PROCEEDINGS

OF THE

ONONDAGA ACADEMY OF SCIENCE

VOLUME I.

EDITED BY

THE PUBLICATION COMMITTEE.

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PROCEEDINGS.

VOLUME I. BROCHURE I.

APRIL 17, 1896.

The first regular meeting of the Academy of Science was held in the rooms of the Onondaga Historical Association. Mrs. L. Leonora Goodrich, chairman of the committee on Natural Science of the Historical Association, of which the Academy was the outgrowth, presided. Meetings for the purposes of organization had been previously held on March 5, March 10, March 24, and April 7, and a temporary organization effected.

Prof. J. A. Dakin delivered a lecture entitled

THE WARBLERS AND HUMMING BIRDS OF ONONDAGA.

The lecture was illustrated with a large number of specimens of birds and their nests. In the discussion which followed many questions were answered by Prof. Dakin.

MAY 15, 1896.

SECOND REGULAR MEETING.

Mrs. L. L. Goodrich in the chair.

Prof. E. N. Pattee spoke of

THE ANALYSES OF THE GREEN STREET DIKE.

The rock had been studied in place in the water pipe trenches and analyses made of the same in the university laboratory. These clearly proved the igneous nature of the rock. The miner-

als contained in the rock and also the inclusions were carefully described and illustrated with specimens. Borings in the adjoining rock clearly proved that the igneous matter has been forced upward fully 6,000 feet.

Prof. Philip F. Schneider next reported upon

THE GEOLOGY OF THE GREEN STREET DIKES.

Four dikes had been found crossing Green street at nearly right angles and extending in a northerly direction. The eruptive matter had changed to a yellowish decomposition product in all of these but Dike IV., the most easterly. This had a foot of decayed material on either side of a twelve foot center of comparatively hard rock, and was traced northward to Highland place. The only sign of metamorphism noted was a slight change in color of the adjoining shales.

A record was made of the capture of a Lumpsucker, or seafish, in Onondaga Lake during the past week.

JUNE 5, 1896.

THIRD REGULAR MEETING.

Mrs. L. L. Goodrich in the chair.

Reports on the various branches of work were given as follows:

Conchology by Dr. W. M. Beauchamp.
Ornithology by Prof. J. A. Dakin
Geology by Prof. Philip F. Schneider.
Botany by Mrs. L. L. Goodrich.

OCTOBER 2, 1896.

FOURTH REGULAR MEETING.

Mrs. L. Leonora Goodrich in the chair.

The committee on Constitution being ready to report, the Constitution and By-Laws as published in a previous pamphlet were adopted.

The election of officers as provided in the constitution was then held resulting as follows:

President, Charles W. Hargitt.
Vice-President, S. R. Calthrop.
Secretary, Philip F. Schneider.
Treasurer, Miss Louise W. Roberts.
Librarian, Miss Virginia L. Jones.
Councillors, for one year, W. M. Beauchamp, E. C. Quereau; for two years, Eugene Haanel, John A. Dakin; for three years, John D. Wilson, Mrs. L. L. Goodrich.

The following list of charter members was then prepared.

Charles W. Hargitt, Henry A. Peck, John A. Dakin, W. H. Metzler, E. N. Pattee, H. W. Britcher, Louise W. Roberts, Joanna M. Campbell, Virginia L. Jones, W. M. Beauchamp, L. Leonora Goodrich, Jesse G. Huntington, Philip F. Schneider. Also by nomination, E. C. Quereau, Frank L. Mead, John D. Wilson S. R. Calthrop, Eugene Haanel, Franklin H. Chase, George A. Dakin, S. Ellis Crane.

November 20, 1896.

FIFTH REGULAR MEETING.

The president, Charles W. Hargitt, in the chair.

Forty-two persons present.

President Hargitt delivered his inaugural address entitled:

THE AIMS OF OUR ACADEMY.

An abstract of this address is published in the first brochure of the academy under the heading, Organized Science.

Mr. Horace W. Britcher read a paper entitled:

A SUMMER LABORATORY ON THE COAST OF MAINE.

Mr. Britcher told of his specialty, spiders, and also described the methods of securing material at the laboratory, by dredging, etc. Many specimens were also shown.

DECEMBER 18, 1896.

SIXTH REGULAR MEETING.

The president, CHARLES W. HARGITT, in the chair.

Forty-seven persons present.

Dr. S. R. Calthrop delivered an address entitled,

LOCAL GLACIERS.

He described the earth's surface at the time of the Glacial Epoch especially in this vicinity of Central New York, and then took up the results of the ice action in this vicinity. Skaneateles Lake was stated to be a result of glacial action.

Dr. Alfred Mercer next spoke about

ALASKAN GLACIERS.

He explained that the trip was taken with Prof. Muir, the discoverer of the famous glacier, and illustrated his talk with many maps, charts, and photographs.

Dr. E. C. Quereau spoke about

SWISS GLACIERS.

The character of these streams of ice, their method of formation, their appearance, and their habit of forcing their way down to the region of green fields and flowers, were all carefully described, and many photographs shown.

JANUARY 15, 1897.

SEVENTH REGULAR MEETING.

The president, CHARLES W. HARGITT, in the chair.

Forty-one persons present.

The report of the council recommended the election of Miss Mary Stanley and Gaylord P. Clark to active membership, and John H. Rollo and William W. Newman to associate membership.

The report was adopted and the candidates elected by formal ballot.

Dr. W. M. Beauchamp read a paper entitled,

WHAT A BOTANIST MAY FIND OF INTEREST IN THIS VICINITY.

More than a dozen violets with rare colorings, and a half dozen species of the mallow family, forty species of leguminous plants, forty umbelliferous plants, fifty of the rose family, twenty-five of the heath family, more than one hundred of the composite family, milk weeds five in number, and many other varieties were described in detail. He did not neglect the trees, finding a score of willows, five oaks, nine cone-bearing evergreens and others. Orchids, ferns, smilax, pond weeds, grasses (seventy-five in number), were given along with valuable suggestions that should excite the botanist who heard them.

FEBRUARY 19, 1897.

EIGHTH REGULAR MEETING.

The president, CHARLES W. HARGITT, in the chair.

Thirty-eight persons present.

The names of Joseph Glass and W. R. Maxon were favorably reported for associate membership and they were elected by formal ballot.

Prof. J. A. Dakin read a paper entitled:

HOW TO STUDY BIRDS.

