 45: 167[23])

Not known whether *Cicadula* [*Limotettix*] *exitiosa* will attack clover in wheat fields.

Natural history of bacteria. (Country gentleman. Mar. 25, 1880. 45: 203[33]–4[12])

Gener account of the nature of various bacteria.

Raspberry gouty gall beetle. (Country gentleman. Ap. 1, 1880. 45: 215[12])

Brief notice of *Agrilus ruficollis* Fabr.

Wheat insects. (Country gentleman. Ap. 15, 1880. 45:247[22])

Habits of *Siphonophora avenae* [*Nectarophora granaria*], the work of its Chalcid parasites, etc.

Apple leaf Bucculatrix—*Bucculatrix pomifoliella* Clemens. (Country gentleman. Ap. 22, 1880. 45:263[21])

General account of the insect, giving life history and remedies.

Diseased quince twigs. (Country gentleman. Ap. 22 1880. 45: 264[24])

There is no evidence of insect attack.

Poisonous centipede—*Cermatia* [*Scutigera*] *forceps* Raf. (Country gentleman. May 13, 1880. 45: 311[21])

Brief notice of its abundance in Albany.

Rose bug—*Macrodactylus subspinosus* Fabr. (Country gentleman. June 24, 1880. 45: 407[14])

General account of this pest, giving habits, preventives and remedies.

Tallow to preserve insect collections. (American entomologist. June 1880. 3: 145–46)

The value of tallow as a repellant to various insects.

Carpet bug—*Anthrenus scrophulariae* Linn. (Johnson's natural history, by S. G. Goodrich. 1880. 2: 651–52, fig. a–d)

General account, giving its discovery in this country, life history and remedies.

Potato beetle—*Coptocycla clavata* Fabr. (Country gentleman. July 1, 1880. 45: 423[25])

Short notice as a potato insect.

Cut worm moth. (Country gentleman. July 1, 1880. 45: 424[15])

Larva of *Agrotis* [*Noctua*] *clandestina* Harris is identified and habits given.

Eggs of army worm. (Country-gentleman. July 1, 1880. 45: 424[26])

Eggs of *Leucania unipuncta* are identified.

White grub worm—*Lachnosterna fusca* Frohl. (Country gentleman. July 8, 1880. 45:439[14])

Records injuries by the grubs to lawns, remedies given.

Hessian fly. (Country gentleman. July 8, 1880. 45:439[17])

Brief general notice of *Cecidomyia destructor* Say.

A leaf eater. (Country gentleman. July 8, 1880. 45:439[39])

Insect is identified as the hairy necked leaf eater, *Phyllophaga pilosicollis* Knoch [*Lachnosterna tristis* Fabr.].

Squash borer. (Country gentleman. July 15, 1880. 45:455[25])

General account of *Aegeria cucurbitae* Harris [*Melittia satyriniformis* Hübn.] is given.

Stalk borer. (*Gortyna* [*Hydroecia*] *nitela* Guen.). (Country gentleman. July 22, 1880. 45 : 472[19])

Record of injury to potatoes by this species.

Striped blister beetle—*Epicauta vittata.* (Country gentleman. July 29, 1880. 45 : 488[15])

Beetles recorded as destructive to potatoes in Cayuga co., and about Albany.

Basket worm—*Thyridopteryx ephemeraeformis.* (Country gentleman. Aug. 19, 1880. 45 : 535[45])

Larva and moth described and remedies indicated.

Basket or bag worm—*Thyridopteryx ephemeraeformis.* (Country gentleman. Sep. 30, 1880. 45 : 631[36])

Reported as destroying arbor vitae hedges—habits and remedies given.

Caterpillars on the Ampelopsis. (Country gentleman. Oct 7, 1880. 45 : 647[26])

Two blue caterpillars are identified as *Alypia octomaculata* and *Eudryas* [*Euthisanotia*] *grata*, remedies are given.

Harlequin cabbage bug—*Murgantia histrionica* Hahn. (Country gentleman. Oct. 21, 1880. 45 : 679[14])

General account of its spread northward and remedies.

Two spotted tree hopper—*Enchophyllum binotatum* [*Enchenopa binotata*]. (Country gentleman. Nov. 4, 1880. 45 : 711[18])

Several stages described and the food plants and remedies given.

Flour paste flies. (Country gentleman. Nov. 18, 1880. 45 : 743[22])

Flies bred from flour paste are referred to *Drosophila ampelophila.*

Lepidoptera of the Adirondack region. Collected by W. W. Hill in 1875–78. (Progress of the topographical survey of the Adirondack region of New York. 7th annual report, by Verplanck Colvin. Albany 1880. p. 375–400. Separate, with title page and cover [November] 1880. p. 375–400)

Records 415 species collected, with sexes and dates of collection, and gives interesting facts about those taken.

Report on some injurious insects of the year 1879. [Presented to the New York state agricultural society at its annual meeting, Jan. 21, 1880] (New York state agricultural society. 39th annual report, 1880. p. 35–55) Also, in (New York state agricultural society. Transactions for 1877–82. 1884. 33 : 142–64, fig. 4)

After prefatory remarks the following insects are discussed: the clover seed midge, *Cecidomyia leguminicola* Lintn.; clover root borer, *Hylesinus* [*Hylastes*] *trifolii* Müll.; wheat stem maggot, *Meromyza americana* Fitch; corn curculio, *Sphenophorus zeae* [*sculptilis*]; stalk borer, *Gortyna* [*Hydroecia*] *nitela* Guen.; apple tree case bearer, *Coleophora malivorella* Riley, concluding with a notice of the entomologic labors of Dr Asa Fitch.

[Address before the farmers' club of Onondaga co., N. Y., Dec. 4, 1880] (Syracuse morning standard. Dec. 6, 1880. p. 4)

General account of the value of ecomomic entomology.

Bean weevil — *Bruchus fabae* Riley [*obtectus* Say]. (Country gentleman. Jan. 6, 1881. 46 : 7[21])

Brief notice of its spread in this country and remedies.

Flight of Ephemera. (Country gentleman. Jan. 6, 1881. 46 : 7[25])

Records a remarkable flight of Ephemeridae or day-flies.

On the importance of entomological studies. (Papilio. Jan. 15, 1881. 1 : 1–2)

Shown by the literature and its relation to an extensive agriculture.

Description of a new species of Eudamus. (Canadian entomologist. April 1881. 13 : 63–65) Republished in (Injurious and other insects the state of New York. 1st annual report, 1882. p. 338–39)

Describes *Eudamus* [*Thorybes*] *electra*, from an example captured in Hamilton, Ontario.

Asparagus beetle—*Crioceris asparagi* Linn. (Country gentleman. Ap. 14, 1881. 46 : 243[11])

General account of its introduction, spread, life history and remedies.

Army worm. The invasion of northern New York by this destructive pest. (Albany evening journal. May 23, 1881. p. 3; Country gentleman. June 2, 1881. 46 : 359[12])

Describes the ravages of a caterpillar [*Crambus vulgivagellus* Clem.], and indicates remedies.

On some species of Nisoniades. (Papilio. May 1881. 1 : 69–74. Separate, June 1881. p. 1–6) Republished in (Injurious and other insects of the state of New York. 1st annual report, 1882. p. 333–37)

Describes *Nisoniades* [*?Thanaos*] *naevius*, and *N.* [*?Thanaos*] *petronius* and *N.* [*Thanaos*] *somnus* and gives notes on *N.* [*?Thanaos*] *propertius*, *N.* [*?Thanaos*] *juvenalis*, *N.* [*Thanaos*] *icelus*, *Eudamus nevada* [*mexicana*] and *Eudamus proteus*.

'Army worm' invasion of northern New York. (St Lawrence republican. June 8, 1881. p. 51)

General notice of the operations and habits of the caterpillars [*Crambus vulgivagellus* Clem.], some are identified as *Nephelodes violans* Guen. [var. of *N. minians* Guen.]

A new insect pest — not the army worm. (Country gentleman. June 9, 1881. 46 : 375[11])

Insect in northern New York identified as *Nephelodes violans* Guen. [var. of *N. minians* Guen.]

Insects on plum trees. (Country gentleman. June 9, 1881. 46: 376[23])

Notices *Bibio femoratus* and the plum curculio.

Mites in clothing. (Country gentleman. June 9, 1881. 46:376[26])

Mites in a box of clothing were probably *Bryobia pratensis.*

Late insect invaders of northern New York. (Albany evening journal. July 1, 1881)

Larvae collected at Potsdam have been identified as *Nephelodes violans* Guen. [var. of *N. minians* Guen.] and *Crambus exsiccatus* Zeller [*trisectus* Walk.].

Orchard caterpillar. (Country gentleman. July 14, 1881. 46:455[35])

Apple tree tent caterpillar, *Clisiocampa americana* Fabr., is noticed.

Worms on tomatoes. (Country gentleman. July 14, 1881. 46:456[32])

'Light brown worm or fly,' can not be named without examples of the insect.

Pear tree blight. (Middleburgh gazette. July ? 1881)

Pear blight is described and treatment indicated.

Insects and fungus on quinces. (Country gentleman. Aug. 18, 1881. 46:535[16])

Quince curculio, *Conotrachelus crataegi* Walsh, the apple worm, *Carpocapsa pomonella* Linn. and a fungus, *Roestelia aurantiaca* [aecidial form of *Gymnosporangium clavipes*], are noticed.

Insect pest. Preservation of our shade trees from its ravages. (Albany evening journal. Aug. 31, 1881)

General account of the white marked tussock moth, *Orgyia* [*Notolophus*] *leucostigma.*

Insects on strawberry roots. (Country gentleman. Sep. 8, 1881. 46: 583[18])

Unable to identify the insect without examples.

Apple leaf cluster cup fungus. (Country gentleman. Sep. 8, 1881. 46: 583[22])

Brief notice of the fungus, *Oecidium pyratum* Schw. [aecidial form of *Gymnosporangium macropus*].

Beetle on the tomato. (Country gentleman. Sep. 8, 1881. 46: 584[36])

Ash gray blister beetle, *Epicauta cinerea* Forst. is recorded on the tomato.

Crambus vulgivagellus in northern New York. (St Lawrence republican. Sep. 14, 1881)

Notes on this species—it is the depredator, not *Nephelodes violans* Guen. [var. of *N. minians* Guen.]

Injurious insects, with special notice of some new insect pests. [Read before the New York state agricultural society at Elmira, Sep. 13, 1881] (Husbandman [Elmira, N. Y.] Sep. 14, 1881. p. 3, 6, 7 — 5 col.; Country gentleman. Sep. 29, 1881. 46 : 631[21]; Oct. 6, 1881. p. 647[18]. Republished in New York state agricultural society. 41st annual report, 1881. Albany [August] 1882. p. 40–50. New York state agricultural society. Transactions, 1877–82. 1884. 33 : 221–34)

The following insects are noticed: vagabond Crambus, *Crambus vulgivagellus* Clem., punctured clover leaf weevil, *Phytonomus punctatus* Fabr. and a pyralid web caterpillar, *Eurycreon rantalis* Guen. [*Loxostege similalis* Guen.]

Vagabond Crambus. (Ogdensburg [N. Y.] daily journal. Sep. 21, 1881)

This popular name proposed for *Crambus vulgivagellus* Clem., and remedies given.

Grass eating grub. (Country gentleman. Sep. 22, 1881. 46 : 615[25])

Injuries by the white grub, *Lachnosterna fusca,* to grass, with remedies.

Barn beetle—*Lathridius pulicarius* Mels. [*ruficollis* Marsh.] (Country gentleman. Sep. 29, 1881. 46 : 632[24])

Beetle infesting a barn is referred to this species.

Remarkable invasion of northern New York by a pyralid insect, *Crambus vulgivagellus.* [Abstract of a paper read before the American association for the advancement of science, at its Cincinnati meeting, in August 1881] (Science. Oct. 1, 1881. 2 : 467; American association for the advancement of science. Proceedings, 1881. 30 : 267–68)

Gives the principal features of the recent remarkable abundance of this insect and its injuries.

Peach pest—*Largus succinctus.* (Country gentleman. Oct. 13, 1881. 46 : 663[15])

Brief notice of this bug attacking nearly ripened peaches.

Insect enemies of the strawberry. (Country gentleman. Oct. 27, 1881. 46 : 695[24])

Notices the following insects: White grub, goldsmith beetle, *Cotalpa lanigera, Allorhina nitida,* grape vine Colaspis, strawberry crown borer, strawberry aphis, and *Paria aterrima* Oliv. [*Typophorus canellus* Fabr.].

Insects of the clover plant. [Read before the New York state agricultural society, at its annual meeting, Jan. 19, 1881] (New York state agricultural society. 40th Annual report. 1880. p. 10–26, fig. 1–6. 1881. Separate, with t. p. cover, p. 17, fig, 6 [October] 1881) Republished in New York state agricultural society. Transactions, 1877–82. 33 : 187–207)

Gives lists of insects depredating on clover and notices the following species: clover root borer, *Languria mozardi* Latr.; clover seed midge, *Cecidomyia leguminicola* Lintn.; clover leaf midge, *Cecidomyia trifolii* Loew; clover Oscinis, *Oscinis trifolii* Burg.

On the life duration of the heterocera (moths). [Read before the American association for the advancement of science, at its Cincinnati meeting, August 1881] (Canadian entomologist. November 1881. 13: 217–20) Republished in (Injurious and other insects of New York, 1st annual report. 1882. p. 339–41)

Gives the life duration in the following families: *Noctuidae*, *Attacinae* of the *Bombycidae*, *Sphingidae*.

Corn beetle. (Country gentleman. Nov. 3, 1881. 46 : 711[15])

Beetle feeding on corn is identified as *Lathridius pulicarius* Mels. [*ruficollis* Marsh].

Cabbage Plusia—*Plusia brassicae* Riley. (Country gentleman. Nov. 3, 1881. 46 : 711[22])

General account of this insect, giving injuries, life history and remedies.

On the life duration of the heterocera (moths). [Abstract of a paper read before the A. A. A. S. at its Cincinnati meeting in August 1881] (Science. Nov. 5, 1881. 2 : 525; Proceedings of the A. A. A. S., 1881. 30 : 268–69)

Summary of the paper is given above.

Corn worm — *Heliothis armigera* [*armiger*] Hübn. (Country gentleman. Nov. 24, 1881. 46 : 759[22]; Ontario county times. Nov. 24, 1881. 31 : 3)

General notice of an attack on corn by this insect.

Habits of the Phylloxera. (Country gentleman. Dec. 17, 1881. 46:779[13])

Brief notice of *Phylloxera vitifoliae* on grape.

Bean weevil — *Bruchus obsoletus* Say [*obtectus* Say] (Country gentleman. Dec. 8, 1881. 46 : 795[15])

Brief account of this species and its allies.

Insects on sweet potato vines. (Country gentleman. Feb. 23, 1882. 47 : 149[21])

Larvae infesting sweet potato vines are probably those of *Coptocycla aurichalcea* Fabr. [*bicolor* Fabr.]

Entomological — The anatomy of the mouth parts and the sucking apparatus of some diptera. (Country gentleman. Feb. 23, 1882. 47 : 151[27])

Review of a paper by Mr George Dimmock on this subject.

Millions of grasshoppers in midwinter. (Albany evening journal. Feb. 25, 1882)

Notice of *Tragocephala* [*Chortophaga*] *viridifasciatia* on snow.

Winter grasshopper—*Tragocephala* [*Chortophaga*] *viridifasciata*. (Country gentleman. Mar. 9, 1882. 47 : 189[24])

A brief general notice of the insect.

Hickory borer—*Cyllene pictus* Drury. (Country gentleman. Mar. 9, 1882. 47 : 189[28])

Differences between this species and *C. robiniae*.

Apple leaf Bucculatrix. (Country gentleman. Mar. 16, 1882. 47 : 207[18])

Small white ribbed cocoons upon apple tree bark are those of *Bucculatrix pomifoliella* Clemens.

New principle in protection from insect attack. [Read before the Western New York horticultural society, at its annual meeting, Jan. 25 1882] (Western New York horticultural society. Proceedings. 1882, p. 52–66. Separate, with one-half title page cover, 15 p. [March, 1882])

Use of counterodorants as a preventive of insect attacks.

Insects that injure trees. (Country gentleman. Ap. 20, 1882. 47 : 313[16])

Notice of Dr Packard's *Insects injurious to forest and shade trees*, being Bulletin no. 7 of the U. S. entomological commission

White grub—*Lachnosterna fusca* Frohl. (Country gentleman. Ap. 27, 1882. 47 : 333[22])

General account of the insect.

Spring canker worm, *Anisopteryx* [*Paleacrita*] *vernata*. (Country gentleman. May 18, 1882. 47 : 393[13])

Its distribution from Maine to Texas, and the various remedies.

Mites in timothy fields. (Country gentleman. May 18, 1882. 47 : 395[15])

Mite is probably *Trombidium bicolor* [*Bryobia pratensis*].

Leaf mining Anthomyiidae. (Canadian entomologist. May 1882. 14 : 96–97. Entomological society of Ontario. 13th annual report. 1882. 1883, p. 31)

Chortophila [*Phorbia*] *floccosa* Macq., and two new species are treated.

Grain aphis—*Siphonophora avenae* Fabr. [*Nectarophora granaria* Kirby]. (Country gentleman. June 22, 1882. 47 : 493[25])

General notice of attack by this species on wheat.

Apple tree case bearer. (Country gentleman. July 6, 1882. 47 : 535[15])

Caterpillar of *Coleophora malivorella* Riley identified, and remedies given.

Spring canker worm—*Anisopteryx* [*Paleacrita*] *vernata* Peck. (Country gentleman. July 6, 1882. 47 : 533[24])

Injuries in New Canaan, Ct., and remedies indicated.

Rose bug. (Country gentleman. July 6, 1882. 47 : 534[32])

Gives several remedies for *Macrodactylus subspinosus*.

17 year locust. (Ontario county times. July 12, 1882. 28: 3)

General account of *Cicada septendecim* in the state of New York.

New household pest—*Attagenus megatoma* Fabr. [*piceus* Oliv.]. (Country gentleman. July 20, 1882. 47: 567[24])

General account of this carpet beetle.

Hessian fly in Ohio. (Country gentleman. July 20, 1882. 47: 567[36])

Attack by second brood, life history, remedies.

Bark beetle. (Country gentleman. Aug. 3, 1882. 47: 605[28])

Identification of *Hymenorus obscurus* Say, with notice of habits.

Stalk borer. (Country gentleman. Aug. 3, 1882. 47:605[34])

Gortyna [*Hydroecia*] *nitela* Guen. injurious to potatoes and corn, remedies.

Wire worms infesting potato vines. (Country gentleman. Aug. 10, 1882. 47:625[22])

Brief notice of wire worms, *Elateridae*, infesting potatoes.

Horn tail borer—*Tremex columba* Linn. (Country gentleman. Aug. 10, 1882. 47:625[26])

Notices injuries to maples by this species and *Glycobius* [*Plagionotus*] *speciosus*, and the parasites, *Rhyssa* [*Thalessa*] *lunator* and *R.* [*Thalessa*] *atrata*.

Spotted horn bug. (Country gentleman. Aug. 27, 1882. 47:645[21])

General notice of *Dynastes tityus*.

Mites infesting a poultry house. (Country gentlemen. Aug. 17, 1882. 47:645[28])

Mites are probably a common species, remedies are given.

New worm in apples. (Country gentleman. Sep. 21, 1882. 47:745[25])

White worm in early apples may be *Sciara mali*.

Black blister beetle—*Epicauta pennsylvanica* DeGeer. (Country gentleman. Sep. 21, 1882. 47:745[32])

Beetle injurious to carrots and cabbages, remedies indicated.

Hag moth caterpillar. (Country gentleman. Sep. 21, 1882. 47:745[36])

Larvae of *Phobetron pithecium* Sm.-Abb. described and interesting facts given.

New apple insect—*Amphidasys* [*Lycia*] *cognataria* Guen. (Country gentleman. Oct. 5, 1882. 47: 785[24])

Brief account as an apple tree pest.

Destructive elm leaf beetle—*Galerucella xanthomelaena* Schrank [*luteola* Müll.] (Country gentleman. Oct. 12, 1882. 47: 805[11])

Identified from Bound Brook, N. J., and remedies given.

Rose leaf insect. (Country gentleman. Mar. 1, 1883. 48: 169[25])

Caterpillar feeding on rose leaves is identified as *Penthina nimbatana* Clem.

Of interest to flower growers — A new enemy found. (Troy daily times. Ap. 2, 1883)

Discovery of a caterpillar, probably *Plusia dyaus* Grote [*rogationis* Guen.], feeding upon heliotrope, geranium, wandering jew (*Tradescantia*), etc.

Bean weevil. (Country gentleman. Ap. 19, 1883. 48:317[32])

Identification and brief notice of *Bruchus fabae* Riley [*obtectus* Say].

Thousand legged worms in a nursery—*Julus caeruleocinctus* Wood. (Country gentleman. May 24, 1883. 48: 421[23])

General account of this species, giving characteristics, habits and remedies.

Curious ichneumon cocoons. (Country gentleman. June 14, 1883. 48: 481[24])

Cocoons of *Apanteles congregatus* Say described; the habits and value of allied species.

On an egg parasite of the currant saw fly, *Nematus ventricosus* Klug. [*Pteronus ribesii* Scop.]. (Psyche. 1883. 4: 48–51)

Account of *Trichogramma pretiosa* as a parasite of this saw fly.

Rearing lepidoptera. (Psyche. 1883. 4: 53, 13 cm)

Notices work of Mr S. L. Elliot and his success in rearing lepidoptera.

Book notice. (Psyche. 1883. 4: 53, 11 cm)

Notices the volume, *Insects injurious to fruits*, by Mr William Saunders as soon to be published.

Codling moth of the apple. (Country gentleman. June 28, 1883. 48: 421[23])

Identification of *Carpocapsa pomonella* and remedies.

An interesting bug. (Country gentleman. June 28, 1883. 48: 521[27])

Account of the beneficial habits of the 'wheel-bug,' *Prionotus* [*Prionodus*] *cristatus* Linn.

Maple tree scale insect—*Lecanium* [*Pulvinaria*] *innumerabilis* Rathvon. (Country gentleman. July 5, 1883. 48: 541[31])

General account of this species, giving life history, references to papers treating on it and remedies.

Black long sting—*Rhyssa* [*Thalessa*] *atrata* Fabr. (Country gentleman, July 12, 1883. 48: 561[26])

Characters of the species and its method of oviposition.

Hairworm, Vanessa, Alaus, Gordius and Mermis. (Country gentleman. July 19, 1883. 48: 581[12])

Gordius, *Mermis*, *Vanessa* [*Euvanessa*] *antiopa* and *Alaus oculatus* are briefly treated.

Oak moth—*Anisota senatoria* Sm.-Abb. (Country gentleman. July 26. 1883. 48: 601[33])

Brief notice of this species.

Captures of *Feniseca tarquinius* Fabr. (Psyche. 1883. 4 : 75, 13 cm)
Number of examples collected at Keene Valley, N. Y., and one at Center, N. Y.

[Platygaster larva destroying galls of *Cecidomyia salicis-batatus*] (Psyche. 1883. 4 : 79—7 cm)
Reference to Prof. D. S. Kellicott's observations on the above.

[Collecting cut worms at evening with a light] (Psyche. 1883. 4 : 80, 10 cm)
Notice of collections made about dusk in the evening.

Grape pest—*Procris* [*Harrisina*] *americana*. (Country gentleman. Aug. 2, 1883. 48 : 621[26])
Insect in Champaign co., Ohio, description, remedies.

Potter wasp cells on grape leaves—*Eumenes fraternus* Say. (Country gentleman. Aug. 9, 1883. 48: 641[44])
Description of the cells and habits of the insect.

Frenching of corn. (Country gentleman. Aug. 16, 1883. 48: 661[42])
Causes of frenching, a brief account of *Sphenophorus sculptilis*.

Striped squash beetle. (Country gentleman. Aug. 23, 1883. 48: 681[23])
Brief account of *Diabrotica vittata* Fabr.

Carpet bug—*Anthrenus scrophulariae*. (Country gentleman. Aug. 23, 1883. 48: 681[27])
Report of this larva injuring linen and silk goods doubted ; remedies.

Pine emperor moth. (Country gentleman. Sep. 27, 1883. 48: 781[27])
Larva of *Eacles* [*Basilona*] *imperialis* Drury is identified and habits given.

Saw fly larvae on quince. (Country gentleman. Oct. 4, 1883. 48: 801[23])
Describes the larva of saw fly on quince leaves, and notices *Vanessa* [*Euvanessa antiopa* and *Adalia bipunctata*.

Bark louse on willow. (Country gentleman. Oct. 4, 1883. 48: 801[26])
Apple tree bark louse, *Mytilaspis pomorum*, recorded on Kilmarnock willow.

Chinch bug in northern New York. (Argus [Albany]. Oct. 10, 1883. p. 3; Watertown [N. Y.] daily times. Oct. 12, 1883. [same article copied] Country gentleman. Oct. 18, 1883. 48 : 841[25] [same copied nearly entire])
General account of *Blissus leucopterus* in northern New York, giving appearance, ravages and remedies.

New enemy to the farm. (Argus [Albany]. Oct. 10, 1883. p. 4, col. 3, 30 cm)
Recapitulation of the preceding paper slightly altered.

Chinch bug in New York. (Science. Oct. 19, 1883. 2 : 540, 16 cm)
Its detection in large numbers in St Lawrence co., N. Y.

Mole cricket. (Country gentleman. Oct. 25, 1883. 48: 861[24])

Habits of *Gryllotalpa borealis* Burm. and remedies.

Directions for arresting the chinch bug invasion of northern New York. (New York state museum of natural history: Department of entomology. Circular no. 1. October 1883. 3 p., fig. 1)

Brief account emphasizing the necessity for remedial measures.

1st annual report on the injurious and other insects of the state of New York. Made to the state legislature, pursuant to ch. 377 of the laws of 1881. Albany: Weed, Parsons and Company, printers. 1882. 22+381p., 84 fig. [issued in October, 1883]

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Ant lion. (Country gentleman. Nov. 1, 1883. 48: 981[16])

Gives an interesting account of the habits of several species of ant lions.

New corn pest—*Megilla maculata*. (Country gentleman. Nov. 22, 1883. 48: 941[15])

Injurious habits of this species exceptional in the *Coccinellidae*.

Apple maggot—*Trypeta pomonella*. (New York agricultural experiment station. Bulletin 75. Dec. 29, 1883, 110 cm)

General account of this species, giving injuries, life history, remedies, and mentions *Sciara mali*.

New sexual character in the pupae of some Lepidoptera. (Psyche. 1883. 4: 103–6—Issued Feb. 11, 1884.) Abstract in proceedings of the American association for the advancement of science, for the meeting held at Montreal, Canada, August 1882, 1883. pt 2, 31: 470–71.

On sexual characters among insects, specially of certain ones in the pupae of the *Cossidae* and *Aegeriadae*.

Horn tail—*Urocerus cressoni*. (Country gentleman. Jan. 3, 1884. 49: 9[12])

Identified and habits briefly given.

Fuller's rose beetle — *Aramigus fulleri.* (Country gentleman. Jan. 17, 1884. 49:49[21])

General account of this insect, giving injuries, distribution, life history and remedies.

Lunate long sting — *Thalessa lunator* Fabr. (Country gentleman, Ap. 17, 1884. 49:331[36])

Life history and habits of this species, with mention of its host, *Tremex columba.*

Insect attack on a Julus. (Canadian entomologist. April 1884. 16:80. 7 cm)

Of a possible attack by ichneumon flies on a Julus.

Insect injury to grape vines. (Country gentleman. May 8, 1884. 49:397[11])

General account of injury by *Oecanthus latipennis* to grape vines.

Squash borers. (Country gentleman. May 8, 1884. 49:397[24])

Injuries to squash vines referred to *Melittia cucurbitae* Harris [*satyriniformis* Hübn.].

Punctured clover leaf weevil. (Country gentleman. May 29, 1884. 49:457[21]; Ontario county times, extra. May 29, 1884)

General account of *Phytonomus punctatus* Fabr., giving description of the insect, and remedies.

New clover pest—its ravages in the southern portion of Canandaigua. (Ontario county times, extra. May 29, 1884, 30 cm. June 4, 1884. p. 3, col. 4–5, 85 cm)

Ravages of *Phytonomus punctatus,* and remedies for the pest.

Corn cut worm. (New York agricultural experiment station. Bulletin 86. Geneva. May 31, 1884)

Gives the methods of controlling cut worms.

White grub of the May beetle — *Lachnosterna fusca.* [Read before the New York state agricultural society at the annual meeting, Jan. 16, 1884.] (New York state agricultural society. 43d annual report. 1883. [June 5] 1884. p. 20–37, fig. 5)

General account of white grubs and the parent beetles.

Squash vine borer — 1. *Melittia cucurbitae* Harr. [*satyriniformis* Hübn.] (Country gentleman. June 5, 1884. 49:477[25])

Describes caterpillar and moth, with remarks upon its family.

Squash vine borer — 2. (Country gentleman, June 12, 1884. 49:497[21])

Life history, habits and injuries discussed.

Squash vine borer — 3. (Country gentleman. June 19, 1884. 49:517[11])

Treats of various remedies and preventives.

Bacon beetle — *Dermestes lardarius*. (Country gentleman. June 26, 1884. 49 : 537^{23})

Brief account of this species, giving description, habits and remedies.

Maple tree scale insect. (Country gentleman. July 3, 1884. 49 : 556^{46}–57^{17})

Identifying *Lecanium* [*Pulvinaria*] *innumerabilis* Rathv., and giving remedies.

Spring canker worm—*Anisopteryx* [*Paleacrita*] *vernata* Peck. (Country gentleman. July 10, 1884. 49 : 577^{24})

Treats of the importance and means of arresting its spread.

Buffalo gnat. (Country gentleman. July 10, 1884. 49 : 577^{33})

General account of the species [*Simulium invenustum*].

Carpet bug. (Daily democrat [Amsterdam, N. Y.] July 21, 1884)

Gives description and habits of the insect, with remedies.

Elm tree beetle. (New York weekly tribune. July 23, 1884)

Destroying the larvae and pupae at base of trees recommended.

Carpet beetle—*Anthrenus scrophulariae* Linn. (Country gentleman. Aug. 14, 1884. 49 : 676^{43}–77^{18})

Gives its habits, habitat, injuries, materials eaten, transformations, preventives and remedies.

Insects mining beet leaves. (Country gentleman. Aug. 14, 1884. 49 : 677^{22})

Attack on beet leaves referred to Anthomyians.

Peach root aphis. (Gardener's monthly and horticulturist (Phil.) September 1884. 26 : 271–72, 29 cm)

Root aphis on seedling peach trees is believed to be *Myzus persicae* Sulz. [*Aphis prunicola* Kalt.] and remedies are given.

New rose pest—*Homoptera lunata*. (Country gentleman. Sep. 1, 1884. 49 : 737^{16})

Caterpillars of this species are recorded feeding on rose buds.

Jumping seeds. (Country gentleman. Sep. 11, 1884. 49:757^{15})

General notice of *Carpocapsa saltitans* and of other species.

White grub—*Lachnosterna fusca*. (Country gentleman. Sep. 11, 1884. 49:757^{27})

Starvation remedy is recommended.

Insect attack new to the state—*Isosoma tritici*, on wheat, in Geneva. (New York agricultural experiment station, Bulletin 100. Geneva, N. Y. Oct. 4, 1884)

General account of the insect and its treatment.

Stinging bug—*Melanolestes picipes* H.-S. (Country gentleman. Oct. 23, 1884. $49{:}877^{24}$)

Melanolestes picipes H.-S., or 'black corsair,' *Conorhinus sanguisugus* LeC., *Melanolestes abdominalis* H.-S., *Reduvius*, [*Opsicoetus*] *personatus* Linn., and *Prionotus* [*Prionodus*] *cristatus* Linn. are mentioned.

Attack on the apple worm—A friend, not a foe. (Country gentleman. Oct. 30, 1884. $49{:}897^{27}$)

Notice of *Chauliognathus marginatus* Fabr. feeding upon the apple worm—the larva of *Carpocapsa pomonella. Chauliognathus pennsylvanicus* and *Conotrachelus crataegi* mentioned.

Clover insects. (New York state agricultural society. Transactions, 1877–82. [October] 1884. 33:206–7)

Supplement to the paper on 'The insects of the clover plant,' in which are named 24 additional species—making a total of 70.

White grub. (New England homestead. Nov. 8, 1884. 18:383, col. 1–3)

Extended notice of white grubs, giving distribution, life history and remedies.

Report of the state entomologist to the regents of the University of the State of New York, for the year 1883. (New York state museum of natural history. 37th annual report by the regents of the University of the State of New York. [November] 1884. p. 45–60)

The following insects are noticed: *Grapta* [*Polygonia*] *faunus*, *G.* [*Eugonia*] *j-album*, *Feniseca tarquinius*, *Agrilus torpidus* [*anxius*], *Agrotis* [*Noctua*] *clandestina*, *Simulium molestum* [*venustum* Say], *Orgyia* [*Notolophus*] *leucostigma*, and *Blissus leucopterus*.

Apple leaf Bucculatrix. (Husbandman [Elmira, N. Y.] Dec. 3, 1884. No. 537, 11 : 1)

General account of *Bucculatrix pomifoliella*.

On some Rio Grande Lepidoptera. (Papilio. 1884. 4 : 135–47) [Published February 1885]

Gives an annotated list of collections made by Messrs Sennett and Webster in 1877 and 1878, the following new species being described: *Kricogonia lanice*, *Apatura cocles*, *Sphinx insolita* and *Ecpantheria sennettii* Lintn. [*garzoni* Oberthur].

Scale insect attack on ivy. (Country gentleman. Feb. 26, 1885. $50 : 169^{22}$)

Identifies *Aspidiotus nerii* Bouché on ivy and gives remedies.

Owl beetle — *Alaus oculatus* [subsequently proved to be *A. myops*] (Country gentleman. Ap. 9, 1885. $50 : 307^{43}$)

Brief notice of the insect.

Remedies for the white grub. (New England homestead. May 16, 1885. 19 : 205, col. 2)

Starvation, crops of buckwheat, mustard, are the remedies given.

Cut worms. [Read before the New York state agricultural society, at the annual meeting, Jan. 21, 1885.] (New York state agricultural society. 44th annual report. 1884. [May] 1885. p. 56–80, fig. 1–20) (Separate, with cover and half title [June 1885] 25 p., 20 fig.)

Extended account of cut worms and their treatment.

Potato bug parasite. (New England homestead. June 6, 1885. 19 : 237, col. 2)

Mite infesting and killing Colorado potato beetles is identified as *Uropoda americana* Riley.

Visitation of locusts. (Argus [Albany], June 7, 1885)

On the appearance of the 17 year locusts in New York.

Pear blight beetle. (Country gentleman. June 18, 1885. 50 : 517^{23})

General notice of *Xyleborus pyri* [*dispar*].

Canker worm. (Country gentleman. June 18, 1885. 50 : 519^{26})

Notice of *Anisopteryx* [*Paleacrita*] *vernata* Peck, with remedies.

Insect eggs on strawberries. (Country gentleman. June 25, 1885. 50 : 537^{31})

Eggs of hemipteron can not be identified, *Corimelaena pulicaria* mentioned.

Plant lice, elm beetles, etc. (New England homestead. July 4, 1885. 19 : 269, col. 1–2)

Schizoneura americana and *Galeruca xanthomelaena* [*Galerucella luteola*] noticed.

Apple tree bark louse. (New England homestead. July 4, 1885. 19 : 269, col. 4–5)

Mytilaspis pomorum Bouché identified and remedies given.

Cut worm and onion maggot. (Country gentleman. July 9, 1885. 50 : 574^{45}–75^{11})

Remedies for cut worms—*Anthomyia* [*Phorbia*] *brassicae* and *Phorbia ceparum* are given.

Peach and cherry borers. (Country gentleman. July 9, 1885. 50 : 575^{11})

Brief notice of *Phloeotribus liminaris* Harr. and *Scolytus rugulosus* Ratz.

Fig eater—*Allorhina nitida*. (Country gentleman. July 9, 1885. 50:575^{16})

Its habits are described briefly.

Round headed apple tree borer—*Saperda candida* Fabr. (Country gentleman. July 16, 1885. 50:590^{44}–91^{14})

Borers in hawthorn are probably this insect—several remedies are given.

Entomological. [Answers to inquiries] (Country gentleman. July 16, 1885. 50:592[25])

Remedies are given for the potato beetle and rose bug.

Cause of black knot. (Country gentleman. July 23, 1885. 50:607[18])

It is produced by a fungus, *Plowrightia morbosa.*

Cucumber moth. (Country gentleman. July 23, 1885. 50:607[26])

Notices *Phakellura* [*Margaronia*] *nitidalis* Cram., *P.* [*Margaronia*] *hyalinata* and *Melittia cucurbitae* Harr. [*satyriniformis* Hübn.].

Apple insects and the Rhinoceros beetle. (Country gentleman. July 30, 1885. 50 : 623[25])

Orgyia [*Notolophus*] *leucostigma* [subsequently emerged and proved to be *Acronycta* sp.] and *Dynastes tityus* noticed.

Another potato pest. (New England homestead. Aug. 8, 1885. 19: 309, col. 3)

Remedies are given for *Macrobasis unicolor* Kirby.

Roestelia aurantiaca. (Country gentleman. Aug. 13, 1885. 50 : 661[38])

Brief notice of the above fungus [aecidial form of *Gymnosporangium clavipes*] occurring on quince.

False chinch bug. (Country gentleman. Aug. 13, 1885. 50 : 661[43])

Food plants and remedies for *Nysius angustatus* Uhler.

Bag worm—*Thyridopteryx ephemeraeformis.* (Country gentleman. Oct. 1, 1885. 50 : 801[31])

Gives the remedies for this insect.

Red spider—*Tetranychus telarius* Linn. (Country gentleman. Oct. 8, 1885. 50 : 821[38])

Mite identified and remedies given.

13-year Cicada. (Argus [Albany]. Oct. 11, 1884. p. 4, 32 cm)

Notices specially Riley's experiment on the 13 and 17 year forms.

Elm leaf beetle. (Country gentleman. Oct. 15, 1885. 50 : 841[35])

Galeruca xanthomelaena [*Galerucella luteola*] identified and remedy given.

Clubbed tortoise beetle. (Country gentleman. Oct. 15, 1885. 50 : 841[43])

Appearance, habits and food plants of *Coptocycla clavata* Fabr.

Leaf mining insect. (Home Farm [Augusta, Me.] Oct. 15, 1885. p. 1)

Brief notice of *Chortophila* [*Pegomyia*] *betarum* Lintn.

Death watch—*Clothilla pulsatoria.* (Country gentleman. Oct. 22, 1885. 50 : 861[35])

Habits and occurrence of this species.

Eggs of a katydid. (Country gentleman. Oct. 29, 1885. 50 : 881[42])

Notices *Microcentrum retinervis* and *Platyphyllum concavum* [*Cyrtophyllus concavus*].

New insect foe to the cut worm. (New England homestead. Oct. 31, 1885. 19 : 405, col. 3–4)

Brief account of a cut worm parasite, a species of *Gonia*.

Saw fly on fruit trees. (Country gentleman. Nov. 12, 1885. 50+921[34])

Notices briefly an attack in Scotland by a saw fly, probably *Eriocampa adumbrata*, and gives remedies.

2d report on the injurious and other insects of the state of New York. Made to the legislature, pursuant to ch. 377 of the laws of 1881. Albany: Weed, Parsons & Co., legislative printers. 1885. 14+265p., 68 fig. [Issued Feb. 20, 1886]

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Appendix

Some injurious insects of Massachusetts. (Massachusetts state board of agriculture. 33d annual report. 1886. Also, separate, with title page and cover [Mar. 12] 1886, 34 p.) [Read before the Massachusetts state board of agriculture, at its meeting at Framingham, Dec. 1, 1885]

Treats of canker worm, cut worms, *Sphinx quinquemaculata* [*Phlegethontius celeus*], *S.* [*Phlegethontius*] *carolina*, *Trypeta pomonella*, *Crioceris asparagi*, Rose leaf 'Thrips,' *Tettigonia vitis* [var. of *Typhlocyba comes* Say], *Tettigonia* [*Typhlocyba*] *rosae.*

Spring canker worm—*Anisopteryx* [*Paleacrita*] *vernata* Peck. (Country gentleman. Ap. 1, 1886. 51: 249[21])

Its ravages in Dutchess co., remedies.

Cause of gapes. (Country gentleman. Ap. 8, 1886. 51: 269[13])

General history of the gapes parasite, *Syngamus trachealis.*

Birch seed insect. (Country gentleman. Ap. 15, 1886. 51: 287[23])

Describes larva of birch seed insect [*Cecidomyia betulae.*]

Cause and treatment of gapes. (Country gentleman. Ap. 15, 1886. 51: 289[25])

Gives life history of *Syngamus trachealis* and remedies.