He would divide Ornithology into three classes, the systematic, the philosophic, and the economic. By this classification we can trace not only the relationship of one bird to another, but to all vegetable and animal life. From the study of the structure the step is to the philosophic, or the bird in field and forest, where we find the reason for the differences in structure. The migrations of birds make a living calender.

March 19, 1897.

NINTH REGULAR MEETING.

The president, Charles W. Hargitt, in the chair.

Thirty-three persons present.

Dr. H. A. Peck gave a lecture entitled:

THE NEBULAR HYPOTHESIS.

The theory was carefully traced from the time that it was first given to the world by La Place, and the antagonism which it had provoked briefly outlined. He did not believe that Book of Genesis was intended as a treatise on Astronomy. When we read the Bible as an exposition of religious facts instead of scientific facts we are not led astray.

April 23, 1897,

TENTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

About two hundred and fifty persons present.

The meeting was held in the Physical Lecture Room at Syracuse University.

A set of memorial resolutions on the death of Prof. Edward D. Cope, president of the American Association for the Advancement of Science, was then offered by President Hargitt, and read by the secretary.

The resolutions were unanimously adopted as the sentiment of the society.

Dr. Eugene Haanel gave a semi-popular lecture on

THE X RAYS.

MAY 21, 1897.

ELEVENTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

About fifty persons present.

The report of the council recommended:

(1) The election of Miss Belle Douglass, Miss Gertrude Moorehouse, Mr. E. A. Winchell, and Mr. Wardner Hall as associate members.

(2) The payment of certain bills amounting to $9.20.

The report was adopted, the bills ordered paid, and the candidates elected by formal ballot.

A memorial of Edson S. Bastin was then read by Mrs. L. L. Goodrich, and the sympathy of the academy extended to his widow.

Prof. John D. Wilson spoke about

THE GONIATITE LIMESTONE.

This formation is best studied on the road east of Jamesville, where some twenty feet of dark fragile Marcellus shale separates it from the underlying Corniferous Limestone. The Goniatite Limestone is less than three feet thick at this locality, and has two horizontal seams, one six inches from the top, and the other

fourteen inches. The rock contains a large amount of organic matter, and has a distinct petroleum odor when first broken.

When by means of chisels driven into the upper seam, a slab is raised, the Goniatites appear on the lower side of the raised portion. The fossil can rarely be obtained free from the rock, because the upper side of the shell is usually broken, having been more exposed than the lower which was imbedded in the soft sea bottom.

Several varieties of goniatites, orthoceras, gomphoceras, and gyroceras, together with other genera contained in the formation were described.

June 18, 1897.

TWELFTH REGULAR MEETING.

The president, Charles W. Hargitt, in the chair.

About thirty persons present.

For the geological section Prof. J. D. Wilson reported that meetings were being held regularly the first Friday of each month, at which time papers are read and reports on local work given.

For the botanical section Mrs. L. L. Goodrich reported that a herbarium is being prepared for the academy. Two new plants have been discovered, one of which, a violet, is new to the state.

For the zoological section Mr. H. W. Britcher reported that our local insects and reptiles are being classified at present. Also that classified lists of shells and birds are being made in those departments.

September 17, 1897.

THIRTEENTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Twenty-five persons present.

Dr. W. M. Beauchamp gave an address entitled:

ARCHEOLOGY.

The speaker brought out the fact that this region was visited temporarily at least by the Esquimaux and the Mound Builders before the Indian came and made a permanent home here for himself. Aboriginal implements may be classified as of chipped and polished stone, of bone, horn, shell, and copper. The Indian knew nothing of flint drills, and scrappers, stone spears, slate gorgets, stone tubes, and curious bird amulets. These had become lost arts, showing an entire change in race before the Iroquois and Algonquins came. The Onondagas did little work in stone, preferring to work in wood and bone. Their harpoons of bone have been found in large quantities near Brewerton. The difference between the Indian's and the white man's wampum was explained; many of the belts for which great antiquity is claimed belong to the latter class, and therefore the traditions concerning many of them are really mythical.

OCTOBER 22, 1897.

FOURTEENTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Twenty-six persons present.

An invitation was extended to the Microscopical Society of America to hold its next annual meeting in Syracuse.

Reports of summer's work were presented by the various sections.

NOVEMBER 19, 1897.

FIFTEENTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Forty-four persons present.

Dr. Gaylord P. Clark gave an address entitled:

THE SENSORY FUNCTIONS OF THE SKIN.

December 17, 1897.

SIXTEENTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Twenty-five persons present.

The report of the council recommended:

(1) That the name of Albert Perrior be added to the charter membership list.

(2) That a public exhibit be given the third Tuesday in January.

(3) That Charles E. Wheelock and James M. Bronson be elected associate members.

(4) That Charles E. White, A. Clifford Mercer, S. G. Harris, and F. P. Knowlton be elected active members.

(5) That treasurer be authorized to secure some necessary supplies.

The report was adopted, the consent given, and the members elected by formal ballot.

Prof. E. N. Pattee read a paper entitled:

CHEMISTRY IN MODERN LIFE.

January 11, 1898.

SPECIAL MEETING.

Dr. Charles W. Hargitt, president of the academy, presided at this meeting which was held in the Historical Rooms.

A lecture was given by Dr. E. C. Quereau entitled:

CHANGES IN THE CRUST OF THE EARTH.

Dr. Quereau spoke of various agencies at work affecting the surface of the earth constantly, and illustrated his remarks with stereopticon views representing scenes in various parts of the country.

The president also spoke, calling attention to the work of the academy and its various discoveries, after which a social hour was indulged in, during which refreshments were served by the ladies of the academy.

January 21, 1898.

SEVENTEENTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Thirty-four persons present.

Mr. W. R. Maxon read a paper entitled:

THE DISTRIBUTION OF THE SCOLOPENDRIUM.

The election of officers for the ensuing year resulted as follows: President, C. W. Hargitt; Vice-President, Gaylord P. Clark; Secretary, Philip F. Schneider; Treasurer, Miss L. W. Roberts; Librarian, Miss Virginia L. Jones; Councillors, W. M. Beauchamp, Edmund C. Quereau.

February 18, 1898.

EIGHTEENTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Twenty-seven persons present.

The annual reports were presented as follows:

SECRETARY'S REPORT.

The report of the secretary, Professor Philip F. Schneider, is summarized as follows:

The academy has held twenty-two meetings at which papers and reports have been given. Fourteen have been held since our organization, October 23, 1896.

The following subjects have been discussed: Zoology, Glaciology, Botany, Ornithology, Electricity, Astronomy, Archeology, Geology, Physiology, Chemistry.

The membership at present consists of thirty active, and eight associate members.

The average attendance at regular meetings is thirty-six.

Two semi-popular lectures have been held during the year, one entitled the "X Rays"; the other, "Geologic Changes in the Earth's Crust."

Two papers read before the Geologic section have been printed in pamphlet form and distributed to the members. They are entitled: "A Geologic Fault Near Jamesville, N. Y.," and "The Limestones of Central New York."

TREASURER'S REPORT.

The treasurer, Miss Louise W. Roberts, made a report of the finances of the year, summarized as follows:

Receipts during the year	$42.80
Disbursements during the year	21.00
Balance on hand January 21, 1898	$21.80

LIBRARIAN'S REPORT.

Miss Virginia L. Jones, librarian, reported the receipt of three bound volumes, and a large number of pamphlets during the year.

REPORT OF SECTION A.

Mr. John D. Wilson, chairman of the Geologic section, reported that the regular meetings of the section had been discontinued since October. Previous to that time regular meetings had been held the first Friday of each month. Two of the papers read had been printed and copies distributed to all the members of the academy. A gasteropod shell, new to science, had been found in the Goniatite Limestone, and named *Macrochelius Onondagensis* by State Geologist John M. Clarke.

REPORT OF SECTION B.

Mrs. L. L. Goodrich, chairman of the Botanical section, announced that brief accounts of the work in that section had been given from time to time in the regular meetings, and that her annual report had already been printed among the papers of the Historical Association.

REPORT OF SECTION C.

Mr. Horace W. Britcher, chairman of the Zoological section, read a report which is summarized as follows:

During last spring six Batrachians were taken and during the summer six Reptilians.

In September a small specimen of *Scutigera forceps*, a myriadpod as yet rather uncommon here was taken.

A beginning in the collection of the smaller Mammalia was made by the trapping last December of three mole-shrews, *Blarina brevicanda,* and one white-footed mouse, *Calomys americanus.*

During the year one hundred and thirty bottles of spiders have been taken (from one to twenty specimens to a bottle) comprising probably seventy-five different species, of which six or seven are new to the county, but not to science. These were collected as follows:

May 9, shaken from the trees and bushes at the Indian Reservation, 16 species; August 3, from bushes and among dried leaves at Oak Orchard, 27 species; August 26, beneath stones at Onondaga Hill, 10 species; August 27, from bushes and beneath stones, Jamesville road, 15 species; October 1-10, shaken from cedar trees in the swamp on Jamesville road, 22 species; October 1-10, shaken from cedar trees along the top of rocks overlooking the Jamesville road, 32 species; from Cicero swamp, Syracuse, Jamesville, Pompey Hill, and Tully, 10 species.

President C. W. Hargitt delivered an address entitled:

THE FUTURE OF THE ACADEMY.

Special lines of work suggested in this for the year included the biology of the lakes, streams, canals, and swamps; some-

thing in meteorology; chemical analysis of soils, rocks, and water; exhaustive study of our limestones, which are full of interesting problems; our mineralogy, with a view to furnishing a successor to the Solvay Process Company when it follows the salt business in exit; a further campaign in botany; a study of the fungi, liverworts, and algae, and continued research in the field of insect life, which is vast and almost unexplored.

The report of the council recommended the election of Mrs. M. B. Ackerman and Dr. I. H. Levy to active membership, and Miss Ada A. Harris to associate membership.

The report was adopted and the members elected by formal ballot.

FEBRUARY 24, 1898.

A special lecture was given on this date by Dr. Ralph S. Tarr of Cornell entitled:

A TRIP TO GREENLAND.

The lecture was illustrated with numerous lantern slides and described the trip with the "Hope", which went to relieve Explorer R. E. Perry in 1896. The Cornell party were left at Greenland while the Hope proceeded farther north, and the study of the glaciers there furnished material for the lecture.

MARCH 18, 1898.

NINETEENTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Thirty-eight persons present.

The lecture committee reported receipts amounting to $18.20.

Prof. John A. Dakin read a paper on

ENTOMOLOGY.

At the conclusion of the paper the academy took an intermission to examine the collection of "Lepidoptera" which had been arranged for exhibition in the committee rooms.

The council recommended the election of John Van Duyn to active membership, Miss Carrie M. Allen and Adam C. Hazelbarth to associate membership.

The report was adopted and the members elected by formal ballot.

April 15, 1898.

TWENTIETH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

About sixty persons were present, the meeting being held in Lecture Room C at the Medical College.

Dr. A. Clifford Mercer gave a lecture entitled:

PHOTOMICROGRAPHY.

The lecture was illustrated with many slides showing his method of securing photomicrographs, and the arrangement of his apparatus, together with many views of the objects themselves, which were thrown upon the screen.

May 20, 1898.

TWENTY-FIRST REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Thirty-two persons present.

Dr. John Van Duyn gave an interesting talk entitled:

ANIMAL MORPHOLOGY.

This was illustrated with a large number of microscopic slides.

Additional facts along this same line were given by Prof. F. P. Knowlton.

A committee of five consisting of Dr. A. C. Mercer, Charles W. Hargitt, John Van Duyn, Mrs. L. L. Goodrich, and Miss Louise W. Roberts was appointed to act as a committee of arrangements for the summer meeting of the American Microscopical Society.

JUNE 17, 1898.

TWENTY-SECOND REGULAR MEETING.

PROF. J. A. DAKIN in the chair.

Fifteen persons present.

Mr. C. W. Wheelock outlined the work in the geological section. The season has been spent in making a careful study of the fauna of the Goniatite Limestone, the glacial evidences, and the chemical analysis of the Salina formation.

In the Botanical section Miss L. W. Roberts reported the discovery of the horned poppy, *Glaucium luteum,* new to this county. Because of the unfavorable weather fewer excursions were made than in previous years.

Mr. John A. Dakin reported one excursion of the Zoologic section; he is also contemplating the preparation of a life history of the birds of the county.

SEPTEMBER 16, 1898.

TWENTY-THIRD REGULAR MEETING.

DR. W. M. BEAUCHAMP in the chair.

Eighteen persons present.

Mr. Britcher reported the taking of brown hydras, and of a tree toad, *Hyla versicolar,* during the summer.

Dr. Beauchamp called attention to the opportunity afforded by the bone implements among the Indian relics for listing the extinct mammals of the county.