Aphis mali—the apple plant louse in Ontario orchards. (Ontario county times. May 12, 1886. Copied in Sentinel [Trumansburg, N. Y.] May 19, 1886; Watkins express [N. Y.] May 20, 1886; Palmyra courier [N. Y.] May 28, 1886)

Identifies and gives remedies for this plant louse.

Curculio demonstration. (Country gentleman. May 13, 1886. 51: 366[48]–67[12])

Note on *Pachylobius picivorus* Germ.

Orange insects. (Country gentleman. May 13, 1886. 51: 370[32])

Review of Mr Hubbard's report on this subject.

Apple tree aphis infesting our orchards. (New England homestead. May 15, 1886. 20: 189, col. 3)

Brief account of *Aphis mali.*

Canker worm and codling moth described. (New England homestead. May 15, 1886. 20: 192, col. 4)

Notice of canker worm and codling moth.

Insects and other pests. (New England homestead. May 22, 1886. 20: 189, col. 5)

Nematus ventricosus [*Pteronus ribesii*] and *Bembecia marginata* noticed.

Horizontal borings in tree trunks. (Country gentleman. May 27, 1886. 51: 409[15])

Injury is referred to the work of the yellow bellied woodpecker.

Elm leaf beetle. (Country gentleman. May 27, 1886. 51: 409[25])

Galerucella xanthomelaena [*luteola*] identified.

Plea for entomological study. (Glens Falls [N. Y.] republican. June 1, 1886)

Extracts from an address before the Agassiz association of Glens Falls.

Apple tree aphis. (Country gentleman. June 3, 1886. 51: 429[16])

Mentions *Aphis mali* and *A.* [*Myzus*] *ribis.*

Asparagus beetle. (Country gentleman. June 3, 1886. 51: 429[24])

Brief notice of *Crioceris asparagi.*

New strawberry insect (New England homestead. June 5, 1886. 20: 216, col. 5)

Bembidium quadrimaculatum is recorded as injurious to strawberries.

Grapevine scale insect. (New England homestead. June 12, 1886. 20: 221, col. 6)

Brief notice of *Pulvinaria vitis* [*innumerabilis*].

Apple tree bark louse. (Country gentleman. June 17, 1886. 51: 469[42])

Identifies and gives remedies for *Mytilaspis pomicorticis* [*pomorum*].

Forest tent caterpillar. (New England homestead. June 19, 1886. 20: 229, col. 4–5)

Brief account of *Clisiocampa sylvatica* [*disstria*].

Squash bug. (New England homestead. June 19, 1886. 20:229, col. 5)

Records injuries to melon vines by *Anasa tristis*.

New attack on wheat. (Country gentleman. June 24, 1886. 51:487[25])

Describes the attack of an unknown saw fly on wheat.

Unknown grass insect. (Country gentleman. July 1, 1886. 51:503[16])

Gives characters of an unknown attack on grass.

Gortyna nitela destroying tomato plants. (Orange county farmer. July 1, 1886. p. 4)

Injuries to tomato plants by *Gortyna* [*Hydroecia*] *nitela* Guen.

Hop vine insects — Origin of honey dew. (Waterville [N. Y.] times. July 16, 1886. p. 2)

General account of *Phorodon humuli*.

Honey dew on the hop vine. (Country gentleman. July 22, 1886. 51: 553[44])

Gives origin of honey dew and identifies the larva of *Adalia bipunctata*.

New attack on the potato. (New England homestead. July 24, 1886. 20: 273, col. 1)

Attack by aphids is referred with doubt to *Megoura solani*.

Potato stalk weevil—*Trichobaris trinotata* Say. (American rural home. July 24, 1886. No. 30, 16: 8, col. 4–5, 22 cm)

Brief notice of this species.

Plant louse on the potato. (Country gentleman. July 29, 1886. 51: 569[18])

Referred with doubt to *Megoura solani* and remedies given.

[Notice of Dr Walker's communication on Experiments with gapes] (Country gentleman. July 29, 1886. 51: 576[14])

Review of paper on identity of parasites in earthworms with *Syngamus*.

Stalk borer. (New England homestead. July 31, 1886. 20: 277, col. 1)

Notices an attack on corn by *Gortyna* [*Hydroecia*] *nitela*.

Maple tree pruner—*Elaphidion* sp. (Country gentleman. Sep. 9, 1886. 51: 677[25])

Gives features of attack by *Elaphidion parallelum* Newm. [*villosum* Fabr.] on maples.

[Myriads of minute insects in the air] (Albany evening journal. Sep. 9, 1886. p. 4)

Insects in the air are identified as *Aphis* [*Nectarophora*] *granaria*.

Apple tree pest and parasite. (Country gentleman. Sep. 16, 1886. 51:695[13])

Oedemasia [*Schizura*] *concinna* and *Limneria fugitiva* noticed.

Carrot and parsnip aphids. (Country gentleman. Sep. 16, 1886. 51:695[18])

Records injuries to carrots and parsnips by aphids.

Ham infesting mite. (Country gentleman. Sep. 16, 1886. 51:695[25])

Identifies the cheese mite, *Tyroglyphus siro,* on ham.

Cockscomb elm gall. (Country gentleman. Sep. 23, 1886. 51:713[34])

Galls of *Glyphina* [*Colopha*] *ulmicola* described, and synonymy and bibliography given.

U. S. entomological report. (Country gentleman. Sep. 23, 1886. 51:715[25])

Short notice of Riley's report for 1885.

New and destructive borer to be conquered. (New England homestead. Sep. 25, 1886. 20:341, col. 4)

Identifies *Scolytus rugulosus* and *Phloeotribus liminaris.*

Honey dew on maple leaves. (New England homestead. Sep. 25, 1886. 20:344, col. 2)

Brief notice of honey dew, its source and value to bees.

Gapes in fowls. (Country gentleman. Sep. 30, 1886. 51:731[41])

Comments on Dr Walker's paper on gapes.

Muskmelon worm. (Country gentleman. Sep. 30, 1886. 51 : 733[35])

Account of *Phakellura* [*Margaronia*] *nitidalis* and mention of *Chauliognathus marginatus.*

Silk culture. (Country gentleman. Sep. 30, 1886. 51 : 735[23])

Brief review of *The mulberry silk worm,* by Riley.

A queer bug and other insects. (Country gentleman. Oct. 7, 1886. 51 : 753[41])

Notices *Leptoglossus oppositus, L. phyllopus* and *Metapodius femoratus.*

Severe attack on the potato. (Country gentleman. Oct. 14, 1886. 51 : 773[35])

Records an attack of *Julus caeruleocinctus* and a species of *Polydesmus* on potatoes.

Beech tree blight. (Husbandman [Elmira, N. Y.] Oct. 27, 1886. No. 636. 13 : 1, col. 1, 2, 38 cm)

Brief account of *Pemphigus imbricator* Fitch.

Grain aphis in Maryland. (Country gentleman. Nov. 25, 1886. 51 : 893[25])

Refers an attack on rye to *Siphonophora avenae* [*Nectarophora granaria*].

Annual address of the president of the entomological club of the A. A. A. S., at the Buffalo meeting, Aug. 17, 1886. (Entomologica americana. 1886. 2: 143–60)

Gives the evidences of progress in entomology during the past year.

Sweet potato pest. (Albany express. Dec. 8, 1886)

Notice of the sweet potato weevil, *Cylas formicarius* Fabr.

Praying Mantis and its eggs. (Country gentleman. Jan. 6, 1887. 52: 9[32], fig.)

Gives the life history and beneficial habits of *Mantis* [*Stagmomantis*] *carolina*.

Bug injurious to shade trees. (Country gentleman. Jan. 27, 1887. 52: 69[27])

Brief notice of *Leptocoris trivittatus* Say in Kansas.

Fuller's rose beetle — *Aramigus fulleri* Horn. (Country gentleman. Feb. 3, 1887. 52: 89[12])

Describes its injuries in greenhouses.

Harmlessness of the lady bird, *Adalia bipunctata*. (The Owl [organ of Agassiz association, Glens Falls, N. Y.] February 1887. 2: 15)

Mention of its abundance and beneficial habits.

Aphididae, or plant lice. (Western New York horticultural society. Proceedings. 32d annual meeting, Jan 26 and 27, 1887. p. 85–97) [Issued in March 1887]

General account of plant lice, giving systematic position, features, distribution, injuries, propagation, our imperfect knowledge and recent discoveries.

Wood eating insect. (Country gentleman. Mar. 31, 1887. 52: 257[13])

Records the presence of *Xylotrechus colonus* Fabr. in a house.

Do spiders protect fruit trees from aphids? (Green's fruit grower. April 1887. p 17)

No record is known of spiders devouring aphids under natural conditions.

Currant worm remedy. (Popular gardening. April 1887. 2: 120–21)

Recommends hellebore and mentions the parasite, *Trichogramma pretiosa*.

Life history of *Hemileuca maia* Drury. (Swiss cross. April 1887. 1: 135–39, fig. 1–3)

General account of the life history of this species.

How to prevent the cabbage maggot. (New England homestead. Ap. 9, 1887. 21: 136, col. 5)

Gives a number of remedies for this species.

Apple tree bark louse. (Country gentleman. Ap. 21, 1887. 52: 321[15])

Gives life history and remedies for *Mytilaspis pomicorticis* [*pomorum*].

Borers in timber. (Country gentleman. Ap. 28, 1887. 52: 341[31])

A few general recommendations for the protection of timber from borers.

Honey dew eaten by bees. (Country gentleman. Ap. 28, 1887. 52: 341[36])

On the value of honey dew as a food for bees.

17 year locust — *Cicada septendecim.* (Owl [Glens Falls, N. Y.] May 1887. 2: 17–19, fig. 1–5)

General account of *Cicada septendecim*, reference is made to the 13 year form and to *C. tibicen.*

[Root aphis of the hop vine.] (Waterville [N. Y.] times. May 6, 1887. p. 2)

Records the attack by an unknown root aphis on the roots of hop vines.

Lady birds, leaf and carpet beetles. (Country gentleman. May 12, 1887. 52: 381[15], fig. 1–6)

Gives the characters of the lady birds, leaf beetles (*Chrysomelidae*) and the carpet beetle.

Little winged pest. (Argus [Albany]. May 16, 1887. p. 2)

Abstract of a paper on the mosquito [See 12th report, p. 319–35].

Another apple tree pest. (Country gentleman. May 19, 1887. 52: 398[44])

Records serious injuries to apple buds by *Crepidodera rufipes* Linn.

New(?) aphis on hop roots. (Country gentleman. May 19, 1887. 52: 401[31])

Importance of knowing the life history of *Phorodon humuli.*

Currant worm parasite. (Express [Albany]. May 23, 1887. 41: 2)

Mentions the attack of *Trichogramma pretiosa* on the currant worm.

Leather beetle. (Boots and shoes weekly. May 25, 1887. 11: 473)

Insect burrowing in leather is probably *Dermestes vulpinus, Sitodrepa panicea* mentioned.

Saw fly on apple trees. (Country gentleman. May 26, 1887. 52: 421[31])

Habits of *Dolerus sericeus* Say and *D. arvensis* Say, food plants of latter.

Elm leaf beetle going northward. (Country gentleman. May 26, 1887. 52: 421[37])

Galerucella xanthomelaena [*luteola*] received from Poughkeepsie.

New cotton pest. (Country gentleman. June 2, 1887. 52: 441[45])

Injuries to cotton by *Systena blanda* var. *bitaeniata* [*taeniata*] recorded.

Thrips in strawberry blossoms. (Country gentleman. June 9, 1887. 52: 459)

General account of injuries by the *Thripidae.*

Leather beetle again. (Boots and shoes weekly. June 15, 1887. 11:608)

Injuries by *Sitodrepa panicea* to shoes, with remedies.

Apple pest. (Oswego daily times. June 18, 1887. p. 4)

Records serious injuries by the rose bug, *Macrodactylus subspinosus* to apple trees, and gives several remedies.

Cockscomb elm gall. (Country gentleman. June 23, 1887. 52:491[23])

Brief notice of *Glyphina* [*Colopha*] *ulmicola*.

Ox warble fly. (Country gentleman. June 23, 1887. 52:493[11])

General account of *Hypoderma bovis* [an erroneous reference of *H. lineata*] giving its life history and remedies.

Grape vine leaf hopper. (Country gentleman. June 23, 1887. 52:493[41])

Gives a brief account of *Tettigonia vitis* [*Typhlocyba comes* var.]

Rose bug. (Country gentleman. June 30, 1887. 52:511[13])

Treats of various remedies for *Macrodactylus subspinosus*.

Hop louse. (Country gentleman. June 30, 1887. 52:511[24])

Gives remedies used in England against *Phorodon humili*.

Report of the state entomologist to the regents of the University of the State of New York, for the year 1885. (State museum of natural history. 39th annual report. 1885. p. 77–125) [Published, July 6, 1887]

Contents

Contents — concluded

Meal worm in salt. (Country gentleman. July 7, 1887. 52 : 530[38])

Larvae in a sack of salt are identified as those of *Tenebrio molitor* Linn.

Four lined leaf bug on the currant. (Country gentleman. July 14, 1887. 52 : 547[27])

Gives remedies for *Poecilocapsus lineatus*.

Elm leaf beetle. (Country gentleman. July 21, 1887. 52 : 565[31])

Brief notice of *Galeruca xanthomelaena* [*Galerucella luteola*].

The Curculio on the apple. (Country gentleman. July 21, 1887. 52 : 565[38])

Blackened pits in apples are identified as probably the work of *Conotrachelus nenuphar*.

An ichneumonized caterpillar. (Country gentleman. Sep. 1, 1887. 52 : 673[38])

Identifies the cocoons of *Apanteles congregatus* on the larva of *Darapsa* [*Ampelophaga*] *myron*.

Milkweed beetle with bad habits. (Country gentleman. Sep. 1, 1887. 52 : 673[42])

Records an attack by *Chelymorpha argus* on barley, corn and cabbage.

Blister beetle attack. (Country gentleman. Sep. 1, 1887. 52 : 674[22])

Identifies *Epicauta cinerea* on *Clematis flammula*.

Harvest fly. (Country gentleman. Sep. 1, 1887. 52 : 674[33])

Cicada tibicen is identified and briefly noticed.

Mites on arbor vitae. (Country gentleman. Sep. 1, 1887. 52 : 674[34])

Gives remedies for mites [*Tetranychus telarius*] on arbor vitae.

Elm leaf spraying. (Country gentleman. Sep. 8, 1887. 52 : 694[28])

Apparatus for spraying elms is described.

Pests of the pomologist. (Boston herald. Sep. 16, 1887. p. 3)

Abstract of an address delivered before the American pomological society.

Queer foe to the caterpillar. (New England homestead. Oct. 1, 1887. p. 354, col. 3)

Cocoons of *Apanteles congregatus* on the larva of *Darapsa* [*Ampelophaga*] *myron* are identified.

Value of crustaceans as food for fishes. (American angler. Oct. 8, 1887. p. 235)

Treats of the value of Crustacea, May flies, Phryganid larvae and other aquatic forms as food for fishes.

Two marked tree hopper. (Country gentleman. Oct. 13, 1887. 52:783[27])

Identifies a variety of *Enchenopa binotata* on *Juglans rupestris*.

Mites on arbor vitae. (Country gentleman. Oct. 20, 1887. 52:800[24])

Tetranychus telarius is the mite on arbor vitae.

Asparagus and pear blight beetles. (Country gentleman. Oct. 27, 1887. 52:817[32])

Gives remedies for *Crioceris asparagi* and *Xyleborus pyri* [*dispar*].

White grub attack on wheat. (Country gentleman. Oct. 27, 1887. 52:817[43])

Describes a species of white grub attacking wheat, apparently not that of *Lachnosterna fusca*.

Bag worm. (Country gentleman. Nov. 3, 1887. 52:837[26])

General account of *Thyridopteryx ephemeraeformis*, giving habits, life history and remedies.

Insects and yellows in the peach. (Country gentleman. Nov. 3, 1887. 52:837, col. 4, 22 cm)

Phloeotribus liminaris not the cause of yellows.

Grape insects in manure. (American garden. December 1887. 8:396)

Larvae living in manure, as those of *Ligyrus relictus*, do not feed on living plants.

Report of the state entomologist to the regents of the University of the State of New York, for the year 1886. (New York state museum of natural history. 40th report 1887. p. 79–154. Also, separate, with cover and title page: same paging) [Published Jan. 20, 1888. Designated as '3d report of the state entomologist']

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Some pests of the pomologist. [From the American pomological society's report for 1887. Read before the A. P. S. at its Boston meeting, Sep. 1887] (Separates, quarto, with cover and title page, 13p.) [Published Mar. 1, 1888]

The paper presents the following headings: Progress in pomology; Evils attending progress in pomology; Need of scientific study; Demands of science on the pomologist; Immense fruit production—no overproduction; Large areas devoted to fruit crops; Increase in plant diseases; Increase of insect ravages; Food habits of insects; Change of food plants; Introduction from abroad; Spread of scale insects; Number of insect pests; An unknown currant insect; How insect ravages are to be met; Insecticides; Publications relating to fruit insects; Conclusion.

[Published, also, in the 4th report on the insects of New York. 1888. p. 183–92]

Remedies for scale insects. (Country gentleman. Mar. 1, 1888. 53: 169^{25})

Gives the remedies for *Chionaspis furfurus* and notices *Chilocorus bivulnerus.*

[Injurious fruit insects of the vicinity of New York] (New York farmers. Proceedings. 1886–87. p. 52–59) [Published in March 1888]

The following insects are noticed: Apple maggot, *Trypeta pomonella;* apple worm of the codling moth; apple tree aphis; bark borers, *Xyleborus pyri* [*dispar*], *Scolytus rugulosus, S. obesus* [*Xyleborus dispar*]: plum curculio; peach tree borer; eight spotted Alypia on grape vines; currant worm; cabbage butterfly, *Pieris rapae;* and Colorado potato beetle.

Sulfur for the elm beetle. (Country gentleman. Mar. 15, 1888. 53: 209^{26})

Futility of sulfur as a remedy for *Galerucella luteola.*

Pea weevil. (Country gentleman. Mar. 22, 1888. 53: 229^{13})

General account of *Bruchus pisi* [*pisorum*].

Elm leaf beetle. (Country gentleman. Mar. 29, 1888. 53: 249^{27})

Remedies are given for *Galerucella luteola.*

Our worst enemies — the bugs. (Country gentleman. Ap. 5, 1888. 53: 269^{12})

Brief account of insect ravages and remedies for the same.

Striped flea beetle. (Country gentleman. Ap. 12, 1888. 53: 289^{18})

General account of *Phyllotreta vittata* Fabr.

Unrecognized apple tree attack. (Country gentleman. Ap. 26, 1888. 53: 329^{23})

Describes the injury to the limbs of an apple tree, subsequently referred to the oviposition of one of the flower crickets.

White flower cricket. (Country gentleman. Ap. 26, 1888. 53: 329^{28})

Egg punctures in a Concord grape vine are those of *Oecanthus niveus* Serv.

Leaf hopper. (Vineyardist. May 1, 1888. 2: 113)

Injuries to grapes by *Erythroneura vitis* Harris [*Typhlocyba comes* Say, var.] and remedies.

To kill plant lice. (Farm and home. May 1, 1888. 9: 158, col. 4)

Gives the best method of fighting plant lice.

Bacon beetle attacks comb. (Bee keepers' magazine. May 1888. 16: 143–44)

Records the feeding on the wax of empty honeycomb by the larvae of *Dermestes lardarius* Linn.

Elm leaf beetle. (Country gentleman. May 10, 1888. 53 : 366[37])

Brief notice of *Galeruca xanthomelaena* [*Galerucella luteola*] from Scarsdale, N. Y.

Friends, not foes. (Country gentleman. May 31, 1888. 53 : 430[32])

Small beetles said to be injurious in hot beds to flower plants are *Tachys incurvus* Say and *Homalota lividipennis* Mann., neither of which could cause the injury.

Maple leaf mite gall. (Country gentleman. June 14, 1888. 53 : 460[47]–61[11])

Describes the galls of *Phytoptus quadripes* Shimer, and gives remedies.

Grape vine pest. (Orange county farmer. June 21, 1888. 7 : 5, col. 1)

Galls of *Lasioptera vitis* O. S. are described and remedies indicated.

Cockscomb elm gall. (Country gentleman. June 28, 1888. 53 : 496[15])

Galls on the 'weeping slippery elm' are described and identified as those of *Colopha* [*Glyphina*] *ulmicola* Fitch.

Apple tree tent caterpillar — *Clisiocampa americana.* (Country gentleman. July 5, 1888. 53 : 511[24])

Recommends removal of the egg belts or spraying with arsenites, and records its unusual abundance.

Honey dew on hickory leaves. (Country gentleman. July 5, 1888. 53 : 511[35])

Honey dew is produced by plant lice or may result from a diseased condition of the leaves.

Grape leaf galls. (Country gentleman. July 5, 1888. 53 : 511[46])

Galls from Worcester, Mass., are identified as those of *Lasioptera vitis.*

New pest threatens the hay crop. (Albany evening journal. July 7, 1888. p. 7)

Records injury to grass by a species of *Thrips.*

Stalk borer. (Country gentleman. July 12, 1888. 53 : 532[17])

Larva from Rock Hall, Md., where it is known as the 'bud worm,' and infesting stalks of young corn is *Gortyna* [*Hydroecia*] *nitela* Guen. Remedies are given.

An entomological friend. (Orange county farmer. July 12, 1888. No. 45. 7 : 8)

15 spotted lady bug, *Anatis 15-punctata* [*ocellata*] is identified and its beneficial habits given.

Ash grey blister beetle. (Country gentleman. July 19, 1888. 53 : 547[22])

General notice of injuries to potatoes at Charlottesville, Va., by *Macrobasis unicolor* Kirby. The imported Spanish fly, *Cantharis vesicatoria*, is also noticed.

Insects on apple trees. (Country gentleman. July 19, 1888. 53:548[15])

So-called 'black knot' on apple trees is not caused by insects.

Light loving grape vine beetle—*Anomala lucicola*. (Country gentleman. July 26, 1888. 53:565[38])

Beetles from grape vines at Hightstown, N. J., are *Anomala lucicola* Fabr. Their general features are given and preventives of attack indicated.

Black long sting. (New England homestead, Aug. 4, 1888. 22:286, col. 5)

Thalessa atrata Fabr. and *T. lunator* Fabr. are characterized and their habit of preying on the larva of *Tremex columba* described.

Grape vine caterpillar—*Thyreus abbotii*. (Country gentleman. Aug. 19, 1888. 53:599[21])

General account of the food plants, life history and dimorphic larvae of this species is given.

Spittle insects. (New England homestead. Sep. 15, 1888. 22:333, col. 1–2)

Gives habits and injuries to grass by spittle insects.

Fly on the heads of cattle. (Country gentleman. Sep. 20, 1888. 53:705[47])

Brief notice of a fly attacking cattle [proves to be *Haematobia serrata*.]

Melon plant ouse. (Country gentleman. Sep. 27, 1888. 53:725[26])

Notices an attack on muskmelon leaves by *Aphis cucumeris* [*gossypii*] and galls on the shoots produced by *Cecidomyia* [*Diplosis*] *cucumeris*.

Hag moth caterpillar. (Country gentleman. Sep. 27, 1888. 53:725[36])

Describes the caterpillar of *Phobetron pithecium* Sm.-Abb., and gives its food plants and habits.

An ichneumonizd caterpillar. Interesting case of parasitism. (Country gentleman. Sep. 27, 1888. 53:725[42])

Describes the cocoons of *Apanteles congregatus* Say on a sphinx larva, probably *Darapsa* [*Ampelophaga*] *myron* Cram., and records an interesting case of secondary parasitism by a Chalcid.

Thousand legged worms. (Country gentleman. Sep. 27, 1888. 53:725[47])

Worms destroying geraniums by eating their roots are identified as *Julus caeruleocinctus* Wood and remedies given.

Bee keeper's guide. (Country gentleman. Sep. 27, 1888. 53:727[24])

Notices the 13th edition of the *Manual of the apairy* by Prof. A. J. Cook.

Yellow necked apple tree caterpillar. (Country gentleman. Oct. 4, 1888. 53 : 743[42])

Caterpillars devastating apple trees are identified as *Datana ministra* Drury. Feeding habits and remedies are given.

Cow fly, horn fly or Texan fly. (Country gentleman. Oct. 11, 1888. 53 : 759[22])

A résumé of what was then known of the insect [*Haematobia serrata*].

Oak galls. (Country gentleman. Oct. 18, 1888. 53 : 775[25])

Small, round, pubescent galls on oak leaves are identified as those of *Neuroterus verrucarum* O. S.

Cow fly or Texas fly. (Country gentleman. Oct. 18, 1888. 53 : 779[25])

The fly [*Haematobia serrata*] is stated to be a species of *Stomoxys*.

Caterpillar on the chestnut. (Country gentleman. Oct. 18, 1888. 53 : 786[23])

Caterpillars from a Spanish chestnut tree are *Halisidota tessellaris* Sm.-Abb.

White grub of the May beetle. (New York state museum of natural history. Bulletin 5. November 1888. 31p., 5 fig.) [Reprinted, with additions, from the New York state agricultural society, 43d annual report. 1883. New York state agricultural society. Transactions. 1883–86. 34 : 5–33]

The following are the subheads of the paper: White grub. Egg—Injurious character of the insect—Injuries from the grub—Injuries by the beetle—Life history—Distribution—Its enemies—Preventives and remedies—Study of the insect desired.

Cut worms. (New York state museum of natural history. Bulletin 6. November 1888. 36 p., 28 fig.) [Reprinted, with additions, from the New York state agricultural society, 44th annual report. 1884–85. New York state agricultural society. Transactions. 1883–86. 34 : 66–100]

Contents: What are cut worms?; Their appearance; Their habits; Habits of the moths; Natural history; Conditions favorable to cut worms; Their food plants; Abundance of cut worms; Literature of cut worms; List of species; Natural enemies; Parasites; Preventives and remedies. Two preventives specially commended.

Red humped apple tree caterpillar. (Country gentleman. Nov. 22. 1888. 55 : 875[23])

General notice of *Oedemasia* [*Schizura*] *concinna* Sm.-Abb.

4th report on the injurious and other insects of the state of New York. Albany, The Troy press company, printers, 1889. [Issued November 23, 1888] 237 p., 68 fig. (From the New York state museum of natural history. 41st report. 1888. p. 123–358)

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Appendix

A familiar pest. (New England homestead. Nov. 24, 1888. 22 : 421, col. 1–2)

Identifies the pupa of *Sphinx quinquemaculata* [*Phlegethontius celeus*] and gives life history briefly.

Identification of the cow fly—*Haematobia serrata*. (Country gentleman. Nov. 29, 1888. 53 : 893[27])

Reference of the species by Baron Osten Sacken, of Germany, to *Haematobia serrata* Rob.-Desv.

Wire worms. (Country gentleman. Nov. 29, 1888. 53 : 893[34], fig. 1–6)

Gives several of the best remedies for these pests.

Egg deposits of flower crickets. (Country gentleman. Dec. 6, 1888. 53 : 911[11])

Oecanthus niveus Harris, *Oecanthus fasciatus* DeGeer and *Pelidnota punctata* Linn. are noticed.

White marked tussock egg clusters. (Country gentleman. Dec. 6, 1888. 53 : 911[18])

Identifies the eggs of *Orgyia* [*Notolophus*] *leucostigma* Sm.–Abb. and notices a parasite, *Pimpla conquisitor* Say.

Transformations of *Sesia* [*Hemaris*] *buffaloensis* Gr.–Rob. (American entomological society. Transactions. 1888. 15 : 105)

Immature stages are described, the larvae being found on snowball.

Apple tree tent caterpillar. (Country gentleman. Ap. 4, 1889. 54 : 269[11])

Eggs of *Clisiocampa americana* on a peach twig are identified and the insect briefly noticed.

Apple tree bark louse. (Country gentleman. Ap. 4, 1889. 54: 269[22])

Gives the remedy for *Mytilaspis pomorum* Bouché.

Mite infesting dwellings. (Ohio farmer. Ap. 13, 1889. p. 274)

Reported infestation is referred with doubt to *Bryobia* species.

Remarkable display of eel worms. (Country gentleman. May 16, 1889. 54: 389[17])

Red appearance in a shallow stream at Saratoga Springs, N. Y., is found to be owing to the presence of myriads of small red worms belonging to the *Anguillulidae*.

Preserving insect specimens. (Country gentleman. May 23, 1889. 54: 409[28])

Directions are given for preparing a 'cyanide bottle' for the collection of insects.

Cabbage maggot. (Country gentleman. June 6, 1889. 54: 440[43])

An infusion of burdock, caustic lime applied to the roots, unleached ashes about the plant and kerosene emulsion are remedies recommended.

Apple tree worm. (Country gentleman. June 6, 1889. 54: 440[46])

Remedies are given for *Clisiocampa americana* and its ease of control commented upon.

Rose bug destroying peaches. (Country gentleman. June 6, 1889. 54: 441[11])

Gives remedies to be used against this insect, *Macrodactylus subspinosus*.

Rose leaf hopper. (Country gentleman. June 6, 1889. 54: 441[14])

Appearance of *Tettigonia* [*Typhlocyba*] *rosae* Harris and remedies.

[Forest tent caterpillar devastating maples.] (Albany evening journal. June 8, 1889)

Account of the ravages of *Clisiocampa sylvatica* [*disstria*] in a maple grove at Kingsbury, Washington co., N. Y.

Parasite on potato beetle. (Country gentleman. June 13, 1889. 54: 456[44]–57[12])

General notice of *Uropoda americana* Riley, a parasite of the potato beetle.

Grain aphis. (Country gentleman. June 13, 1889. 54: 457[17])

Records an attack on wheat at Allendale, Ill., by the grain aphis, *Siphonophora* [*Nectarophora*] *granaria*.

Apple tree flies. (Country gentleman. June 13, 1889. 54: 457[23])

Fly occurring 'by millions' on apple trees at Meadville, Pa. [June 4] is the white winged Bibio, *Bibio albipennis*.

Hop yard pest reappears. (Albany evening journal. June 20, 1889. p. 1; Utica morning herald. June 21, 1889; Fort Plain free press. June 25, 1889; Country gentleman, June 27, 1889. 54: 497[11])

Warning of attack by the hop aphis, *Phorodon humuli*; remedies given.

Currant aphis. (Country gentleman. June 20, 1889. 54 : 474[31])

Gives remedies for aphis on currant stems, may be *Myzus ribis*.

Asparagus beetle. (Country gentleman. June 20, 1889. 54 : 478[28])

Crioceris asparagi is identified and remedies given.

Grain aphis. (Country gentleman. June 27, 1889. 54 : 496[33])

Identification of *Siphonophora avenae* [*Nectarophara granaria*] on wheat from LaGrange, Ill.

Insect depredations. (Country gentleman. June 27, 1889. 54 : 496[48])

Remarks on the grain aphis injuring wheat in Indiana.

Our insect enemies and how to meet them. [An address before the New Jersey state board of agriculture, at its annual meeting at Trenton, Feb. 1, 1889. Camden, N. J., [July] 1889. 22 p.] (State board of agriculture. 16th report. 1888–89. p. 285–304)

Importance of agriculture—its present and future. Economic entomology. Importance of entomological study. Secrecy of insect depredations. Small size of insects. Number of insects. Rapidity of propagation. Voracity of insects. Can insect ravages be prevented? How to meet our insect enemies.

Early appearance of the common house fly and its fungus. (Albany evening journal. July 11, 1889)

Records the early appearance of *Musca domestica* and its fungus.

Corn worm. (New England homestead. July 13, 1889. 23 : 237, col. 1)

Caterpillar of *Gortyna* [*Hydroecia*] *nitela* is identified feeding on the tassels of corn.

Insects on lima beans—squash bugs. (Country gentleman. July 18, 1889. 54 : 543[22].)

The insect on beans can not be identified without examples. Cucumber beetle, *Diabrotica vittata*, and squash bug *Anasa tristis*, are noticed.

Remedies for the hop louse. (New England homestead. July 27, 1889. 23 : 253, col. 6)

Gives several remedies for this insect, *Phorodon humuli*.

Yellow woolly bear. (New England homestead. July 27, 1889. 23 : 253, col. 6)

Caterpillar, *Spilosoma virginica*, known in the winged state as 'the white miller' is identified.

White grub of the May beetle—*Lachnosterna fusca*. (New York state agricultural society. Transactions. 1883–86. [July] 1889. 34 : 5–33, fig. 1–5)

Reprint, with additions, of Bulletin 5 of the New York state museum of natural history. For contents, see 5th report on the insects of New York, 1889. p. 308.

Cut worms. (New York state agricultural society. Transactions. [July] 1889. 34 : 66–100, fig. 1–28)

Reprint, with additions, of Bulletin 6 of the New York state museum of natural history.

Aphididae or plant lice. (New York state agricultural society. Transactions. [July] 1889. 34 : 101–15, fig. 1–9)

Reprint, with illustrations and additional matter, from the proceedings of the Western New York horticultural society. 1887. For contents, see 4th report on the insects of New York. 1888. p. 194.

Grain aphis. (Country gentleman. Aug. 1, 1889. 54 : 579[22])

Heads of rye from Stone Ridge, N. Y., show attack by *Siphonophora avenae* [*Nectarophora granaria*].

Maple tree borer. (Country gentleman. Aug. 1, 1889. 54 : 579[26])

Identifies the larvae infesting maples as probably those of *Glycobius* [*Plagionotus*] *speciosus* and gives the remedies.

Cow fly. (Country gentleman. Aug. 1, 1889. 54 : 579[33])

Notices the cow fly, *Haematobia serrata*, and names several remedies.

Insects in wheat — not injurious. (Rural New Yorker. Aug. 3, 1889. 48 : 509, col. 1–2)

States that the small, shining, black beetles in heads of wheat are *Phalacrus politus* Linn. They are scavenger beetles, and are not injurious.

Oak tree pruner. (Country gentleman., Aug. 29, 1889. 54 : 651[38])

Notices the work of *Elaphidion parallelum* [*villosum*] in branches of red oak.

A bombarding beetle. (Country gentleman. Sep. 5, 1889. 54 : 671[11])

Describes discharge of a 'bombardier,' its effects, and names *Brachinus fumans* as a common form.

Black blister beetle. (Country gentleman. Sep. 12, 1889. 54 : 694[23])

Notices the work of *Epicauta pennsylvanica* DeGeer on chrysanthemums and gives remedies.

Mites in bran. (Country gentleman. Sep. 19, 1889. 54 : 711[27])

Tyroglyphus siro in bran may be killed with carbon bisulfid.

Beech tree borer—*Aegeria* [*Sanninoidea*] *exitiosa.* (Country gentleman. Nov. 14, 1889. 54 : 861[18])

Extended account of this insect is given.

Insects in cord wood. (Country gentleman. Nov. 14, 1889. 54 : 862[34])

Sounds from wood stored in a dry cellar can not be identified from the description.

A horn tail and its enemies. Country gentleman. Nov. 21, 1889. 54 : 881[25])

Treats of a maple borer, *Tremex columba* Linn. and its parasite, *Thalessa.*

5th report on the injurious and other insects of the state of New York. Albany, the Troy press company, printers, 1889. [Issued Nov. 23, 1889] 205 p., 50 fig. Also as report of the state entomologist to the regents of the University of the State of New York, for the year 1888. (State museum of natural history. 42d annual report of the trustees, for the year 1888 [Nov. 20, 1889]. p. 145–347, fig. 1–50)

Contents

Bean weevil. (New England homestead. Dec. 21, 1889. 23:425, col. 2–3)

Gives several remedies for this insect.

Gypsy moth in Medford, Mass. (Country gentleman. Jan. 23, 1890. 55:69[25])

Comment on a notice in the New York world on the introduction in Medford of the European gypsy moth, *Ocneria* [*Porthetria*] *dispar*.

Insect pests of the state [New York.] (Albany evening journal. Jan. 23, 1890. 34:3)

Extract from an address before the Albany farmers' institute, held the above date.

Mites infesting smoked meats. (Orange judd farmer. Jan. 25, 1890. 7 : 63, col. 1–2)

Records an infestation of smoked hams in a provision house by *Tyroglyphus siro*. Several remedies are given.

Useful insects. (Country gentleman. Feb. 27, 1890. 55 : 170[37])

Eggs of the Carolina mantis are identified and its beneficial habits stated.

Singular fly. (New York times. Ap. 14, 1890. p. 5, col. 2; Albany daily press and knickerbocker. Ap. 15, 1890; Plattsburg [N. Y.] morning telegram. Ap. 23, 1890)

Records the abundance of *Chloropisca prolifica* Osten Sacken [*variceps* Loew] in a house in September.

Fighting the insect pests. (Albany evening journal. Ap. 16, 1890, 44 cm)

Report of a paper read before the Albany institute, Ap. 15, 1890, noticing a number of insects briefly.

Late experiences with insects injurious to the orchard and garden. [Read before the Western New York horticultural society, at its annnual meeting, Jan. 22, 1890] (Western New York horticultural society, proceedings at its 35th annual meeting, Jan. 22, 23, 1890. p. 16–35) Also, in separates, 20 p. [Ap. 22, 1890].

Treats of insecticides and fungicides combined and briefly of a number of insects.

Spraying for the curculio. (Country gentleman. Ap. 24, 1890. 55 : 329[16])

Manner of spraying for the curculio.

Apple tree insects. (Country gentleman. Ap. 24, 1890. 55 : 329[23])

Identifies the cocoons of the apple leaf Bucculatrix, *B. pomifoliella* Clem. and the eggs of the apple tree tent caterpillar, *Clisiocampa americana*.

Poisoning insects. (Country gentleman. May 1, 1890. 55 : 347[12])

Directions are given for using paris green and london purple in water for spraying purposes.

Fly, *Chloropisca prolifica* [*variceps*]. (Country gentleman. May 1, 1890. 55 : 349[23])

General notice of the insect in this country and abroad.

Voracity of the silk worm. (Albany times. May 8, 1890. p. 2)

Corrects gross errors about the weight of a recently hatched silk worm and the amount it consumes.

Spraying for fruit tree insects. (Country gentleman. May 22, 1890. 55 : 407[41])

Arsenites are recommended for use in gardens provided they are not applied too strong.

Eggs in plum twig. (Country gentleman. May 22, 1890. 55: 407[47])

Deposit of eggs in a plum twig are doubtless those of some 'tree hopper' allied to *Ceresa bubalus*.

Australian lady bug. (New York times. May 23, 1890)

Notices *Vedalia* [*Novius*] *cardinalis* and its extermination of the Icerya scale.

[Eye spotted budmoth] (Albany evening journal. May 28, 1890. p. 6)

Describes the ravages and gives the remedy for this insect.

Insect strawberry pests. (New England farmer. June 4, 1890. p. 1)

Notices *Paria aterrima* [*Typophorus canellus*] and *Otiorhynchus ovatus*.

Wire worms on cabbage. (Country gentleman. June 5, 1890. 55: 450[45])

Mentions several species of wire worms attacking cabbage.

Grain aphis. (Country gentleman. June 12, 1890. 55: 470[35])

No method known of arresting a serious attack on rye by *Siphonophora avenae* [*Nectarophora granaria*].

Coleophora sp.—A new pear insect. (Popular gardening. June 1890. 5: 198, col. 1-2)

Records an attack by a case bearer on pears.

Pear blight beetle. (Popular gardening. June 1890. 5: 198, col. 2)

Notices an attack by *Xyleborus pyri* [*dispar*] in a pear orchard at Lockport, N. Y.

Quince blossom beetle. (Popular gardening. June 1890. 5 198, col. 2)

Records injury by a snapping beetle [*Limonius confusus*] to quince blossoms.

Peach bark borer. (Popular gardening. June 1890. 5: 198, col. 2)

No preventive of the attack of this Scolytid borer, [*Phloeotribus liminaris*], is known. Infested trees should be taken up and burned.

Grape vine flea beetle. (Popular gardening. June 1890. 5: 198, col. 2)

Remedies for this insect [*Haltica chalybea*] are given.

New enemy of the currant worm. (Popular gardening. June 1890. 5: 198, col. 2)

One of the large plant bugs, *Podisus cynicus*, preys upon it.

17 year locusts make their appearance. (Albany morning express June 13, 1890. p. 2)

Capture of examples of *Cicada septendecim* reported at Tivoli, N. Y.

Grain weevil distributed. (Country gentleman. June 19, 1890. 55: 489[11])

Records the distribution of seed corn, badly infested with *Calandra oryza* Linn.

Sheep scab. (Country gentleman. June 19, 1890. 55 : 493[23])

Brief notice of the scab mite, *Psoroptes equi* [*communis*].