Dr. E. C. Quereau gave the address of the afternoon entitled:

THE GEOLOGY OF MARTHA'S VINEYARD.

OCTOBER 21, 1898.

TWENTY-FOURTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Fifteen persons present.

The report of the council recommended:

(1) The payment of certain bills contracted in connection with the meeting of the Microscopical Society.

(2) The election to active membership of A. A. Tyler, and S. G. Rogers.

(3) The election to associate membership of Dr. Mary E. Wright, Miss M. E. Hill, and Miss M. Rosenthal.

(4) The transfer of the name of Dr. S. G. Harris to the corresponding membership list.

The report was adopted, the bills ordered paid, and the candidates elected by ballot.

The first lecture of the afternoon was by Mr. H. W. Britcher entitled:

NOTES ON THE BIOLOGY OF BRANCHIPPUS POND.

This was followed by a paper on

RECENT WORK ON ANIMAL GRAFTING.

By Charles W. Hargitt.

The thanks of the academy were extended to the speakers.

November 18, 1898.

TWENTY-FIFTH REGULAR MEETING.

The president, Dr. C. W. Hargitt, in the chair.

Thirty-five persons present.

The publication committee was instructed to ascertain the cost of publishing a thirty-two page pamphlet.

The following paper was then read:

THE WHETSTONE INDUSTRY.

By Philip F. Schneider.

(Abstract.)

The speaker first gave a short history of the general subject of whetstones, in which he showed how they came to be employed and the circumstances leading to their use. This was followed by the description of local stone and the methods of its manufacture, concluding with an account of the Arkansas and Washita Novaculites.

THE LABRADOR STONE.

Introduction. In an almost inaccessible region among our southern hills lies a small body of water known as Labrador Lake. On either side of it rise lofty hills averaging more than five hundred feet above the water, while not far to the eastward is the loftiest summit in Central New York, towering more than one thousand feet above the water of the lake and over twice that distance above the sea. Up toward the top of these steep cliffs

are the layers of rock which have recently become famous as the outcrop of the Labrador Whetstone. The layers used for this purpose are some fine grained greenish colored sandstones, interbedded with brittle shales of the Portage Group, the entire mass being several hundred feet in thickness and capping the hills.

History. The fitness of this rock for sharpening purposes was recognized long before it came into prominence as a whetstone. The wood choppers of Fabius were among the first to note its effectiveness, for early in the fifties they are said to have used detached pieces from the neighboring ledges for sharpening their axes. One of the first of these primitive stones is still used by its finder, Mr. Hotaling, who picked it up on his farm near Labrador Lake over sixty years ago. It is still in good preservation, all the rough edges having long since been worn off. Indeed, a large share of the stones used for sharpening purposes have been obtained in just this way, having been picked up by their owners in the fields or rocky ledges, and have never seen the interior of a whetstone factory.

As this rough sandstone seemed to give such excellent results in all of the ordinary sharpening purposes for which it was used, there seemed to be no question but if it were properly cut, it would prove an excellent whetstone. Mr. M. M. Thomas of Manlius was one of the first who was strongly impressed with this idea, and he spent many days in trying to convince others of the advisability of manufacturing this rock into whetstones. As a result the Labrador Oilstone Company of Manlius, N. Y., was organized in the autumn of 1878. Mr. A. S. Wilcox of Manlius was the principal stockholder, Mr. M. M. Thomas, and Mr. Allan Gillette also holding shares. Quarters were immediately secured at Manlius on the site of what is now known as Cheney's Lower Foundry and work was begun with two small gang-saws, one rubbing plate, and one pair of wheel machines. But so great was the demand for the new stone that they could not begin to supply the same. It is estimated that ninety ton of the rough rock was cut during the first year. Increased facilities being demanded, the company decided to move their quarters and quadruple their facilities, This was accomplished by the addition of four pair

of large gang-saws. The industry continued to flourish and for several years no stone was cut excepting the Labrador oilstone, but after three years other kinds were also received until to-day there are over two dozen varieties of whetstone handled at the factory.

Structure of the Stone. While almost everybody is sufficiently acquainted with whetstones to know their most important uses and qualities, only a few know what to expect of a stone or how to care for one after it is obtained. Because the whole subject seems so simple and so common it is given little, if any, thought even by persons who constantly use whetstones, and they are the losers thereby. Many a valuable stone has been ruined by being used just once by the person who knows nothing about the proper care of a stone and who thinks there is nothing to know.

The Labrador stone has been described by Griswold as a hard tough sandstone of keen grit, particularly suitable for glass-worker's and carver's files.

There are at least three factors which determine the effectiveness of every whetstone: the size of the grit grain, its form and composition, and its structure.

Looking at these three qualities in the order mentioned we find (1) that the effectiveness of a stone will depend on its ability to scratch off particles of the substance which is being sharpened. Some one has said that the grains may be likened to sharp teeth, which are comparatively large, in coarse gritted stones, and small in those of finer grit. In the coarser varieties the spaces between the cutting points are so large that the scratches made on the tool are far apart, deep scratches are also made by these large points, and hence because the furrows are both deep and far apart it is impossible to obtain a fine edge with a coarse stone. The fine grained stones on the other hand show only small particles of grit crowded closely together, so closely in fact that each grain makes only a tiny scratch, while the furrows are so close together that the eye cannot distinguish the individual scratches and the result is a polished surface. These little grains cannot work rapidly and the amount of work given them to do should not be

large. In many instances it were better to first sharpen the tool on a coarse whetstone before using the finer variety. As both the rapidity and fineness of abrasion depend on the size of the cutting grains, the effectiveness of two stones will be as the cubes of the diameters of these grains. Hence a stone with grains of a diameter of one will abrade steel eight times as fast as a stone having grains with a diameter only half that size, but on the other hand the work of the latter stone will be eight times as fine.

2. In examining the effect of the form and mineral composition of the grit grain we notice that in the fine grained stones the grains should be uniform in size, for should there be large grains among the smaller ones it would be impossible to obtain a fine edge. The grains should also be angular in form otherwise they will not scratch, it is this rounded character of the grains which causes some stones to glaze after being used for a time. The amount of foreign matter among the grains also influences the abrading qualities, for if it separates the grains too much the scratches will be too far apart for effective work. The hardness of the material itself also effects its usefulness, but as silica is the abrading substance in almost all whetstones, it really makes the form of the silica the last influence. In sandstones the silica is in rough irregular grains, in schists in irregular massive grains scratching by means of angles and points, while in the novaculites it is in minute angular grains. The varieties of silica also vary slightly in hardness depending on the manner in which the particles are joined together.