[Grain aphis] (New England homestead. June 21, 1890. 24 : 216, col. 6)

Grain aphis is quite prevalent in rye fields in New York and New Jersey.

[Insects killed by electric lights] (Albany evening journal. June 26, 1890, p. 5)

100,000, the estimated number of insects killed by one arc light in a single night.

Rose leaf hopper and rose slug. (Country gentleman. July 3, 1890. 55 : 538[11])

Notices the injuries to roses by *Tettigonia* [*Typhlocyba*] *rosae* Harr. and the rose slug, *Selandria* [*Monostegia*] *rosae* Harr.

Sweet potato beetles. (Country gentleman. July 3, 1890. 55 : 538[19])

Notices briefly *Cassida nigripes* and *Coptocycla aurichalcea* [*bicolor*].

New bug. [Destructive apple tree insect] (New England homestead. July 5, 1890. 24 : 232, col. 4)

Caterpillar boring into the pith of the new wood of apple trees is identified as the eye-spotted bud moth, *Tmetocera ocellana*.

[Corn] cutworm. (Country gentleman. July 24, 1890. 55 : 590[18])

Identifies the boll worm or corn worm of the southern states, *Heliothis armiger*, and gives a remedy.

Locust tree borer. (Country gentleman Aug. 14, 1890. 55 : 644[16])

Gives several preventives of attack by *Cyllene robiniae*.

Syrphus fly. (Country gentleman. Aug. 14, 1890. 55 : 644[33])

Rat tailed larva found in a cow stable may be a species of *Eristalis* (it proved to be *E. tenax* Linn.).

Elm tree beetle. (Country gentleman. Aug. 14, 1890. 55 : 644[38])

Recommends spraying with paris green and killing larvae on the trunks.

[Collections in Keene Valley, N. Y] (Albany evening journal. Aug. 16, 1890. p. 6)

Brief notice of collections made in the Adirondacks by the state entomologist, and of a reported disease of pine trees near Keene Valley.

Insect parasites. (Country gentleman. Aug. 21, 1890. 55 : 662[14])

Identifies *Apanteles congregatus* Say as a parasite of the green grape vine Sphinx.

Carpet beetle. (Country gentleman., Aug. 21, 1890. 55 : 662[33])

Gives remedies for *Anthrenus scrophulariae*.

[Severe bite of a horse fly] (Albany evening journal. Aug. 28, 1890. p. 8)

Describes the effect of the painful bite of a horsefly, *Tabanus atratus*.

Curious jumping gall. (Popular science news. Aug. 1890. 24:119. col. 1–3)

Curious insect from England is identified as probably the bedeguar of the hawthorn, *Cecidomyia crataegi* Winnertz.

Midge or punky of the Adirondacks. (Albany evening journal. Sep. 5, 1890. p. 5, col. 2)

Punky or 'the little gray gnat' is the name preferred for this insect.

[Mites infesting a water trough] (Albany evening journal. Sep. 5, 1890. p. 5, col. 2)

Mites occurring at Schodack Center, N. Y., are probably *Bryobia pratensis*.

Spittle insects. (Country gentleman. Sep. 25, 1890. 55:759[44])

Gives characters and habits of spittle insects.

Mite parasitic on the house fly. (Albany evening journal. Oct. 1, 1890. p. 6, col. 2)

Some flies were infested with a red mite which is identified as *Trombidium muscarum* Riley.

Pear leaf blister. (Country gentleman. Oct. 2, 1890. 55:781[35])

Identifies the work of *Phytoptus pyri* and gives remedies.

Weevils in rye. (Country gentleman. Oct. 2, 1890. 55:782[23])

Weevil is probably *Calandra granaria*. Carbon bisulfid is recommended.

6th report on the injurious and other insects of the state of New York. Albany, James B. Lyon, state printer, 1890. [Issued Oct. 2, 1890] 110 p., 25 fig. Also as report of the state entomologist to the regents of the University of the State of New York, for the year 1889. (New York state museum of natural history. 43d report, for the year 1889, p. 99–206, fig. 1–25)

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Contents — concluded

Snails — slugs. (Country gentleman. Oct. 16, 1890. 55 : 819[24])

Gives remedies for snails in mushroom beds.

Diseased Austrian pines (Country gentleman. Oct. 16, 1890. 55 : 820[24])

Cause of unhealthy condition not known. *Chionaspis pinifoliae* Fitch, a few black thrips and some mites are present, but could not have caused the injury.

Manual of injurious insects. (Country gentleman. Oct. 16, 1890. 55 : 822[46]–23[16])

Notice of a new edition of Miss E. A. Ormerod's manual.

A guest to be welcomed in our homes. (Amsterdam [N. Y.] daily democrat. Nov. 1, 1890. p. 2, col. 5)

Larva of *Scenopinus fenestralis* Linn. does not injure woolens or other fabrics, but feeds only, so far as known, on the larvae and pupae of the clothes moth.

Bean weevil. (Country gentleman. Nov. 13, 1890. 55 : 898[37])

Gives life history of *Bruchus obsoletus* [*obtectus*] and remedies.

Larch saw fly. (Country gentleman. Nov. 13, 1890. 55 : 905[42])

Ravages of *Nematus* [*Lygaeonematus*] *erichsonii* Hartig are described and the remedy given.

Bot fly of the hare. (Country gentleman. Nov. 13, 1890. 55 : 905[46]–6[12])

Notices *Cuterebra cuniculi* Fabr. and *Cuterebra emasculator* Fitch.

Insects infesting maple trees. (New England homestead. Nov. 15, 1890. 24 : col. 4)

Imperfect description does not admit of identification.

Striped cucumber beetle. (Country gentleman. Nov. 20, 1890. $55:925^{44}–26^{12}$)

Gives remedies for *Diabrotica vittata* Fabr.

Woolly bear caterpillar—*Pyrrharctia isabella.* (Country gentleman. Nov. 27, 1890. $55:941^{26}$)

A general account of its habits and life history.

Apple leaf bucculatrix. (Country gentleman. Dec. 4, 1890. $55:962^{33}$)

Small white cocoons on apple twigs are identified as those of *Bucculatrix pomifoliella.*

Squash bug. (Country gentleman. Jan. 8, 1891. $56:33^{15}$)

Gives the best remedies for this pest.

Grain weevil infesting mills. (Country gentleman. Jan. 15, 1891. $56:47^{17}$)

Recommends bisulfid of carbon for *Calandra granaria.*

Protection from insect injuries. (Albany morning express. Jan. 23, 1891. p. 2, col. 5) [Abstract of an address before the farmers' institute at Albany, Jan. 22, 1891]

General address on the losses caused by insects and means to be used against them.

Bacon beetle. (Country gentleman. Feb. 12, 1891. $56:130^{35}$)

Records *Dermestes lardarius* in soiled clothing.

Insectivorous birds. (Albany evening journal. Feb. 14, 1891. p. 6, col. 3)

Protecting the birds. (New York times. Feb. 15, 1891)

Remarks before the assembly committee on game laws, asking for such amendments and additions to the revised game law as shall protect birds beneficial to the agriculturist in the destruction of insect pests, and withholding protection from those which are detrimental; prominent among these last is the English sparrow.

Scale insects. (Country gentleman. March 26, 1891. $56:257^{28}$)

Leaves of oleander and camellia show attacks of scale insects — the former of *Aspidiotus nerii* Bouché and the latter of a species of ? *Parlatoria.*

Bark lice. (Country gentleman. Mar. 26. 1891. $56:257^{33}$)

Gives remedies for scale insects.

Blind crustacean from a well. (Albany evening journal. Mar. 27, 1891. p. 6, col. 2; New York times. Mar. 28, 1891. p. 2, col. 5)

Small crustacean infesting a driven well of moderate depth, is identified as *Crangonyx mucronatus* Forbes.

Injurious insects. (Country gentleman. Ap. 2, 1891. $56:273^{24}$)

Treats of a number of insect pests and insecticides.

Quince tree borer. (Country gentleman. Ap. 9, 1891. 56 : 294[46])

Recommends soft soap and carbolic acid wash.

Honey dew on pear twigs. (Country gentleman. Ap. 16, 1891. 56 : 317[11])

It has no connection with apple scab. Probably the trees had been attacked by *Psylla pyri* [*pyricola*].

Arsenic and honey — experiments. [Is arsenical spraying harmful to honey bees ?] (Country gentleman. Ap. 16, 1891. 56 : 317[15])

The liability of bees to be poisoned from blossoms sprayed with arsenites should be determined by experiment.

Entomology. (37th annual meeting of the western New York horticultural society. Proceedings. Jan. 28 and 29, 1891. April 1891. p. 10–17. Also, as separates, 8 p.)

Report of the society's committee on entomology, upon 'Spraying with insecticides,' and 'Some garden and orchard insects.' Topics embraced are: Effect of london purple on the plum. London purple on the peach. Solubility of london purple. An efficient nozzle for low spraying. Addition of lime to the arsenites. Fungicides combined with the arsenites. Spraying for the plum curculio. Spraying for the codling moth. New insecticidal machine. Insecticides lately recommended. Protection from the striped cucumber beetle. Apple curculio. Pear blight beetle. Rose bug. Marguerite fly. Bean weevil.

How to control the hop aphis. (New England homestead. May 2, 1891. 25 : 193, col. 1)

Gives remedies and manner of applying them.

Apple tree insects of early spring. (Country gentleman. May 7, 1891. 56 : 374[34]–75[11])

The following are noticed: apple aphis, *Aphis mali* Fabr.; apple tree case bearer, *Coleophora malivorella* Riley; eye spotted bud-moth, *Tmetocera ocellana* Schiff.; apple leaf Bucculatrix, *B. pomifoliella* Clem.; pear tree Psylla, *Psylla pyri* [*pyricola*], and remedies given.

Orange leaf trouble. (Country gentleman. May 7, 1891. 56 : 375[28])

Not caused by *Typhlodromus oleivorus*, but may possibly be owing to an attack by a species of *Lecanium* or *Ceroplastes*.

How to kill the rose bug. (New England homestead. May 9, 1891. 25 : 205, col. 1)

Recommends hand picking or spraying with sludge oil soap solution.

[Cermatia centipede.] (Albany morning express. May 19, 1891. p. 55 : 8, col. 1)

Pyrethrum recommended for the destruction of *Cermatia* [*Scutigera*] *forceps*.

Wire worms in corn. (Country gentleman. May 28, 1891. 56 : 431[43])

Gives several methods of protecting recently planted corn.

Apple worm. (Country gentleman. May 28, 1891. 56 : 438[27])

Carpocapsa pomonella breeds in pears, plums, peaches and apricots, in addition to the apple.

Wheat insects. (Country gentleman. May 28, 1891. 56 : 438[33])

Identifies an attack on wheat as probably that of *Siphonophora avenae* [*Nectarophora granaria*].

Destructive to pears—A pest discovered in a Catskill orchard—*Diplosis pyrivora*. (Albany evening journal. May 30, 1891. p. 8, col. 1; Sun [N. Y.] June 1, 1891. p. 3, col. 5)

Records the occurrence of the pear midge in the Catskill orchards and points out its dangerous character.

Insect pests. (Oswego daily times. June 2, 1891. 49 : 4, col. 2)

Notices a new case worm or Coleophora on apple, eye spotted bud worm, *Tmetocera ocellana*, apple leaf Bucculatrix, *B. pomifoliella* and *Aspidisca splendoriferella*.

Another formidable insect pest. (Oswego daily times. June 3, 1891 49 : 5, col. 2–3)

Pear midge, *Diplosis pyrivora*, discovered at Catskill, N. Y. Gives its injuries, life history and methods of controlling it.

Melon and strawberry pests. (Country gentleman. June 4, 1891. 56 : 457[17])

Treats of *Aphis cucumeris* [*gossypii*] and the flea like negro bug, *Corimelaena pulicaria* Germ.

Peach tree borer. (Country gentleman. June 4, 1891. 56 : 457[23])

Gives a number of remedies for this insect.

A serious danger—New pest that threatens the pear crop. (New England homestead. June 13, 1891. 25 : 249, col. 4)

Introduction of the pear midge, *Diplosis pyrivora*, injuries and remedies.

Gartered plume moth. (Country gentleman. June 18, 1891. 56 : 497[31])

Brief account of *Oxyptilus periscelidactylus*.

[New onion pest] (Albany evening journal. June 19, 1891. p. 8, col. 5)

Notices *Agrotis ypsilon* Rott., or the black cut worm—a common and widespread species not previously reported on onions.

New strawberry pest. (Country gentleman. June 25, 1891. 56 : 515[27])

Records *Serica tristis* LeConte, as a strawberry pest.

Lady bird and cherry aphis. (Country gentleman. July 2, 1891. 56 : 537[17])

Notices black cherry aphis *Myzus cerasi*, and 15 spotted lady bird, *Anatis 15-punctata* [*ocellata*].

Beet insects. (Country gentleman. July 16, 1891. 56 : 577[42])

The serious injury to beets is in part due probably to *Lygus pratensis*, species of flea beetles, and some leaf miner, probably a species of *Anthomyia*.

Apple aphis. (Country gentleman. July 16, 1891. 56 : 578[19])

Severe attack of *Aphis mali* Fabr. is recognized and remedies given.

Pear tree psylla. (Country gentleman. Aug. 6, 1891. 56 : 637[24])

General notice, giving introduction, distribution and remedies for *Psylla pyricola*.

Insects injuring red raspberries. (Rural New Yorker. Aug. 8, 1891. 50 : 577, col. 3)

Caterpillar found on red raspberry is identified as *Synchlora rubivoraria* [*glaucaria*].

Pine beetle injuring linen. (Country gentleman. Aug. 27, 1891. 56 : 706[11])

Records injury to linen by a beetle, probably a Ptinid, which was boring in pine shelving.

Foe of the Kilmarnock willow. (Orange county farmer. Sep. 3, 1891. 10 : 1, col. 2)

Identifies the apple tree bark louse, *Mytilaspis pomorum* Bouché, on Kilmarnock willows and gives remedies.

New dairy pest. (Oswego semi-weekly times. Sep. 4, 1891. 2 : 1, col. 1)

General account of the cow-horn fly [*Haematobia serrata*] giving introduction, injuries and remedies.

Cow horn fly in New York. (Country gentleman. Sep. 10, 1891. 56 : 735[22])

Gives injuries, distribution and remedies for *Haematobia serrata*.

Leaf eating beetle. (Country gentleman. Sep. 10, 1891. 56 : 735[34])

Beetle taken on a cherry tree is *Euphoria fulgida* Fabr.

Elm leaf beetle. (Country gentleman. Sep. 10, 1891. 56 : 735[35])

Larvae are probably those of *Galeruca xanthomelaena* [*Galerucella luteola*].

Grape curculio. (Country gentleman. Sep. 10, 1891. 56 : 735[37])

Records injuries by the grape curculio, *Craponius inaequalis* Say, and gives a preventive.

Measuring worm. (Country gentleman. Sep. 10, 1891. 56 : 735[43])

Caterpillar sent for name may be *Eutrapela* [*Sabulodes*] *transversata* Drury.

Rat tail larva. (Country gentleman. Sep. 10, 1891. 56 : 735[45])

Rat tail larva is one of the *Syrphidae*, resembles *Helophilus latifrons*.

Locust mite. (Country gentleman. Sep. 24, 1891. 56 : 775[15])

Locust mite, *Trombidium locustarum* Riley, is named, and its life history briefly given.

Cecropia caterpillar. (Country gentleman. Sep. 24, 1891. 56 : 777[27])

Describes the markings and beauty of the Cecropia caterpillar.

An interesting caterpillar. (Country gentleman. Oct. 1, 1891. 56 : 797[38])

Describes the cocoon of *Artace punctistriga* and gives briefly the features of Cerura caterpillars.

Grape vine leaf hopper. (Country gentleman. Oct. 8, 1891. 56 : 815[27])

Mentions the leaf hoppers, *Erythoneura vitifex* Fitch [*Typhlocyba comes* Say] and *E. vitis* [*Typhlocyba comes* var.] with remedies.

[Extraordinary flight of moths] (Albany evening journal. Oct. 20, 1891. col. 5)

Records a flight continuing for two nights and a day of *Zerene* [*Cingilia*] *catenaria* Drury.

Squash bug. (Country gentleman. Oct. 22, 1891. 56 : 854[43])

Anasa tristis DeGeer is identified and a brief sketch of its habits and transformations given.

A destructive potato aphis. (Country gentleman. Oct. 22, 1891. 56 : 857[44])

Records serious injuries to potatoes by a plant louse.

White grubs. (Country gentleman. Oct. 29, 1891. 56 : 875[46])

White grubs sent for name may be those of *Lachnosterna fusca* Fröhl.

Sprayed grapes are harmless. (Entomological news. Nov. 1891. 2 : 181)

There is not a poisonous amount of copper on the grapes and their destruction was unwarranted.

Pear midge, *Diplosis pyrivora*, in New York. (Canadian entomologist. Nov. 1891. 23 : 224)

Noticed for the first time in New York the present year at Catskill, N. Y.

On the eye spotted bud moth in western New York. (Canadian entomologist. Nov. 1891. 23 : 231)

Abundance of *Tmetocera ocellana*, habits of the caterpillar, remedies.

On some of our Orgyias. (Canadian entomologist. November 1891. 23 : 232)

Does *Orgyia* [*Notolophus*] *definita* occur at Albany? Is *O. nova* [*Notolophus antiqua*] identical with *O.* [*Notolophus*] *antiqua* of Europe?

Killing the pea weevil. (Rural New Yorker. Ap. 2, 1892. 51 : 227, col. 2–3)

Bruchus pisi [*pisorum*] may be killed by heat or the vapor of bisulfid of carbon.

Early 'grasshoppers.' (Country gentleman. Ap. 14, 1892. 57 : 286[43]–87[11])

Notices a very early appearance of the young of the green striped locust, *Chimarocephala* [*Chortophaga*] *viridifasciata* De Geer.

7th report on the injurious and other insects of the state of New York. Albany, James B. Lyon, state printer, 1891 [Issued May 8, 1892] 210 p., 40 fig. Also as report of the state entomologist for the year 1890. (New York state museum. 44th annual report, for the year 1890. p. 197–405, fig. 1–40)

Contents

Appendix

Cluster flies—*Pollenia rudis.* (Country gentleman. May 5, 1892. 57 : 358[11])

The fly identified, its habits, features, and remedies for it given.

Slugs on pear trees. (Country gentleman. May 19, 1892. 57 : 387[26])

An attack on pear trees is recognized as that of the pear tree slug, *Eriocampa cerasi* Peck [*Eriocampoides limacina* Retz.], and remedies given.

Cherry tree aphis on the wild goose plum. (Country gentleman. May 26, 1892. 57 : 407[45])

Identifies *Myzus cerasi* Fabr. on the wild goose plum, and states that the species on the burning bush was probably *Aphis rumicis* Linn.

Scurfy bark louse. (Country gentleman. June 9, 1892. 57 : 458[11])

Identifies *Chionaspis furfurus* Fitch and gives several remedies.

Harlequin cabbage bug. (Country gentleman. June 9, 1892. 57 : 458[19])

General account of *Murgantia histrionica* Hahn with remedies.

Pear tree Psylla. (Science. June 17, 1892. 19 : 343-44)

Notices injuries to pear trees by *Psylla pyri* [*pyricola*] and *Diplosis pyrivora.*

Apple tree tent caterpillar. (Country gentleman. June 23, 1892. 57 : 492[11])

Gives remedies for *Clisiocampa americana* Fabr.

Aster and lily pests. (Country gentleman. June 23, 1892. 57 : 492[15])

Injuries attributed to *Aphis middletonii* and thousand legged worms.

Cow horn fly. (Country gentleman. June 30, 1892. 57 : 501[23])

The spread of *Haematobia serrata* is noticed and remedies given.

Meal worm—*Tenebrio obscurus.* (Country gentleman. June 30, 1892. 57 : 501[28])

Notices the American meal worm, *Tenebrio obscurus* Fabr., and the European, *T. molitor*, with remedies.

Pear leaf blister. (Country gentleman. June 30, 1892. 57 : 504[25])

Identifies the pear leaf blister mite, *Phytoptus pyri*, and gives remedies.

Injuries to a maple tree. (Country gentleman. July 21, 1892. 57 : 552[27])

Identifies the maple tree borer, *Glycobius* [*Plagionotus*] *speciosus* and gives remedies.

Cauliflower pest. (Country gentleman. Aug. 11, 1892. 57 : 600[33])

Pieris rapae is identified as injurious to the cauliflower and remedies given.

Pear eating beetle. (Country gentleman. Sep. 8, 1892. 57 : 667[28])

Brief notice of *Euphoria inda* Linn. injuring pears.

Rose leaf caterpillar. (Country gentleman. Sep. 8, 1892. 57 : 667[35])

Records *Parasa chloris* H.-S. on rose leaves.

Strawberry root grub. (Country gentleman. Sep. 8, 1892. 57 : 667[37])
Gives remedies for the white grub infesting strawberry roots.

Black blister beetle. (Country gentleman. Sep. 15, 1892. 57 : 689[32])
Food plants and remedies given for *Epicauta pennsylvanica* De Geer.

Hag moth caterpillar. (Country gentleman. Sep. 22, 1892. 57 : 709[37])
Peculiar features of the larva of *Phobetron pithecium* are given.

Remedy for the army worm. (Country gentleman. Oct. 6, 1892. 57 : 750[33])
Recommends ditching, barriers, poisoning strips, etc.

Weevil in a granary. (Country gentleman. Oct. 6, 1892. 57 : 750[35])
Describes manner of using bisulfid of carbon.

Spotted horn bug. (Country gentleman. Oct. 13, 1892. 57 : 767[37])
Records injuries by *Dynastes tityus* Linn. to ripe pears.

Cabbage worms. (Country gentleman. Oct. 13, 1892. 57 : 767[42])
Recommends sprinkling with corn meal.

Tent caterpillar. (Country gentleman. Oct. 13, 1892. 57 : 767[43])
Gives best remedies for this insect, *Clisiocampa americana.*

Kerosene emulsion. (Country gentleman. Oct. 13, 1892. 57 : 767[45])
Directions for preparing the emulsion are given.

Will the cow horn fly remain with us? (Country gentleman. Oct. 13, 1892. 57 : 769[42])
Haematobia serrata is no more injurious in this state than *Stomoxys calcitrans.*

Thrips attack on cabbage. (Country gentleman. Oct. 27, 1892. 57 : 809[27])
Records an attack on cabbage by a species of *Thrips* [probably *T. tabaci*].

Tischeria apple leaf miner. (Country gentleman. Oct. 27, 1892. 57 : 809[36])
General notice of *Tischeria malifoliella* Clem. with remedies.

Distribution of the pear Psylla. (Country gentleman. Nov. 3, 1892. 57 : 831[18])
Introduction and known distribution of *Psylla pyricola.*

Cow horn fly in New York. (Country gentleman. Nov. 10, 1892. 57 : 847[12])
Gives distribution in this state of *Haematobia serrata.*

Apple tree Bucculatrix. (Country gentleman. Dec. 22, 1892. 57 : 967[24])
Identifies *Bucculatrix pomifoliella.*

How to prevent the ravages of the cabbage maggot. (Gardening. Feb. 1, 1893. 1:155, fig. 1–3)

Names a number of remedies and preventives.

A destructive elm tree bark borer. (Garden and forest. Feb. 15, 1893. 6:76)

A general notice of *Saperda tridentata* Oliv. in the white elm and giving remedies.

Plant lice. (Country gentleman. Mar. 9, 1893. 58:186[37])

Methods of fighting root infesting aphids.

Angoumois moth — *Sitotroga cerealella.* (Country gentleman. Mar. 9, 1893. 58:188[44]–89[25])

General account of its history, distribution, injuries and remedies.

Report of the committee on entomology. (Western New York horticultural society. Proceedings, January 1893. p. 28–43. Also, separate with cover and title, Mar. 21, 1893. 16 p.) [Read before the society at its annual meeting, Jan. 26, 1893]

Notices the following: Destructive shade tree pests, gypsy moth, *Ocneria* [*Porthetria*] *dispar*, *Zeuzera pyrina*, and elm borer, *Saperda tridentata.*

Periodical cicada. (Country gentleman. Mar. 23, 1893. 58:226[35])

Predicts the appearance of *Cicada septendecim* in 1894, and gives means of preventing serious injury.

Mites attacking mushrooms. (Country gentleman. Mar. 23, 1893. 58:228[46]–29[14])

Notices several species of mites, among them being *Tyroglyphus rostroserratus* and *Bryobia pratensis.*

Flower crickets and apple twigs. (Country gentleman. Mar. 30, 1893. 58:246[24])

Comments on the oviposition of *Oecanthus niveus* and *Oecanthus fasciatus.*

Onion fly—*Phorbia ceparum.* (Country gentleman. Mar. 30, 1893. 58:246[28])

Onion fly compared with the cabbage fly, *Anthomyia* [*Phorbia*] *brassicae* Bouché and remedies given.

Miss Ormerod's report. (Country gentleman. Ap. 13, 1893. 58:289[21])

Brief review of Miss Ormerod's 16th report.

Myriapods and mites in scabby potatoes. (Country gentleman. Ap. 27, 1893. 58:329[12])

Records injuries to potatoes by a 'thousand legged worm,' *Julus caeruleocinctus* Wood, and *Rhizoglyphus phylloxerae.* The scab is caused by a fungus, *Oospora scabies* Thaxter.

Spraying for codling moth. (Country gentleman. Ap. 27, 1893. 58: 329[26])

Describes the method of spraying for this insect.

[Insects on lettuce and cabbage] (Gardening, May 1, 1893. 1: 264, col. 2)

Notices *Plusia simplex* on lettuce, *Plusia brassicae* and *Aphis brassicae* on cabbage.

Clover hay worm—*Pyralis costalis* Fabr. (Country gentleman. May 4, 1893. 58: 349[16])

General account of the life history, ravages and remedies.

When to spray. (Country gentleman. May 11, 1893. 58: 368[25])

Gives directions for preparing and applying insecticides for a number of common insects.

Clover leaf weevil. (Country gentleman. May 18, 1893. 58: 386[43]–87[11])

General notice of *Phytonomus punctatus*, giving its introduction, distribution and remedies.

Apple tree borer. (Country gentleman. May 18, 1893. 58: 387[11])

Identifies *Saperda candida* Fabr., refers to *Chrysobothris femorata* Fabr., and gives remedies.

Bud worm. (Country gentleman. May 18, 1893. 58: 387[16])

Recommends spraying with paris green for *Tmetocera ocellana*.

Danger to apple buds. (New York homestead. May 25, 1893. 27: 236, col. 4)

Tmetocera ocellana received from Lancaster, N. Y., remedies are given.

Pear midge. (Albany evening journal. May 30, 1893. p 6, col. 5)

Records appearance of *Diplosis pyrivora* in Columbia and Greene counties in this state.

Invasion of plant lice in New York. (American farmer. June 1, 1893. 74: 1, col. 4)

Unusual abundance of the apple tree aphis, *Aphis mali*, and remedies for it and the hop aphis.

Apple tree aphis. (Country gentleman. June 8, 1893. 58: 449[23])

Brief notice of *Aphis mali*.

Some potato pests. (Country gentleman. June 8, 1893. 58: 449[27])

Treats of injuries to potatoes by the cucumber flea beetle, *Crepidodera* [*Epitrix*] *cucumeris* and *Julus caeruleocinctus*.

Greenhouse pest. (Gardening. June 15, 1893 1: 313, col. 1–3)

General account of species of *Sciara* infesting greenhouses and mushroom beds [subsequently described as *Sciara coprophila* and *S. caldaria*].

Apple tree aphis. (American farmer. June 15, 1893. 74:8, col. 6)

Impossible to predict injury by aphids. Gives remedies for plant lice and for *Tmetocera ocellana*.

Immense swarms of a butterfly. (New York homestead. June 22, 1893. 27:273, col. 1–2)

Describes the swarming habit of the milk weed butterfly, *Danais archippus* Fabr. [*Anosia plexippus* Linn.]

New peach insect. (Country gentleman. June 29, 1893. 58:508[24])

Records injuries to peaches by a plant bug, *Pentatoma juniperina* Linn.

Caterpillar on rye. (Country gentleman. June 29, 1893. 58:508[28])

Identifies the larva of *Leucania albilinea* Hübn. on rye and mentions the army worm, *Leucania unipuncta*.

Hellgramite fly. (Country gentleman. June 29, 1893. 58:508[32])

Describes the pupa of *Corydalis cornuta* Linn. and gives its habits and transformations briefly.

Ants on fruit trees. (Country gentleman. July 6, 1893. 58:523[12])

Camponotus herculaneus Linn. and *Cremastogaster cerasi* Fitch are briefly noticed.

New grape vine pests. (Country gentleman. July 6, 1893. 58:523[17])

Records severe ravages by *Anomala marginata* and gives remedies.

Ants on peonies. (Country gentleman. July 6, 1893. 58:524[18])

Ants are probably merely drawn to the flowers for the purpose of feeding on the sweet secretion of the buds.

Three lined leaf beetle. (Country gentleman. July 6, 1893. 58:524[25])

Gives the destructive habits of *Lema trilineata* in gardens, specially to potatoes.

Useful beetle. (Country gentleman. July 6, 1893. 58:524[32])

Describes *Calosoma sycophanta* of Europe and compares it with our *Calosoma scrutator*, and gives their beneficial habits.

[Angoumois moth] (Orange county farmer. July 6, 1893. 12:4, col. 5)

Identifies *Sitotroga cerealella* Oliv. and gives remedies.

[Wheat midge in central New York] (Albany evening journal. July 10, 1893. p. 8, col. 9)

Notices the presence of the insect [*Diplosis tritici*] and its earlier ravages.

Wheat head army worm. (Country gentleman. July 13, 1893. 58:539[24])

Brief account of *Leucania albilinea* injuring timothy.

Zebra caterpillar. (Country gentleman. July 13, 1893. 58:539[29])

Mamestra picta injuring the leaves and pods of peas, its feeding habits and remedies.

Wheat weevil. (Country gentleman. July 13, 1893. 58 : 540^{24})

Gives remedy for weevils in wheat.

Ground beetle. (Country gentleman. July 13, 1893. 58 : 540^{26})

States that larvae of ground beetles are most probably not injurious to roots of watermelons.

Maple tree borer. (Country gentleman. July 20, 1893. 58 : 557^{18})

Glycobius [*Plagionotus*] *speciosus* is identified and remedies indicated.

Insect on wistaria. (Country gentleman. July 20, 1893. 58 : 557^{23})

Describes the two spotted tree hopper, *Enchenopa binotata* Say, and gives remedies.

Elm leaf beetle. (Country gentleman. July 20, 1893. 58 : 558^{16})

Beetle is identified and a number of references given.

Water beetle. (Country gentleman. July 20, 1893. 58 : 558^{25})

Identifies *Dytiscus harrisii* Kirby and gives habits.

Silk worm moth. (Country gentleman. July 20, 1893. 58 : 558^{27})

Brief popular notice of *Telea polyphemus* Cramer.

Woolly plant louse. (Country gentleman. July 20, 1893. 58 : 558^{33})

The rather rare *Pemphigus acerifolii* Riley, is identified on maple, and remedies given.

Walnut span worm. (Gardening. Aug. 15, 1893. 1 : 377, col. 2)

A 'brown worm' injuring black walnut trees in Kansas City is probably *Boarmia* [*Coniodes*] *plumigeraria* Hulst.

How to control the squash bug. (Gardening. Aug. 15, 1893. 1 : 377–78, col. 3, 1)

Trapping the adults, *Anasa tristis*, destroying the young and eggs recommended.

Humming bird moth. (Country gentleman. Aug. 17, 1893. 58 : 634^{18})

Gives the characters of *Sesia uniformis* [*Hemaris thysbe* var. *ruficaudus*].

Bag worm. (Country gentleman. Aug. 17, 1893. 58 : 634^{25})

Bag worm or basket worm, *Thyridopteryx ephemeraeformis*, is identified.

Grain weevil. (Country gentleman. Aug. 31, 1893. 58 : 674)

Describes the method of treating infested wheat.

Insects of the past year and progress in insect studies. [Read before the Albany institute Ap. 15, 1890] (Albany institute. Transactions. [August] 1893. 12 : 227–40)

Treats of the grain aphis, *Siphonophora avenae* [*Nectarophora granaria*], hop aphis, *Phorodon humuli*, apple tree tent caterpillar, *Clisiocampa americana*, white marked tussock moth, *Orgyia* [*Notolophus*] *leucostigma*, forest tent caterpillar, *Clisiocampa sylvatica* [*disstria*], *Otiorhynchus ovatus* and *Silvanu surinamensis*.

Cabbage aphis. (Country gentleman. Sep. 14, 1893. 58 : 717[13])

Aphis brassicae Linn. difficult to control, insecticides recommended.

Beetle destroying strawberry plants. (Albany evening journal. Sep. 27, 1893. p. 1, col. 6)

Records injuries to strawberry plants by *Paria aterrima* [*Typophorus canellus*].

Plugging trees with sulfur. (Country gentleman. Sep. 28, 1893. 58 : 753[34])

Exposes the worthlessness of the 'sulfur cure' and cites experiment by Dr Fitch.

Black blister beetle attack on asters. (Gardening. Oct. 1, 1893. 2 : 28, col. 3)

Records injuries to asters by *Epicauta pennsylvanica* DeGeer, and gives remedies.

Clover seed caterpillar. (Country gentleman. Oct. 5, 1893. 58 : 773[16])

A general notice of *Grapholitha interstinctana* Clem., giving life history and remedies.

Grasshopper plague in New York. (Country gentleman. Oct. 12, 1893. 58 : 793[18])

A general account of *Melanoplus femur-rubrum* and *M. atlanis*, with notice of their operations, associated species and remedies.

Potato beetle killer. (Orange county farmer. Oct. 19, 1893. 13 : 1, col. 7)

Beetle sent as 'the new potato bug killer,' is identified as *Lebia grandis*.

Insect pests. (Gardening. Nov. 15, 1893. 2 : 77)

In too poor condition to identify, one referred with doubt to *Sphinx drupiferarum*.

On arsenical spraying of fruit trees while in blossom. (Insect life. 1893. 6 : 181–85)

Not proven [since demonstrated] that death of bees may be due to spraying with arsenicals. Recommends caution.

8th report on the injurious and other insects of the state of New York for the year 1891. Albany, University of the State of New York. 1893. [Issued Feb. 7, 1894] 218 p., 53 fig. (New York state museum, 45th annual report for the year 1891. Albany, University of the State of New York. 1892. [Issued in Feb. 1894] p. 103–320, fig. 53)'

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Appendix

Grubs destroying Mermet roses. (Florist's exchange. Feb. 10, 1894. 6 : 176, col. 1)

Grubs working at roots of roses are probably a species of *Lachnosterna*. Remedies are given.

9th report on the injurious and other insects of the state of New York, for the year 1892. Albany, University of the State of New York. 1893. [Issued Mar. 2, 1894] 211 p., 34 fig. (New York state museum, 46th report, for the year 1892. Albany, University of the State of New York. 1892. [Issued in March, 1894] p. 289–495 fig 34)

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Appendix

Maple tree scale insect. (Gardening. Mar. 15, 1894. 2 : 206)

In the absence of examples the scale is identified as probably *Pulvinaria innumerabilis* Rathv. and remedies given.

Rose slug. (Gardening. Ap. 1, 1894. 2 : 230)

Gives remedies for common rose slug, *Monostegia rosae*, mentions bristly rose worm, *Cladius pectinicornis* Four., and curled rose worm, *Emphytus cinctus* Linn.

White worms at the roots of house plants. (Gardening. Ap. 15, 1894. 2 : 257, col. 2)

Recommends strong mustard water, tobacco or pyrethrum water.

Apple maggot — *Trypeta pomonella*. (Country gentleman. May 3, 1894. 59 : 349[18])

Identifies the insect and gives remedies.

The foe of shade trees. (Albany evening journal. May 7, 1894)

Notice of the elm borer, *Saperda tridentata*, giving remedies.

Cotton wood beetle. (Syracuse union. May 9, 1894. p. 2, col. 1)

Identifies *Lina scripta* Fabr., giving its earlier history and remedies.

Insect that kills the pine tree borers. (Gardening. May 15, 1894. 2 : 292, col. 2)

Notices the introduction of *Clerus formicarius* for the purpose of preying on *Dendroctonus frontalis*.

Probably white grubs. (Country gentleman. May 17, 1894. 59 : 386[22])

Recommends kerosene emulsion for white grubs in a lawn.

Periodical cicada, or the 17 year locust. (Issued as a circular of four pages. Albany. June 19, 1894)

Brief general account of *Cicada septendecim* and *C. tredecim*.

Pear leaf blister mite. (Country gentleman, June 21, 1894. 59 : 468[41])

Identifies an attack by *Phytoptus pyri* and gives remedies.

Chestnut weevil. (Country gentleman. July 5, 1894. 59 : 504[16])

The 'chestnut worm' is identified as probably *Balaninus caryatrypes* [*proboscideus*].

Rose bugs. (Country gentleman. July 5, 1894. 59 . 504[17])

Recommends collecting by mechanical devices as described by Dr Smith.

Friendly insects. (Country gentleman. July 5, 1894. 59 : 504[22])

Identifies the twice stabbed lady bird, *Chilocorus bivulnerus* Muls., and describes its beneficial habits.

Hellgramite fly. (Country gentleman. July 12, 1894. 59 : 520[23])

Corydalis cornuta identified. Its larva is known to fishermen as 'the dobson.'

Plant lice at the roots of asters, etc. (Gardening. July 15, 1894. 2 : 358, col. 1)

Root lice attacking asters, chrysanthemums and other plants are probably *Aphis middletonii* Thos., several remedies are given.

Ants in strawberry beds. (Country gentleman. Aug. 2, 1894. 59 : 568[13])

Recommends bisulfid of carbon for the destruction of their nests or hills.

Grape vine caterpillar. (Country gentleman. Aug. 2, 1894. 59:568[16])

Identifies *Thyreus abbotii* and refers one 'looking like a snake with the head of a frog' to the Geometridae.

Enemies of the potato beetle. (Country gentleman. Aug. 2, 1894. 59:568[25])

States that there are many enemies of the Colorado potato beetle.

Elm leaf beetle. (Country gentleman. Aug. 16, 1894. 59:600[25])

Spraying the foliage with paris green or london purple is recommended.

Above ground buildings of the 17 year cicada. (New York daily tribune. Aug. 21, 1894. p. 12, col. 2)

Brief abstract of a paper read before the American association for the advancement of science.

Worm destroying canna leaves. (Florist's exchange. Sep. 8, 1894. 6:788)

Insects are identified as *Pamphila* [*Calpodes*] *ethlius* and as probably the common *Spilosoma* [*Pyrrharctia*] *isabella*.

Sumac galls. (Country gentleman. Sep. 20, 1894. 59:686[14])

Brief notice of an aphis, *Melaphis rhois* Fitch, and its galls on *Rhus glabra* and *R. typhina*.

Box elder plant bug. (Country gentleman. Sep. 27, 1894. 59:699[26])

Insect on the city sidewalks of Shenandoah, Iowa, is identified from the description as *Leptocoris trivittatus* Say.

Beetle feeding on green corn. (Country gentleman. Sep. 27, 1894. 59 : 701[24])

Beetle, *Euphoria inda* Linn., feeding on the tips of standing sweet corn, is noticed briefly.

Muskmelon borers at the south. (Country gentleman. Oct. 4, 1894. 59:721[26])

General account of the two melon boring caterpillars in the southern states, *Eudioptis* [*Margaronia*] *nitidalis* Cram. and *E.* [*Margaronia*] *hyalinata* Linn.

Pear rust. (Country gentleman. Oct. 4, 1894. 59:722[17])

Pear shows a rust which may have been caused by a mite, possibly *Phytoptus pyri.*

'Pear rust' — cause unknown. (Country gentleman. Oct. 25, 1894. 59:773[31])

The above is probably but an unusual development of its natural rust.

Indian Cetonia. (Gardening. Nov. 1, 1894. 3:55–56, col. 3, 1)

Gives the habits of *Euryomia* [*Euphoria*] *inda* and states that the reported injury to the bark of young pear trees is confirmatory of an earlier statement.

Injurious beetles. (Gardening. Nov. 1, 1894. 3:56, col. 1–2)

Brief notice of *Euryomia* [*Euphoria*] *inda*, *Cyllene robiniae* Forster and *Glycobius* [*Plagionotus*] *speciosus* Say.

Maple tree borer. (Gardening. Nov. 1, 1894. 3:56, col. 2)

Identifies the pupal case of *Aegeria* [*Sesia*] *acerni* Clem. and gives remedies.

Squash bug. (Gardening. November 1, 1894. 3:56, col. 2, 3)

Gives several remedies for the squash bug, *Anasa tristis* De Geer.

Report of the state entomologist to the regents of the University of the State of New York, for the year 1893. Albany. November 1894. 26 p.

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San José scale. (Albany evening journal. Nov. 7, 1894. p. 6, col. 5)

Notes the finding of *Aspidiotus perniciosus* in a pear orchard at Kinderhook N. Y., and gives its distribution.

'North Dakota's new bug.' (Country gentleman. Nov. 22, 1894. 59: 841[26])

Records *Leptocoris trivittatus* Say from Jamestown, N. D., with a brief notice of the insect.

Experiment station work on Long Island. (American agriculturist. Dec. 1, 1894. 54: 404, col. 1)

Brief notice of the important work done on Long Island.

Grubs in manure. (Country gentleman. Dec. 27, 1894. 59: 931[12])

White grubs in manure are identified as those of *Ligyrus relictus*.

Ants in a lawn. (Country gentleman. Jan. 3, 1895. 60: 9[13])

Gives several means of destroying ants in nests.

Apple tree aphis. (Country gentleman. Jan. 10, 1895. 60: 27[11])

Indicates proper remedies for *Aphis mali* and notices the pear Psylla.

Apple tree bark louse. (Country gentleman. Jan. 10, 1895. 60: 27[23])

Recommends kerosene emulsion for *Mytilaspis pomorum* and gives its many food plants.

Colorado beetles. (Country gentleman. Jan. 10, 1895. 60: 30[23])

Gives dates of appearance of *Doryphora 10-lineata* in several localities in this state.

Attacking scale insects. (Country gentleman. Feb. 7, 1895. 60: 108[23])

Recommends winter treatment with a whale oil soap solution.

Garden slugs. (Country gentleman. Feb. 21, 1895. 60: 147[13])

Best remedy is freshly slacked lime or lime water applied to them while feeding during morning or evening.

Rhinoceros beetle. (Country gentleman. Mar. 21, 1895. 60: 230[17])

Identifies *Dynastes tityus* and gives its habits.

Bounty on the English sparrow. (Albany evening journal. Mar. 21, 1895. p. 8, col. 4, 23 cm; Scientific american. Ap. 27, 1895)

An argument against a bounty on this bird, since it would tend to drive it into the country.

Vermicides [insecticides for vermin] (Country gentleman. Ap. 4, 1895. 60: 266[42])

Recommends Buchan's carbolic soap and Little's chemical fluid for killing vermin on cattle, sheep and lambs.

English sparrow. (Country gentleman. Ap. 11, 1895. 60: 285[28])

Substantially the same as in the *Albany evening journal*, Mar. 21, 1895, of which an abstract is given above.

Some destructive shade tree pests. (State of New York — Department of public instruction, arbor day manual. May 3, 1895. Albany, Ap. 6, 1895. p. 13–17, fig. 6)

Notices elm leaf beetle, *Galerucella xanthomelaena* [*luteola*], Orgyia tussock caterpillar, *Orgyia* [*Notolophus*] *leucostigma*, leopard moth, *Zeuzera pyrina*, maple tree scale, *Pulvinaria innumerabilis*.

Bad scale on currant bushes. (Gardening. May 15, 1895. 3 : 263, col. 2)

Identifies *Aspidiotus ancylus* Putnam on currant bushes and gives remedy.

Currant aphis. (Gardening. May 15, 1895. 3 : 263, col. 3)

Gives remedies and preventives for *Myzus ribis* Linn.

Bean weevil. (Country gentleman. May 16, 1895. 60 : 389[15])

Describes methods of destroying weevils in beans.

Bean weevil. (Country gentleman. May 23, 1895. 60 : 408[32])

Eggs deposited on pods and no preventive of this is known.

Millepedes and wire worms. (Country gentleman. May 30, 1895. 60 : 423[16])

Indicates several preventives and remedies.

Carpet eating insects. (Country gentleman. May 30, 1895. 60 : 423[32])

Notices *Tinea pellionella* and *Attagenus piceus*, the black carpet beetle, with remedies.

Plum tree aphis. (Gardening. June 1, 1895. 3 : 281, col. 3)

Identifies an attack as due probably to *Aphis prunifoliae*, and gives remedies.

Cut worms. (Country gentleman. June 6, 1895. 60 : 440[32])

As there are 50 or more species, no general remedy can be given for them, and reference is made to Museum bulletin 6, 'Cut worms.'

Manual for the study of insects. (Nation. June 6, 1895. No. 1562, 60 : 451, col. 1, 2, 3.)

Review of the above named volume by Prof. J. H. Comstock and Anna Botsford Comstock, O. 701 p., 6 pl. and 797 fig.

San José scale, *Aspidiotus perniciosus*, and some other destructive scale insects of the state of New York (New York state museum. Bulletin vol. 3, no. 13, April 1895. Published June 11, 1895, 44p., 7 pl.)

As introductory, 'What scale insects are,' is told. The destructive New York scale insects noticed are: apple tree bark louse; scurfy barklouse; pine leaf scale insect; white scale; maple tree scale insect; and plum tree scale insect. Of the San José scale is given: Introduction and spread; Occurrence in the eastern United States; Investigations by the U. S. Department of agriculture; San José scale in New York; San José scale on Long Island; San José scale in New Jersey; The two infested New Jersey nurseries; San

José scale in Ohio; Description of the scale; Description of the insect; Its life history; its food plants; Spread of the insect; Protection from infested stock; Proposed legislation; Remedies; Bibliography; Plates and their explanations.

Asparagus beetle goes north. (Country gentleman. June 13, 1895. 60:455[13])

Remarks on the northern extension of *Crioceris asparagi* and its probable limitation by the upper austral life zone.

Pear midge. (Country gentleman. June 13, 1895. 60:456[26])

Records presence of *Diplosis pyrivora* at Millbrook, N. Y., and gives remedies.

Pear midge again. (Country gentleman. June 20, 1895. 60:472[18])

Diplosis pyrivora is received from Poughkeepsie, N. Y.

New maple tree insect. (Country gentleman. June 27, 1895. 60:484[48]-85[14])

Larvae of a Tortricid moth, burrowing the stems of maple leaves are those of *Steganoptycha claypoliana*.

Plum tree scale. (Country gentleman. June 27, 1895. 60:485[15])

Brief notice of *Lecanium juglandifex* Fitch [erroneous reference of *L. prunastri* Fonsc.].

Elm leaf beetle. (Albany evening journal. July 20, 1895. p. 3, col. 1)

Brief general notice of *Galerucella luteola* in Albany.

Elm leaf beetle. (Country gentleman. Aug. 1, 1895. 60:568[14])

Identifies *Galerucella xanthomelaena* [*luteola*] and gives remedies.

Horn tail borer. (Country gentleman. Aug. 1, 1895. 60:568[17])

Notices briefly *Tremex columba*, *Thalessa atrata* and *T. lunator*.

Orchard insects. (Country gentleman. Aug. 1, 1895. 60:568[26])

No satisfactory reply can be given to such a general inquiry.

Black peach aphis. (Country gentleman. Aug. 8, 1895. 60:583[21])

Destructiveness of *Aphis persicae-niger* [*prunicola* Kalt.] its life history and remedies.

Sugar maple borer. (Country gentleman. Aug. 8, 1895. 60:583[26])

Identifies *Glycobius* [*Plagionotus*] *speciosus* and gives remedies and preventives.

New scale insect. (Country gentleman. Aug. 8, 1895. 60:585[23])

Scale from Loudonville, N. Y., on the Camperdown elm, is *Gossyparia ulmi*.

Harlequin cabbage bug. (Country gentleman. Aug. 15, 1895. 60:595[25])

Injuries by *Murgantia histrionica*, its spread and remedies.

Carpet beetle. Country gentleman. Aug. 15, 1895. 60:599[31])

Brief notice of *Anthrenus scrophulariae*, giving its habits, life history and remedies.

A pugnacious caterpillar. (Gardening. Aug. 15, 1895. 3:364, col. 3)
Describes the larva of *Thyreus abbotii*, and gives its habits.

Insect attack on maples (Gardening. Aug. 15, 1895. 3:364, col. 3)
Attack on center shoots of cut leaf maples can not be identified without examples.

Insect gall. (Gardening. Aug. 15, 1895. 3:366, col. 1)
A 'tiny green burr' taken from a sweet briar in Georgetown, Ky., is a gall made by one of the gall flies of the genus *Rhodites*.

Another note of warning [against the elm leaf beetle]. (Albany evening journal. Aug. 20, 1895. p. 8, col. 5)
Records a second brood of *Galerucella luteola* in Albany and gives remedies.

Caterpillars and borers. (Country gentleman. Aug. 29, 1895. 60:632[23])
Gives remedies for apple tree tent caterpillars and borers.

Black blister beetle. (Country gentleman. Aug. 29, 1895. 60:632[34])
Insect on china asters is the black blister beetle, *Epicauta pennsylvanica* DeGeer. Remedies are indicated.

Scale insect on osage orange hedge. (Gardening. Sep. 15, 1895. 4:11 col. 3)
Identifies *Pulvinaria innumerabilis* and gives remedies.

To kill red ants in the house. (Gardening. Sep. 15, 1895. 4:12, col. 1)
Gives several remedies for *Monomorium pharaonis*.

A friend, not a foe. (Country gentleman. Sep. 19, 1895. 60:685[15])
Describes the beneficial habits and value of the larva of a lady bug, *Hippodamia convergens*.

Humbug insect cure. (Country gentleman. Sep. 19, 1895. 60:687[11])
Exposes the old remedy of plugging trees with sulfur.

Squash bug. (Country gentleman. Sep. 19, 1895. 6:687[16])
Gives best remedy for *Anasa tristis*.

Squash bugs — squash vine borers. (Country gentleman. Oct. 3, 1895. 60:719[16])
Comparative injury to crops by the two insects. Desirability of preventing attack.

Frail children of the air: Excursions into the world of butterflies: by S. H. Scudder. (Nation. Oct. 17, 1895. No. 1581, p. 280–81, col. 3, 1)
Brief notice of the more interesting features of this delightful volume.

Natural history of aquatic insects: by Prof. L. C. Mial, F. R. S. (Nation. Oct. 31, 1895. No. 1583, p. 317–18, col. 3, 1)
Review emphasizing the value of the original matter published in this work.

Box elder plant bug. (Country gentleman. Oct. 31, 1895. 60 : 786[18])

Identifies *Leptocoris trivittatus* Say from McGregor, Ia.

On the girdling of elm twigs by the larvae of *Orgyia* [*Notolophus*] *leucostigma* and its results. (American naturalist. January 1896. 30 : 74–75)

Records the peculiar twig girdling habit of the larva.

Wire worms in corn. (Country gentleman. Feb. 20, 1896. 61 : 144[12])

Gives several remedies.

Solution for killing worms. (Gardening. Mar. 15, 1896. 4 : 199[24])

Recommends several insecticides for millepedes.

Apple maggot—*Trypeta pomonella*. (Gardening. Ap. 1, 1896. 4 : 218[24])

Brief general account, giving life history and remedies.

Apple maggot. (Country gentleman. Ap. 2, 1896. 61 : 270[36])

Identifies *Trypeta pomonella* and gives proper remedies.

Cheese skipper. (Country gentleman. Ap 9, 1896. 61 : 293[22])

Brief general account of the meat skipper, *Piophila casei* Linn., giving life history and remedies.

Scale insects. (Gardening. Ap. 15, 1896. 4 : 234, col. 1)

Notices briefly *Mytilaspis pomorum* and *Chionaspis furfurus* and gives remedies.

Southern corn root worm. (Country gentleman. Ap. 30, 1896. 61 : 353[17])

General account of 'the 12 spotted Diabrotica,' *D. 12-punctata* Oliv., and the northern corn root worm, *Diabrotica longicornis* Say, giving injuries and remedies.

Thousand legged worms infesting greenhouses. (Gardening. May 1, 1896. 4 : 251–52, col. 2–3, 1)

General account of a species of millepedes [subsequently referred to *Leptodesmus*], and giving a number of remedies.

Handbook of British lepidoptera. By Edward Meyrick. (Nation. May 14, 1896. 62:385, col. 2–3)

General review of this work.

Elm leaf beetle. (Country gentleman. May 14, 1896. 61:386[33])

Galerucella xanthomelaena [*luteola*] identified from Gaylordsville, Ct.

Harlequin cabbage bug. (Gardening. May 15, 1896. 4:266, col. 2–3, 26 cm)

Murgantia histrionica is identified and its spread over the country noticed.

Plum mite. (Country gentleman. May 21, 1896. 61:406[22])

Galls on a Chickasaw plum are identified as possibly those of *Phytoptus pruni* Amerl.

The 'Fire worm.' (Country gentleman. May 28, 1896. 61 : 431[37])

Records the resistance of the canker worm, *Anisopteryx* [*Paleacrita*] *vernata* Peck, to paris green.

On the girdling of elm twigs by the larvae of *Orgyia* [*Notolophus*] *leucostigma* and its results. (American association for the advancement of science. Proceedings 44th meeting, held at Springfield, Mass., August–September 1895, May 1896, p. 156, 5 cm)

Brief abstract of the paper under the above title was published in the American naturalist, January 1896.

Fruit tree aphids. (Country gentleman. June 11, 1896. 61 : 466[37])

Notices the cherry tree aphis, *Myzus cerasi* Fabr. and one on plum, *Aphis prunifoliae* Fitch, and gives remedies.

[Kill the larvae of the elm leaf beetle.] (Albany evening journal. June 24, 1896, p. 4, col. 4)

Recommends killing the larvae and pupae of *Galerucella luteola* with hot water or kerosene.

[Report on the work of the gypsy moth committee after an examination made in June 1893.] (Gypsy moth, *Porthetria dispar* Linn.—Report of the work by E. H. Forbush & C. H. Fernald [June] 1896, appendix D, p. 32–35.)

Report commending the work of the committee and recommending more liberal appropriations and the importation of parasites.

Elm tree beetle in Albany. (Albany express. July 1, 1896)

Gives the progress of the insect up the valley of the Hudson river.

Rose bugs. (Gardening. July 1, 1896. 4 : 311, col. 2)

Recommends the destruction of this insect on its breeding grounds when they are known.

10th report on the injurious and other insects of the state of New York for the year 1894. Albany, University of the State of New York, 1895. [Issued July 8, 1896.] 297 p., 4 pl., 24 fig. Also as report of the state entomologist for the year 1894. (New York state museum. 48th report, for the year 1894. Albany, University of the State of New York. 1895, 297 p., 4 pl., 24 fig.)

Contents

Army worm invasion. (Argus [Albany]. July 8, 1896. p. 8, col. 3; the same, in part New York recorder. July 15, 1896; Country gentleman. July 16, 1896. 61 : 552[12]; Rome sentinel. July 17, 1896; Circular of the department of agriculture of the state of New York)

Records injury by *Leucania unipuncta* and indicates remedies.

Wire worm. (Country gentleman. July 9, 1896. 61 : 540[18])

Gives several remedies for these insects.

Army worm invasion. (New York daily tribune. July 18, 1896)

Notice of *Leucania unipuncta* and remedies.

Tent caterpillar. (Country gentleman. July 23, 1896. 61 : 571[46])

Identifies the apple tree tent caterpillar, *Clisiocampa americana*.

Army worm. (Country gentleman. July 23, 1896. 61 : 574[33])

Ravages of *Leucania unipuncta* and remedies.

Cut worms and borers. (Country gentleman. July 30, 1896. 61 : 591[14])

Gives several remedies for these pests.

More about the army worm. (Country gentleman. Aug. 6, 1896. 61 : 606[12])

General notice of *Leucania unipuncta* and its parasites.

Snapping bugs. (Country gentleman. Aug. 6, 1896. 61 : 610[14])

Recommends several baits for attracting these beetles.

Blister beetles. (Country gentleman. Aug. 13, 1896. 61 : 624[33])

Notices the margined blister beetle, *Epicauta cinerea* Forst. and the striped blister beetle, *Epicauta vittata* Fabr.

Willow butterfly. (Country gentleman. Aug. 27, 1896. 61 : 666[18])

Records injury to trees at Whitehall, N. Y. by *Vanessa* [*Euvanessa*] *antiopa*.

Caterpillars and parasites. (Country gentleman. Aug. 27, 1896. 61 : 670[17])

Brief notice of the larva of *Ampelophaga myron* Cram. and its common parasite, *Apanteles congregatus*.

Oak pruner. (Country gentleman. Sep. 3, 1896. 61 : 682[45])

Identifies an attack on maples by *Elaphidion parallelum* [*villosum*].

Beech tree blight. (Country gentleman. Sep. 10, 1896. 61 : 705[43])

General notice of *Schizoneura imbricator* Fitch on beech leaves, describing the insect and indicating the remedies.

Elm tree borer. (Country gentleman. Sep. 24, 1896. 61 : 746[16])

Saperda tridentata Oliv. is identified and several remedies given.

Cecropia moth. (Country gentleman. Sep 24, 1896. 61 : 746[21])

The cocoon of this moth, *Attacus* [*Samia*] *cecropia*, is described.

Imported scale insects. (Country gentleman. Sep. 24, 1896. 61 : 746[33])

Brief comment on the reported importation of *Diaspis lanatus* [*amygdali*] and the importance of quarantine regulations.

Pea bugs. (Country gentleman. Oct. 1, 1896. 61 : 763[37])

Chloroform or bisulfid of carbon are recommended for *Bruchus pisorum*.

Rose leaf hopper. (Country gentleman. Oct. 1, 1896. 61 : 763[44])

Gives several remedies for *Typhlocyba rosae* Harris.

Wheat wire worm. (Country gentleman. Oct. 22, 1896. 61 : 826[14])

Agriotes mancus Say is identified and remedies given.

Apple tree borers. (Country gentleman. Dec. 10, 1896. 61 : 949[24])

Brief general notice of *Saperda candida* Fabr. and *Chrysobothris femorata* Fabr. and remedies for them.

Notes on some of the insects of the year in the state of New York. (U. S. Dep't agriculture, Division entomology. Bulletin 6, new ser., 1896, p. 54–61)

Notes on the following insects: *Leucania unipuncta*, *Leucania albilinea*, *Anisopteryx* [*Paleacrita*] *vernata*, *Cacoecia rosaceana*, *Nolophana* [*Balsa*] *malana*, Cecidomyiid larva on choke cherry, *Euphoria inda*, *Elaphidion villosum*, *Crioceris asparagi*. *Macrobasis unicolor*, Chinch bug, *Aspidiotus perniciosus*, *Kermes galliformis* and *Gossyparia ulmi*.

Elm leaf beetle. (Country gentleman. Jan. 7, 1897. 62 : 7[13])

Corrections of a very erroneous article on this insect.

11th report on the injurious and other insects of the state of New York for the year 1895. Albany, University of the State of New York, 1896. [Issued Jan. 21, 1897] 246 p. (85–330), 16 pl., 25 fig. Also as report of the state entomologist for the year 1895. (New York state museum. 49th report for the year 1895. Albany, University of the State of New York, 1897. [Issued in October 1897], 245 p., 16 pl., 25 fig.)

Contents

Two insects. (Country gentleman. Feb. 11, 1897. 62: 106^{42})

Notices the warble flies, *Hypoderma bovis* De Geer and *H. lineata* Villers, and the buffalo fly, *Haematobia serrata* Rob.-Desv.

Potato bugs. (Country gentleman. Feb. 18, 1897. 62:126^{33})

Gives remedies for Colorado potato beetle.

Carbon bisulfid for pea weevil—A serious danger. (Farmer's advocate. Mar. 15, 1897. 32 : 130, col. 3)

Directions for using this insecticide are given.

Probably the cheese mite. (Country gentleman. Mar. 18, 1897. 62 : 217^{26})

Hams infested with quantities of animated dust have probably been attacked by the cheese mite, *Tyroglyphus siro* Linn , several remedies are given.

Canker worms. (Country gentleman. Ap. 1, 1897. 62 : 248^{18})

Work of canker worms, *Anisopteryx* [*Paleacrita*] *vernata* or *Anisopteryx* [*Alsophila*] *pometaria* is recognized and remedies indicated.

Apple tree borers. (Country gentleman. Ap. 22, 1897. 62 : 307^{33})

Habits of *Saperda candida* and *Chysobothris femorata* are given and several remedies advised.

A grasshopper. (Country gentleman. Ap. 29, 1897. 62 : 326^{38})

Eggs of the angular winged katydid, *Microcentrum retinervis*, are identified and several curious places for oviposition named.

Cow horn fly. (Country gentleman. May 6, 1897. 62 : 350^{16})

Several remedies are given for *Haematobia serrata*.

Elm and apple tree pests. (Country gentleman. May 20, 1897. 62 : 390^{17})

Remedies for the elm leaf beetle and preventives of apple tree borers are described.

Tent caterpillar. (Country gentleman. May 20, 1897. 62 : 390^{24})

Clisiocampa americana is identified.

May beetle. (Country gentleman. May 20, 1897. 62 : 390^{27})

Injuries to a lawn are probably caused by white grubs. Kerosene emulsion is recommended.

Strawberries and indian corn. (Country gentleman. May 20, 1897. 62 : 394[17])

Cut worms are probably attacking the strawberries and the boll worm, *Heliothis armiger,* is injuring the corn. Remedies are indicated.

Elm tree beetle. (Country gentleman. May 27, 1897. 62 : 406[35])

Method of spraying elms is briefly described.

Grasshoppers. (Country gentleman. June 10, 1897. 62 : 446[18])

Allowing fowls to run in garden, or poisoned bran mash is recommended.

Apple woolly louse. (Country gentleman. June 10, 1897. 62 : 454[24])

Schizoneura lanigera is identified and remedies indicated.

Arsenic and animals. (Country gentleman. June 10, 1897. 62 : 454[33])

Drippings from properly sprayed trees harmless to animals eating the grass or hay from beneath.

Apple tree aphis. (Country gentleman. June 17 : 1897. 62 : 470[13])

Attack by *Aphis mali* briefly noticed.

Carpet beetles. (Country gentleman. June 17, 1897. 62 : 470[22])

Anthrenus scrophulariae abundant on flowers at this time.

Grain weevil. (Country gentleman. June 24, 1897. 62 : 486[25])

No plant will protect grain from weevil, but a French agricultural paper states that aniseed will attract weevils from grain and kill them.

Wire worms. (Country gentleman. June 24, 1897. 62 : 486[27])

Carbon bisulfid or kerosene emulsion is recommended for wire worms at roots of cabbages.

The long sting. (Country gentleman. July 1, 1897. 62 : 506[32])

Gives a brief popular account of *Thalessa atrata.*

Army worm. (Country gentleman. July 1, 1897. 62 : 506[42])

Army worm eggs do not occur in grass seed. Repetition of last year's attack need not be feared.

Honey dew. (Country gentleman. July 8, 1897. 62 : 526[15])

Nature of honey dew on maple leaves is briefly explained.

Cherry tree Myzus. (Country gentleman. July 8, 1897. 62 : 526[26])

Cherry trees show severe attack by *Myzus cerasi.* Remedies are indicated.

Scurfy bark louse. (Country gentleman. July 8, 1897. 62 : 526[28])

Chionaspis furfurus is identified and remedies given.

Plant lice. (Country gentleman. July 8, 1897. 62 : 526[35])

General directions are given for controlling aphids.

San José scale. (Country gentleman. July 8, 1897. 62 : 533[11])

General article giving in brief form what is known of *Aspidiotus perniciosus.*

Elm leaf beetle. (Argus [Albany]. July 10, 1897. p. 17)

Galerucella luteola is the chief depredator on elms and should be promptly suppressed.

Not the gypsy moth. (Country gentleman. July 15, 1897. 62 : 558[11])

Apple tree and forest tent caterpillars mistaken for the gypsy moth.

Chinch bug. (Country gentleman. July 15, 1897. 62 : 558[14])

General directions are given for arresting an attack by *Blissus leucopterus*.

Subterranean grubs. (Country gentleman. Aug. 26, 1897. 62 : 666[47])

Kerosene emulsion is recommended for treating *Lachnosterna* species or *Allorhina nitida*.

San José scale. (Country gentleman. Aug. 26, 1897. 62 : 667[12])

Refers to previous article for remedies.

Tussock moth. (Country gentleman. Sep. 2, 1897. 62 : 686[22])

Notes attack on plum by *Halisidota caryae*.

Insects and fruit. (Country gentleman. Sep. 2, 1897. 62 : 686[24])

Gives suggestions for decreasing injury to fruits by wasps.

Urocerus albicornis. (Country gentleman. Sep. 9, 1897. 62 : 707[13])

Brief popular account of this interesting horn tail.

A plague of flies. (Country gentleman. Oct. 14, 1897. 62 : 806[46]–7[12])

May be the cluster fly, *Pollenia rudis*. Screens and pyrethrum are recommended.

Pine borer. (Country gentleman. Nov. 4, 1897. 62 : 867[27])

Work of the borer is described and commented upon.

Pine borer. (Country gentleman. Nov. 11, 1897. 62 : 887[16])

From examples sent it is identified as *Harmonia* [*Parharmonia*] *pini* Kellet.

Fall canker worm and its eggs. (Country gentleman. Dec. 16, 1897. 62 : 986[27])

Life history and habits of the fall canker worm, *Anisopteryx* [*Alsophila*] *pometaria* are briefly given and remedies indicated.

12th report on the injurious and other insects of the state of New York for the year 1896. Albany, University of the State of New York, 1897. [Issued Ap. 22, 1898] 246 p. (159–404), 15 pl., 10 fig. Also as report of the state entomologist for the year 1896; New York state museum. 50th annual report, for the year 1896. Albany, University of the State of New York. 1897. p. 159, 15 pl., 10 fig.

Contents

3th report on the injurious and other insects of the state of New York, for the year 1897. Albany, University of the State of New York, 1898. [Issued Feb. 18, 1899]. 64 p., 2 pl, 3 fig. Also as Report of the state entomologist for the year 1897. New York state museum, 51st annual report, for the year 1897. Albany, University of the State of New York. 1898, p. 151.

Contents

Index to entomologist's reports 1-13 and to supplement of 14

This index is an extension, with modifications, of Dr Lintner's index to reports 1–10. References are given under preferred scientific names. The synonyms used in the text of preceding reports are placed in curves after the name or where there is simply a change in genus or species, the old term alone is given, preceded in the case of specific names by the initial for the genus. The synonymy given applies only to the publications indexed. In the case of reports 13 and 14 the superior figures tell the exact place on the page in ninths; e. g. 13:342[7], means 13th report, page 342 beginning in the seventh ninth of the page, i. e. a little over two thirds of the way down.

a European.

Errata to entomologist's reports 1-13 and to supplement of 14

The following are errors detected since the publication of the individual reports. Many of them were corrected by Dr Lintner on printed slips or in a subsequent report, others have been found in working on the index to his publications. If desired, these may be inserted as slips in the respective reports.

Additional errata in first report

Page 40, line 15, for *Sylvanus* read *Silvanus*.
Page 42, line 24, for Tenthridinidae read Tenthredinidae.
Page 42, line 10 from bottom, take out the comma after *cerasi*.
Page 57, line 21 from bottom, for tiers read tyers.
Page 80, lines 5, 6, 7, 17, take out the period after the species.
Page 120, line 7 from bottom, for *Cicia* read *Cicer*.
Page 156, line 4 from bottom, for *pinifoliae* read *pinifoliella*.
Page 160, line 29, for BUCCULATRIX read BUCCULATRICIS.
Page 181, line 29, for 107 read 170.
Page 191, line 1, for BIBLIOGRAPH read BIBLIOGRAPHY.
Page 215, line 35, change the comma to a period.
Page 226, line 10 from bottom, after different, insert: class of the.
Page 227, lines 15 and 16 from bottom, for p. 682 *et seq.* read p. 477-84.
Page 247, line 16, take out the comma after *opimus*.
Page 264, line 6, for 183 read 1834.
Page 268-9, for *Pentatomoidae* read *Pentatomoidea*.
Page 271, line 26, for 324 read 124.
Page 272, line 2, for *ribes* read *ribis*.
Page 296, line 22, read two of the three bound volumes.
Page 297, line 25, for *caprea* read *capraea*.
Page 297, line 5 from bottom, for *togata* read *tergata*.
Page 300, line 15, for *Telamone* read *Telamona*, and for *Heleochara* read *Helochara*.
Page 302, line 5, for 264 read 254.
Page 314, last line, for *Cyniphidae* read *Cynipidae*.
Page 329, line 28, for pomotellus read pometellus.
Page 330, line 12, for *fuscata* read *fuscatus*.
Page 330, line 16, for (Rhagolites) read (Rhagoletis).

Page 330, line 2 from bottom, for ix read x.
Page 331, line 3, for *aculifer* read *aculiferus.*
Page 336, line 6, for *Daimia* read *Daimio.*
Page 343, line 14 from bottom, for *marcellaria* read *macellaria.*
Page of errata, omit the first line.

Additional errata in second report

Page xii, line 16, for *raeus* read *reus.*
Page 5, line 11, for *Pristophora* read *Pristiphora.*
Page 23, line 13 from bottom, for *Ampelophila* read *Drosophila.*
Page 31, line 3 from bottom, for *Pscyche* read *Psyche.*
Page 46, line 16, for Mille read Miller.
Page 57, line 3, for Harris read (Harris).
Page 57, line 7, for 1834 read 1839.
Page 57, line 20, for 487 read 497.
Page 69, line 10, for Psyche read Papilio.
Page 74, line 32, for *Thyriodopteryx* read *Thyridopteryx.*
Page 77, line 5, for *Cupili-* read *Cupuli-.*
Page 94, line 2, for Grote read Grote.
Page 97, line 4, from bottom, for Can. read Ont.
Page 98, line 8 from bottom, for honey-locust read common locust.
Page 101, line 3, same as above.
Page 101, line 5, for *Spiraae* read *Spiraea.*
Page 102, line 31, for 169 read 171.
Page 119, line 14, for on read in.
Page 119, line 18, for where read when.
Page 121, line 13, for Mich. read Ill.
Page 125, line 12, for *Sciari* read *Sciara.*
Page 136, line 17, for BANDI read BAUDI.
Page 140, line 5, for Ryhnchoporid read Rhynchophorid.
Page 140, line 26, for pora read phora.
Page 142, line 2, for (Horn) read Horn.
Page 146, line 24, for *chistes* read *chistus.*
Page 152, line 33, for *Cimex lectularia* read *Cimex lectularius.*
Page 166, line 15 from bottom, for *Euchetes* read *Euchaetes.*
Page 168, line 7, for 1860 read 1862.
Page 180, line 2, for Fitch read (Fitch).
Page 182, line 10, for longer read shorter.
Page 199, line 9, for *Pscocidae* read *Psocidae.*
Page 203, line 21, take out BURG.
Page 207, line 20 and under figures, for *purpurascens* read *purpurescens.*
Page 213, line 5 from bottom, for *Corydalus* read *Corydalis.*
Page 235, line 6, take out the first with.
Page 241, line 2 from bottom, for *Anophales* read *Anopheles.*

Errata in third report

Page 116, line 6, for *Anaitis* read *Anatis.*
Page 123, line 25, for Hcmpitera read Hemiptera.
Page 138, line 16 from bottom, for NUTTALI read NUTTALLI.
Page 138, line 7 from bottom, for DACTOLYPIUS read DACTYLOPIUS.
Page 140, line 10, for chaleid *Copodosoma truncatella* read chalcid *Copidosoma truncatellum.*
Page 140, line 18, for *Irus* read *strigosa.*
Page 141, line 8, for *fusciventris* read *fasciventris.*
Page 142, line 3 from bottom, for 260 read 269, [continued on page 289].
Page 144, line 7, for *picivorous* read *picivorus.*
Page 153, line 24, for *Euschistes* read *Euschistus.*
Page 153, line 25, for *Phylira* read *Phyllira.*

Additional errata in fourth report

Page 50, lines 4, 9, 13, 14, 21, for *definata* read *definita.*
Page 67, line 25, for Daniels read Daniell.
Page 71, lines 20 and 21, for auxiliary read first.
Page 72, lines 18 and 41, for Wager read Waga.
Page 73, line 7, after p. 152 add (of Synop. Br. Ins.).
Page 104, bottom line, for back read bark.
Page 115, line 12, for COOK read COOKE.
Page 137, line 7, for *hypophleas* read *hypophlaeas.*
Page 139, line 10, for *Cramcr* read (*Cramer*).
Page 151, line 9, for 41, 44 read 41-44.
Page 154, line 8 from bottom, for *tamariscis* read *tamarisci.*
Page 162, line 2 from bottom, for *geminata* read *gemmata.*
Page 180, line 18 from bottom, for *Periplanata* read *Periplaneta.*
Page 197, line 14 from bottom, for *Tenthridinae* read *Tenthredinae.*
Page 206, line 3, for *crocotaria* read *crocataria.*
Page 207, line 12, for Thung. read Thunb.
Page 207, line 16 from bottom, for *vestata* read *vestita.*
Page 208, line 8 from bottom, for *obtusa* read *obtrusa.*

Additional errata in fifth report

Page 148, line 5, for zanthomelaena read xanthomelaena.
Page 170, line 8, for Dallas read (Dallas).
Page 174, line 18, transfer comma from after *choerocampa* to before.
Page 193, line 3, for *Adolecephala* read *Adelocephala.*
Page 199, line 7 from bottom, for *Ceratocampadae* read *Ceratocampidae.*
Page 201, line 3, for Hist. read Sci.
Page 213, line 4, for Boisdaval read Boisduval.
Page 219, line 20, for ac ss read across.
Page 224, line 9 from bottom, for L. A. Howard read L. O. Howard.

Page 224, line 3 from bottom, and page 225, line 13, for Boder read Bodee.
Page 231, omit first and third paragraphs, relating to tobacco feeding.
Page 232, line 14 from bottom, for *basilis* read *basalis*.
Page 245, line 25, for *quadrinota* read *quadrinotata*.
Page 257, line 16, for Guer. read Guér.
Page 266, line 16 and under figure, for *pinifolii* read *pinifoliae*.
Page 268, line 15, for subjec read subject.
Page 268, line 23, for *fraterna* read *fraternus*.
Page 271, line 4 from bottom, for *Blaphar-* read *Blephar-*.
Page 282, line 2, for *Trypetdiae* read *Trypetidae*.
Page 283, line 3 from bottom, for more read less.
Page 295, line 19, for Raf. read (Raf.).
Page 300, line 9 from bottom, for *Chrysomelidae* read *Bruchidae*.
Page 303, line 18, for *Tachus* read *Tachys*.
Page 303, line 19, for *Homolota* read *Homalota*.
Page 313, bottom line, for he read the.
Page 320, last line, for *hyalinatalis* read *hyalinata*.
Page 326, line 19, for Husted read Huested.

Additional errata in sixth report

Page 120, line 2 from bottom, for Henshaw read Dimmock.
Page 146, line 23, precede the line with—it and.
Page 151, lines 12 and 16, *longipennis* and *Columbia* are the same.
Page 170, line 26, for *Anthomenus* read *Anchomenus*.
Page 176, line 23, for *pilisicollis* read *pilosicollis*.
Page 188, line 20, for *confusor* read *confusus*.
Page 189, line 2, for Linn. read (Linn.) and for DeGeer read (DeGeer).
Page 189, line 3, for Crouse read Crowe.

Additional errata in seventh report

Page 201, line 12, for Phytoomyza read Phytomyza.
Page 229, line 25, for *abbreviatella* read *abbreviata*.
Page 250, line 4 from bottom, for ventral surface read dorsal segment.
Page 279, line 19, for (Boheman) read Boheman.
Page 285, line 20, for Syn. read Syst.
Page 296, line 14 from bottom, for Magazine read Weekly.
Page 297, line 5, for McNeal read McNeil.
Page 297, line 8, for ii read i.
Page 320, line 6, for G. F. Pierce read G. T. Pierce.
Page 325, line 10 from bottom, for *Periplanata* read *Periplaneta*.
Page 334, line 13, for *pygmeus* read *pygmaeus*.
Page 357, line 1, for (C) read (B).
Page 360, line 12 from bottom, for Oliv. read (Oliv.).
Page 367, lines 29 and 30, for *Cuterabra* read *Cuterebra*.

Page 369, line 11, for *Amblycomorpha* read *Amblycorypha*.
Page 371, line 10, for *Daimia* read *Daimio*.
Page 375, lines 29 and 30, for Xylina lambda (*Fabr.*) var. Thaxteri *Grote* read Xylina Thaxteri *Grote* var. lambda (*Fabr.*).
Page 381, line 1, for (D) read (C).
Page 382, line 25, for *Cuterabra* read *Cuterebra*.
Page 384, line 17, for Harris read (DeGeer).
Page 384, line 19, for *Amblycomorpha* read *Amblycorypha*.

Additional errata in eighth report

Page 106, line 31, for *C. pyrivora* read *D. pyrivora*.
Page 163, omit last line.
Page 167, line 13, for *pygmeus* read *pygmaeus*.
Page 238, line 8 from bottom, for *Masicora* read *Masicera*.
Page 275, line 13, for *Chalciddiae* read *Chalcididae*.
Page 289, line 4, for *definata* read *definita*.
Page 291, lines 3 and 8 from bottom, for *Deshaiziana* read *Deshaisiana*.
Page 298, line 7, for *Helophilus* read *Hydrophilus*.
Page 300, line 12 from bottom, for *Chlosops* read *Chlorops*.

Additional errata in ninth report

Page 296, line 8, for pelargium read pelargonium.
Page 296, line 15, for *Garpocapsa* read *Carpocapsa*.
Page 313, line 15, for *Chlorops* read *Chloropisca*.
Page 343, line 12, for 1844 read 1884.
Page 450, line 12, for *Gonopteryx* read *Gonoptera*.
Page 455, line 4 from bottom, for *Lecontii* read *Lecontei*.
Page 456, last line, for *Schlagaeri* read *Schlaegeri*.
Page 461, line 14, for *Xylocapa* read *Xylocopa*.
Page 462, line 2 from bottom, for *fulvipes* read *fuscipes*.

Additional errata in 10th report

Page 403, line 21, for *Africa* read *Australia* and for Ezra P. read Frazer S.
Page 406, in explanation of figure 8, for RUFICOLIS read RUFICOLLIS.
Page 411, line 7, for 1894 read 1844.
Page 430, line 5 from bottom, for Hist. read Sci.
Page 443, line 10, for *verruculosa* read *verruculatus*.
Page 477, line 10 from bottom, for GUIER read FIGUIER.
Page 483, line 23, for nigrinodes read nigrinodis.
Page 512, line 27, for Linn. read (Linn.).
Page 515, line 7, for JOHN read JULIUS.
Page 516, line 10, for LEFLER read LAFLER.
Page 518, line 11 from bottom, for *tenebrosus* read *tenebricosus*.
Page 526, line 8 from bottom, for (*Fabr.*) read (*Linn.*).

Page 528, line 2, for *Linn.* read (*Linn.*).
Page 528, line 18, for Odontata read Odontota.
Page 531, line 19, for *Harris* read (*DeGeer*).
Page 531, line 3 from bottom, for (*DeGeer*) read *DeGeer*.

Additional errata in 11th report

Page 109, next to last line, for p. 240 read p. 249.
Page 121, line 12 from bottom, for *indiginella* read *indigenella*.
Page 238, line 15 from bottom, for *Brachnemurus* read *Brachynemurus*.
Page 266, line 5 from bottom, for pyricclana read pyricolana.
Page 272, line 5, for cyaneipes read cyanipes.
Page 284, line 2, for 1894 read 1895.

Additional errata in 12th report

Page 243, line 16, for *trinlieata* read *trilineata*.
Page 361, line 13, for *nigra* read *niger*.
Page 362, lines 19 and 20, for J. A. HOUCK read J. H. HOUCK.

Erratum in 13th report

Page 351, line 2 from bottom, for *lineatus* read *linearis*.

Errata in supplement to 14th report

Page 317, lines 3-4, for [*Prionodus*] read [*Prionidus*].
Page 318, line 29, for [*Glyphina*] read [*Colopha*].
Page 321, line 16, *Lycaena lotis* is not a var. of *Cyaniris pseudargiolus*.
Page 321, line 10 from bottom, for *populata* read *populatum*.
Page 331, line 11 from bottom, for *Chortophila* [*Phorbia*] *floccosa* read *Chortophila floccosa* [*Phorbia brassicae*].
Page 333, line 16 from bottom, for [*Prionodus*] read [*Prionidus*].
Page 339, line 6, for [*Prionodus*] read [*Prionidus*].
Page 354, line 16, take out [*Glyphina*].
Page 368, line 6, for beetle read bug.
Page 380, line 13 from bottom, for *ruficaudus* read *ruficaudis*.

(*Pages 613–14 were bulletin cover pages*)

University of the State of New York

BULLETIN

OF THE

New York State Museum

FREDERICK J. H. MERRILL, *Director*

VOL. 5 No. 25

October 1899

REPORT OF THE STATE BOTANIST

1898

ALBANY

UNIVERSITY OF THE STATE OF NEW YORK

1899

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REPORT

OF THE

STATE BOTANIST

1898

To the Honorable the Regents of the University of the State of New York :

Gentlemen : I have the honor of submitting to you my report of work done in the botanical department of the state museum during the year 1898.