Finally, in considering the effects of structure we find that the particles may be consolidated simply by pressure, either with or without the presence of earthy material; or they may be actually cemented together, with or without the presence of earthy matter; or consolidation may be due to both of these causes. In the Labrador stone we have an excellent example of a stone in which the cementation is the important factor although it has also been subjected to pressure. It contains very little earthy matter. An iron cement binds the particles of silica together, and so strong is this cement that unless the stone is used hard it has a tendency to glaze.

Glazing. One of the pricipal reasons why whetstones glaze is because they do not wear away fast enough. The wear on the stone should always be greater than the wear on the steel, or the stone will glaze. This may be due to the scratching points becoming worn and smoothed which frequently happens in coarse grained, strongly cemented stones; or it may be caused by the filling in of the spaces between the grains with particles of the metal so that the stone loses its scratching power, which is more likely to happen with hard, fine-grained stones; or it may be due to a combination of both causes. Hence it will be seen that slow wearing stones always have a tendency to glaze, while fast cutting stones, by constantly giving a renewed supply of scratching points, ought never to glaze. But all mechanics know that some of the best fast wearing stones also glaze. Whenever this has occurred it has almost always been due to the use of poor lubricants, or else to an imperfect knowledge of their use. There can be no question but that the dry surface of a whetstone cuts more keenly than does the same surface when covered with a fluid; still a dry stone heats the tool which should be diligently guarded against. With the coarser stones which are liable to heat tools water is used, but as all such stones are fast wearing plenty of water should be used, otherwise the particles worn off by the abrasion will unite with the water to form a paste which is slowly ground into the pores of the stone. This soon produces a glaze which will damage the stone if allowed to harden. Such glazed spots are sometimes of service in putting a finer edge on the tool than would the stone itself, but they should be carefully scraped off after finishing the edge of the tool. Water is also occasionally used with some fine grained stones but as such stones do not heat much its main use is for carrying away the powder formed. Since but a small amount of heat is generated by the use of such stones, it might at first appear feasible to use them dry, thus securing more rapid work, but the pores of the dry stone would surely become filled with the fine dust which is always worn off, thus causing it to glaze. As glazing due to this cause would prove equally injurious to a coarse stone it forms an important

objection to the dry use of any stone. The free use of water overcomes the objection

Oil, however, is more frequently used with the fine-grained stones. As it is thicker than water, it keeps the powder out of the pores by holding it on the surface of the stone, where it acts like a polishing powder in giving a finer edge to the tool. Very little oil is necessary, and it is better in every case to carefully wipe off the same after using and thus prevent the formation of a glaze due to the hardening of the oil and powder. Oilstones should always be kept moist thus preventing the formation of a hard gum by the drying of the oil. Frequently, porous stones are ruined by the hardening of oil in the pores of the stone.

Cutting Qualities. Sandstones, which are used for whetstone purposes, are divided into two kinds, the coarser and the finer, the Labrador stone being one of the latter. Two other fine sandstones have become more than locally famous, the Hindostan and the Adamascobite stones. The Labrador stone is harder and coarser than the others, its grain averaging 1-20 of a millimeter in diameter. In the common scythe stone they are 1-5 of a millimeter in diameter. As the work done is proportional to the cubes of the diameters of the grains, the Labrador stone does work sixty-four times as fine as the scythe stone, that is it will produce sixty-four furrows or scratches to one of the other. The Hindostan averages 1-50 of a millimeter in diameter and is fifteen times finer than the Labrador stone. The Arkansas stone also cut at the Manlius factory, is 1-100 of a millimeter in diameter and is thus eight times as fine as the Hindostan, 125 times as fine as the Labrador, and 8,000 times as fine as the scythe stone. Thus it may be seen that while the Labrador stone does not give a fine finish, still it is a great improvement over the common scythe stone, giving a good cutting edge for many kinds of work.

Griswold* gives the following microscopic description of a slide of the Labrador oilstone: "This stone is a fine-grained

*Annual Report of the Geological Survey of Arkansas for 1890 Volume III. Novalculites, by L. S. Griswold.

sandstone of greenish-gray color. The grains of quartz vary from .08 to .01 of a millimeter in diameter and many give polorization colors of a high order. The silica is imbedded in a matrix of calcareous earth containing a large percentage of iron, and there are present also flakes of muscovite, sometimes bent between the grains of silica. The iron is limonite unevenly distributed, which binds the particles of the stone together by its branching lines. The aggregation of iron into these lines represents probably a secondary process, but with the exception of this and some doubtful secondary quartz, the stone is an unaltered sediment. Considerable effervesence occurs when treated with dilute hydrochloric acid. The abrasive qualities are due entirely to the rough quartz grains."

This description emphasizes the fact that the Labrador stone is a strong slowly wearing stone with a grit of medium fineness. Its strength and resistance to wear being its important qualities. It is well adapted for kitchen stones into which it is manufactured in considerable quantities. In this respect it differs from both of the other fine grained sandstones, which are not strong enough for kitchen stones or files. The Hindostan is better fitted for the ordinary tools of carpenters and mechanics, while the Adamascobite is too soft and too expensive for an economical carpenter's stone. The Labrador stone, on the other hand, is not only a good but at the same time a handsome stone for all kitchen and table purposes, also for the various forms of files, and in fact for all whetstones where the tools permit of a considerable pressure, and do not require an extremely fine edge. It makes a first-class intermediate stone to use before finishing on the Arkansas. In speaking of its peculiar adaptation for kitchen purposes, a recent catalogue of the Pike Company says: "It is a handsome stone cut from a solid piece of Labrador rock. It has a sharp, medium coarse grit, and gives a splendid edge to carving knives. It is strong and more desirable for ordinary kitchen or table use than the emery, as it will not glaze, nor easily break."

Manufacture. The preparation of whetstones for use has always been a simple matter; the principle being the same for

every method of manufacture although the details differ somewhat in order to suit the various stones. The process consists of but two parts: (1) the rough shaping of the stone to the desired form, (2) the rubbing down of these rough stones to a smooth finish which is always accomplished with sand and water. Thus simple is the entire process. In the early history of whetstones it is quite probable that the grinding with sand and water on a smooth surface comprised the greater part of the process, and even now it takes much time and labor. Since, however, it has become customary to first saw the stones into shape, the grinding has been much reduced. At present the cutting is done by means of gang-saws, while the rub-wheel is employed in the abrading process. In the factory at Manlius they have eight pair of gang-saws, also three rub-wheels, and so successful is the industry that all are kept running constantly.