Specimens of plants for the herbarium have been collected in the counties of Albany, Essex, Greene, Herkimer, Oswego, Rensselaer, Saratoga, Schenectady, Schoharie and Washington. Specimens have been received from correspondents, either as contributions or for identification, collected in the counties of Cayuga, Columbia, Essex, Kings, Monroe, Onondaga, Queens, Richmond, Saratoga, St Lawrence, Tioga and Washington. The number of species of which specimens have been added to the herbarium is 282. Of these 46 were not before represented in it and 236 are now more completely and satisfactorily represented than before. Specimens contributed by correspondents represent 21 species, specimens collected by the botanist, 261. The number of new species described is 6.

A list of the names of the species of which specimens have been added to the herbarium is marked A. A list of the names of contributors and of the species represented by their respective contributions is marked B. This list contains the names of 30 contributors of whom 15 have sent specimens collected beyond our state limits.

In the sixth and latest edition of Gray's *Manual of botany* many plant names adopted in former editions are changed. These changes are partly due to a different understanding of species and partly to the requirements of the law of priority of publication. The change of well-established botanical names made familiar by long use is greatly to be deplored and is the source of much perplexity and annoyance. Such changes should never be made except in accordance with well-recognized principles of justice and for the sake of ultimate uniformity and permanency. Evidently desirous of putting our botanical nomenclature on a firm foundation the authors of the recently issued *Illustrated flora* have made a rigid application of the law of priority, both to generic and specific names. More than 600 names of our New York species of flowering plants and ferns included in this work have been changed. This is nearly one third the whole number and necessitates the rejection of nearly one in three, if the nomenclature of the *Illustrated flora* is adopted in place of that of the *Manual.*

This may cause some temporary inconvenience to the older botanists who have been familiar with other names, but if it shall be the means of securing greater uniformity and stability of nomenclature it will be worth all the temporary inconvenience Some of the changes have been caused by a better understanding of certain species, and some by raising forms previously regarded as varieties to the rank of species. This element of instability is not likely to be eliminated so long as mistakes in identification are made and so long as there are differences of opinion as to what should constitute a species and what a variety. But the changed names due to these causes are few in comparison with those due to the requirements of the law of priority. To show in compact form the changes made in the names of our New York species, a list of these names has been prepared in which the names adopted in the *Manual* stand in a column on the left of the page, and the corresponding names in the *Illustrated flora*, in a column on the right. This list is marked C.

The 46 species not before reported are noticed under the letter D. Some are plants of comparatively recent introduction, some have been previously regarded as mere varieties of other species, but are now recognized as distinct species. A few are considered new species and are named and described as such. A record of observations on species previously reported, remarks concerning them and descriptions of new varieties is marked E.

Mt Marcy is the highest peak of the Adirondacks and of the state. Its summit is too elevated to permit trees to grow there in any other than a dwarf or shrub-like form and but few of the most hardy species appear there even in this form. This leaves the summit open to the full sunlight and inhabitable by hardy shrubs, undershrubs and herbaceous plants. The locality is also prolific in such mosses, liverworts and lichens as find their favorite abode in cold mountainous regions and alpine situations. The number of species of plants found in this cold, bleak place exceeds 200 of which 75 are seedbearing, though they do not all perfect seed there. The summit may be regarded as a natural botanic garden full of interesting and instructive hardy plants. Several species occur there that have been found nowhere else in the state. Having made several botanical excursions to the top of the mountain, and having been there on different occasions in June, July and August, the months which constitute nearly all the growing season of the place, it has seemed to me desirable to make a record of the plants found there. A list of the species with remarks concerning some of the most interesting and important ones and describing the character and conditions of the place is marked F.

My investigations of the edible mushrooms of the state have been continued. Satisfactory trial has been made of 12 additional species. Colored life-size figures of these have been prepared and placed on five plates of the same size as those previously published. Descriptions of them have been written, uniform in plan with those of the species already published. This descriptive part of the report is designated by the letter G.

During September, October and November more packages of mushrooms of various kinds were received for identification, and for information concerning their edible qualities, than in any previous corresponding period. These came from distant and widely separated places, and they indicate an extensive and rapidly increasing interest in the subject. Through these and the communications accompanying them it is evident that in some places the general crop of species growing in woods and fields was unusually abundant. In other places there was a great scarcity of them. This difference is due chiefly to differences in climatic and meteoric conditions. The conditions favorable to a large crop appear to have prevailed in most places along the coast from Maine to Virginia, extending inland to central Pennsylvania and some parts of western New York. One correspondent in Pennsylvania reports that he never before saw such a variety and such an abundance of mushrooms. Sitting on his piazza he was able to count 52 species in sight at one time.

Another correspondent writing from Washington, D. C., gives information of a remarkable crop or succession of crops on an island in the Potomac river. The island is near the city and dredgings from the river had been dumped in low places on it, filling them up and making a soil of great fertility. In due time several species of mushrooms appeared in such quantity as to attract his attention. Three species were specially prevalent. These were the shaggy Coprinus, *C. comatus*, the masked Tricholoma, *T. personatum*, and the tufted Clitocybe, *C. multiceps*. These are all edible mushrooms. The last grew in great clusters, in one of which 90 individual plants were counted. The masked Tricholoma was also very abundant and is a mushroom of excellent flavor. The abundance of the crop gradually increased and the area occupied by it extended till about 15 acres were covered by the various species. It was not pleasant to see so much good food wasting and decomposing on the ground. Mr Braendle therefore directed public attention to the fact by publishing a notice in one of the daily papers of the presence of a bounteous crop of mushrooms which could be had for the slight trouble of gathering them. People soon began to throng the island and to gather its unusual and interesting crop. I quote by permission from Mr Braendle's letter of November 21, "I visited the island yesterday and though over a hundred bushels had been carted away on Saturday there are just as many *C. multiceps* and *T. personatum* as before. They are spreading over the island very rapidly. People are no longer afraid of them, as thousands of persons have tried them since November 11. Italians, Greeks and Germans make the most use of them, and many families are drying them for winter use. There are now about fifteen acres covered by these fungi, including *Coprinus comatus* of which thousands are gathered every day."

These statements show what prolific crops of edible fungi may be expected when the conditions for their growth are favorable, and also how readily people avail themselves of them as an article of food as soon as they are confident that they can do so without danger.

The investigation of the flora of the town of North Elba has been continued, and some parts of the town I had not previously visited have been botanically explored. Among these are the top of Wallface mountain and the cold, elevated, swampy district west and northwest of this mountain. These new localities have added several species to the list of those previously known to belong to the flora of North Elba, and a few to the flora of the state.

Respectfully submitted

Charles H. Peck

State botanist

Albany, December 28, 1898

A

PLANTS ADDED TO THE HERBARIUM

New to the herbarium

Sisymbrium altissimum *L.*
Diplotaxis tenuifolia (*L.*) *DC.*
Cytisus scoparius (*L.*) *Lk.*
Onagra cruciata (*Nutt.*) *Small*
Galium Claytoni *Mx.*
Nabalus trifoliatus *Cass.*
Broussonetia papyrifera (*L.*) *Vent.*
Salsola Tragus *L.*
Convallaria majalis *L.*
Juncoides spicatum (*L.*) *Kuntze*
Panicum Atlanticum *Nash*
Alopecurus agrestis *L.*
Koeleria cristata (*L.*) *Pers.*
Sphagnum Russowii *Warnst.*
S. quinquefarium *Warnst.*
Splachnum rubrum *L.*
Hypnum laxepatulum *L. & J.*
Scapania apiculata *Spruce.*
Jungermannia Kunzeana *Huben.*
Umbilicaria erosa (*Web.*) *Hoffm.*
Peltigera rufescens (*Neck.*) *Hoffm.*
Physcia agglutinata (*Floerk.*) *Nyl.*
P. setosa (*Ach.*) *Nyl.*
Placodium vitellinum (*Ehrh.*) *N. & H.*
Lecanora Laureri *Hepp*
Biatora Schweinitzii *Fr.*
Cladonia decorticata *Floerk.*
C. sobolescens *Nyl.*
Lepiota solidipes *Pk.*
Tricholoma acre *Pk.*
T. portentosum *Fr.*
Clitocybe eccentrica *Pk.*
Marasmius acerinus *Pk.*
Clitopilus socialis *Pk.*
Hebeloma palustre *Pk.*
Crepidotus epibryus *Fr.*
Gomphidius furcatus *Pk.*
Psilocybe uda *Pers.*
Polyporus hispidellus *Pk.*
Vermicularia punctans, *Schw.*
Uromyces caryophyllinus (*Schrank*)
Peridermium Engelmanni *Thum*
Gymnosporangium Nidus-avis *Thaxter*
Peronospora australis *Speg.*
Chlorosplenium aeruginascens (*Nyl.*)
Tympanis laricina (*Fckl.*) *Sacc.*

Not new to the herbarium

Ranunculus acris *L.*
R. recurvatus *Poir.*
Batrachium trichophyllum (*Chaix.*) *Bossch*
Actaea alba (*L.*) *Mill.*
Cimicifuga racemosa (*L.*) *Nutt.*
Barbarea Barbarea (*L.*) *MacM.*
Cardamine bulbosa (*Schreb.*) *B. & P.*
C. Pennsylvanica *Muhl.*
Roripa sylvestris (*L.*) *Bess.*
R. hispidula (*Desv.*) *Britton*
Brassica nigra (*L.*) *Koch*
B. arvensis (*L.*) *B. & P.*
Papaver somniferum *L.*
Glaucium Glaucium (*L*) *Karst.*
Nymphaea advena *Soland.*
Nymphaea rubrodisca (*Morong*) *Greene*
N. Kalmiana (*Mx*) *Sims*
Viola blanda *Willd.*
V. primulaefolia *L.*
V. palmata *L.*
V. Labradorica *Schrank*
V. rostrata *Pursh*
V. pubescens *Ait.*
V. striata *Ait.*
Drosera intermedia *Hayne*
Hypericum ellipticum *Hook.*
H. Canadense *L.*
Triadenum Virginicum (*L.*) *Raf.*
Alsine borealis (*Bigel*) *Britton*
A. longifolia (*Muhl.*) *Britton*

Alsine graminea (*L.*) *Britton*
Saponaria officinalis *L.*
Abutilon Abutilon (*L.*) *Rusby*
Ceanothus Americanus *L.*
Acer rubrum *L.*
A. saccharinum *L.*
Oxalis violacea *L.*
Trifolium hybridum *L.*
Falcata comosa (*L.*) *Kuntze*
Apios Apios (*L.*) *MacM.*
Amygdalus Persica *L.*
Prunus Americana *Marsh.*
P. Virginiana *L.*
Waldsteinia fragarioides (*Mx.*) *Tratt.*
Spiraea salicifolia *L.*
Agrimonia hirsuta (*Muhl.*) *Bicknell*
Geum rivale *L.*
G. macrophyllum *Willd.*
Rosa cinnamomea *L.*
Rubus strigosus *Mx.*
R. Americanus (*Pers.*) *Britton*
Crataegus coccinea *L.*
C. macracantha *Lodd.*
Amelanchier spicata (*Lam.*) *DC.*
A. rotundifolia (*Mx.*) *Roem.*
A. oligocarpa (*Mx.*) *Roem.*
A. Botryapium (*L. f.*) *DC.*
A. Canadensis (*L.*) *Medic.*
Sorbus sambucifolia (*C. & S.*) *Roem.*
Malus coronaria (*L.*) *Mill.*
Tiarella cordifolia *L.*
Mitella diphylla *L.*
Ribes rubrum *L.*
R. lacustre (*Pers.*) *Poir.*
R. prostratum *L'Her.*
R. oxyacanthoides *L.*
Hippuris vulgaris *L.*
Anychia Canadensis (*L.*) *B. S. P.*
Onagra biennis (*L.*) *Scop.*
Sanicula gregaria *Bicknell*
Cicuta maculata *L.*
Cornus Canadensis *L.*
Galium trifidum *L.*
G. asprellum *Mx.*
Lonicera ciliata *Muhl.*
L. coerulea *L.*
Sambucus Canadensis *L.*
Viburnum alnifolium *Marsh.*
Valeriana officinalis *L.*
Valerianella radiata (*L.*) *Dufr.*
Eupatorium perfoliatum *L.*
E. ageratoides *L. f.*
Solidago alpestris *W. & K.*
S. Canad. glabrata *Porter*
S. Virg. Redfieldii *Porter*
S. macrophylla *Pursh*
S. serotina *Ait.*
S. juncea ramosa *P. & B.*
Doellingeria umbellata (*Mill.*) *Nees*
Bidens Beckii *Torr.*
Aster divaricatus *L.*
A. divar. cymulosus *Burgess*
A. macr. velutinus *Burgess*
A. acuminatus *Mx.*
A. cordifolius *L.*
A. amethystinus *Nutt.*
A. patens *Ait.*
A. lateriflorus (*L.*) *Britton*
A. puniceus *L.*
A. Novi-Belgii *L.*
Gnaphalium decurrens *Ives*
G. obtusifolium *L.*
Xanthium strumarium *L.*
Senecio vulgaris *L.*
Tanacetum vulgare *L.*
Hieracium Marianum *Willd.*
Nabalus Boottii *DC.*
N. nanus (*Bigel.*) *DC.*
N. albus (*L.*) *Hook.*
N. altissimus (*L.*) *Hook.*
N. serpentarius (*Pursh*) *Hook.*
Lobelia inflata *L.*
L. Dortmanna *L.*
Campanula rotundifolia *L.*
Vaccinium uliginosum *L.*
V. Pennsylvanicum *Lam.*
Chamaedaphne calyculata (*L.*) *Moench*
Ledum Groenlandicum *OEder*
Rhodora Canadensis *L.*
Pyrola elliptica *Nutt.*
Kalmia glauca *Ait.*
K. angustifolia *L.*
Plantago Virginica *L.*
Trientalis Americana *Pursh*

Ilex monticola *Gray*
Ilicioides mucronata (*L.*) *Britton*
Gentiana linearis *Froel.*
Veronica arvensis *L.*
V. peregrina *L.*
V. serpyllifolia *L.*
Chelone glabra *L.*
Stachys palustris *L.*
Diapensia Lapponica *L.*
Sassafras Sassafras (*L.*) *Karst.*
Polygonum scandens *L.*
Rumex crispus *L.*
R. Britannica *L.*
R. Patientia *L.*
Razoumofskya pusilla (*Pk.*) *Kuntze*
Amaranthus paniculatus *L.*
Chenopodium album *L.*
C. album viride (*L.*) *Moq.*
Euphorbia nutans *Lag*
Fraxinus Americana *L.*
Empetrum nigrum *L.*
Corema Conradii *Torr.*
Utricularia intermedia *Hayne*
Alnus Alnobetula *Koch*
Betula nigra *L.*
B. papyrifera *Marsh.*
Salix sericea *Marsh.*
S. petiolaris *Sm.*
Populus bals. candicans *Gray*
Pinus Strobus *L.*
P. divaricata (*Ait.*) *Sudw.*
Picea Canadensis (*Mill.*) *B. S. P.*
Larix laricina (*Du Roi*) *Koch*
Tsuga Canadensis *Carr.*
Abies balsamea (*L.*) *Mill.*
Juniperus nana *Willd.*
J. nana alpina (*Gaud.*)
J. Sabina *L.*
J. Virginiana *L.*
Thuja occidentalis *L.*
Chamaecyparis thyoides (*L.*) *B. S. P.*
Taxus minor (*Mx.*) *Britton*
Sparganium simplex *Huds.*
S. simp. angustifolium (*Mx.*)
S. andr. fluctuans *Morong*
Potamogeton Oakesianus *Robbins*
Sagittaria rigida *Pursh*
Sagittaria latifolia *Willd.*
Vagnera trifolia (*L.*) *Morong*
V. racemosa (*L.*) *Morong*
Streptopus roseus *Mx.*
S. amplexifolius (*L.*) *DC.*
Trillium undulatum *Willd.*
T. grand. variegatum *Pk.*
Sisyrinchium angustifolium *Mx.*
Arisaema triph. pusillum *Pk.*
Habenaria lacera (*Mx.*) *R. Br.*
H. bracteata *R. Br.*
H. orbiculata (*Pursh*) *Torr.*
Peramium repens (*L.*) *Salisb.*
Medeola Virginiana *L.*
Juncus militaris *Bigel.*
J. filiformis *L.*
J. Can. brevicaudatus *Engelm.*
Scirpus Torreyi *Olney*
Eriophorum Virginicum *L.*
E. Virginicum album *Gray*
Carex arctata *Boott*
C. altocaulis (*Dew.*) *Britton*
C. Bigelovii *Torr.*
C. canescens *L.*
C. deflexa *Hornem.*
C. formosa *Dew.*
C. laxiflora *Lam.*
C. lenticularis *Mx.*
C. pedicellata (*Dew.*) *Britton*
C. scirpoidea *Mx.*
C. stricta xerocarpa (*Wright*) *Britton*
C. utriculata *Boott*
Agrostis rubra *L.*
A. hyemalis (*Walt.*) *B. S. P.*
Calamagrostis breviseta (*Gr.*) *Scribn.*
C. Canadensis (*Mx.*) *Bv.*
Cinna arundinacea *L.*
Zizania aquatica *L.*
Danthonia compressa *Aust.*
Trisetum subspicatum (*L.*) *Bv.*
Bromus ciliatus *L.*
Panicum Crus-galli *L.*
Poa compressa *L.*
Avena striata pallida *Pk.*
Savastana alpina (*Sw.*)
Elymus Canadensis *L.*
Andropogon scoparius *Mx.*

Botrychium obliquum *Muhl.*
Asplenium Filix-foemina (*L.*) *Bernh.*
Lycopodium Selago *L.*
L. complanatum *L.*
L. obscurum *L.*
L. clavatum *L.*
L. annot. pungens *Spring.*
Sphagnum acutifolium *Ehrh.*
S. squarrosum *Pers.*
S. cuspidatum *Ehrh.*
Sphagnum intermedium *Hoffm.*
S. Wulfianum *Girgen.*
S. strictum *Lindl.*
Jungermannia gracilis *Scleich.*
Russula foetens (*Pers.*) *Fr.*
Stropharia aeruginosa *Curt.*
Gymnosporangium clavariiforme *Rees*
Hydnum Erinaceus *Bull.*
H. Caput-ursi *Fr.*
H. Cap. brevispineum *Pk.*

B

CONTRIBUTORS AND THEIR CONTRIBUTIONS

Mrs E. C. Anthony, Gouverneur, N. Y.

Uromyces caryophyllinus (*Schrank*) *Schroet.*

Mrs L. A. Millington, New Russia, N. Y.

Circaea alpina *L.*

Mrs C. S. Maurice, Athens, Pa.

Lepiota rhacodes *Vitt.*

Mrs M. A. Knickerbocker, New York.

Hypholoma sublateritium *Schaeff.*
Collybia velutipes *Curt.*

Miss L. W. Roberts, Syracuse, N. Y.

Glaucium Glaucium (*L.*) *Karst.*

Mrs E. G. Britton, New Dorp, N. Y.

Bryoziphium Norvegicum (*Brid.*) *Mitt.*

Mrs E. Watrous, New York.

Conopholis Americana *Wallr.*

L. M. Underwood, New York.

Gymnosporangium Nidus-avis *Thaxter*

F. G. Howland, Saratoga, N. Y.

Lepiota solidipes *Pk.*
Cantharellus cinnabarinus *Schw.*
Morchella esculenta (*L.*) *Pers.*
M. deliciosa *Fr.*

F. E. Fenno, Barton, N. Y.

Oxalis violacea *L.*
Cuscuta Coryli *Engelm.*
Carex laxiflora *Lam.*
C. pedunculata *Muhl.*
Cinna arundinacea *L.*
Eragrostis pilosa (*L.*) *Bv.*
E. hypnoides (*Lam.*) *B. S. P.*
E. Frankii *Steud.*
E. Purshii *Schrad.*
E. major *Host.*

E. A. Burt, Middlebury, Vt.

Lepiota rubrotincta *Pk.*
Clitocybe eccentrica *Pk.*
Hygrophorus pudorinus *Fr.*
Lactarius pubescens *Fr.*
Pholiota discolor *Pk.*
Crepidotus dorsalis *Pk.*
C. versutus *Pk.*
Cortinarius pholideus *Fr.*
Polyporus planus *Pk.*
P. maculatus *Pk.*
Poria vaporaria *Fr.*
Hydnum albidum *Pk.*
Anthostoma adustum (*C. & P.*) *Sacc.*

F. J. Braendle, Washington, D. C.

Merulius rubellus *Pk.*

E. C. Howe, Troy, N. Y.

Irpex canescens *Fr.*

H. P. Burt, New Bedford, Mass.

Polyporus admirabilis *Pk.*

G. E. Morris, Waltham, Mass.

Cortinarius cinnabarinus *Fr.*
Hygrophorus Morrisii *Pk.*

H. W. Barratt, Poughkeepsie, N. Y.

Clitocybe monadelpha *Morg.*

F. R. Rathbun, Auburn, N. Y.

Stropharia aeruginosa (*Curt.*) *Fr.*
Boletus scaber *Fr.*
Polyporus flavovirens *B. & R.*

Charles McIlvaine, Colebrook, Pa.

Lepiota rhacodes *Vitt.*
Flammula aliena *Pk.*
Cyclomyces Greenii *Berk.*

P. H. Dudley, New York.

Lentinus lepideus *Fr.*
Geaster triplex *Jungh.*

G. H. Nye, Auburn, N. Y.

Hydnum Caput-ursi brevispineum *Pk.*

G. H. Nye and W. G. Cowell, Auburn, N. Y.

Hydnum Caput-ursi *Fr.*
Hydnum Erinaceus *Bull.*

J. C. Arthur, Lafayette, Ind.

Puccinia Windsoriae *Schw.*
Puccinia Bolleyana *Sacc.*

M. S. Baxter, Rochester, N. Y.

Salsola Tragus *L.*

F. N. Otis, Catskill, N. Y.

Hypholoma sublateritium *Schaeff.*

G. E. Francis, Worcester, Mass.

Tricholoma piperatum *Pk.*
Craterellus corrugis *Pk.*
Hygrophorus sordidus *Pk.*
H. hypothejus *Fr.*

E. B. Sterling, Trenton, N. J.

Lentodium squamulosum *Morg.*

R. F. Dearborn, Lynn, Mass.

Agaricus maritimus *Pk.*

Hollis Webster, East Milton, Mass.

Lepiota rhacodes *Vitt.*

Elam Bartholomew, Rockport, Kan.

Pholiota comosa *Fr.*

J. J. Davis, Racine, Wis.

Doassansia Zizaniae *Davis*
Physoderma Plantago *Wallr.*

C

LIST OF CHANGED NAMES

608 changed names, 26 double names

Manual	*Illustrated flora*
Actaea spicata var. rubra *Ait.*	Actaea rubra (*Ait.*) *Willd.*
Anemone Pennsylvanica *L.*	Anemone Canadensis *L.*
A. nemorosa *L.*	A. quinquefolia *L.*
Hepatica acutiloba *DC.*	Hepatica acuta (*Pursh*) *Britton*
H. triloba *Chaix.*	H. Hepatica (*L.*) *Karst.*
Anemonella thalictroides *Spach*	Syndesmon thalictroides (*L.*) *Hoff.*
Ranunculus multifidus *Pursh*	Ranunculus delphinifolius *Torr.*
R. abortivus var. micranthus *Gray*	R. micranthus *Nutt.*
R. ambigens *Wats.*	R. obtusiusculus *Raf.*
R. Flammula var. reptans *E. Meyer*	R. reptans *L.*
R. circinatus *Sibth.*	Batrachium divaricatum (*Schrank*)
R. aquatilis var. trichophyllus *Gray*	B. trichophyllum (*Chaix.*) *Bossch*
R. Ficaria *L.*	Ficaria Ficaria (*L.*) *Karst.*
R. Cymbalaria *Pursh*	Oxygraphis Cymbalaria (*Pursh*) *Prantl.*
Magnolia glauca *L.*	Magnolia Virginiana *L.*
Brasenia peltata *Pursh*	Brasenia purpurea (*Mx.*) *Casp.*
Nymphaea odorata *Ait.*	Castalia odorata (*Dryand*) *W. & W.*
N reniformis *DC.*	C. tuberosa (*Paine*) *Greene*
Nuphar advena *Ait.*	Nymphaea advena *Soland.*
N. Kalmianum *Ait.*	N. microphylla *Pers.*
Glaucium luteum *Scop.*	Glaucium Glaucium (*L.*) *Karst.*
Adlumia cirrhosa *Raf.*	Adlumia fungosa (*Ait.*) *Greene*
Dicentra Cucullaria *DC.*	Bicuculla Cucullaria (*L.*) *Millsp.*
D. Canadensis *DC.*	B. Canadensis (*Goldie*) *Millsp.*
D. eximia *DC.*	B. eximia (*Ker.*) *Millsp.*
Corydalis glauca *Pursh*	Capnoides sempervirens (*L.*) *Borck.*
C. flavula *Raf.*	C. flavulum (*Raf.*) *Kuntze*
C. aurea *Willd.*	C. aureum (*Willd.*) *Kuntze*
Cardamine rhomboidea *DC.*	Cardamine bulbosa (*Schreb.*) *B. S. P.*
C. rhomboidea var. purpurea *Torr.*	C. purpurea (*Torr.*) *Britton*
Arabis perfoliata *Lam.*	Arabis glabra (*L.*) *Bernh.*
A. confinis *Wats.*	A. brachycarpa (*T. & G.*) *Britton*
Alyssum calycinum *L.*	Alyssum alyssoides (*L.*) *Gouan*
Nasturtium officinale *R. Br.*	Roripa Nasturtium (*L.*) *Rusby*
N. sylvestre *R. Br.*	R. sylvestris (*L.*) *Bess.*
N. palustre *DC.*	R. palustris (*L.*) *Bess.*
N. palustre var. hispidum *Gray*	R. hispida (*Dew.*) *Britton*
N. lacustre *Gray*	R. Americana (*Gray*) *Britton*

Manual	*Illustrated flora*
Nasturtium Armoracia *Fries*	Roripa Armoracia (*L.*) *Hitchc.*
Barbarea vulgaris var. stricta *Gray*	Barbarea stricta *Andrz.*
B. vulgaris var. arcuata *Gray*	B. Barbarea (*L.*) *MacM.*
Sisymbrium Alliaria *Scop.*	Alliaria Alliaria (*L.*) *Britton*
S. canescens *Nutt.*	Sophia pinnata (*Walt.*) *Britton*
S. Thaliana *Gaud.*	Stenophragma Thaliana (*L.*) *Celak.*
Brassica Sinapistrum *Boiss.*	Brassica arvensis (*L.*) *B. S. P.*
B alba *Boiss.*	Sinapis alba *L.*
Capsella Bursa-pastoris *Moench*	Bursa Bursa-pastoris (*L.*) *Britton*
Lepidium intermedium *Gray*	Lepidium apetalum *Willd.*
Cakile Americana *Nutt.*	Cakile edentula (*Bigel.*) *Hook.*
Lechea major *Mx.*	Lechea villosa *Ell.*
L. thymifolia *Mx.*	L. minor *L.*
L. minor var. maritima *Gray*	L. maritima *Leggett*
Viola palmata var. cucullata *Gray*	Viola obliqua *Hill*
V. blanda var. renifolia *Gray*	V. renifolia *Gray*
V. pubescens var. scabriuscula *T. & G.*	V. scabriuscula (*T. & G.*) *Schw.*
V. canina var. Muhlenbergii *Gray*	V. Labradorica *Schrank*
Solea concolor *Ging.*	Cubelium concolor (*Forst.*) *Raf.*
Saponaria Vaccaria *L.*	Vaccaria Vaccaria (*L.*) *Britton*
Silene Cucubulus *Wibel*	Silene vulgaris (*Moench*) *Garcke*
S. Pennsylvanica *Mx.*	S. Caroliniana *Walt.*
Lychnis vespertina *Sibth.*	Lychnis alba *Mill.*
L. diurna *Sibth.*	L. dioica *L.*
L. Githago *Lam.*	Agrostemma Githago *L.*
Arenaria Michauxii *Hook. f.*	Arenaria stricta *Mx.*
A. lateriflora *L.*	Moehringia lateriflora (*L.*) *Fenzl.*
A. peploides *L.*	Ammodenia peploides (*L.*) *Rupr.*
Stellaria media *Smith*	Alsine media *L.*
S. longifolia *Muhl.*	A. longifolia (*Muhl.*) *Britton*
S. longipes *Goldie*	A. longipes (*Goldie*) *Coville*
S. graminea *L.*	A. graminea (*L.*) *Britton*
S. borealis *Bigel.*	A. borealis (*Bigel.*) *Britton*
Cerastium nutans *Raf.*	Cerastium longipedunculatum *Muhl.*
Buda marina *Dumort.*	Tissa marina (*L.*) *Britton*
B. rubra *Dumort.*	T. rubra (*L.*) *Britton*
Ascyrum Crux-Andreae *L.*	Ascyrum hypericoides *L.*
Hypericum Canadense var. majus *Gray*	Hypericum majus (*Gray*) *Britton*
H. nudicaule *Walt.*	Sarothra gentianoides *L.*
Elodes campanulata *Pursh*	Triadenum Virginicum (*L.*) *Raf.*
Malva crispa *L.*	Malva verticillata crispa *L.*
Abutilon Avicennae *Gaertn.*	Abutilon Abutilon (*L.*) *Rusby*
Oxalis corniculata var. stricta *Sav.*	Oxalis stricta *L.*
Impatiens pallida *Nutt.*	Impatiens aurea *Muhl.*
I. fulva *Nutt.*	I. biflora *Walt.*
Nemopanthes fascicularis *Raf.*	Ilicioides mucronata (*L.*) *Britton*

Manual	*Illustrated flora*
Euonymus Americanus var. obovatus *T. & G.*	Euonymus obovatus *Nutt.*
Vitis riparia *Mx.*	Vitis vulpina *L.*
Ampelopsis quinquefolia *Mx.*	Parthenocissus quinquefolia (*L.*) *Planch.*
Acer saccharinum *Wang.*	Acer Saccharum *Marsh.*
A. saccharinum var. nigrum *T. & G.*	A. nigrum *Mx.*
A. dasycarpum *Ehrh.*	A. saccharinum *L.*
Negundo aceroides *Moench*	A. Negundo *L.*
Rhus typhina *L.*	Rhus hirta (*L.*) *Sudw.*
R. venenata *DC.*	R. Vernix *L.*
R. Toxicodendron *L.*	R. radicans *L.*
R. Canadensis *Marsh.*	R. aromatica *Ait.*
Polygala sanguinea *L.*	Polygala viridescens *L.*
P. verticillata var. ambigua *Gray*	P. ambigua *Nutt.*
Tephrosia Virginiana *Pers.*	Cracca Virginiana *L.*
Astragalus Canadensis *L.*	Astragalus Carolinianus *L.*
A. Cooperi *Gray*	Phaca neglecta *T. & G.*
Desmodium nudiflorum *DC.*	Meibomia nudiflora (*L.*) *Kuntze*
D. acuminatum *DC.*	M. grandiflora (*Walt.*) *Kuntze*
D. rotundifolium *DC.*	M. Michauxii *Vaill.*
D. canescens *DC.*	M. canescens (*L*). *Kuntze*
D. cuspidatum *T. & G.*	M. bracteosa (*Mx.*) *Kuntze*
D. laevigatum *DC.*	M. laevigata (*Nutt.*) *Kuntze*
D. viridiflorum *Beck*	M. viridiflora (*L.*) *Kuntze*
D. Dillenii *Darl.*	M. Dillenii (*Darl.*) *Kuntze*
D. paniculatum *DC.*	M. paniculata (*L.*) *Kuntze*
D. Canadense *DC.*	M. Canadensis (*L.*) *Kuntze*
D. rigidum *DC.*	M. rigida (*Ell.*) *Kuntze*
D. ciliare *DC.*	M. obtusa (*Muhl.*) *Kuntze*
D. Marilandicum *F. Boott*	M. Marylandica (*L.*) *Kuntze*
Lespedeza procumbens *Mx.* (*in part*)	Lespedeza repens (*L.*) *Bart.*
L. reticulata *Pers.*	L. Virginica (*L.*) *Britton*
L. Stuvei var. intermedia *Wats.*	L. frutescens (*L.*) *Britton*
L. polystachya *Mx.*	L. hirta (*L.*) *Ell.*
Stylosanthes elatior *Sw.*	Stylosanthes biflora (*L.*) *B. S. P.*
Vicia Americana var. linearis *Wats.*	Vicia linearis (*Nutt.*) *Greene*
V. sativa var. angustifolia *Ser.*	V. angustifolia *Roth*
Lathyrus palustris var. myrtifolius *Gray*	Lathyrus myrtifolius *Muhl.*
Apios tuberosa *Moench*	Apios Apios (*L.*) *MacM.*
Phaseolus perennis *Walt.*	Phaseolus polystachyus (*L.*) *B. S. P.*
Strophostyles angulosa *Ell.*	Strophostyles helvola (*L.*) *Britton*
S. peduncularis *Ell.*	S. umbellata (*Muhl.*) *Britton*
Amphicarpaea monoica *Nutt.*	Falcata comosa (*L.*) *Kuntze*
Galactia pilosa *Ell.*	Galactia volubilis (*L.*) *Britton*
Gymnocladus Canadensis *Lam.*	Gymnocladus dioica (*L.*) *Koch*
Physocarpus opulifolius *Maxim.*	Opulaster opulifolius (*L.*) *Kuntze*

Manual	*Illustrated flora*
Gillenia trifoliata *Moench*	Porteranthus trifoliatus (*L.*) *Britton*
G. stipulacea *Nutt.*	P. stipulatus (*Muhl*) *Britton*
Rubus triflorus *Richardson*	Rubus Americanus (*Pers.*) *Britton*
R. villosus var. humifusus *T. & G.*	R. Baileyanus *Britton*
Geum album *Gmelin*	Geum Canadense *Jacq.*
G. triflorum *Pursh*	G. ciliatum *Pursh*
Fragaria Indica *L.*	Duchesnea Indica (*Andr.*) *Focke*
Potentilla Norvegica *L.*	Potentilla Monspeliensis *L.*
P. supina *L.*	P. paradoxa *Nutt.*
P. palustris *Scop.*	Comarum palustre *L.*
Poterium Canadense *B. & H.*	Sanguisorba Canadensis *L.*
P. Sanguisorba *L.*	S. Sanguisorba (*L.*) *Britton*
Rosa Engelmanni *Wats.*	Rosa acicularis *Lindl.*
R. Sayi *Schw.*	R. acicularis *Lindl.*
R. lucida *Ehrh.*	R. humilis lucida (*Ehrh.*) *Best*
Pyrus coronaria *L.*	Malus coronaria (*L.*) *Mill.*
P. arbutifolia *L. f.*	Aronia arbutifolia (*L.*) *Ell.*
P. arbutifolia var. melanocarpa *Hook.*	A. nigra (*Willd.*) *Britton*
P. Americana *DC.*	Sorbus Americana *Marsh.*
P. sambucifolia *C. & S.*	S. sambucifolia (*C. & S.*) *Roem.*
Crataegus Pyracantha *Pers.*	Cotoneaster Pyracantha (*L.*) *Spach*
C. parviflora *Ait.*	Crataegus uniflora *Moench*
C. coccinea var. mollis *T. & G.*	C. mollis (*T. & G.*) *Scheele*
C. coccinea var. macracantha *Dudl.*	C. macracantha *Lodd.*
Amelanchier Canadensis var. rotundifolia *T. & G.*	Amelanchier rotundifolia (*Mx.*) *Roem.*
A. Canadensis var. oblongifolia *T. & G.*	A. Botryapium (*L. f.*) *DC.*
Ribes rubrum var. subglandulosum *Maxim.*	Ribes rubrum *L.*
Tillaea simplex *Nutt.*	Tillaea aquatica *L.*
Drosera intermedia var. Americana *DC.*	Drosera intermedia *Hayne*
Myriophyllum ambiguum *Nutt.*	Myriophyllum humile (*Raf.*) *Morong*
Proserpinaca pectinacea *Lam.*	Proserpinaca pectinata *Lam.*
Callitriche deflexa var. Austini *Hegelm.*	Callitriche Austini *Engelm.*
C. verna *L.*	C. palustris *L.*
C. autumnalis *L.*	C. bifida (*L.*) *Morong*
Cuphea viscosissima *Jacq.*	Parsonsia petiolata (*L.*) *Rusby*
Epilobium angustifolium *L.*	Chamaenerion angustifolium (*L.*) *Scop.*
E. glandulosum *Lehm.*	Epilobium adenocaulon *Haussk.*
OEnothera biennis *L.*	Onagra biennis (*L.*) *Scop.*
OE. biennis var. cruciata *T. & G.*	O. cruciata (*Nutt.*) *Small*
OE. biennis var. grandiflora *Lindl.*	O. biennis grandiflora (*Ait.*) *Lindl.*
OE. pumila *L.*	Kneiffia pumila (*L.*) *Spach*
OE. fruticosa *L.*	K. fruticosa (*L.*) *Raimann*
OE. fruticosa var. linearis *Wats.*	K. linearis (*Mx.*) *Spach*
OE. fruticosa var humifusa *Allen*	K. Alleni (*Britton*) *Small*

Manual	*Illustrated flora*
Echinocystis lobata *T. & G.*	Micrampelis lobata (*Mx.*) *Greene*
Opuntia vulgaris *Mill.*	Opuntia Opuntia (*L.*) *Coult.*
Angelica hirsuta *Muhl.*	Angelica villosa (*Walt.*) *B. S. P.*
Conioselinum Canadense *T. & G.*	Conioselinum Chinense (*L.*) *B. S. P.*
Tiedemannia rigida *C. & R.*	Oxypolis rigidus (*L.*) *Britton*
Cryptotaenia Canadensis *DC.*	Deringa Canadensis (*L.*) *Kuntze*
Discopleura capillacea *DC.*	Ptilimnium capillaceum (*Mx.*) *Hollick*
Osmorrhiza brevistylis *DC.*	Washingtonia Claytoni (*Mx.*) *Britton*
O. longistylis *DC.*	W. longistylis (*Torr.*) *Britton*
Sanicula Marylandica var. Canadensis *Torr.*	Sanicula Canadensis *L.*
Aralia quinquefolia *D. & P.*	Panax quinquefolium *L.*
A. trifolia *D. & P.*	P. trifolium *L.*
Thaspium aureum *Nutt.*	Thaspium trifoliatum aureum (*Nutt.*) *Britton*
T. aureum var. atropurpureum *C. & R.*	T. trifoliatum (*L.*) *Britton*
Crantzia lineata *Nutt.*	Lilaeopsis lineata (*Mx.*) *Greene*
Carum Petroselinum *Benth.*	Apium Petroselinum *L.*
Cornus sericea *L.*	Cornus Amonum *Mill.*
C. paniculata *L'Her.*	C. candidissima *Marsh.*
Sambucus racemosa *L.*	Sambucus pubens *Mx.*
Viburnum lantanoides *Mx.*	Viburnum alnifolium *Marsh.*
Symphoricarpos vulgaris *Mx.*	Symphoricarpos Symphoricarpos (*L.*) *Mac M.*
S. racemosus var. pauciflorus *Robbins*	S. pauciflorus (*Robbins*) *Britton*
Lonicera glauca *Hill*	Lonicera dioica *L.*
Diervilla trifida *Moench*	Diervilla Diervilla (*L.*) *Mac M.*
Houstonia purpurea var. ciliolata *Gray*	Houstonia ciliolata *Torr.*
H. purpurea var. longifolia *Gray*	H. longifolia *Gaertn.*
Oldenlandia glomerata *Mx.*	Oldenlandia uniflora *L.*
Galium trifidum var. latifolium *Torr.*	Galium tinctorium *L.*
G. trifidum var. pusillum *Gray*	G. trifidum *L.*
Valerianella olitoria *Poll.*	Valerianella Locusta (*L.*) *Bettke*
Mikania scandens *L.*	Willugbaea scandens (*L.*) *Kuntze*
Eupatorium teucrifolium *Willd.*	Eupatorium verbenaefolium *Mx.*
E. rotundifolium var. ovatum *Torr.*	E. pubescens *Muhl.*
Liatris cylindracea *Mx.*	Lacinaria cylindracea (*Mx.*) *Kuntze*
L. scariosa *Willd.*	L. scariosa (*L.*) *Hill*
L. spicata *Willd.*	L. spicata (*L.*) *Kuntze*
Solidago latifolia *L.*	Solidago flexicaulis *L.*
S. bicolor var. concolor *T. & G.*	S. hispida *Muhl.*
S. Virgaurea var. alpina *Bigel.*	S. alpestris *W. & K.*
S. humilis *Pursh*	S. Purshii *Porter*

Manual	*Illustrated flora*
Solidago speciosa var. angustata *T. & G.*	Solidago rigidiuscula (*T. & G.*) *Porter*
S. neglecta var. linoides *Gray*	S. uniligulata (*DC.*) *Porter*
S. Canadensis var. scabra *T. & G.*	S. Canadensis scabriuscula *Porter*
S. lanceolata *L.*	Euthamia graminifolia (*L.*) *Nutt.*
S. tenuifolia *Pursh*	E. Caroliniana (*L.*) *Greene.*
Sericocarpus conyzoides *Nees*	Sericocarpus asteroides (*L.*) *B. S. P.*
S. solidagineus *Nees*	S. linifolius (*L.*) *B. S. P.*
Aster corymbosus *Ait.*	Aster divaricatus *L.*
A. patens var. phlogifolius *Nees*	A. phlogifolius *Muhl.*
A. ericoides var. Pringlei *Gray*	A. Pringlei (*Gray*) *Britton*
A. diffusus *Ait.*	A. lateriflorus (*L.*) *Britton*
A. diffusus var. thyrsoideus *Gray*	A. lateriflorus thyrsoideus(*Gr.*)*Sheldon*
A. diffusus var. bifrons *Gray*	A. lateriflorus grandis *Porter*
A. diffusus var. hirsuticaulis *Gray*	A. hirsuticaulis *Lindl.*
A. puniceus var. laevicaulis *Gray*	A. puniceus firmus *Nees*
A. umbellatus *Mill.*	Doellingeria umbellata (*Mill.*) *Nees*
A. infirmus *Mx.*	D. infirma (*Mx.*) *Greene*
A. linariifolius *L.*	Ionactis linariifolius (*L.*) *Greene*
Erigeron Canadensis *L.*	Leptilon Canadense (*L.*) *Britton*
E. strigosus *Muhl.*	Erigeron ramosus (*Walt.*) *B. S. P.*
E. bellidifolius *Muhl.*	E. pulchellus *Mx.*
Filago Germanica *L.*	Gifola Germanica (*L.*) *Dumort.*
Gnaphalium polycephalum *Mx.*	Gnaphalium obtusifolium *L.*
Heliopsis laevis *Pers.*	Heliopsis helianthoides (*L.*) *B. S. P.*
Lepachys pinnata *T. & G.*	Ratibida pinnata (*Vent.*) *Barnhart*
Actinomeris squarrosa *Nutt.*	Verbesina alternifolia (*L.*) *Britton*
Coreopsis trichosperma *Mx.*	Bidens trichosperma (*Mx.*) *Britton*
C. discoidea *T. & G.*	B. discoidea (*T. & G.*) *Britton*
Bidens connata var. comosa *Gray*	B. comosa (*Gray*) *Wiegand*
B. chrysanthemoides *Mx.*	B. laevis (*L.*) *B. S. P.*
Senecio aureus var obovatus *T. & G.*	Senecio obovatus *Muhl.*
S. aureus var. Balsamitae *T. & G.*	S. Balsamitae *Muhl.*
Cacalia suaveolens *L.*	Synosma suaveolens (*L.*) *Raf.*
C. atriplicifolia *L.*	Mesadenia atriplicifolia (*L.*) *Raf.*
Arctium Lappa var. tomentosum *Gray*	Arctium tomentosum (*Lam.*) *Schk.*
A. Lappa var. minus *Gray*	A. minus *Schk.*
Cnicus lanceolatus *Hoffm.*	Carduus lanceolatus *L.*
C. horridulus *Pursh*	C. spinosissimus *Walt.*
C. altissimus *Willd.*	C. altissimus *L.*
C. altissimus var. discolor *Gray.*	C. discolor (*Muhl.*) *Nutt.*
C. muticus *Pursh*	C. muticus (*Mx.*) *Pers.*
C. pumilus *Torr.*	C. odoratus (*Muhl.*) *Porter*
C. arvensis *Hoffm.*	C. arvensis (*L.*) *Robs.*
Krigia Virginica *Willd.*	Adopogon Carolinianum (*Walt.*) *Britton*
K. amplexicaulis *Nutt.*	A. Virginicum (*L.*) *Kuntze*
Prenanthes racemosa *Mx.*	Nabalus racemosus (*Mx.*) *DC.*

Manual	*Illustrated flora*
Prenanthes alba *L.*	Nabalus albus (*L.*) *Hook.*
P. serpentaria *Pursh*	N. serpentarius (*Pursh*) *Hook.*
P. serpentaria var. nana *Gray*	N. nanus (*Bigel.*) *DC.*
P. altissima *L.*	N. altissimus (*L.*) *Hook.*
P. Boottii *Gray*	N. Boottii *DC.*
Taraxacum officinale *Weber*	Taraxacum Taraxacum (*L.*) *Karst.*
Lactuca integrifolia *Bigel.*	Lactuca sagittifolia *Ell.*
L. acuminata *Gray*	L. villosa *Jacq.*
L. leucophaea *Gray*	L. spicata (*Lam.*) *Hitchc.*
Specularia perfoliata *A. DC.*	Legouzia perfoliata (*L.*) *Britton*
Vaccinium corymbosum var. atrococcum *Gray*	Vaccinium atrococcum (*Gray*) *Heller*
V. Oxycoccus *L.*	Oxycoccus Oxycoccus (*L.*) *Mac M.*
V. macrocarpon *Ait.*	O. macrocarpus (*Ait.*) *Pers.*
Chiogenes serpyllifolia *Salisb.*	Chiogenes hispidula (*L.*) *T. & G.*
Andromeda Mariana *L.*	Pieris Mariana (*L.*) *B. & H.*
A. ligustrina *Muhl.*	Xolisma ligustrina (*L.*) *Britton.*
Cassandra calyculata *Don.*	Chamaedaphne calyculata (*L.*) *Moench*
Rhododendron viscosum *Torr.*	Azalea viscosa *L.*
R. viscosum var. glaucum *Gray*	A. viscosa glauca *Mx.*
R. viscosum var. nitidum *Gray*	A. viscosa nitida (*Pursh*) *Britton*
R. nudiflorum *Torr.*	A. nudiflora *L.*
R. calendulaceum *Torr.*	A. lutea *L.*
R. Rhodora *Don.*	Rhodora Canadensis *L.*
Ledum latifolium *Ait.*	Ledum Groenlandicum *OEder*
Moneses grandiflora *Salisb.*	Moneses uniflora (*L.*) *Gray*
Pyrola rotundifolia var. asarifolia *Hook.*	Pyrola asarifolia *Mx.*
P. rotundifolia var. uliginosa *Gray*	P. uliginosa *Torr.*
Monotropa Hypopitys *L.*	Hypopitys Hypopitys (*L.*) *Small*
Statice Limonium var. Caroliniana *Gray*	Limonium Carolinianum (*Walt.*) *Britton*
Steironema longifolium *Gray*	Steironema quadriflorum (*Sims*) *Hitchc.*
Lysimachia stricta *Ait.*	Lysimachia terrestris (*L.*) *B. S. P.*
L. thyrsiflora *L.*	Naumbergia thyrsiflora (*L.*) *Duby*
Samolus Valerandi var. Americanus *Gr.*	Samolus floribundus *H. B. K.*
Fraxinus pubescens *Lam.*	Fraxinus Pennsylvanica *Marsh.*
F. viridis *Mx.*	F. lanceolata *Borck.*
F. sambucifolia *Lam.*	F. nigra *Marsh.*
Asclepias Cornuti *Dec.*	Asclepias Syriaca *L.*
A. incarnata var. pulchra *Pers.*	A. pulchra *Ehrh.*
A. phytolaccoides *Pursh*	A. exaltata (*L.*) *Muhl.*
Vincetoxicum nigrum *Moench*	Cynanchum nigrum (*L.*) *Pers.*
Erythraea ramosissima *Pers.*	Erythraea pulchella (*Sw.*) *Fries*
Sabbatia chloroides *Pursh*	Sabbatia dodecandra (*L.*) *B. S. P.*
Gentiana serrata *Gunner*	Gentiana detonsa *Rottb.*

Manual	*Illustrated flora*
Gentiana quinqueflora *Lam.*	Gentiana quinquefolia *L.*
G. linearis var. lanceolata *Gray*	G. rubricaulis *Schw.*
Halenia deflexa *Griseb.*	Tetragonanthus deflexus (*Smith*) *Kuntze*
Bartonia tenella *Muhl.*	Bartonia Virginica (*L.*) *B. S. P.*
Polemonium caeruleum *Gray*	Polemonium Van Bruntiae *Britton*
Echinospermum Virginicum *Lehm.*	Lappula Virginiana (*L.*) *Greene*
E. Lappula *Lehm.*	L. Lappula (*L.*) *Karst.*
Myosotis verna *Nutt.*	Myosotis Virginica (*L.*) *B. S. P.*
Lithospermum hirtum *Lehm.*	Lithospermum Gmelini (*Mx.*) *Hitchc.*
Convolvulus sepium var. Americanus *Sims*	Convolvulus sepium *L.*
Cuscuta tenuiflora *Engelm.*	Cuscuta Cephalanthi *Engelm.*
C. inflexa *Engelm.*	C. Coryli *Engelm.*
Physalis Virginiana *Mill.*	Physalis heterophylla *Nees*
Nicandra physaloides *Gaertn.*	Physalodes Physalodes (*L.*) *Britton*
Linaria vulgaris *Mill.*	Linaria Linaria (*L.*) *Karst.*
L. Elatine *Mill.*	Elatinoides Elatine (*L.*) *Wettst.*
Scrophularia nodosa var. Marilandica *Gray*	Scrophularia Marylandica *L.*
Pentstemon pubescens *Soland.*	Pentstemon hirsutus (*L.*) *Willd.*
P. laevigatus *Soland.*	P. Pentstemon (*L.*) *Britton*
Limosella aquatica var. tenuifolia *Hoffm.*	Limosella tenuifolia *Hoffm.*
Ilysanthes riparia *Raf.*	Ilysanthes gratioloides (*L.*) *Benth.*
Veronica Anagallis *L.*	Veronica Anagallis-aquatica *L.*
V. Buxbaumii *Tenore*	V. Byzantina (*S. & S.*) *B. S. P.*
Gerardia pedicularia *L.*	Dasystoma Pedicularia (*L.*) *Benth.*
G. flava *L.*	D. flava (*L.*) *Wood*
G. quercifolia *Pursh*	D. Virginica (*L.*) *Britton*
G. purpurea var. paupercula *Gray*	Gerardia paupercula (*Gray*) *Britton*
Melampyrum Americanum *Mx.*	Melampyrum lineare *Lam.*
Epiphegus Virginiana *Bart.*	Leptamnium Virginianum (*L*) *Raf.*
Aphyllon uniflorum *Gray*	Thalesia uniflora (*L.*) *Britton*
Catalpa bignonioides *Walt.*	Catalpa Catalpa (*L.*) *Karst.*
Martynia proboscidea *Glox.*	Martynia Louisiana *Mill.*
Isanthus caeruleus *Mx.*	Isanthus brachyatus (*L.*) *B. S. P.*
Mentha viridis *L.*	Mentha spicata *L.*
M. aquatica var. crispa *Benth.*	M. crispa *L.*
M. Canadensis var. glabrata *Benth.*	M. Canadensis *L.* (*in part*)
Lycopus sinuatus *Ell.*	Lycopus Americanus *Muhl.*
Cunila Mariana *L.*	Cunila origanoides (*L.*) *Britton*
Pycnanthemum lanceolatum *Pursh*	Koellia Virginiana (*L.*) *MacM.*
P. linifolium *Pursh*	K. flexuosa (*Walt.*) *MacM.*
P. muticum *Pers.*	K. mutica (*Mx.*) *Britton*
P. muticum var. pilosum *Gray*	K. pilosa (*Nutt.*) *Britton*
P. Torreyi *Benth.*	K. verticillata (*Mx.*) *Kuntze*
P. clinopodioides *Gray*	K. clinopodioides (*T. & G.*) *Kuntze*
P. incanum *Mx.*	K. incana (*L.*) *Kuntze*

Manual	*Illustrated flora*
Calamintha Clinopodium *Benth.*	Clinopodium vulgare *L.*
C. Nuttallii *Gray*	C. glabrum (*Nutt.*) *Kuntze*
Lophanthus nepetoides *Benth.*	Agastache nepetoides (*L.*) *Kuntze*
L. scrophulariaefolius *Benth.*	A. scrophulariaefolia (*Willd.*) *Kuntze*
Nepeta Glechoma *Benth.*	Glecoma hederacea *L.*
Brunella vulgaris *L.*	Prunella vulgaris *L.*
Stachys aspera var. glabra *Gray*	Stachys tenuifolia *Willd.*
Plantago decipiens *Barneoud*	Plantago maritima *L.*
P. Patagonica var. aristata *Gray*	P. aristata *Mx.*
P. pusilla *Nutt.*	P. elongata *Pursh*
Amarantus hypochondriacus *L.*	Amaranthus hybridus *L.* (*in part*)
A. paniculatus *L.*	A. hybridus paniculatus (*L.*) *U. & B.*
A. chlorostachys *Willd.*	A. hybridus *L.* (*in part*)
A. albus *L.*	A. graecizans *L.*
Acnida tuberculata var. subnuda *Wats.*	Acnida tamariscina tuberculata (*Moq.*) *U. & B.* (*in part*)
Chenopodium capitatum *Wats.*	Blitum capitatum *L.*
C. ambrosioides var. anthelminticum *Gr.*	Chenopodium anthelminticum *L.*
Atriplex patulum var. hastatum *Gr.*	Atriplex hastata *L.*
A. patulum var. littorale *Gr.*	A. patula *L.*
Salicornia mucronata *Bigel.*	Salicornia Bigelovii *Torr.*
Suaeda linearis *Moq.*	Dondia Americana (*Pers.*) *Britton*
Rumex maritimus *L.*	Rumex persicarioides *L.*
Fagopyrum esculentum *Moench*	Fagopyrum Fagopyrum (*L.*) *Karst.*
Polygonum lapathifolium var. incarnatum *Wats.*	Polygonum incarnatum *Ell.*
P. Muhlenbergii *Wats.*	P. emersum (*Mx.*) *Britton.*
P. acre *H. B. K.*	P. punctatum *Ell.*
P. dumetorum var. scandens *Gr.*	P. scandens *L.*
P. cuspidatum *S. & Z.*	P. Zuccarinii *Small*
Arceuthobium pusillum *Pk.*	Razoumofskya pusilla (*Pk.*) *Kuntze*
Euphorbia Preslii *Guss.*	Euphorbia nutans *Lag.*
Acalypha Virginica var. gracilescens *Muell.*	Acalypha gracilescens *Gray*
Maclura aurantiaca *Nutt.*	Toxylon pomiferum *Raf.*
Laportea Canadensis *Gaud.*	Urticastrum divaricatum (*L.*) *Kuntze*
Pilea pumila *Gray*	Adicea pumila (*L.*) *Raf.*
Carya alba *Nutt.*	Hicoria ovata (*Mill.*) *Britton*
C. sulcata *Nutt.*	H. laciniosa (*Mx. f.*) *Sarg.*
C. tomentosa *Nutt.*	H. alba (*L.*) *Britton*
C. microcarpa *Nutt.*	H. microcarpa (*Nutt.*) *Britton*
C. porcina *Nutt.*	H. glabra (*Mill.*) *Britton*
C. amara *Nutt.*	H. minima (*Marsh.*) *Britton*

Manual	*Illustrated flora*
Myrica asplenifolia *Endl.*	Comptonia peregrina (*L.*) *Coult.*
Alnus viridis *DC.*	Alnus Alnobetula (*Ehrh.*) *Koch*
A. serrulata *Willd.*	A. rugosa (*Du Roi*) *Koch*
Ostrya Virginica *Willd.*	Ostrya Virginiana (*Mill.*) *Willd.*
Quercus stellata *Wang.*	Quercus minor (*Marsh.*) *Sarg.*
Q. macrocarpa var. olivaeformis *Gr.*	Q. macrocarpa *Mx.* (*in part*)
Q. bicolor *Willd.*	Q. platanoides (*Lam.*) *Sudw.*
Q. Muhlenbergii *Engelm.*	Q. acuminata (*Mx.*) *Sarg.*
Q. ilicifolia *Wang.*	Q. nana (*Marsh.*) *Sarg.*
Q. coccinea var. tinctoria *Gray*	Q. velutina *Lam.*
Castanea sativa var. Americana *Wats.*	Castanea dentata (*Marsh.*) *Borkh.*
Fagus ferruginea *Ait.*	Fagus Americana *Sweet*
Salix longifolia *Muhl.*	Salix fluviatilis *Nutt.*
S. rostrata *Richardson*	S. Bebbiana *Sarg.*
Pinus inops *Ait.*	Pinus Virginiana *Mill.*
P. Banksiana *Lamb.*	P. divaricata (*Ait.*) *Sudw.*
P. mitis *Mx.*	P. echinata *Mill.*
Picea nigra *Link.*	Picea Mariana (*Mill.*) *B. S. P.*
P. nigra var. rubra *Engelm.*	P. rubra (*Lamb.*) *Link.*
P. alba *Link.*	P. Canadensis (*Mill.*) *B. S. P.*
Larix Americana *Mx.*	Larix laricina (*Du Roi*) *Koch*
Chamaecyparis sphaeroidea *Spach*	Chamaecyparis thyoides (*L.*) *B. S. P.*
Juniperus communis var. alpina *Gaud.*	Juniperus nana *Willd.*
J. Sabina var. procumbens *Pursh*	J. Sabina *L.*
Taxus Canadensis *Willd.*	Taxus minor (*Mx.*) *Britton*
Elodea Canadensis *Mx.*	Philotria Canadensis (*Mx.*) *Britton*
Microstylis monophyllos *Lindl.*	Achroanthes monophylla (*L.*) *Greene*
M. ophioglossoides *Nutt.*	A. unifolia (*Mx.*) *Raf.*
Liparis liliifolia *Richardson*	Leptorchis liliifolia (*L.*) *Kuntze*
L. Loeselii *Richardson*	L. Loeselii (*L.*) *MacM.*
Calypso borealis *Salisb.*	Calypso bulbosa (*L.*) *Oakes*
Tipularia discolor *Nutt.*	Tipularia unifolia (*Muhl.*) *B. S. P.*
Aplectrum hiemale *Nutt.*	Aplectrum spicatum (*Walt.*) *B. S. P.*
Corallorhiza innata *R. Br.*	Corallorhiza Corallorhiza (*L.*) *Karst.*
Spiranthes latifolia *Torr.*	Gyrostachys plantaginea (*Raf.*) *Britton*
S. Romanzoffiana *Cham.*	G. Romanzoffiana (*Cham.*) *MacM.*
S. cernua *Richardson*	G. cernua (*L.*) *Kuntze*
S. praecox *Wats.*	G. praecox (*Walt.*) *Kuntze*
S. gracilis *Bigel.*	G. gracilis (*Bigel.*) *Kuntze*
S. simplex *Gray*	G. simplex (*Gray*) *Kuntze*
Goodyera repens *R. Br.*	Peramium repens (*L.*) *Salisb.*
G. pubescens *R. Br.*	P. pubescens (*Willd.*) *MacM.*
G. Menziesii *Lindl.*	P. Menziesii (*Lindl.*) *Morong*
Epipactis Helleborine *Crantz*	Epipactis viridiflora (*Hoffm.*) *Reichb.*
Calopogon pulchellus *R. Br.*	Limodorum tuberosum *L.*

Manual	*Illustrated flora*
Pogonia pendula *Lindl.*	Pogonia trianthophora (*Sw.*) *B. S. P.*
Habenaria tridentata *Hook.*	Habenaria clavellata (*Mx.*) *Spreng.*
H. virescens *Spreng.*	H. flava (*L.*) *Gray*
H. Hookeri *Torr.*	H. Hookeriana *Gray*
H. fimbriata *R. Br.*	H. grandiflora (*Bigel.*) *Torr.*
Cypripedium pubescens *Willd.*	Cypripedium hirsutum *Mill.*
C. spectabile *Sw.*	C. reginae *Walt.*
Lachnanthes tinctoria *Ell.*	Gyrotheca capitata (*Walt.*) *Morong*
Belamcanda Chinensis *Adans.*	Gemmingia Chinensis (*L.*) *Kuntze*
Sisyrinchium anceps *Cav.*	Sisyrinchium graminoides *Bicknell*
Hypoxis erecta *L.*	Hypoxis hirsuta (*L.*) *Coville*
Polygonatum giganteum *Dietr.*	Polygonatum commutatum(*R. & S.*)*Dietr.*
Smilacina racemosa *Desf.*	Vagnera racemosa (*L.*) *Morong*
S. stellata *Desf.*	V. stellata (*L.*) *Morong*
S. trifolia *Desf.*	V. trifolia (*L.*) *Morong*
Maianthemum Canadense *Desf.*	Unifolium Canadense (*Desf.*) *Greene*
Clintonia umbellata *Torr.*	Clintonia umbellulata (*Mx.*) *Torr.*
Oakesia sessilifolia *Wats.*	Uvularia sessilifolia *L*
Trillium erythrocarpum *Mx.*	Trillium undulatum *Willd.*
Chamaelirium Carolinianum *Willd.*	Chamaelirium luteum (*L.*) *Gray*
Amianthium muscaetoxicum *Gray*	Chrosperma muscaetoxicum (*Walt.*) *Kuntze*
Heteranthera graminea *Vahl.*	Heteranthera dubia (*Jacq.*) *MacM.*
Xyris flexuosa var. pusilla *Gray*	Xyris montana *H. Ries*
Juncus Balticus var. littoralis *Engelm.*	Juncus Balticus *Willd.*
J. alpinus var. insignis *Fr.*	J. Richardsonianus *Schult.*
J. nodosus var. megacephalus *Torr.*	J. Torreyi *Coville*
J. Canad. var. longicaudatus *Engelm.*	J. Canadensis *J. Gray*
J. Canad. var. brachycephalus *Engelm.*	J. brachycephalus (*Engelm.*) *Buch.*
J. Canad. var. coarctatus *Engelm.*	J. Canadensis brevicaudatus *Engelm.*
Luzula vernalis *DC.*	Juncoides pilosum (*L.*) *Kuntze*
L. spadicea var. melanocarpa *Meyer*	J. parviflorum (*Ehrh.*) *Coville*
L. campestris *DC.*	J. campestre (*L.*) *Kuntze*
Sparganium simplex var. androcladum *Engelm.*	Sparganium androcladum *Engelm.*
S. simplex var. fluitans *Engelm.*	S. androcladum fluctuans *Morong*
Peltandra undulata *Raf.*	Peltandra Virginica (*L.*) *Kunth*
Symplocarpus foetidus *Salisb.*	Spathyema foetida (*L.*) *Raf.*
Alisma Plantago *L.*	Alisma Plantago-aquatica *L.*
Sagittaria variabilis *Engelm.*	Sagittaria latifolia *Willd.*
S. heterophylla *Pursh*	S. rigida *Pursh*
S. natans var. lorata *Chapm.*	S. subulata (*L.*) *Buch.*
Potamogeton Pennsylvanicus *Cham.*	Potamogeton Nuttallii *C. & S.*
P. hybridus *Mx.*	P. diversifolius *Raf.*
P. rufescens *Schrad.*	P. alpinus *Balbis*

Manual	*Illustrated flora*
Potamogeton fluitans *Roth*	Potamogeton lonchites *Tuckm.*
P. perfoliatus var. lanceolatus *Robbins*	P. perfoliatus Richardsonii *Bennett*
P. pauciflorus *Pursh*	P. foliosus *Raf.*
P. pauciflorus var. Niagarensis (*Tuckm.*) *Morong*	P. foliosus var. Niagarensis *Gray*
P. mucronatus *Schrad.*	P. Friesii *Rup.*
P. Tuckermani *Robbins*	P. confervoides *Reichb.*
Naias Indica var. gracillima *A. Br.*	Naias gracillima (*A. Br.*) *Morong*
Cyperus aristatus *Rottb.*	Cyperus inflexus *Muhl.*
C. Torreyi *Britton*	C. cylindricus (*Ell.*) *Britton*
Dulichium spathaceum *Pers.*	Dulichium arundinaceum (*L.*) *Britton*
Eleocharis quadrangulata *R. Br.*	Eleocharis mutata (*L.*) *R. & S.*
E. compressa *Sulliv.*	E. acuminata (*Muhl.*) *Nees*
E. pygmaea *Torr.*	Scirpus nanus *Spreng.*
Fimbristylis spadicea var. castanea *Gray*	Fimbristylis castanea (*Mx.*) *Vahl.*
F. capillaris *Gray*	Stenophyllus capillaris (*L.*) *Britton*
Scirpus pungens *Vahl.*	Scirpus Americanus *Pers.*
S. maritimus var. macrostachyos *Mx.*	S. robustus *Pursh*
S. sylvaticus var. digynus *Boeckl.*	S. microcarpus *Presl.*
Eriophorum lineatum *B. & H.*	S. lineatus *Mx.*
E. cyperinum *L.*	S. cyperinus (*L.*) *Kunth*
E. cyperinum var. laxum *Gray*	S. cyperinus Eriophorum (*Mx.*) *Britton*
Fuirena squarrosa var. pumila *Torr.*	Fuirena squarrosa *Mx.*
Hemicarpha subsquarrosa *Nees*	Hemicarpha micrantha (*Vahl.*) *Britton*
Rhynchospora cephalantha *Gray*	Rynchospora axillaris (*Lam.*) *Britton*
R. macrostachya *Torr.*	R. corniculata macrostachya (*Torr.*) *Britton*
Carex subulata *Mx.*	Carex Collinsii *Nutt.*
C. Michauxiana *Boeckl.*	C. abacta *Bailey*
C. Grayii *Carey*	C. Asa-Grayi *Bailey*
C. lupulina var. polystachya *S. & T.*	C. lupuliformis *Sartwell*
C. retrorsa var. Hartii *Gray*	C. Hartii *Dew.*
C. lurida var. gracilis *Bailey*	C. Baileyi *Britton*
C. Pseudo-Cyperus var. Americana *Hochst.*	C. comosa *Boott*
C. striata var. brevis *Bailey*	C. Walteriana *Bailey*
C. filiformis var. latifolia *Boeckl.*	C. lanuginosa *Mx.*
C. trichocarpa var. aristata *Bailey*	C. aristata *R. Br.*
C. atrata var. ovata *Boott*	C. atratiformis *Britton*
C. vulgaris var. hyperborea *Boott*	C. Bigelovii *Torr.*
C. stricta var. decora *Bailey.*	C. Haydeni *Dew.*
C. crinita *Lam.* (*in part*)	C. gynandra *Schw.*
C. virescens var. costata *Dew.*	C. costellata *Britton*
C. triceps var. hirsuta *Bailey*	C. triceps *Mx.*

Manual	*Illustrated flora*
Carex debilis var. Rudgei *Bailey*	Carex tenuis *Rudge*
C. debilis var. strictior *Bailey*	C. tenuis erectior *Britton*
C. venusta var. minor *Boeckl.*	C. oblita *Steud.*
C. granularis var. Haleana *Porter*	C. granularis Shriveri *Britton*
C. flava var. viridula *Bailey*	C. viridula *Mx.*
C. laxiflora var. striatula *Carey*	C. laxiflora blanda (*Dew.*) *Boott*
C. laxiflora var. latifolia *Boott*	C. Albursina *Sheldon*
C. laxiflora var. styloflexa *Boott*	C. styloflexa *Buckley*
C. Saltuensis *Bailey*	C. altocaulis (*Dew.*) *Britton*
C. eburnea *Boott*	C. setifolia (*Dew.*) *Britton*
C. communis *Bailey*	C. pedicellata (*Dew.*) *Britton*
C. communis var. Wheeleri *Bailey*	C. pedicellata Wheeleri (*Bailey*) *Britton*
C. Backii *Boott*	C. durifolia *Bailey*
C. polytrichoides *Muhl.*	C. leptalea *Wahl.*
C. teretiuscula var. ramosa *Boott.*	C. teretiuscula prairea (*Dew.*) *Britton*
C. rosea var. retroflexa *Torr.*	C. retroflexa *Muhl.*
C. gynocrates *Wormsk.*	C. Redowskyana *C. A. Meyer*
C. echinata var. cephalantha *Bailey*	C. sterilis cephalantha *Bailey*
C. echinata var. microstachys *Boeckl.*	C. sterilis *Willd.*
C. echinata var. angustata *Bailey*	C. sterilis *Willd.*
C. canescens var. alpicola *Wahl.*	C. brunnescens (*Pers.*) *Poir.*
C. canescens var. vulgaris *Bailey*	C. brunnescens gracilior *Britton*
C. tribuloides var. reducta *Bailey*	C. tribuloides moniliformis (*Tuckm.*) *Britton*
C. tribuloides var. cristata *Bailey*	Carex cristatella *Britton*
C. scoparia var. minor *Boott*	C. scoparia *Schk.* (*in part*)
C. straminea var. brevior *Dew.*	C. festucacea *Willd.*
C. straminea var. aperta *Boott.*	C. tenera *Dew.*
C. straminea var. invisa *W. Boott*	C. tenera invisa (*W. Boott*) *Britton*
C. straminea var. alata *Bailey*	C. alata *Torr.*
C. straminea var. cumulata *Bailey*	C. albolutescens *Schw.* (*in part*)
C. straminea var. foenea *Torr.*	C. albolutescens *Schw.* (*in part*)
Spartina juncea *Willd.*	Spartina patens (*Ait.*) *Muhl.*
S. stricta var. glabra *Gray*	S. stricta maritima (*Walt.*) *Scrib.*
Panicum filiforme *L.*	Syntherisma filiformis (*L.*) *Nash*
P. glabrum *Gaudin*	S. linearis (*Krock*) *Nash*
P. sanguinale *L.*	S. sanguinalis (*L.*) *Nash*
P. agrostoides *Muhl.*	Panicum agrostidiforme *Lam.*
P. latifolium *L.*	P. Porterianum *Nash*
P. scoparium *Lam.*	P. Scribnerianum *Nash*
P. Crus-galli var. hispidum *Torr.*	P. Walteri Pursh
Setaria verticillata *Bv.*	Ixophorus verticillatus (*L.*) *Nash*
S. glauca *Bv.*	I. glaucus (*L.*) *Nash*
S. viridis *Bv.*	I. viridis (*L.*) *Nash*
S. Italica *Kunth*	I. Italicus (*L.*) *Nash*

Manual	*Illustrated flora*
Leersia Virginica *Willd.*	Homalocenchrus Virginicus (*Willd.*) *Britton*
L. oryzoides *Sw.*	H. oryzoides (*L.*) *Poll.*
Andropogon macrourus *Mx.*	Andropogon glomeratus (*Walt.*) *B. S. P.*
Chrysopogon nutans *Benth.*	Chrysopogon avenaceus (*Mx.*) *Benth.*
Hierochloe borealis *R. & S.*	Savastana odorata (*L.*) *Scribn.*
H. alpina *R. & S.*	S. alpina (*Sw.*) *Scribn.*
Stipa Richardsonii *Lk.*	Stipa Macounii *Scribn.*
Oryzopsis Canadensis *Torr.*	Oryzopsis juncea (*Mx.*) *B. S. P.*
Muhlenbergia glomerata *Trin.*	Muhlenbergia racemosa (*Mx.*) *B. S. P.*
M. Willdenovii *Trin.*	M. tenuiflora (*Willd.*) *B. S. P.*
Brachyelytrum aristatum *Bv.*	Brachyelytrum erectum (*Schreb.*) *Bv.*
Alopecurus geniculatus var. aristulatus *Torr.*	Alopecurus geniculatus *L.* (*in part*)
Agrostis alba var. vulgaris *Thurb.*	Agrostis alba *L.* (*in part*)
A. scabra *Willd.*	A. hyemalis (*Walt.*) *B. S. P.*
A. canina *L.*	A. rubra *L.* (*in part*)
Cinna pendula *Trin.*	Cinna latifolia (*Trev.*) *Griseb.*
Calamagrostis Nuttalliana *Steud.*	Calamagrostis cinnoides (*Muhl.*) *Scribn.*
C. Pickeringii *Gray*	C. breviseta (*Gray*) *Scribn.*
Ammophila arundinacea *Host.*	Ammophila arenaria (*L.*) *Lk.*
Arrhenatherum avenaceum *Bv.*	Arrhenatherum elatius (*L.*) *Bv.*
Trisetum palustre *Torr.*	Trisetum Pennsylvanicum (*L.*) *Bv.*
T. subspicatum var. molle *Gray*	T. subspicatum (*L.*) *Bv.*
Cynodon Dactylon *Pers.*	Capriola Dactylon (*L.*) *Kuntze*
Bouteloua racemosa *Lag.*	Bouteloua curtipendula (*Mx.*) *Torr.*
Triodia cuprea *Jacq.*	Sieglingia seslerioides (*Mx.*) *Scribn.*
T. purpurea *Hack.*	S. purpurea (*Walt.*) *Kuntze*
Phragmites communis *Trin.*	Phragmites Phragmites (*L.*) *Karst.*
Eatonia Dudleyi *Vasey*	Eatonia nitida (*Spreng.*) *Nash*
Eragrostis reptans *Nees.*	Eragrostis hypnoides (*Lam.*) *B. S. P.*
Uniola gracilis *Mx.*	Uniola laxa (*L.*) *B. S. P.*
Distichlis maritima *Raf.*	Distichlis spicata (*L.*) *Greene*
Poa serotina *Ehrh.*	Poa flava *L.*
Glyceria Canadensis *Trin.*	Panicularia Canadensis (*Mx.*) *Kuntze*
G. obtusa *Trin.*	P. obtusa (*Muhl.*) *Kuntze*
G. elongata *Trin.*	P. elongata (*Torr.*) *Kuntze*
G. nervata *Trin.*	P. nervata (*Willd.*) *Kuntze*
G. pallida *Trin.*	P. pallida (*Torr.*) *Kuntze*
G. grandis *Wats.*	P. Americana (*Torr.*) *MacM.*
G. fluitans *R. Br.*	P. fluitans (*L.*) *Kuntze*
G. acutiflora *Torr.*	P. acutiflora (*Torr.*) *Kuntze*
Festuca tenella *Willd.*	Festuca octoflora *Walt.*
F. elatior var. pratensis *Gray*	F. elatior *L.* (*in part*)
Bromus ciliatus var. purgans *Gray*	Bromus ciliatus *L.* (*in part*)
B. mollis *L.*	B. hordeaceus *L.*

Manual	*Illustrated flora*
Agropyrum repens *Bv.*	Agropyron repens (*L.*) *Bv.*
Elymus striatus var. villosus *Gray*	Elymus striatus *Willd.* (*in part*)
Asprella Hystrix *Willd.*	Hystrix Hystrix (*L.*) *Millsp.*
Equisetum limosum *L.*	Equisetum fluviatile *L.*
Cheilanthes vestita *Sw.*	Cheilanthes lanosa (*Mx.*) *Watt*
Pellaea gracilis *Hook.*	Pellaea Stelleri (*Gmel.*) *Watt*
Woodwardia angustifolia *Sm.*	Woodwardia areolata (*L*) *Moore*
Asplenium ebeneum *Ait.*	Asplenium platyneuron (*L.*) *Oakes*
A. thelypteroides *Mx.*	A. acrostichoides *Sw.*
Scolopendrium vulgare *Sm.*	Scolopendrium Scolopendrium (*L.*) *Karst.*
Phegopteris polypodioides *Fee*	Phegopteris Phegopteris (*L.*) *Underw.*
Aspidium Thelypteris *Sw.*	Dryopteris Thelypteris (*L.*) *Gray*
A. Noveboracense *Sw.*	D. Noveboracensis (*L.*) *Gray*
A. fragrans *Sw.*	D. fragrans (*L.*) *Schott*
A. spinulosum *Sw.*	D. spinulosa (*Retz*) *Kuntze*
A. spin. var. intermedium *Eaton*	D. spin. intermedia (*Muhl.*) *Underw.*
A. spin. var. dilatatum *Hook.*	D. spin. dilatata (*Hoffm.*) *Underw.*
A. Boottii *Tuckm.*	D. Boottii (*Tuckm.*) *Underw.*
A. cristatum *Sw.*	D. cristata (*L.*) *Gray*
A. crist. var. Clintonianum *Eaton*	D. crist. Clintoniana (*Eaton*) *Underw.*
A. Goldianum *Hook.*	D. Goldieana (*Hook.*) *Gray*
A. marginale *Sw.*	D. marginalis (*L.*) *Gray*
A. acrostichoides *Sw.*	D. acrostichoides (*Mx.*) *Kuntze*
A. aculeatum var. Braunii *Koch*	D. Braunii (*Spenner*) *Underw.*
Woodsia hyperborea *R. Br.*	Woodsia alpina (*Bolton*) *Gray*
Dicksonia pilosiuscula *Willd.*	Dicksonia punctilobula (*Mx.*) *Gray*
Lycopodium obscurum var. dendroideum *Gray*	Lycopodium obscurum *L.* (*in part*)

D

SPECIES NOT BEFORE REPORTED

Sisymbrium altissimum *L.*

In a newly seeded meadow. Vaughns, Washington co. June. S H. Burnham. This is an introduced plant whose seeds were probably mixed with the grass or clover seed used. It has been introduced into some of the western states where it is becoming a very troublesome weed. It is 2 to 4 feet tall when well grown. It branches freely and when old and dry it is liable to be broken from its base and rolled over the ground like a tumble weed, the wind driving it about and scattering its seeds wherever it goes.

Diplotaxis tenuifolia *(L.) DC.*

Erie basin, Brooklyn. August. G. D. Hulst. This is also an introduced plant found chiefly in waste places about cities.

Viola ovata *Nutt.*

Dry ground. Saugerties, Ulster co. and Sand Lake, Rensselaer co. May. This violet has sometimes been considered a variety of *V. sagittata*, but its specific validity is recognized in *Illustrated flora*.

Lespedeza frutescens *(L.) Britton*

Wading River, Suffolk co., Bethlehem, Albany co. and Dresden Station, Washington co. August.

L. violacea sessilifolia and *L. Stuvei intermedia* are synonyms formerly applied to this species of bush clover.

Lespedeza Nuttallii *Darl.*

Dry soil. Poestenkill, Rensselaer co. and on Long Island. August and September.

Cytisus scoparius *(L.) Lk.*

This plant, known as broom or Scotch broom, has been introduced and is occasionally found in waste places. Richmond Hill, Queens co. G. D. Hulst.

Onagra cruciata *(Nutt.) Small*

Roadsides. North Elba, Essex co. August. In the *Manual* this plant is considered a variety of the common evening primrose and stands as *OEnothera biennis* var. *cruciata* T. & G. It is easily distinguished from *OE. biennis* by its much smaller petals which are narrow and almost pointed.

Galium Claytoni *Mx.*

Damp or wet places. Fulton Chain, Herkimer co. July. Related to *G. trifidum* but distinguished from it by having five or six stem leaves at a node.

Solidago erecta *Pursh*

Sandy soil. Baiting Hollow, Suffolk co. September. This goldenrod has been reported under the name *Solidago speciosa* var. *angustata* T. & G., but it is now classed as a distinct species.

Solidago hispida *Muhl.*

Dry sandy soil. Karner, Albany co. August and September.

This is *Solidago bicolor* var. *concolor* T. & G. in the *Manual.* It is a pretty goldenrod, similar in its general characters to *S. bicolor*, but easily distinguished from it by the yellow rays of the flower heads. In the smaller and less vigorous plants the panicle is long, narrow and spike-like, in the larger and more vigorous it is comparatively shorter and broader, its branches being longer.

Aster hirsuticaulis *Lindl.*

Woods and roadsides. Charlotteville swamp, Schoharie co.; Wells, Hamilton co.; Northville, Fulton co. and Corning, Steuben co. August and September. This species has generally been regarded as a variety of *A. miser* Nutt. or its equivalent *A. diffusus* Ait., but in *Illustrated flora* it has been restored to specific rank.

Antennaria neglecta *Greene*

Pastures and roadsides. Wynantskill and Sand Lake, Rensselaer co.; Menands, Albany co. and New Paltz, Ulster co. May and June. This species may be distinguished from the more common *A. plantaginifolia*, with which it has till recently been confused, by its smaller and single veined basal leaves and by its racemed heads of flowers.

Nabalus trifoliatus *Cass.*

Woods. Menands and North Elba. August and September.

Broussonetia papyrifera (*L.*) *Vent.*

Roadsides. Woodlawn, Long Island. May. G. D. Hulst. Introduced and occasionally escapes from cultivation.

Salsola Tragus *L.*

Near Rochester and also along the railroad at Livonia salt mine about 30 miles south of Rochester. October. M. S. Baxter.