The Gang-Saw consists of a rectangular frame in which strips of iron one-eighth of an inch in thickness, three inches in width, and some ten feet in length, are placed edgewise at the desired distances apart, and parallel to the long sides of the rectangle. This machine is suspended in a horizontal position over the bed on which the stone to be sawed is placed, but attached to another framework sliding in oiled grooves; the latter is fastened at the four corners by chains which pass over wheels in the solid woodwork above and attached to an axle at about the center and top of the machine. To the wheel of the axle is attached a rope also passing over wheels at or near the end of the gang, and to the other end of this is fastened an adjustable weight. By means of this contrivance the gang-saw may be very easily raised, for simply pressing down on this weight turns the wheel and axle, winds up the chains, raises the sliding framework, and thus lifts the gang-saw attachment. By means of the adjustable weight which is always lighter than the framework and gang, the saws are kept constantly and steadily at work with a pressure equal to the difference of the two weights. While this machine, which is known as the Rope and Chain Gang, may seem a trifle cumbersome it has the great advantage of regulating itself to the char-

acter of the stone cut. Hence it is well adapted to the whetstone industry for here the rock is not always one great block of stone, in fact it is hardly ever that, but is almost always a mass composed of many small pieces which have been cemented together with plaster of Paris and sand in the saw bed and thus offers a somewhat varying resistance to the action of the saws. This is an important advantage over a " Screw-feed " gang in which the saws are moved down regularly by machinery at a rate proportional to the hardness of the stone. In the latter gang the saws become choked if hard spots are encountered, although they work well enough where the texture of the stone is perfectly homogeneous.

The cutting is produced by moving the saw gang backward and forward over the stone and freely supplying it with sand and water, the actual cutting of the stone being caused by the constant rubbing against the rock of these iron bands or saws in which the hard grains of sand become imbedded. As the sand is coarser than the grains of the stone, the latter are gradually scratched away.

The Sand Pump. Until recently it was necessary to employ workman, not only to watch the several gangs but also to supply the same with the sand necessary for sawing. One pair of gangs would usually furnish one man with plenty of employment. At that time the necessary water was supplied from a perforated pipe extending across the entire bed above the stone and from which the water was continually dripping. In thus trickling down it would first carry the sand to the saws, and then wash out the fine powder produced by the sawing. Recently, however, they have introduced the sand pump in the factory by means of which the water after carrying the sand to the saws and doing its work there, is drained from the groove surrounding the gang-saw and pumped up again to drop from the pipe above the bed. Thus the same sand and water is used over and over again making it possible to dispense with the extra workman, and enabling one man to watch an entire bank of saws instead of but one pair as formerly.

While the size of the wooden framework in which the saws are set measures five by ten feet, the stone bedding is somewhat less than this. More than three feet will have to be deducted from this length to allow for the eighteen inch swing of the saws, although the width of the bedding is nearly the same as that of the gang. Four by six feet is about the actual size of the stone bedding. The saws swing at the rate of sixty-five strokes per minute.

The Rub-Wheel, or rubbing-plate, is simply an iron disk one and five-eighths inches in thickness, and revolving in a horizontal direction. Water and sand are also used upon the wheel to assist in the abrading process. The sand is kept on a slightly elevated platform at the center of the wheel, and the water drips down upon it from an open pipe. Occasionally, if the dripping water does not carry along a sufficient quantity of sand, one of the workman will losen the sand a trifle with an iron hook, thus keeping a sufficient amount of sand constantly upon the wheel for polishing the stones. Above the wheel a stationary framework is placed, which comes close down to the surface of the wheel and divides the circle into several parts. Whenever it is desirable to grind a flat surface the stone is placed on the wheel next to one of the arms where it is weighted down and the moving wheel and grinding sand do the work. Much of the work, however, including all rounded edges, ends of slips, and particular forms, requires the special attention of a workman, who holds the stone in his hand while it is being ground. The wheels used at the Manlius factory are seven feet in diameter and are divided into five separate parts by the framework. Thus five men may work advantageously at one plate at the same time, but if necessary, each of these parts could accommodate two workman, although neither would then have the perfect freedom at present enjoyed. Fourteen men are now kept constantly at work in the rubbing department at Manlius.

The Sand used in the sawing is also deserving of mention. The regular sawing sand is obtained from Sylvan Beach, near Oneida Lake. It is a reddish brown in color and composed

almost entirely of fine angular quartz grains. At a recent visit to the factory during the snow blockade, which prevented their obtaining the regular sand I found that they were using the local village sand for cutting purposes with fair results. Specimens of it were obtained for comparison with the regular sand. It lacked the purity of the latter, containing hardened mud, small pieces of shale, and finely triturated limestone, together with the siliceous particles. Although no actual measurements were made, an examination with the low power showed that the grains varied more in size than the Oneida Lake sand, some of its particles being much larger than any of the grains of the latter. Occasionally sand has been used which was obtained from Lake Ontario, no specimens of this were examined.

The "green" sand as it is received at the factory can not be used on the rub-wheel, but must first be broken and reduced in the sawing process, after which it is preserved for use on the rubbing-plate.

Water Power is used at this factory, there being several falls along the course of this stream, which is noted for its steady power. This is due to the existence of the DeRuyter reservoir at the head of the stream which is used as a feeder for the Erie canal, thus giving a regular supply of water. A fifty horse power turbine wheel is used for obtaining the power.

Uses and Prices. We have already spoken of the fitness of the Labrador stone for glass-worker's and carver's files, also of its admirable adaptation for kitchen and table stones. It is also cut into carpenter's whetstones, axe stones, and smaller stones for mechanic's use. Its toughness makes it valuable wherever strength is a necessary quality, hence it is particularly adapted for coarser kinds of files. The following are wholesale prices quoted from the Pike catalogue for 1893. Cut into axe stones it brings 20 cents a pound, as slips it brings 50 per cent. more, wheels are classified at 50 cents per inch, while the kitchen hones bring from $4.00 to $5.00 per pound.