The Russian thistle has probably been brought to these stations from the west. A few years ago it was introduced into North Dakota, and from this as a starting point it has been spreading in various directions. It has already acquired the reputation of being a most pernicious weed, and it should meet with prompt destruction in every new locality in which it may appear. It is an annual plant and special care should be taken to destroy it before it has had time to mature a crop of seeds. If this is thoroughly done it should not be difficult to prevent its becoming established in new localities. It is often considered a variety of the sea-coast plant *Salsola Kali*, and mentioned under the name *Salsola Kali* var. *Tragus*.

Convallaria majalis *L.*

The lily of the valley grows wild farther south, but is frequently cultivated in our state because of its delightful fragrance and early flowers. It sometimes escapes from cultivation here and grows spontaneously. Specimens were found growing in a grove on the margin of a meadow at Menands. May.

Juncoides spicatum (*L.*) *Kuntze*

Top of Wallface mountain, Essex co. June. At present this is the only known station of this northern species in our state. It is found in considerable abundance along the brow of the precipice that forms the western wall of Indian pass. Why it should be here and not on other prominent peaks of the Adirondack mountains is not easily answered. Its spike-like panicle bears some resemblance to that of *Carex teretiuscula*.

Panicum Atlanticum *Nash*

Pastures and dry open places. Fulton Chain. July. Dresden Station. August. Our plant is a small or dwarf form 4 to 8 inches high. Its panicles are few-flowered, and its spikelets are scarcely one line long. It grows in patches and both leaves and culms bear long white spreading hairs.

Alopecurus agrestis *L.*

Menands. June. This is an introduced grass occasionally found in waste places.

Panicularia borealis *Nash*

Shallow water along streams and margins of lakes. Lansingburg. E. C. Howe. Caroga, Fulton co. and Cascade lake, Essex co. It appears like a small or slender form of *Panicularia fluitans*, and like that species it sometimes has floating leaves.

Botrychium dissectum *Spreng.*

Old fields and pastures. Alcove, Albany co. North Elba. August and September. This is *Botrychium ternatum* var. *dissectum* in the *Manual* and *Botrychium lunarioides* var. *dissectum* in *New York state flora*.

Sphagnum Russowii *Warnst.*

Wet rocks and slides of the mountains. Mt Whiteface. September. Mrs E. G. Britton. *S. Russowii poecilum Russ.* occurs in a marsh near Scotts ponds. June.

Sphagnum quinquefarium *Warnst.*

Wet cliffs. Indian pass and a rocky bluff near Wood farm. June.

Sphagnum medium *Limpr.*

Cold marshes, wet rocks and slides of mountains. Mt Whiteface. September. Mrs Britton. Sand Lake and Mt Marcy. July and August. This peat moss closely resembles *Sphagnum cymbifolium.*

Splachnum rubrum *L.*

A few specimens of this singular and very rare moss were found growing among peat mosses near Scotts ponds. June. It has been reported from the Rocky mountains and from Maine.

Hypnum laxepatulum *L. & J.*

Forming thin mats on rocks. Lake Placid. September. Mrs Britton. The specimens are sterile.

Jungermannia Kunzeana *Huben.*

Rocks. Indian pass. June and August.

Jungermannia gracilis *Schleich.*

Rocks. Mt Marcy. August.

Scapania apiculata *Spruce*

Decaying prostrate trunks of balsam fir. North Elba. August.

Umbilicaria erosa (*Web.*) *Hoffm.*

Rocks. Thirsty pond, near Big Moose station. July. Summit of Mt Marcy. August.

Peltigera rufescens (*Neck.*) *Hoffm.*

Rocks. North Elba. June.

Physcia adglutinata (*Floerk.*) *Nyl.*

Bark of beech trees. North Elba. June.

Physcia setosa *(Ach.) Nyl.*

Rocks. Cascade lake. August.

Placodium vitellinum *(Ehrh.) N. & H.*

Rocks. North Elba. June.

Biatora Laureri *Hepp*

Bark of beech trees. North Elba. June.

Biatora Schweinitzii *Fr.*

Decorticated wood of balsam fir. Near Marcy camp. August.

Biatora granulosa *(Ehrh.) Poetsch*

Mucky and heathy soil, dead mosses, etc. Mt Marcy and North Elba. August.

Cladonia sobolescens *Nyl.*

Thin soil covering rocks. Dresden Station. August.

Cladonia decorticata *Floerk.*

Ground. Mt Marcy. August.

Lepiota solidipes *n. sp.*

Pileus fleshy, very convex or subhemispheric, becoming broadly convex or nearly plane, white, sometimes with a slight pinkish tint, flesh white, taste and odor farinaceous; lamellae thin, close, free, white; stem equal or somewhat bulbous, silky-fibrillose, solid, white or whitish, the thin annulus slightly floccose externally, subevanescent; spores globose or subglobose, .00016 to .0002 inch broad.

Pileus 2 to 4 in broad; stem 2 to 4 in. long, 4 to 6 lines thick.

Damp or swampy ground. Woodlawn park, Saratoga. October. F. G. Howland.

The solid stem and small globose spores specially distinguish this species. By the former it may be separated from *L. naucina*, and by both from *L. naucinoides*.

Tricholoma portentosum *Fr.*

Woods. Sand Lake. September. Our specimens have the pileus yellow on the margin as in the form figured by Saunders and Smith. We have not yet found the typical form, which has the pileus uniformly sooty brown. Our plant seems worthy of varietal distinction and we name it variety *centrale*.

Tricholoma acre *Pk.*

Thin woods. Karner, Albany co. October. This mushroom has the not peppery taste which belongs to many species of *Lactarius* and *Russula*.

Clitocybe eccentrica *Pk.*

Decaying wood. Meadowdale, Albany co. and North Elba. August. In this species the stem is frequently eccentric. It is usually adorned with a coarse strigose villosity at the base and long branching strands of white mycelium permeate the soft decaying wood.

Marasmius acerinus *n. sp.*

Pileus thin, submembranaceous, convex, umbilicate, subglabrous, sulcate-striate, pale bay red; lamellae broad, distant, adnate, tough, whitish or yellowish white; stem short, often curved, inserted, hollow, clothed with a minute short whitish pubescence, colored like the pileus or sometimes a little darker; spores subelliptic, .0003 in. long, .00016 broad, usually with an oblique apiculus at one end.

Pileus 3 to 6 lines broad; stem 6 to 9 lines long, scarcely 1 line thick.

Dead bark of mountain maple, *Acer spicatum*. Near Adirondack lodge. August.

Closely allied to *M. viticola* B. & C., but it is a smaller plant with a paler and scarcely glabrous pileus and with comparatively broader lamellae. To the naked eye the stem appears to be slightly pruinose, but under a lens it is seen to be thinly clothed with minute short whitish hairs. These also appear to some extent on the pileus.

Clitopilus socialis *n. sp.*

Pileus thin, convex, deeply umbilicate, grayish brown; lamellae thin, moderately close, decurrent, colored like the pileus when young, grayish incarnate when mature; stem equal, stuffed or hollow, colored like the pileus or a little paler; spores irregular, uninucleate, generally a little longer than broad, .0003 to .0004 in. long, .00024 to .0003 broad.

Pileus 6 to 10 lines broad; stem 6 to 12 lines long, 1 to 2 lines thick.

Closely gregarious. Under pine and hemlock trees. Delmar. September.

This species is well marked by its deeply umbilicate pileus. It is apparently related to *C. undatus*, but the pileus is not at all undulate, its color and the shape of its spores are different and its closely gregarious mode of growth will also distinguish it. The plants are sometimes crowded or almost cespitose. In such cases the surface of the ground beneath is often whitened by a profuse development of the mycelium.

Hebeloma palustre *n. sp.*

Pileus fleshy but thin, broadly convex becoming nearly plane with age, sometimes wavy or irregular, glabrous, hygrophanous, grayish brown and slightly striatulate on the margin when moist, paler when dry, flesh whitish; lamellae close thin ventricose, adnexed, grayish white becoming cinnamon brown; stem rather long, equal or tapering upward, hollow, silky, white; spores subelliptic, uninucleate, .0004 to .0005 in. long, .00024 to .0003 broad.

Pileus 1 to 1.5 in. broad; stem 2 to 3 in. long, 2 to 4 lines thick. Mossy ground in swampy woods. Kasoag. October. The pileus is not viscid and there is no evidence of a veil.

Crepidotus epibryus *Fr.*

Mosses, fallen twigs and leaves of coniferous trees. North Elba. August.

Gomphidius furcatus *n. sp.*

Pileus fleshy, convex or nearly plane, rarely somewhat umbonate, glabrous, viscid, whitish, sometimes tinged with red, occasionally with blackish stains when old or becoming blackish where bruised, flesh white; lamellae thick, distant, decurrent, many of them forked, whitish, becoming sooty brown; stem longer than the diameter of the pileus, rather slender, curved or flexuous, firm, solid, whitish; spores oblong or subfusiform, .0006 to .0008 in. long, .00024 to .0003 broad.

Pileus 1 to 2 in. broad; stem 1.5 to 3 in. long, 1.5 to 3 lines thick.

Under or near tamarack trees in swamps. Kasoag. October.

The species is apparently related to *G. maculatus Cookei* Mass., from which it is separated by its more slender habit and forked lamellae. The pileus becomes reddish brown in drying.

Psilocybe uda *Pers.*

In sphagnous marshes. Karner and Kasoag. September and October. Variable in color.

Polyporus hispidellus *n. sp.*

Pileus fleshy, tough, dimidiate, pale cervine or grayish brown, clothed with short stiff erect hairs, flesh white; pores small, short, subrotund, white, the dissepiments thin, the edges uneven dentate or lacerate; stem short, lateral, solid, often irregular, clothed like the pileus; spores fusiform, .0005 in. long, .00016 broad, usually containing a single large nucleus.

Pileus 2 to 3 in. broad; stem about 1 in. long, 4 to 6 lines thick.

Roots of trees or decaying wood buried in the ground. North Elba and Marcy trail. August.

Vermicularia punctans *Schw.*

Dead leaves of Indian grass, *Chrysopogon avenaceus*. Karner. October.

The spores in our specimens are subfusiform and slightly curved. They are supported on slender sporophores from one fourth to one half the length of the spores.

Uromyces caryophyllinus (*Schrank*) *Schroet.*

Living leaves of carnation pink. Gouverneur. November. Mrs E. C. Anthony.

Peridermium Engelmanni *Thum.*

Cones of spruce trees. Fulton Chain and North Elba. June and July. Apparently a rare species. Only a few cones on the tree were affected by it.

Gymnosporangium Nidus-avis *Thaxter*

Living branches of red cedar, *Juniperus Virginiana*. Staten Island. April. L. M. Underwood.

Peronospora australis *Speg.*

Living leaves of star cucumber, *Sicyos angulatus*. Hoffman, Schenectady co. July.

Chlorosplenium aeruginascens (*Nyl.*) *Karst.*

Decaying wood of poplar, *Populus tremuloides*. Karner. October.

This species is closely related to *Chlorosplenium aeruginosum*, from which it may be separated by its smaller spores. Both plants discolor the wood on which they grow.

Tympanis laricina (*Fckl.*) *Sacc.*

Dead branches and bark of larch and balsam fir. North Elba. August and September.

E

REMARKS AND OBSERVATIONS

Glaucium Glaucium (*L.*) *Karst.*

Syracuse. June. Miss L. W. Roberts. The yellow horned poppy or sea poppy is an introduced plant found chiefly along or near the sea shore.

Floerkia proserpinacoides *Willd.*

The occurrence of the false mermaid about Tarrytown has been reported by J. H. Barnhart, and in Richmond county, by W. T. Davis.

Potentilla fruticosa *L.*

A single poor infertile starved bush of the shrubby cinquefoil was found on Wallface mountain. Its appearance did not give much promise that it would long continue to represent its species there.

Geum macrophyllum *Willd.*

The large leaved avens is a rare species in our state, but is quite plentiful in the eastern part of North Elba. It is abundant along the old road to Keene, about the head of Cascade lake and in low meadows between Freemans Home and Wood farm.

Amelanchier oligocarpa (*Mx.*) *Roem.*

This Juneberry ascends to the open summit of Mt Marcy. It also descends to the valleys and occurs by the roadside about a half mile southeast of North Elba post office.

Ribes prostratum *L'Her.*

The flowers of the fetid currant are variable in color. They are pale greenish with slight tints of red or pink on some plants, purplish red on others.

Viburnum alnifolium *Marsh.*

Several years ago the superintendent of the Adirondack survey reported to me the occurrence in the Adirondack region of a hobble bush bearing pink flowers. Finding no mention of such a variety in the botanies, and wishing if possible to procure specimens of it, the region where it had been seen was visited early in the season. A few plants were found in which the large exterior flowers of the cyme or cluster had a pinkish color, and occasionally some of the small interior flowers were similarly colored. In every case the flowers seemed to be old or past their prime and some had fallen. There was no indication that any of them had just opened and the probability is that the pink or rosy hue was acquired by age. The tint was very delicate and was retained by none of the dried specimens though they were treated with great care.

Solidago macrophylla *Pursh.*

The large leaved goldenrod is one of the most common species in the more elevated parts of the Adirondack region. A small leaved variety of it occurs along the banks of the Ausable river on Wood farm. In it the leaves are mostly less than 3 inches long and less than 1 inch broad. The flower heads are also smaller than in the typical form, but they are sometimes more numerous.

Solidago Virgaurea Redfieldii *Porter*

Indian pass. August. It grows here on the moss covered surface of huge boulders.

Aster divaricatus cymulosus *Burgess*

Dry ground in thin woods. Dresden Station. August.

Aster macrophyllus velutinus *Burgess*

Banks of the Ausable river, North Elba. August.

Aster lateriflorus glomerellus (*T. & G.*) *Burgess*

Bethlehem, Albany co. and Sand Lake. September and October.

Aster lateriflorus thyrsoideus (*Gray*) *Sheldon*

Northville. August.

Aster lateriflorus grandis *Porter*

Sand Lake. October.

Aster lateriflorus pendulus (*Ait.*) *Burgess*

Lake Mohonk. October.

Aster prenanthoides porrectifolius *Porter*

Shokan, Ulster co. October.

Aster acuminatus *Mx.*

A singular form of this very variable species was found on the trail between Adirondack lodge and Mt Marcy. Its station is about a half mile from the camp. The flower heads were destitute of rays and had a peculiar bristly appearance, which was apparently due to an excessive development of the scales and pappus and a suppression of the florets. In a patch of plants several feet across all the flower heads were of this character. The plants were otherwise well developed and apparently in a good healthy condition.

Hieracium aurantiacum *L.*

A striking example of the rapidity with which the orange hawkweed is capable of increasing and spreading was seen along the Chateaugay railroad. In June 1897 a few patches of this odious but showy weed were noticed along the railroad between Dannemora and Chazy lake stations. In June 1898 there was an almost continuous display of the brilliant blossoms of this weed between these two stations. The plant had also made its appearance in many places along the railroad between Chazy lake and Loon lake. In some places its rival pest, *Hieracium praealtum*, had also made its appearance and was displaying its yellow blossoms.

Hieracium Marianum *Willd.*

Woods. Menands. June.

Doellingeria umbellata (*Mill.*) *Nees*

A small form of this aster is plentiful along the banks of streams in North Elba. It is generally less than 2 feet high, has few heads of flowers and its leaves are disposed to arrange themselves in two rows, one on each side of the stem. This is specially the case when the plants grow on the edge of the bank and are overshadowed by shrubs or small trees, which cause the plants to reach out over the water in their effort to obtain more sunlight.

Circaea alpina *L.*

This plant sometimes produces oblong white tubers by which it is renewed. Specimens showing this character were collected at New Russia, Essex co. and communicated by Mrs L. A. Millington.

Pinus divaricata (*Ait.*) *Sudw.*

Banks of the Ausable river near Upper Jay, Essex co. This is a newly discovered station for the northern scrub pine, also called Labrador pine and gray pine, and the most distant one from the shore of Lake Champlain. The others are at Wadhams Mills, Mt Discovery and about two miles south of Keeseville.

Juniperus Virginiana *L.*

Young trees of the red cedar sometimes retain their acicular leaves till they have attained considerable size. Trees 3 or 4 feet high were observed near Upper Jay and also near Dresden Station, on which all the leaves were acicular.

Juniperus nana *Willd.*

Three distinct forms of the low juniper occur about Dresden Station. Of these the common form is frequent. A second form has its branches much more erect and is only occasional. It is recognizable at a glance. Both these forms are frequently 3 or 4 feet high. The third form is smaller and has more slender leaves than the others. It is rare.

Juncus militaris *Bigel.*

Specimens with the long filiform leaves of the rootstocks were obtained in Big Moose lake in July. The large emersed leaves and stems appear to afford food for deer.

Eriophorum Virginicum *L.*

A very unusual form of the Virginian cotton grass was found near Big Moose station. In it the stems bore two clusters of spikelets, one terminal, as usual, the other smaller and lateral, 4 to 6 inches below the terminal one.

Carex scirpoidea *Mx.*

This rare sedge whose range extends northward to Greenland occurs on Wallface mountain. It varies from 6 to 12 inches or more in hight and its spike is rarely branched at the base.

Danthonia compressa *Aust.*

This grass is abundant about Fulton Chain. It usually grows in thin woods or along lumber roads in woods, but here it was found growing freely in light sandy soil in open places where it is exposed to the full rays of the sun during the whole day. In such places it forms tufts and is apparently more stout and vigorous than in partly shaded places.

Scolopendrium Scolopendrium *(L.) Karst.*

The discovery of a new station for this rare fern has been published. It is in a ravine near Perryville, Madison co., and is not far from the Chittenango Falls locality. It is said that the original New York station, where it was found many years ago by Pursh, has been destroyed and the fern is no longer there. It is to be hoped that this new locality for it will long escape such a fate.

Sphagnum Pylaesii *Brid.*

On the summits of the high peaks of the Adirondack mountains this moss overspreads the wet surface of bare rocks, lying prostrate as if too weak to stand erect. It was found growing on wet bare earth on the marshy border of a small pond back of Wallface mountain. It was more erect in its mode of growth.

Dicranum flagellare *Hedw.*

A peculiar form of this species was found by Mrs Britton near Whiteface inn, North Elba. In it the stems are long and slender, the flagellae few and the leaves narrow and secund. The specimens are sterile.

Tricholoma portentosum centrale *n. var.*

Pileus pale yellow or greenish yellow, sooty brown in the center; lamellae tranversely marked or irregularly striated with paler lines. Otherwise like the type. Sand Lake. September.

Galera lateritia albicolor *n. var.*

Pileus white, finely striate. Menands. June.

Galera Hypnorum umbonata *n. var.*

Pileus campanulate, 6 to 8 lines broad, strongly umbonate. In a sphagnous marsh. Kasoag. October.

Cortinarius corrugatus subsquamosus *n. var.*

Pileus marked with appressed spot-like scales. Sand Lake. September. The spots are darker than the general color of the pileus and give this variety a very distinct appearance.

Psilocybe caerulipes *Pk.*

This species was discovered in 1884 near Ballston lake. It was found a second time the past season near Round lake. It is evidently a rare species.

Lactarius distans *Pk.*

This species was described and published in 23d report, p. 117, and its resemblance to *Lactarius hygrophoroides* B. & C. was recognized. In 38th report, p. 129 it was regarded as a form of that species and united with it. In taking this view of the case it is necessary to suppose that the very brief description of *L. hygrophoroides* was founded on unusually small specimens and was also somewhat faulty. I have never been able to find a single specimen of our species with a pulverulent pileus, nor can the lamellae be correctly described as decurrent, though they are sometimes subdecurrent. In *Sylloge* the two plants are kept distinct and this seems to be the best course to pursue till we can be more certain of the unity of the species.

Another species has been described under the name *Lactarius Calceolus* Berk. This also has many points of agreement with our plant, but differs in others. Its pileus is described as smooth and the color of it and the stem is said to be brown buff. Its lamellae are very few, not exceeding 20, and are forked near the edge. These characters are not shown by any specimens of our plant that have come under my notice.

Boletus Ravenelii *B. & C.*

The flesh of this beautiful species has a very acrid taste. It is as sharp as that of *Lactarius rufus.*

Hydnum Caput-ursi brevispineum *n. var.*

Aculei very short, usually 2 to 4 lines long, some of them minutely and fimbriately divided.

Standing trunk of a maple tree. Auburn. September. G. H. Nye.

The bear's head hydnum, is an extremely variable species and he who expects to find every species of mushroom adhering strictly to one particular shape, size and outline will be disappointed in this one. Its solid fleshy body may vary in length from 2 inches to 8 inches. The teeth or spines may be 2 lines or 2 inches long, stout or slender simple or branched, and the color which is usually white may be tinged with yellow or pink. The essential character of the species is a solid fleshy body with short, projecting branches bearing numerous simple or branched spines of unequal length.

F

PLANTS OF THE SUMMIT OF MT MARCY

Mt Marcy is the highest mountain in the state, with an altitude of 5344 ft above the sea, and is in the center of a very rugged, mountainous region, where high peaks separated by deep and narrow valleys rise on all sides. From its summit an observer may look on mountain scenery in every direction, and obtain views unsurpassed in beauty and grandeur. A visit to this lofty station necessitates a tiresome walk of six or seven miles through the woods over a rough trail and up some steep acclivities. But the attractions of the place, the magnificent views it affords and the richness of its flora bring many visitors, and few return without feeling well rewarded for the labor and expense incurred. The open summit, the part above the timber line, may be compared to an ellipse whose long axis lies in a northeast and southwest direction, but whose circumference is quite irregular. It may be called treeless, but a few species of trees are found within its limits. They do not however attain the size nor even the shape of trees of the same species below the timber line. They have a mere shrub-like development, with small leaves, wide-spreading crooked branches and a starved and straggling appearance. The timber line is well marked in some places by abrupt precipices, at the base of which the forest suddenly terminates. In other places the declivity is less abrupt and no definite line marks the tree limit. The trees gradually become smaller as the altitude increases, till they are mere shrubs in size or cease entirely. On the eastern slope there are radiating ridges with intervening depressions in which the small balsam firs ascend almost to the summit. As might be expected, the northern and western slopes present the greatest expanse of open surface. But even here are limited patches of small balsam firs in depressions or where some sheltering ledge gives partial protection from fierce winds.

Two small, marshy areas, worthy of special notice, form a part of the open summit. One is a decided depression in the northeast slope. A rugged cliff lies on one side of it and a rocky knob on the other. Possibly a trap dike may have afforded the necessary conditions for its existence. The trail from the top of the mountain to Adirondack lodge passes through it. Its surface is level, soft and marshy. Several species of marsh plants grow here, including three or four sedges not found elsewhere on the open summit. The small cranberry and peat mosses are here, and here the thirsty tourist can find water to drink.

The other is on the eastern slope and is much nearer the top of the mountain. It is at the head of a ravine or depression between two ridges that extend far down the slope. Its water supply is not abundant. Indeed it is scarcely visible and the surface is not level, so that the presence of marshy ground and marsh plants here may at first seem mysterious. The plants that grow here are mostly small and unthrifty and the diminutive balsam firs that grow on three sides of this space avoid its marshy area completely. The water necessary to maintain the character of the place is probably supplied in part by the gradual melting of the snow and ice that accumulate during the winter under the massive boulders and in the crevices of the rocks above. This water would be very cold and would maintain a low temperature in the soil through which it percolates. The location of the place is such that the direct rays of the sun can not reach it during a considerable part of the afternoon. Only plants capable of enduring cold and shade could thrive in such a place. During the winter a vast amount of snow accumulates, for the prevailing north and west winds blow it from the higher ground and pile it in this sheltered nook till it is many feet deep. It remains here in the warm season longer than in any other place on the summit. In 1886, the summit of the mountain was visited June 10. A large part of this sloping marsh was yet covered by a huge snow bank, though the rest of the summit was bare. It is easy to see how the winter is prolonged and the summer shortened in such a spot as this, and such a modification of the growing season must have some influence on the plants of the place. Two sedges, a sundew and a rush are found here that I have not seen growing elsewhere on the mountain. Every botanist who visits the summit of Mt Marcy should examine these two marshy spots. They are cold botanical gardens of natural formation, full of interest and suggestive of thought.

This mountain summit affords a striking object lesson in the formation of soil and the development of vegetation. It is not difficult to imagine that there was a time when the summit of Mt Marcy was a bare rock with neither soil nor plant visible. The thin, heathy soil that now covers much of the surface gives no evidence of having been brought there from other sources, but on the other hand it does suggest the thought that it has been made on the spot, not by the action of sudden or violent agencies so much as by the action of slow and quiet influences continued for ages. "O! these mosses and lichens have made this soil." This was the first utterance of an esteemed and observant friend when for the first time his eyes rested on the open summit of the mountain as he stood upon the brow of the precipice which he had just climbed and which till that moment had kept the suggestive sight from his view. It does not need an extended examination to confirm the truth of the assertion so confidently made at first sight. Mosses and lichens at the present time are showing that they can grow on the bare surface of rocks. The boulders of the summit are variegated by the different colors of the lichens growing on their hard and almost naked surfaces. If we attempt to chip off a specimen we sometimes find the rock beneath the lichen more soft and scaly than elsewhere. Its presence seems in some way to have aided in the softening and disintegration of the rock. If we pluck a tuft of moss from the rock we find the lower part of the interspaces of the stems and leaves filled with dirt and sand, apparently composed of particles of disintegrated rock mingled with the decomposed remains of stems and leaves of mosses. This process of growth and decay of organic matter and the disintegration of inorganic matter aided by the action of the elements would in due time furnish sufficient soil to support the growth of small herbaceous plants. These in turn by their growth and decay would aid in increasing the quantity of soil covering the rocks till there would be sufficient to permit the growth of larger herbs and finally of shrubs and small trees. In this condition we now find the summit of Mt Marcy. The soil in most places is but a few inches deep and its appearance and texture indicate a large percentage of humus. This and other conditions due to the altitude of the place must necessarily have some influence in determining the character of the plants that grow there.

Only plants of the most hardy character could endure a climate in which frost occurs in every month of the year. No tree could grow many feet high without being overturned or broken down when exposed to such fierce winds as sweep over this mountain. A few plants grow here which grow no where else in the state except on the top of other mountains high enough to have open summits. Some grow here which grow also at lower altitudes, but they are so changed by their unfavorable location that they scarcely appear to belong to the same species. The balsam fir of the valleys is a most beautiful and symmetrical tree, but here it is without symmetry, a low shrub-like growth with long crooked branches, often covered with lichens and closely interlocked with those of neighboring trees. The branches are sometimes nearly as long as the trunk. The trees are from 1 to 6 feet high. In the depressions they are too tall to be disregarded in our rambles and their branches are too low and too closely interlocked to admit an easy passage through the almost impenetrable thickets they form. The little scrubby spruces scarcely venture to grow in an upright position. They spread over the ground in a half prostrate way as if in imitation of the low juniper or the ground hemlock. The season for plant growth and activity is so short that the annual elongation of their stems and branches is scarcely more than 1 or 2 inches.

The number of plants growing here that in lower stations are found in marshes and wet places is remarkable. Several species of peat moss, most of the sedges, blue joint grass, the cranberry, the swamp laurel, leather leaf and Labrador tea are examples of this kind. Showers are frequent, the top of the mountain is often capped by clouds, the low temperature retards evaporation, the mosses hold back the water and the abundant humus in the soil is also retentive of moisture. All these unite in producing conditions favorable to the growth of marsh plants.

The number of annual plants is very small. Most of the flowering plants are either perennial herbs or plants with woody stems. The mosses and lichens are mostly perennial. Some of the conditions incident to the locality must be unfavorable to the growth and persistency of annual plants.

The character of the flora is subject to change. Some species disappear, others appear. About 60 years ago the moss plant, *Cassiope hypnoides*, was growing here in a sheltered depression, but in none of my visits to this place have I been able to find it. In my early visits the tall white bog orchis was here, but it has not been seen in any of my recent visits. It is very probable that both these plants are no longer inhabitants of this station. In my last visit a small patch of timothy grass, *Phleum pratense*, was found growing on the very top of the mountain near the signal station. It must be a recent introduction, for it could not have escaped notice in such a conspicuous place if it had been there at the time of my previous visits. Some plants are apparently more abundant now than at my earlier visits. Then the scrub birch was seen in small quantity and appeared to be in danger of extinction. Now it is quite plentiful and apparently spreading. It is abundant about the borders of the sloping marsh mentioned on a preceding page.

Many of the species of flowering plants growing here are such as blossom early in the season. The sweet white violet, oblong fruited

Juneberry, fetid currant, mountain fly honeysuckle, bluets, leather leaf swamp laurel, Lapland rosebay, Lapland diapensia, scrub birch, green alder, bearberry willow, tufted club rush and alpine holy grass are examples of this kind. All these may be found in flower in June and some of them early in the month, soon after the snow has disappeared. On June 10, a few feet below the eastern margin of the snow bank still remaining at the upper end of the sloping marsh, the little bluets, *Houstonia coerulea*, had commenced its growth. A few feet away its flower buds had developed while the plants growing but a little farther down the slope were in blossom. These plants had been uncovered first and before the snow had melted and exposed the plants at the upper end of the marsh, these more fortunate ones had developed and unfolded their blossoms. By flowering early, more time remains in which to mature and ripen their seeds. The shortness of the growing season is perhaps a partial explanation of the presence of but few annual plants. Many of them require a longer season for their growth and the perfection of their seeds than is afforded here.

Some plants that might be expected to occur on the open summit fail to appear there. Some ascend almost to the tree limit but do not pass it. Dalibarda, Canada blueberry, sheep laurel, mountain holly, arbor vitae and cedar-like club moss are examples of this kind. Some of these do appear above the tree limit on mountains of less altitude but I have not seen them on the open summit of Mt Marcy.

The higher the mountain in a given region, the greater the extent of its open summit is likely to be, and the greater the extent of its open summit the larger the number of species of plants inhabiting it, unless it should reach above the limit of vegetation. As Mt Marcy surpasses its neighbors in altitude, so it surpasses them in the number of species of plants inhabiting its open summit. The number of species of flowering or seed bearing plants credited to it in the subjoined list is 75. A census of the species growing on the open summit of Mt McIntyre was taken a year ago and the number of species was found to be 48. Mt McIntyre is almost as high as Mt Marcy, standing second in rank. The number of species found on Mt Marcy exceeds those on Mt McIntyre by 27. But there are 29 species on Mt Marcy that were not seen on Mt McIntyre and two on Mt McIntyre that were not found on Mt Marcy. These two are *Kalmia angustifolia* L. and *Ilicioides mucronata*, (L.) Britton.

Seed bearing plants

Coptis trifolia (L.) *Salisb.*	Goldthread
Viola blanda *Willd.*	Sweet white violet
Arenaria Groenlandica (*Retz*) *Spreng.*	Mountain sandwort
Alsine borealis (*Bigel.*) *Britton*	Northern stitchwort
Oxalis Acetosella *L.*	Wood sorrel
Potentilla tridentata *Soland.*	Three toothed cinquefoil
Rubus strigosus *Mx.*	Red raspberry
R. Americanus (*Pers.*) *Britton*	Dwarf raspberry
Sorbus sambucifolia (*C. & S.*) *Roem.*	Western mountain ash
Spiraea salicifolia *L.*	Meadow sweet
Amelanchier oligocarpa (*Mx.*) *Roem.*	Oblong fruited Juneberry
Ribes prostratum *L'Her.*	Fetid currant
Chamaenerion angustifolium (*L.*) *Scop.*	Fireweed. Willow-herb
Drosera rotundifolia *L.*	Round leaved sundew
Cornus Canadensis *L.*	Bunchberry. Sugarberry
Linnaea borealis *L.*	Twin flower
Lonicera coerulea *L.*	Mountain fly honeysuckle
Houstonia coerulea *L.*	Bluets
Solidago macrophylla *Pursh*	Mountain goldenrod
S. alpestris *W. & K.*	Alpine goldenrod
Nabalus nanus (*Bigel.*) *DC.*	Low rattlesnake root
N. Boottii *DC.*	Boott's rattlesnake root
Vaccinium caespitosum *Mx.*	Tufted bilberry. Dwarf bilberry
V. Pennsylvanicum *Lam.*	Low blueberry
V. Penn. angustifolium *Gray*	Narrow leaved low blueberry
V. uliginosum *L.*	Bog bilberry
Oxycoccus Oxycoccus (*L.*) *MacM.*	Small cranberry
Chiogenes hispidula (*L.*) *T. & G.*	Creeping snowberry
Chamaedaphne calyculata (*L.*) *Moench*	Leather leaf
Ledum Groenlandicum *OEder*	Labrador tea
Kalmia glauca *Ait.*	Swamp laurel
Rhododendron Lapponicum (*L.*) *Wahl.*	Lapland rosebay
Rhinanthus Crista-galli *L.*	Rattle. Rattlebox
Melampyrum lineare *Lam.*	Cow wheat
Trientalis Americana *Pursh*	Star flower
Chelone glabra *L.*	Snake head
Diapensia Lapponica *L.*	Lapland diapensia
Gentiana linearis *Froel.*	Narrow leaved gentian
Empetrum nigrum *L.*	Crowberry
Betula glandulosa *Mx.*	Scrub birch
B. papyrifera *Marsh.*	Paper birch. Canoe birch. White birch
Alnus Alnobetula (*Ehrh.*) *K. Koch*	Green alder
Salix Uva-ursi *Pursh*	Bearberry willow
Picea Canadensis (*Mill.*) *B. S. P.*	White spruce
P. brevifolia *Pk.*	Swamp spruce
Abies balsamea (*L.*) *Mill.*	Balsam. Balsam fir

Juniperus nana *Willd.*	Low juniper
Habenaria dilatata (*Pursh*) *Hook.*	Tall white bog orchis
Streptopus roseus *Mx.*	Sessile leaved twist stalk
S. amplexifolius (*L.*) *DC.*	Clasping leaved twist stalk
Clintonia borealis (*Ait.*) *Raf.*	Northern clintonia
Unifolium Canadense (*Desf.*) *Greene*	Two leaved Solomon's seal
Veratrum viride *Ait.*	Indian poke
Juncus trifidus *L.*	Slender fringed rush
J. filiformis *L.*	Thread rush
Juncoides parviflorum (*Ehrh.*) *Coville*	Small flowered wood rush
Scirpus caespitosus *L.*	Tufted club rush
Eriophorum vaginatum *L.*	Sheathed cotton grass
Carex scirpoidea *Mx.*	Scirpus-like sedge
C. canescens *L.*	Silvery sedge
C. brunnescens (*Pers.*) *Poir.*	Brownish sedge
C. trisperma *Dew.*	Three fruited sedge
C. Magellanica *Lam.*	Magellan sedge
C. sterilis *Willd.*	Little prickly sedge
C. Bigelovii *Torr.*	Bigelow's sedge
C. pauciflora *Lightf.*	Few flowered sedge
Agrostis rubra *L.*	Red bent grass
Calamagrostis Canadensis (*Mx.*) *Bv.*	Blue joint grass
C. breviseta (*Gray*) *Scrib.*	Pickering's reed grass
Stipa Macounii *Scrib.*	Macoun's stipa
Poa laxa *Haenke*	Mountain spear grass
Deschampsia flexuosa (*L.*) *Trin.*	Wavy hair grass
Savastana alpina (*Sw.*) *Scrib.*	Alpine holy grass
Phleum pratense *L.*	Timothy grass
Cinna latifolia (*Trev.*) *Griseb.*	Slender wood reed grass
C. arundinacea *L.*	Wood reed grass

Spore bearing plants

Ferns

Dryopteris spinulosa (*Retz*) *Kuntze*	Spinulose shield fern
Phegopteris Phegopteris (*L.*) *Underw.*	Long beech fern

Club mosses

Lycopodium Selago *L.*	Fir club moss
L. annotinum *L.*	Stiff club moss
L. annotinum pungens *Spring*	Prickly stiff club moss
L. clavatum *L.*	Running pine. Club moss

Mosses

Sphagnum cymbifolium *Ehrh.*	Sphagnum Russowii *Warnst.*
S. medium *Limpr.*	S. strictum *Lindb.*
S. acutifolium *Ehrh.*	S. sedoides *Brid.*

Sphagnum Pylaesii *Brid.*
Andreaea petrophila *Ehrh.*
Cynodontium polycarpum *Schimp.*
Dicranum fulvum *Hook.*
D. fulvellum *Sm.*
D. elongatum *Schwaegr.*
D. fuscescens *Turn.*
D. scoparium *Hedw.*
Fissidens osmundoides *Hedw.*
Ceratodon purpureus *Brid.*
Barbula tortuosa *W. & M.*
Grimmia conferta *Funk*
G. ovata *W. & M.*
Racomitrium Sudeticum *B. & S.*
R. fasciculare *Brid.*
R. microcarpum *Brid.*
Conostomum boreale *Sw.*
Webera nutans *Hedw.*
W. elongata *Schwaegr.*
Aulacomnion turgidum *Schwaegr.*
Aulacomnion palustre *Schwaegr.*
Pogonatum alpinum *Roehl.*
Polytrichum strictum *Banks*
P. Ohioense *R. & C.*
P. juniperinum *Willd.*
Tetraplodon mnioides *B. & S.*
Myurella julacea *B. & S.*
Hypnum recurvans *Schwaegr.*
H. denticulatum *L.*
H. uncinatum *Hedw.*
H. rugosum *L.*
H. Crista castrensis *L.*
H. reptile *Mx.*
H. ochraceum *Turn.*
H. sarmentosum *Wahl.*
H. cuspidatum *L.*
H. Schreberi *Willd.*
H. splendens *Hedw.*
H. umbratum *Ehrh.*

Liverworts

Ptilidium ciliare *Nees*
Bazzania deflexa *Underw.*
Blepharostoma trichophyllum *Dumort.*
Cephalozia multiflora *Spruce*
Scapania nemorosa (*L.*) *Nees*
S. undulata (*L.*) *Dumort.*
Mylia Taylori *S. F. Gray*
Harpanthus scutatus *Spruce*
Jungermannia barbata *Schreb.*
J. gracilis *Scleich.*
J. Michauxii *Weber*
J. minuta *Crantz*
Marsupella emarginata *Dumort.*

Lichens

Cetraria aculeata (*Schreb.*) *Fr.*
C. Islandica (*L.*) *Ach.*
C. nivalis (*L.*) *Ach.*
C. ciliaris *Ach.*
C. lacunosa *Ach.*
C. Oakesiana *Tuckm.*
Evernia furfuracea (*L.*) *Mann*
E. furf. Cladonia *Tuckm.*
Alectoria jubata (*L.*) *Fr.*
Parmelia saxatilis (*L.*) *Fr.*
P. physodes (*L.*) *Ach.*
P. stygia (*L.*) *Ach.*
P. conspersa (*Ehrh.*) *Ach.*
Umbilicaria proboscidea (*L.*) *Stenh.*
U. erosa (*Web.*) *Hoffm.*
Umbilicaria pustulata (*L.*) *Hoffm.*
Nephroma laevigatum *Ach.*
Peltigera canina spongiosa *Tuckm.*
Ephebe pubescens *Fr.*
Biatora Diapensiae (*Th. Fr.*) *Tuckm.*
B. granulosa (*Ehrh.*) *Poetsch*
Buellia petraea (*Flot.*) *Tuckm.*
B. geographica (*L.*) *Tuckm.*
B. spuria (*Schaer.*) *Arn.*
Lecanora badia (*Pers.*) *Ach.*
L. ventosa (*L.*) *Ach.*
L. tartarea (*L.*) *Ach.*
Rinodina sophodes (*Ach.*) *Nyl.*
Stereocaulon paschale (*L.*) *Fr.*
S. condensatum *Hoffm.*

Cladonia symphycarpa *Fr.*
C. cariosa (*Ach.*) *Spreng.*
C. decorticata *Floerke*
C. pyxidata (*L.*) *Fr.*
C. gracilis (*L.*) *Nyl.*
C. grac. elongata *Fr.*
C. squamosa *Hoffm.*
C. furcata (*Huds.*) *Fr.*
C. rangiferina (*L.*) *Hoffm.*
Cladonia rang. sylvatica *L.*
C. rang. alpestris *L.*
C. amaurocraea (*Fl.*) *Schaer.*
C. uncialis (*L.*) *Fr.*
C. cornucopioides (*L.*) *Fr.*
C. cristatella *Tuckm.*
C. deformis (*L.*) *Hoffm.*
Thamnolia vermicularis (*Sw.*) *Schaer.*
Baeomyces aeruginosus (*Scop.*) *DC.*
Lecidea arctica *Sommerf.*

Fungi

Clitocybe laccata (*Scop.*) *Fr.*
Omphalia umbellifera (*L.*) *Fr.*
O. montana *Pk.*
Galera Hypnorum (*Batsch*) *Fr.*
G. Sphagnorum (*Pers.*) *Fr.*
Hygrophorus conicus (*Scop.*) *Fr.*
H. psittacinus *Fr.*
Russula foetens (*Pers.*) *Fr.*
Cantharellus umbonatus *Fr.*
Boletus illudens *Pk.*
Ustilago Caricis (*Pers.*) *Fckl.*
Puccinia Scirpi *DC.*
Peridermium decolorans *Pk.*
AEecidium houstoniatum *Schw.*
Coleosporium Solidaginis (*Schw.*) *Thum.*
Septoria brevis *Pk.*
Leptosphaeria Marcyensis (*Pk.*) *Sacc.*
L. Crepini (*West.*) *De Not.*
Sphaerella alnicola *Pk.*
Dothidella Alni *Pk.*
Hypoderma nervisequum (*DC.*) *Fr.*
Rhytisma salicinum (*Pers.*) *Fr.*
Taphrina bacteriosperma *Johan.*

Summary

Seed bearing plants		75
Ferns	2	
Club mosses	3	
Mosses	45	
Liverworts	13	
Lichens	45	
Fungi	23	
Spore bearing plants		131
Total		206

Viola blanda *Willd.*

The sweet white violet grows on the sloping marsh east of the signal station. It is the only violet of the summit. The marsh violet, *V. palustris* L. is credited to the White mountains of New Hampshire but has not yet been found in the Adirondacks.