In conclusion it is well to remember that the Labrador stone is the only rock found in New York state which is used for whet-

stone purposes. When the industry began in 1878 only the Labrador stone was cut here. At that time they had but two gang-saws and one rub-wheel. Now they have three rub-wheels and eight pair of gang-saws. Then the gangs measured 3x5 feet, now they are nearly twice that size. Then they had one pair of wheel machines, now they use six pair. Then they employed from four to six persons, now they give constant employment to over forty men. Then but one kind of stone was cut, now they cut six different kinds, and handle two dozen varieties. Then about ninety ton of the rough stone was cut, last year they cut over five hundred ton.

The paper was illustrated with many specimens of whetstones from both the old and new world.

DECEMBER 16, 1898.

TWENTY-SIXTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Forty-five persons present.

The publication committee reported that the cost of a sixteen page pamphlet with printed covers would be twenty-three dollars. The report was accepted and the committee authorized to proceed with the publication.

The council report recommended:

(1) The payment of certain bills for postage, etc.

(2) The name of Miss Elizabeth Conklin for associate membership.

The report was adopted, the bills ordered paid, and the candidates elected by formal ballot.

Professor Philip F. Schneider spoke about

THE PALEOBOTANY OF ONONDAGA.

(Abstract.)

The *Arthropycus Harlani* of the Medina group is quite abundant; the Clinton formation contains several small fucoids,

also the *Buthrotrephis gracilis,* and the *Rusophycus bilobatus.* The latter has sometimes been said to be merely the cast of a King Crab impression, but it is doubtless a plant and the most abundant fossil of the group in our vicinity.

The Niagara formation contains a branching fucoid, while the beds of oolyte so closely resembling the roe of fish were no doubt formed by the cells of *Glocotheca* and *Gloeocapsa* in much the same manner that they form in Great Salt Lake and other places to-day. The Blue-green algae require carbon, which they abstract from the water, thus reducing its solvent power and causing it to deposit masses of the cells which form the beds on the bottom of water.

The lignilites of the Salina group are of mineral rather than vegetable origin, although in the flints of the Corniferous we find some protophytes, diatoms, and desmids, also imperfect land plants belonging to the class of Lepidodendrids.

The so-called coal of the Marcellus group is of vegetable origin, although the terrestial plant life at this time was quite limited, and the search for coal in paying quantities in this formation must ever prove futile. In the Hamilton period such life was more or less abundant as is proven by the lepidodendrids occasionally found at Pratt's Falls and other places, the trunk of a tree fern unearthed near Cazenovia, and the somewhat doubtful forms from Skaneateles Lake region which have been referred to the sigillaria and archeocalamites.

It is also of interest to note that our shells and petrified trees are occasionally pierced by a boring algae, belonging to the class of Schizomycetes, proving the existence of bacteria even at that early time.

The second paper of the evening entitled:

VARIATIONS IN TRILLIUMS,

was read by Mrs. L. Leonora Goodrich.

The paper was illustrated with a large number of specimens which had recently been returned to Mrs. Goodrich from the Philadelphia Academy where they had been sent for description.

The third paper was given by Dr. A. A. Tyler, entitled:

THE ORIGIN OF SPECIES THROUGH VARIATION.

The speaker said that the peculiar variations of the trillium, which had just been seen, might be accidental in which case the peculiarity would not be perpetuated, but sometimes peculiarities of plants do manifest themselves and are retained, thus forming new species. The way in which certain forms revert to their ancestral varieties was described. The new shoots which sprout from the stump of a willow tree look more like the willows of the Tertiary age than they do like the tree that was cut down, and thus with numerous other forms.

The paper was discussed by W. M. Beauchamp and Charles W. Hargitt.

After the literary program a social hour was spent together by the members during which refreshments were served by the members of the Botany club.

JANUARY 20, 1899.

TWENTY-SEVENTH REGULAR MEETING.

The president, DR. C. W. HARGITT, in the chair.

Seventeen persons present.

The annual reports were presented as follows.

SECRETARY'S REPORT.

The report of the secretary, Philip F. Schneider, is summarized as follows:

Stated meetings have been held on the regular dates during the year with an average attendance of 32.

Papers on the following subject have been delivered:

Botany, two; Zoology, two; Photomicrography, one; Entomology, one; Geology, one; Sectional reports, 3.

One popular lecture has been given during the year, entitled: "A Trip to Greenland" by Dr. R. S. Tarr.

We have also entertained as guests during the summer the members of the American Microscopical Society. A most enjoyable feature of this convention was the Microscopical Soiree, when several hundred invited guests were received by the officers of the society and of the academy.

Copies of the paper entitled, "The Topography of the Green Lake Region" read by Dr. E. C. Quereau before the Geological Society of America have been distributed among the members. A twenty-page brochure of the academy is now in the hands of the printer.

The present membership is as follows: Active, 32; associate, 17; corresponding, 1; total, 50.

TREASURER'S REPORT.

The treasurer, Miss Louise W. Roberts, made a report of the finances of the year, of which the following is a summary:

Balance on hand, January 21, 1898	$ 21.80
Receipts from all sources	153.05
Total	$174.85.
Disbursements during the year	107.39
Balance on hand, January 20, 1899	$ 67.46

REPORT OF THE LIBRARIAN.

The librarian, Miss V. L. Jones, reported the receipt of two bound volumes, and a large number of pamphlets.

REPORT OF THE GEOLOGICAL SECTION.

Read by Mr. H. W. Britcher, assistant secretary.

The officers of the section are: Edmund C. Quereau, chairman; Frank L. Mead, assistant chairman; Philip F. Schneider, recorder.

The work of the year has included: "A Study of the Green

Lake Drainage," by E. C. Quereau; " A Comparison of the Goniatite Fauna with that of Equivalent Limestone in western New York ", John D. Wilson; A collection of photographs of important rock exposures, falls, and quarries, F. L. Mead; The Study of the Pleistocene Deposits at Onondaga Valley ", C. W. Wheelock; The Disturbances along the line of the Helderberg Escarpment, Philip F. Schneider; Facts relating to the thickness of the Tully Limestone, G. A. Dakin.

Mr. Frank Hall has also reported the discovery of a seam of quartz crystals in the Corniferous rock at the Indian Reservation. This is to be studied in an endeavor to discover the source and method of formation of the same.

REPORT OF BOTANICAL SECTION.

Read by Mrs. L. Leonora Goodrich, chairman.