Oxalis Acetosella *L.*

The wood sorrel is one of the abundant plants of the Adirondacks. Its pretty trifoliate leaves supported on slender petioles may be seen almost everywhere in the woods. Their pleasant acid flavor is quite refreshing to the thirsty tourist when in his long tramps through the woods he fails to find potable water. The flowers are attractive by their white petals striped with red or purplish lines. The ripened seeds are thrown to some distance by the sudden elastic bursting of the mature seed vessel.

Rubus strigosus *Mx.*

The red raspberry ascends to the open mountain summit, but rarely if ever bears fruit there. Once only have I seen it in flower in this elevated station. This was in August and but few flowers were seen. A single fruit composed of only three drupelets had begun to develop. The plant making this effort to bear fruit was far away from the summit and near the tree limit. The lack of vigor in the plants, the prevailing low temperature and the lateness in flowering, together with the probable absence of the insects suitable for the proper pollenizing of the flowers must make fruit bearing difficult and uncertain.

Cornus Canadensis *L.*

The bunchberry, also called dwarf cornel and sugarberry, is one of the very common plants of the Adirondack region. It is found almost everywhere, growing on the mountains, in the valleys and passes, in woods and marshes and open places. To the superficial observer it may appear to have a single cluster of leaves and a single flower with four broad white petals, opening just above the leaves. A closer observation would show that the supposed petals are involucral bracts which surround a cluster of several very small flowers. These are succeeded by a cluster of beautiful bright red fruits which when fully ripe are edible.

Lonicera coerulea *L.*

The mountain fly honeysuckle ascends almost to the very top of the mountain. It occurs behind the sheltering rocks but a short distance south or southeast of the signal station. It is one of the early flowering shrubs. Its leaves bear some resemblance to those of the bog bilberry, *Vaccinium uliginosum* L.

Solidago alpestris *W. & K.*

Two goldenrods inhabit this bleak place and in August give a cheerful aspect to it by the presence of their large heads of attractive golden yellow flowers. The alpine goldenrod is smaller than the mountain goldenrod, *S. macrophylla* Pursh, but its flower heads are quite as large and beautiful. Its leaves are narrower and it does not descend below the tree limit. The mountain goldenrod is less particular in its habitat and descends even to the valleys of North Elba. It is specially abundant in the half open and half shaded places among the small balsam fir trees that grow near the tops of the highest mountains and cover the summits of those which do not reach above the tree limit. In such places the ground is usually moist and often covered with mosses. Probably there is no Adirondack peak having an altitude of 3500 ft or more on which this goldenrod does not grow.

Nabalus Boottii *DC.*

In *New York state flora* this species is credited to Mt Whiteface and *N. nanus* DC. to Mt Marcy. Till the present year Mt Whiteface has been the only known station in our state for Boott's rattlesnake root, and it seemed a little strange that it should be on one mountain and not on the other. In August I visited Mt Marcy and was delighted to find it growing there in a secluded place sheltered on one side by a high outcropping rock and on the other by a dense growth of small balsam fir trees. The plants were thrifty and in flower.

Vaccinium caespitosum *Mx.*

The tufted bilberry is a rare species with us. The station on Mt Marcy and one on Mt Whiteface are the only localities where I have seen it. On Mt Marcy it was seen in several places the past season, but in every instance without fruit. Several years ago, however, fertile specimens were found there. In *Illustrated flora*, *V. Vitis-Idaea* L. is credited to the Adirondacks, but I have not yet found it. The low blueberry and its narrow leaved variety, *V. Pennsylvanicum angustifolium* Gray, both occur here. The bog bilberry, *V. uliginosum* L., is very abundant and somewhat variable. It has a narrow leaved form and a form with slender stem, in which the leaves appear to be half withered and the plant as if about to die. Possibly this may be a diseased condition of the plant.

Oxycoccus Oxycoccus (*L.*) *Mac M.*

The small cranberry is found in both the marsh spots previously described.

Kalmia glauca *Ait.*

The swamp laurel is not rare in the Adirondacks. It occurs in many of the marshes and on the marshy shores of lakes. On the summit of Mt McIntyre it is associated with its near relative the sheep laurel, *Kalmia angustifolia* L., but this species is strangely absent from the top of Mt Marcy.

Rhinanthus Crista-galli *L.*

The summit of Mt Marcy is the only place known to me in our state, where the rattlebox or yellow rattle grows. It may be found on the southwest slope not far from the signal station. It was discovered in this locality nearly 30 years ago and it still persists, apparently having no difficulty in maintaining its position. It is one of the very few annual plants found in this elevated place.

Picea Canadensis (*Mill.*) *B. S. P.*

On the eastern slope a dwarf spruce is occasionally seen among the small starved-looking balsam firs. It does not fruit and its foliage has not the silvery green hue commonly seen in the white spruce. But its twigs are glabrous and on this account it is referred to the white spruce. The abundant half prostrate form with pubescent twigs was formerly supposed to be a sterile dwarf of the black spruce, but because of its very short leaves and their peculiar hue I have considered it a mountain form of the swamp spruce, *Picea brevifolia* Pk.

Abies balsamea (*L.*) *Mill.*

The balsam fir is more abundant than any other of the dwarf forms of trees found on the open summit. Its hardy character is also shown by the fact that it sometimes bears fruit here, but its cones are much smaller than those produced by trees growing at lower altitudes. In the botanical descriptions of this species the cones are said to be two to four inches long. The cones of these dwarf trees are generally less than two inches long. They are usually 10 to 20 lines long. The leaves are shorter than usual and many of them are emarginate at the apex. In this character and in the short cones, the species makes an approach toward an agreement with the characters ascribed to Fraser's balsam fir, *Abies Fraseri* (Pursh) Lindl. Fraser's balsam fir is a southern species inhabiting the mountains of North Carolina, Tennessee and southwestern Virginia. The curious thing is that our northern species, under the influence of a prevailing low temperature, should develop characters similar to those belonging to a southern species presumably habituated to a higher temperature.

Juniperus nana *Willd.*

In my earlier visits to Mt Marcy, the alpine form of this species was there, but I have not seen it in more recent visits. The same remark may be made concerning the tall white bog orchis, the slender fringed rush, the scirpus-like sedge and Macoun's stipa. Nevertheless I have retained these species in the list, since it is possible that they are still there.

Carex Bigelovii *Torr.*

Bigelow's sedge is the only one found on the highest part of the mountain. It grows about the rock on which the signal is planted. With one exception the other sedges will be found on the two marshes. Probably no other Adirondack peak has as many species of sedges and grasses growing on it as this The list contains the names of eight sedges and 10 grasses.

Dryopteris spinulosa (*Retz*) *Kuntze*

The spinulose shield fern and the long beech fern ascend to the open summit of Mt Marcy, but they fail to fruit in this bleak locality. The former usually has a pale yellowish green hue, short fronds and pinnae more blunt than in well developed specimens. It is common, well developed and fertile among the small balsam firs below the tree limit. The latter is also smaller than usual and is evidently not fully at home here.

Sphagnum cymbifolium *Ehrh.*

The numerous peat mosses found here are good witnesses to the moist character of the place. They require a copious supply of water and refuse to grow where this is not obtainable. They also indicate, by their peculiarly modified form, the cold and windy character of the locality. Their stems are shorter than usual, the branches are crowded and the plants are closely compacted in dense cushions as if for mutual support and protection. In the more sheltered places they approach more nearly their normal development.

Sphagnum sedoides *Brid.*

This is a singular peat moss. It forms soft mats of limited extent upon the wet surface of rocks. Beginning at the margin of the thin soil covering the upper part of an outcrop of rock, the stems lie prostrate on the surface, parallel to each other, with their growing tips away from the soil and lower than their bases. The color of this peat moss is usually vinous red or purplish brown, but sometimes it is greenish, yellowish or yellowish brown. There are two forms, one having the stems simple or nearly so, the other bearing numerous short curved branches. The name *S. sedoides* was formerly limited to the simple form and *S. Pylaesii* applied to the branched form. In the recently published *Analytic keys to the genera and species of North American mosses*, the two forms are included as one species under the name *Sphagnum Pylaiei.*

Dicranum fulvellum *Smith*

A rare moss not yet found elsewhere in our state. In our specimens the dry capsule is slightly striate.

Dicranum elongatum *Schwaegr.*

This very distinct species forms dense mats on the ground or in fissures of rocks. The long slender densely compacted stems and erect or appressed leaves make it easily recognized. This is the only locality in which I have found it.

Barbula tortuosa *W. & M.*

This moss forms cushions on rocks. It is not very rare in the Adirondacks but is sterile on Mt Marcy.

Grimmia ovata *W. & M.*

A rare but pretty little moss, which forms small dark green tufts on bare rocks. It ascends to the very summit of the mountain and occurs on the rocks near the signal. It is fertile here. It is not known to occur anywhere else in our state, but in the *Manual* it is credited to various places in the Rocky mountain region.

Conostomum boreale *Sw.*

This is a very rare but most beautiful and attractive species. It forms cushions or tufts on rocks, and loves cold, mountainous regions. In our state it is peculiar to Mt Marcy. Its pale glaucous green color and its closely imbricated five ranked leaves make it a very distinct and easily recognized species. It bears fruit in July.

Aulacomnion turgidum *Schwaegr.*

Damp ground on the northwestern slope. Sterile and in limited quantity but a large moss easily known by its long, simple or sparingly divided stems and obtuse leaves. This is the only locality in our state where I have found it.

Tetraplodon mnioides *B. & S.*

This moss was found here many years ago by the late Prof. Lesquereux and recently by Mrs Britton. It is not common.

Hypnum sarmentosum *Wahl.*

Damp or wet places under overhanging rocks on the western and northwestern slope. Sterile and not abundant. Easily known by its dark purple or intermingled green and purple foliage.

Cetraria aculeata (*Schreb.*) *Fr.*

This is a rare lichen with us and occurs here and on Mt Whiteface in small quantity. The Iceland moss, *C. Islandica* (L.) Ach., is abundant.

Umbilicaria proboscidea (*L.*) *Stenh.*

The species of *Umbilicaria* are not plentiful here. The three recorded in the list were all found growing near each other on the same rock. This one extends northward to Arctic America and Greenland.

Thamnolia vermicularis (*Sw.*) *Schaer.*

This singular lichen attracts attention by its pure white color. It is plentiful, growing among mosses and other lichens on the thin soil of the mountain tops but it is always sterile with us. Its podetia or stems are simple or sparingly branched, hollow, sharp pointed 2 to 4 in. long and about as thick as a goose quill. It is more abundant on Mt McIntyre than on Mt Marcy.

Cladonia cornucopioides (*L.*) *Fr.*

Three Cladonias having red apothecia occur on the mountain top. They are the present species, *C. deformis* (L.) Hoffm. and *C. cristatella* Tuckm. The reindeer moss, *C. rangiferina* (L.) Hoffm., is abundant and variable. There are 13 species of Cladonia represented here. In very dry weather we can feel them crumble under our feet as we walk over them. To a botanist who dislikes to destroy these interesting plants, this is a disagreeable sensation.

Biatora Diapensiae (*Th. Fr.*) *Tuckm.*

A rare lichen inhabiting Diapensia sods and not known to occur elsewhere in our state. In *Tuckerman's synopsis of N. A. lichens* it is credited to the White mountains. Its near relative, *B. granulosa* (Ehrh.) Poetsch is common in the Adirondacks, growing on and encrusting turfy ground, dead mosses and decaying wood, both on mountain tops and in the valleys.

Buellia geographica (*L.*) *Tuckm.*

This lichen is interesting because of its beauty and its habitat. It grows on the hard surface of bare rocks from which it is scarcely possible to detach it. It forms a thin crust over the surface and by its contrast of bright yellow and black colors it attracts the attention of the observer and enlivens the otherwise unattractive and gloomy appearance of the dark, weather beaten surface of the rock. It carries us back in imagination to the time when the whole mountain top was bare rock, and by its peculiar habitat suggests the possibility that it may have been one of the first plants to take possession of this lofty rocky summit.

Omphalia umbellifera (*L.*) *Fr.*

This is the common mushroom of the mountain top. It is a small species whose cap is rarely more than an inch broad. Its color is commonly pale yellow in this locality, but it is sometimes white. *O. montana* Pk., found here about 25 years ago, has not since been found.

Boletus illudens *Pk.*

A single large well developed specimen of this fungus was found on the summit in August. The species also occurs on low land near the sea shore. It is evidently a species of wide range and capable of growing in places of very different altitudes.

Ustilago Caricis (*Pers.*) *Fckl.*

Abundant on Magellan sedge on the lower marsh. The fungus attacks the ovaries or seeds of the sedge and covers them with a black coat of spores.

Peridermium decolorans *Pk.*

In some seasons this parasitic fungus is plentiful on the leaves of spruces. The feeble ones of cold marshes and mountain tops appear to be specially liable to attack. It discolors the leaves it attacks, turning them yellow and increasing their unnatural, unthrifty or sickly appearance. In his revision of the rust fungi of coniferous trees, Baron Thümen considered this fungus a variety of *Peridermium abietinum* A. & S., but the differences between the two are sufficient, in my opinion, to warrant their separation as distinct species. They may be separated at a glance by the difference in the discoloration of the leaves attacked by them. The difference in the shape of their spores also affords a distinctive feature, but this is not visible without the aid of a microscope. Probably our fungus is the aecidial form of some species of Chrysomyxa. *P. abietinum* is the aecidial form of *Chrysomyxa Ledi* (A. & S.) De Bary, a species not yet found within our limits.

Hypoderma nervisequum (*DC.*) *Fr.*

This fungus forms a black line on the lower surface of leaves of balsam fir. It follows the vein of the leaf.

Rhytisma salicinum (*Pers.*) *Fr.*

A parasitic fungus which attacks the leaves of various species of willows in Europe, Asia and America. The only willow on the summit of Mt Marcy is the bearberry willow. The fungus forms large, black protuberances on the upper surface of the leaves and black spots on the lower surface directly under the protuberances. The leaves of this willow are so small that usually but one protuberance occupies a leaf.

G

EDIBLE FUNGI

Tricholoma portentosum centrale *Pk.*

CENTRAL TRICHOLOMA

PLATE 57 *fig.* 1-5

Pileus convex, sometimes slightly umbonate, viscid, virgate with innate blackish fibrils, sooty brown in the center, pale yellow or greenish yellow elsewhere, flesh white; lamellae moderately broad and close, emarginate, white or yellowish; stem equal, solid, white; spores broadly elliptic, 0003 in. long, .0002 broad.

This variety of the dingy Tricholoma, *T. portentosum*, is well marked by the colors of the cap, which is pale yellow or greenish yellow except in the center where it is sooty brown or blackish brown. Minute brown or blackish lines or fibrils radiate from the center toward the margin. When fresh or moist the surface of the cap is viscid. The flesh is white and the taste mild.

The gills are white or yellowish, rather broad and rounded at the end next the stem to which they are narrowly and slightly attached. Sometimes they are transversely striated or streaked by lighter lines. The stem is nearly equal in thickness in all its parts. It is solid and white or whitish both externally and internally. The cap is from 1 to 3 in. broad; the stem 1.5 to 3 in. long, 3 to 5 lines thick. The plants are gregarious and inhabit thin woods. They may be found in autumn. This is a fairly good edible mushroom, but not superior in any respect to many others that are more abundant. The typical form of the species, *Tricholoma portentosum*, has the cap of a uniform sooty brown color. Saunders and Smith figure a variety which occurs in England and which has the cap greenish yellow with a sooty brown center almost exactly like our plant. The brown color of the central part of the cap is very conspicuous and is suggestive of the name we have given to this variety.

Cortinarius corrugatus *Pk.*

Corrugated Cortinarius

Plate 57 *fig.* 6–13

Pileus fleshy, broadly campanulate or very convex, viscid when moist, coarsely corrugated, bright yellow, reddish yellow, tawny or ochraceous, flesh white; lamellae close, pallid when young, becoming tawny with age; stem rather long, equal, hollow, bulbous, pallid or yellowish, the bulb viscid and usually colored like the pileus; spores broadly elliptic, rough, .00045 to .00055 in. long, .0003 to .0004 broad.

The corrugated Cortinarius is a well marked and easily recognized species, quite distinct from its allies. Although the color of the pileus is variable, its viscid, corrugated surface and the viscid bulb of the stem afford distinctive and easily recognized characters. Sometimes the corrugations or wrinkles anastomose with each other in such a way as to give a reticulated appearance. The color varies from yellow to reddish tawny or reddish ochraceous. The margin in young plants is incurved.

There is a variety in which the cap is adorned with darker colored spots or scales. This bears the name, variety *subsquamosus*. In all other respects it is like the species.

The gills are closely placed side by side. They are at first of a pale hue but assume a darker and more definite tawny color with age. They are usually minutely uneven or eroded on the edge and transversely striate on the sides. They are slightly narrowed toward the stem.

The stem is generally a little longer than the width of the cap. It is commonly smooth but sometimes sprinkled near the top with minute yellowish particles and adorned below with a few fibrils. It is hollow and has a distinct viscid bulbous base, the viscidity of which is a peculiar feature. This bulb in the very young plant is even broader than the young cap that at this stage of development appears to rest upon it. The color of the bulb is usually like that of the cap, but the stem is commonly paler than either.

The cap is 2 to 4 in. broad; the stem 3 to 5 in. long, 3 to 8 lines thick. The plants are gregarious in woods and bushy places and may be found from June to September. It sometimes grows in considerable abundance and as an edible species it is not to be despised.

Hygrophorus puniceus *Fr.*

RED HYGROPHORUS

PLATE 58 *fig.* 1–7

Pileus thin, fragile, conical or campanulate, becoming expanded and often wavy or lobed, glabrous, viscid bright red, paler when old; lamellae broad, thick, distant, yellow, often reddish; stem equal or somewhat ventricose, hollow, yellow or red and yellow, usually white at the base; spores elliptic, .0003 to .0004 in. long, .0002 broad.

The red Hygrophorus is a rather large but very tender fragile species. Its bright red cap makes it a beautiful and conspicuous object. It is however often irregular and lobed or split on the margin. Its color is apt to fade to yellow when old. The whole plant is so fragile that it must be handled with care to prevent its breaking in pieces.

The gills are rather broad and moderately distant from each other. Their color is yellow or red and yellow and their attachment to the stem slight. The stem is rather thick and sometimes narrowed toward each end. It is hollow, at least when mature and is usually yellow at the top, red in the middle and white at the base. The cap is 1 to 3 in. broad; stem 2 to 3 in. long, 4 to 6 lines thick.

It grows in damp or mossy places both in woods and open grounds and appears from July to September. It surpasses our other bright red species in size. It may be separated from the carmine Hygrophorus, *H. coccineus*, by its larger size, the narrow attachment of the gills to the stem and the white color of the base of the stem. From the vermilion Hygrophorus, *H. miniatus*, it is distinguished by its glabrous viscid cap. All of these species are edible and no harm would come to the eater if one should be mistaken for either of the others. The red Hygrophorus is very tender and sapid and may be classed as an excellent though not an abundant mushroom.

Hygrophorus virgineus (*Wulf.*) *Fr.*

WHITE HYGROPHORUS

PLATE 58 *fig.* 8–12

Pileus fleshy, convex, often becoming plane or centrally depressed, sometimes irregular or wavy on the thin margin, moist, white, flesh white, taste mild; lamellae thick, distant, decurrent, white; stem firm, smooth, solid, equal or tapering downward, white; spores elliptic, .00025 to .0003 in. long, .0002 broad.

This species is white in all its parts and when regular and well formed is a pretty mushroom. But the large specimens are apt to be irregular. The cap is thick and fleshy except at the margin, and though it may be moist it is not viscid. In the European plant its surface sometimes cracks into small areas and becomes floccose when dry, but I have not seen these features in the American plant. The spores in our plant are generally a little smaller than those of the European plant.

The stem is sometimes thickened upward and enlarges as it enters the cap. The cap is 1 to 3 in. broad; the stem 1 to 2 in. long, 3 to 5 lines thick. It is found in grassy ground and pastures in wet weather from July to October. It sometimes occurs in meadows where it is overshadowed by tall grass. I know of no other wholly white indigenous Hygrophorus that grows in such places. Its flesh is less tender than that of the preceding species, but it is a good mushroom and one that would be more useful if more abundant, and more eagerly sought if better known.

Hypholoma incertum *Pk.*

UNCERTAIN HYPHOLOMA

PLATE 58 *fig.* 13–20

Pileus thin, fragile, at first ovate or subcampanulate, then broadly convex, hygrophanous, whitish, often tinged with yellow, commonly white when dry, the thin margin often wavy lobed or irregular and in the young plant adorned with fragments of the white floccose fugacious veil, flesh white; lamellae thin, narrow, close, adnate, at first whitish, then purplish brown; stem equal, hollow, easily splitting, white or whitish; spores elliptic, .0003 in. long, .0002 broad.

The thin fragile cap is sometimes split on the margin. It has a moist appearance when young and fresh, but this is lost with age and in dry weather. The prevailing color is white, but a yellow tint is often added, specially in the center. The surface is occasionally slightly radiately wrinkled.. The margin is sometimes curved upward, and a faint purplish tint apparently due to the color of the mature gills, is sometimes seen. In the young plant floccose fragments of the ruptured veil adhere to it, but these soon disappear.

The gills when young are nearly white, but they become darker with advancing age and when fully mature are purplish brown. They are attached to the stem by their entire width.

The stem is slender, cylindric, hollow and white. The cap is 1 to 2.5 in. broad; the stem 1 to 3 in. long, 1 to 3 lines thick. It grows in groups or in clusters in lawns, gardens, copses and pastures and may be found throughout the season if the weather is sufficiently wet. Its flesh is tender but not highly flavored, and it may well be regarded as a very good mushroom.

It bears such a close external resemblance to Candolle's Hypholoma, *H. Candolleanum*, that it has been thought by some to be a variety of it. This close similarity is suggestive of the specific name. It differs from that species in having the young gills white or whitish instead of violaceous and in the gills being adnate instead of adnexed. In the color of the gills and in the character of their attachment to the stem the species makes an approach to a similarity with the appendiculate Hypholoma, *H. appendiculatum*, so that it really holds a place intermediate between this and Candolle's Hypholoma. Its paler color and more even dry cap separate it from the appendiculate Hypholoma. Its habitat is also different and it is not so apt to grow in tufts.

Lactarius Chelidonium *Pk.*

Celandine Lactarius

Plate 59 *fig.* 1–6

Pileus convex, becoming nearly plane and umbilicate or centrally depressed, grayish yellow or pale tawny, sometimes with a few narrow zones on the margin, assuming bluish green tints or stains when old; lamellae narrow, close, adnate or slightly decurrent, grayish yellow, milk saffron color, scanty, mild; stem short, nearly equal, hollow, colored like the pileus; spores yellowish, globose, .0003 in. in diameter.

The celandine Lactarius is closely related to the delicious Lactarius, from which it may be separated by its smaller size, shorter stem, paler color, narrow gills and saffron colored milk. The cap is either broadly convex, nearly plane or depressed in the center. Sometimes the central depression is small like an umbilicus. The color is grayish yellow or pale tawny and in some instances there are two or three narrow bands or zones near the margin. When old, its cap becomes bluish green or is marked by bluish green stains.

The narrow gills are close together and are attached to the stem by their entire breadth or are slightly decurrent. They are at first of a peculiar grayish yellow or dingy cream color, but when old they are generally whitish pruinose. In some specimens they are wavy or forked at the inner extremity. The milk is scanty and paler than in the delicious Lactarius. It is nearly a saffron color and is mild.

The stem is short and cylindric or nearly so, glabrous, hollow and colored like the cap. It is sometimes spotted or stained with bluish green when old, but I have not seen it with such permanent depressed colored spots as often adorn the stems of the allied species, *L. deliciosus*, *L. subpurpureus* and *L. Indigo*. The cap is 2 to 3 in. broad; the stem 1 to 1.5 in. long, 4 to 6 lines thick. It grows in light sandy soil under or near pine trees and occurs from July to September. Its edible qualities are similar to those of the delicious Lactarius.

Lactarius distans *Pk.*

Distant-gilled Lactarius

Plate 59 *fig.* 7 to 11

Pileus firm, broadly convex or nearly plane, umbilicate or slightly depressed in the center, with a minute velvety pruinosity, yellowish tawny or brownish orange; lamellae rather broad, distant, adnate or slightly decurrent, white or creamy yellow, the interspaces venose, milk white, mild; stem short, equal or tapering downward, solid, pruinose, colored like the pileus; spores subglobose, .00035 to .00045 in. broad.

The distant-gilled Lactarius is similar to the orange Lactarius in color, but in other respects it is quite distinct. The short stem, widely separated gills and pruinose surface of the cap are distinctive features. The cap is broadly convex and often has a small central depression or umbilicus. In some cases it becomes nearly plane or even slightly funnel shape by the spreading or elevation of the margin. The surface, specially in young and in well developed specimens, has a soft pruinose or almost velvety appearance to the naked eye, and when viewed through a magnifying glass it is seen to be covered with minute persistent granules. The surface is sometimes wrinkled and frequently it cracks in such a way as to form small angular or irregular areas. The color is a peculiar one, varying somewhat in shade, but with tawny hues prevailing. It has been described as yellowish tawny and brownish orange. The flesh is white or whitish and has a mild taste.

The gills are wide apart, somewhat arched in specimens having a convex cap and slightly decurrent in those with fully expanded or centrally depressed caps. Their color is white or creamy yellow and in old and dried specimens they have a white pruinosity as if frosted by the spores. The milk is white and mild.

The stem is short, rarely more than an inch long, and is cylindric or tapering downward. It is solid and colored and clothed like the cap.

The cap is 1 to 4 in. broad; the stem is usually about 1 in. long, 4 to 8 lines thick. It is found in thin woods, bushy places and pastures from July to September. It is similar to the orange Lactarius, *L. volemus*, in its edible qualities. It has several features in common with *Lactarius hygrophoroides* B. & C. and *L. Calceolus* Berk. My reasons for considering it distinct are given in a preceding part of this report.

Lactarius Gerardii *Pk.*

GERARD'S LACTARIUS

PLATE 59 *fig.* 12 to 16

Pileus broadly convex or nearly plane, sometimes slightly depressed and rugosely wrinkled, sooty brown, flesh white, taste mild; lamellae rather broad, distant, adnate or slightly decurrent, white or whitish with venose interspaces, milk white, mild; stem short, equal or tapering downward, stuffed or hollow, colored like the pileus; spores globose, .00035 to .00045 in. broad.

This Lactarius closely resembles the preceding in size and shape, but it differs decidedly in the color of its cap and stem, and in having the latter hollow. It resembles the sooty Lactarius, *L. lignyotus* Fr., in color, but differs from it in having the stem short, the gills wide apart and wounds not changing color. In some specimens the center of the cap is furnished with a small umbo or papilla and the surface is wrinkled. It also has an unpolished appearance caused by a pruinosity similar to that of the preceding species but of a sooty brown color. The margin is thin and often wavy or somewhat lobed. The gills are so nearly like those of the preceding species that they need no further description. The plants grow in woods and open places from July to September. In flavor and edibility the species is very similar to the distant-gilled Lactarius. In nearly all the species of this genus that I have tried, the flesh is firm but brittle and the flavor not of a high order.

Cantharellus cinnabarinus *Schw.*

CINNABAR CHANTARELLE

PLATE 60 *fig.* 1-9

Pileus firm, convex or slightly depressed in the center, often irregular with a wavy or lobed margin, glabrous, cinnabar red, flesh white; lamellae narrow, distant, branched, decurrent, red; stem equal or tapering downward, glabrous, solid or stuffed, red; spores elliptic, .0003 to .0004 in. long, .00016 to .0002 broad.

The cinnabar Chantarelle is readily recognized by its color. It is externally red in all its parts, the interior only being white. It is a small species but often quite irregular in shape. Small specimens are more likely to be regular than large ones. Sometimes the cap is more fully developed on one side than on the other. This makes the stem eccentric or in some cases almost lateral. The color is quite constant, but in some instances it is paler and approaches a pinkish hue. It is apt to fade or even disappear in dried specimens. The gills are blunt on the edge as in other species of this genus. They are forked or branched, narrow and decurrent.

The stem is small, smooth and usually rather short. It is generally solid, but in the original description it is characterized as stuffed. The cap is 8 to 18 lines broad; the stem 6 to 12 lines long and 1 to 3 broad. It grows gregariously in thin woods and open places and may be found from July to September. It sometimes occurs in great abundance, which adds to its importance as an edible species. The fresh plant has a tardily and slightly acrid flavor, but this disappears in cooking. In Epicrisis, Fries referred this species to the genus Hygrophorus, and in Sylloge also it is placed in that genus, but it is a true Cantharellus and belongs in the genus in which Schweinitz placed it.

Cantharellus floccosus *Schw.*

Floccose Chantarelle

PLATE 60 *fig.* 10–14

Pileus firm, rather thin, elongated funnel form or trumpet shaped, deeply excavated, floccose squamulose, yellowish or subochraceous; lamellae thick, narrow, close, repeatedly forked branched or anastomosing, very decurrent, ochraceous yellow; stem short; spores ochraceous, elliptic, .0005 to .0006 in. long, .0003 broad, with an oblique apiculus at one end and usually uninucleate.

The floccose Chantarelle is a large and very distinct species. There is nothing with which it can easily be confused. When young it is narrowly club shaped or almost cylindric, but by the expansion of the upper part it soon becomes trumpet shape. The cavity extends even into the stem. The surface of the cap is somewhat floccose or scaly, but the scales may be thick and persistent or thin and evanescent. The color is yellowish inclining to ochraceous, but the inner flesh is white. The flesh is so thin that the weight of the whole plant is less than might be expected, judging from the size.

The gills are narrow, thick and blunt on the edge. They are so much branched and connected by cross veins that much of the hymenial surface has a coarsely reticulated appearance. Both the gills and the interspaces are ochraceous or yellow ochraceous. The stem is very short and may be either glabrous or hairy. In some cases it is elongated and somewhat curved or flexuous and extended like a horizontal root among fallen leaves. The cap is 2 to 4 in. broad at the top, and 3 to 6 in. long. The plants are gregarious and grow in woods from July to September. My trial of its edible qualities was very satisfactory and I consider it a very good mushroom for the table.

Boletinus pictus *Pk.*

PAINTED BOLETINUS

PLATE 61 *fig.* 1–5

Pileus convex or nearly plane, at first covered with a red fibrillose tomentum, soon spotted with red fibrillose scales, flesh yellowish; tubes tenacious, adnate, pale yellow becoming darker or ochraceous with age, their mouths rather large, angular; stem cylindric, solid, slightly and evanescently annulate by the remains of the fibrillose or webby veil, yellow and glabrous above the annulus, clothed and colored like the pileus below it; spores ochraceous, .00035 to .00045 in. long, .00016 to .0002 broad.

The painted Boletinus is a beautiful and easily recognized species. The cap of the young plant is wholly covered by a red fibrillose tomentum which soon separates into tufts or scales and reveals the yellowish color of the surface beneath. In the very young plant the tomentum of the cap is continuous with that of the stem and conceals the young tubes. This connecting part of the tomentum is usually of a paler or grayer color than the rest. With the expansion of the cap it separates from the margin and clings to the stem forming a kind of fibrillose or webby collar around it. This collar is apt to disappear with age. The flesh of the cap is yellowish and when cut or broken and exposed to the air it sometimes slowly assumes a dull reddish color.

The tubes of the young plant are pale yellow, but when mature they are ochraceous. Their mouths are angular and the edges of the dissepiments are uneven. The stem is cylindric or sometimes slightly thicker at the base than at the top. It is yellow at the top but colored and clothed like the cap below the slight collar. The cap is 2 to 4 in. broad; the stem 1.5 to 3 in. long, 3 to 6 lines thick. The species inhabits woods and mossy swamps. It is most often found under or near pine trees and occurs from July to September. The tubes near the margin of the cap do not separate easily from it and in preparing specimens for cooking it is not necessary to discard them.

Boletus Clintonianus *Pk.*

Clinton's Boletus

PLATE 61 *fig.* 6–10

Pileus convex, very viscid or glutinous, glabrous, golden yellow, reddish yellow or chestnut color, flesh pale yellow or whitish, tubes adnate, their mouths small, angular or subrotund, pale yellow when young, ochraceous when mature, changing to brown or purplish brown where bruised; stem equal or slightly thickened at the base, annulate, solid, yellow above the annulus, colored like the pileus below, the annulus thick, persistent, white or whitish; spores brownish ochraceous, .0004 to .00045 in. long, .00016 to .0002 broad.

Clinton's Boletus is variable in color. In the typical form, which is represented on plate 61, the color is reddish brown or chestnut, but specimens occur in which it is reddish yellow or even golden yellow. The surface of the cap is very viscid when moist, smooth and shining when dry. The flesh is whitish or pale yellow, but it is apt to fade or become dingy by exposure to the air. The taste is mild.

The tubes are at first concealed by the thick veil. This soon separates from the margin of the cap and forms a thick persistent collar on the stem. When first exposed the tubes are pale yellow, but they become ochraceous or dingy ochraceous in the mature plant. Their mouths are small and nearly round.

The stem is stout, solid and nearly equal in thickness in all its parts. It may be straight or flexuous. It is yellow above the collar and colored like the cap below it. Sometimes the extreme apex is slightly reticulated by the decurrent walls of the tubes, but it is not dotted. The cap is 2 to 5 in. broad; the stem 2 to 5 in. long, 4 to 9 lines thick. This Boletus grows in woods and in open places and is generally found under or near tamarack trees. It is specially fond of damp, mossy places, and occurs from July to September. Because of their viscidity the caps are often soiled by adhering dirt or fragments of leaves. It is well therefore to peel them in preparing them for the table and to remove the tubes. It is excellent in flavor and is a fine addition to our list of edible species.

EDIBLE FUNGI

C. H. Peck, Del.

Fig. 1 to 5 TRICHOLOMA PORTENTOSUM CENTRALE Pk.
CENTRAL TRICHOLOMA

Fig. 6 to 13 CORTINARIUS CORRUGATUS Pk.
CORRUGATED CORTINARIUS

C. H. PECK, DEL.

FIG. 1 TO 5 **TRICHOLOMA PORTENTOSUM CENTRALE** PK.
CENTRAL TRICHOLOMA

FIG. 6 TO 13 **CORTINARIUS CORRUGATUS** PK.
CORRUGATED CORTINARIUS


1
2
3
4
5
6
7

C. H. Peck, Del.

Fig. 1 to 7 HYGROPHORUS PUNICEUS Fr.
RED HYGROPHORUS.

Fig. 8 to 12 HYGROPHORUS VIRGINEUS Fr.
WHITE HYGROPHORUS.

C. H. Peck, Del.

Fig. 1 to 7 HYGROPHORUS PUNICEUS Fr.
RED HYGROPHORUS.

Fig. 8 to 12 HYGROPHORUS VIRGINEUS Fr.
WHITE HYGROPHORUS.

Figs. 13 to 20 HYPHOLOMA INCERTUM Pk.
UNCERTAIN HYPHOLOMA.


1
2
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C. H. PECK, DEL.

FIG. 1 TO 6 **LACTARIUS CHELIDONIUM** PK.
CELANDINE LACTARIUS

FIG. 7 TO 11 **LACTARIUS DISTANS** PK.
DISTANT-GILLED LACTARIUS

FIGS. 12 TO 16 **LACTARIUS GERARDII** PK.

Fig. 1 to 6 LACTARIUS CHELIDONIUM Pk.
CELANDINE LACTARIUS

Fig. 7 to 11 LACTARIUS DISTANS Pk.
DISTANT-GILLED LACTARIUS

Figs. 12 to 16 LACTARIUS GERARDII Pk.
GERARD'S LACTARIUS

EDIBLE FUNGI

Fig. 1 to 9. CANTHARELLUS CINNABARINUS Schw.

Fig. 10 to 14 CANTHARELLUS FLOCCOSUS Schw.

EDIBLE FUNGI

Fig. 1 to 9 **CANTHARELLUS CINNABARINUS** Schw.
CINNABAR CHANTERELLE

Fig. 10 to 14 **CANTHARELLUS FLOCCOSUS** Schw.
FLOCCOSE CHANTERELLE

EDIBLE FUNGI

C. H. Peck, Del.

Fig. 1 to 5 **BOLETINUS PICTUS** Pk.
PAINTED BOLETINUS

Fig. 6 to 10 **BOLETUS CLINTONIANUS** Pk.
CLINTON'S BOLETUS

EDIBLE FUNGI

Fig. 1 to 5 **BOLETINUS PICTUS** Pk.
PAINTED BOLETINUS

Fig. 6 to 10 **BOLETUS CLINTONIANUS** Pk.
CLINTON'S BOLETUS.

EXPLANATION OF PLATES

PLATE 57

Tricholoma portentosum centrale *Pk.*

CENTRAL TRICHOLOMA

Figures

1 Young plant

2, 3 Two mature plants

4 Vertical section of the upper part of a plant

5 Four spores × 400

Cortinarius corrugatus *Pk.*

CORRUGATED CORTINARIUS

6 Very young plant, showing cap and bulb

7 Young plant after elongation of the stem

8 Mature plant

9 Vertical section of the upper part of a plant

10 Transverse section of a stem

11 Four spores × 400

Var. subsquamosus *Pk.*

12 Immature plant

13 Immature plant showing the young gills

PLATE 58

Hygrophorus puniceus *Fr.*

RED HYGROPHORUS

1 Young plant

2, 3 Two mature plants, one showing the gills

4 Vertical section of the upper part of a young plant

5 Vertical section of the upper part of a mature plant

6 Transverse section of a stem

7 Four spores × 400

Hygrophorus virgineus (*Wulf.*) *Fr.*

WHITE HYGROPHORUS

8, 9, 10 Three plants showing three forms of cap

11 Vertical section of a plant

12 Four spores × 400

Hypholoma incertum *Pk.*

UNCERTAIN HYPHOLOMA

13 Three young plants united at the base
14 Immature plant showing the young gills
15, 16 Two mature plants showing the gills
17 Vertical section of the upper part of a young plant
18 Vertical section of the upper part of a mature plant
19 Transverse section of a stem
20 Four spores × 400

PLATE 59

Lactarius Chelidonium *Pk.*

CELANDINE LACTARIUS

1 Young plant
2 Mature plant with marginal zones on the cap
3 Mature plant without marginal zones
4 Old plant with cap fully expanded
5 Vertical section of a plant
6 Four spores × 400

Lactarius distans *Pk.*

DISTANT-GILLED LACTARIUS

7 Young plant
8 Mature plant with convex cap
9 Mature plant with cap fully expanded
10 Vertical section of a plant
11 Four spores × 400

Lactarius Gerardii *Pk.*

GERARD'S LACTARIUS

12 Young plant
13 Mature plant with convex cap
14 Mature plant with cap fully expanded
15 Vertical section of a plant
16 Four spores × 400

PLATE 60

Cantharellus cinnabarinus *Schw.*

CINNABAR CHANTARELLE

1, 2 Two young plants with convex caps
3, 4, 5, 6 Four mature plants of various forms
7, 8 Vertical sections of two plants
9 Four spores × 400

Cantharellus floccosus *Schw.*

FLOCCOSE CHANTARELLE

10 Young plant
11 Mature plant of small size
12 Mature plant of larger size
13 Vertical section of a small plant
14 Four spores × 400

PLATE 61

Boletinus pictus *Pk.*

PAINTED BOLETINUS

1 Young plant
2, 3 Two mature plants
4 Vertical section of the upper part of a plant
5 Four spores × 400

Boletus Clintonianus *Pk.*

CLINTON'S BOLETUS

6 Young plant with tubes concealed by the veil
7, 8 Two mature plants
9 Vertical section of the upper part of a plant
10 Four spores × 400

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