The Botanical section has continued the work in ferns, mosses and liverworts, upon which we were engaged at the time of last annual meeting, until early spring. An extremely warm season prevented accomplishing all we desired by way of botanizing, especially through swamps; our usual rendezvous during July and August. May 30, the exact anniversary of the day we found *Cubelium concolor* (gree violet) last year, an unsuccessful search was made in same locality—Round Top. In May several members of the Botanical section found quantities of *Epigea repens,* (Trailing Arbutus) a few miles from Phoenix. This beautiful little harbinger of spring has become nearly exterminated from localities nearer home where it was plentiful a few years ago. Mr. Britcher reports having found *T. erythrocarpum* southeast from Green Lake, in woods at entrance of Tully Lake Park, and Labrador Pond. This pretty painted trillium cannot furnish too many localities to gratify the eye for beauty. Mr. Britcher also furnishes localities for several orchids, among which the rare *Cypripedium Hookerii* blossoming in woods north of Britton's quarry.

Was delighted to hear of that as but one locality is known in the county, *viz,* that furnished by Mr. Beauchamp, near Baldwinsville.

We are pleased to report three plants new to this locality, *Glaucium Glaucium,* yellow horned sea poppy, found by Miss Louise Roberts near the old reservoir, in June. This is a European plant and found here before, only very sparingly near the Atlantic coast. Miss Roberts has made efforts to perpetuate this plant, having collected the seeds and transplanted one of the roots as well as protected the roots that remained.

To Mrs. Ackerman belongs the credit of finding in the southern part of the city *Sanguis orba* (Burnet). A specimen sent to Prof. Peck calls forth the fact that she has added one more plant to the state herbarium. This plant is also introduced from Europe where it is used as a salad.

During August in a lot near my house I found *Crepis virens,* not mentioned by Grey but identified through Britton's Illustrated Flora. Is noticed in the New York State annual report of 1864 as found in Greenwood Cemetery, Long Island, by Mr. Merriam, therefore not new to the state, but the next best thing, new to this county. Probably introduced here with grass seed. We can hardly claim either of these as indiginous.

July 16, in company with two friends visited Tamerack swamp in search of *Zigadenus elegans* and *Tofieldia glutinosa;* two lillies I have never found elsewhere. Tofieldia we did not find though I received it from there about four weeks later, but *Zigadenus elegans* in large quantities. This plant I found in small quantities in Tamerac about sixteen years ago, but could not identify species by any of the existing botanies, though nearest *Zigadenus Glaucus* of Grey. I sent a specimen with statement of attempts and failures to Prof. Grey. In his reply he expressed great delight at receiving the first specimen he had ever seen, and stated that description was wrong and should be corrected in his next edition.

In his last edition not completed at time of his death, it was so corrected under the name of *Zigadenus elegans.*

We also found during that excursion *Parnassia Caroliniana,* three different *pyrolas,* different *galliums* and two orchids. It appeared a grand time for a good find, for one could scarcely step without crushing flowers, but was an excessively warm day

and we did not penetrate the swamp many rods, before two of us, overcome by the heat, retraced our steps, taking a seat on the dusty sidewalk to await the arrival of the cars. I did not again venture to investigate a swamp.

August 20, we found in woods not far away from the university *Dasystoma Pedicularis* (Fern leaved Fox glove,) with its large, yellow, snapdragon flowers. Has been found in the county before I am told, but this is the first I ever saw or heard of. Near it was a fine patch of *Polygala verticillata.*

August 26, *Cimicifuga racemosa* was found on Round Top, also in Oakwood; singular that the two only known localities for that tall and graceful plant should be the two cemeteries.

Miss Stanley and I spent the first week of July on the shores of Oneida Lake near Shackleton's Point, there we found water willow, *Hydrocotile Americana* and the very rare *Selaginella spinosa.* I have yet to learn that this is not new to this state. It may be. I found it in Bangor, Penn., eleven years ago, the only specimens I have ever found.

During September, among the salt blocks found quantities of the beautiful little lavender colored *Tissa marina,* (sand spurry,) and *Aster subulatus,* (salt marsh aster,) both succulant plants, as most of the salt marsh plants are.

Asters have been unusually fine this year. Mrs. Ackerman found a bright red *Nova Anglae* near the University Hill, and Mrs. H. D. White several pink ones in Tamerac, commonly they are blue.

We meet for class work once in two weeks, and once a month evenings for the reading of papers.

In October we met with Miss Stanley and listened to a very interesting talk, a review of work at the summer school at Cornell during two weeks in August.

In November we met with Mrs. T. J. Leach where an interesting and instructive paper was read by Mrs. Hattie White on Papaveraciae, followed by an entertaining discussion.

In December, we met with Mrs. White. A paper was read by Mrs. Goodrich on Insectivorous plants, followed by interesting discussions. Next meeting, on Friday next, we will be with

Mrs. Goodrich. Miss Campbell is expected to entertain, subject not announced.

Friday evening, December 16, members of the Botanical section furnished a literary and social entertainment. We had a very pleasant discussion on the "Variations of Plants," Mrs. Goodrich illustrating with about twenty different variating trilliums of the grandiflorum species. All were collected in this county, and nearly all in the same locality, one Saturday in the month of May.

REPORT OF ZOOLOGICAL SECTION.

Prof. John A. Dakin, chairman, gave a verbal report outlining the work accomplished during the year.

REPORT OF COUNCIL.

The council recommended the payment of certain bills for postage rendered by the treasurer and corresponding secretary.

The election of Mr. D. S. Chatfield as active member, and Mr. George Lynch as associate member.

The report was adopted and the candidates elected by formal ballot.

ELECTION OF OFFICERS.

The following officers were then elected: President, John Van Duyn; Vice-President, John A. Dakin; Secretary, Philip F. Schneider; Corresponding Secretary, Horace W. Britcher; Treasurer, Miss Louise W. Roberts; Librarian, Miss Virginia L. Jones; Councillors, Gaylord P. Clark, Ernest N. Pattee.

FEBRUARY 17, 1899.

TWENTY-EIGHTH REGULAR MEETING.

DR. CHARLES W. HARGITT in the chair.

Twenty-two persons present.

The retiring president, Dr. C. W. Hargitt, gave a brief

address entitled: "The Achievements of the Academy" and introduced the president-elect, Dr. John Van Duyn, who spoke pointedly on the present condition of the academy and suggestively for its future.

March 17, 1899.

TWENTY-NINTH REGULAR MEETING.

The president, Dr. John Van Duyn, in the chair.

Fifteen persons present.

Dr. D. M. Totman was elected to active membership.

Principal J. D. Wilson read a paper entitled:

THE HISTORY OF GEOLOGIC SCIENCE.

Mr. W. W. Newman read the second paper, entitled:

ONONDAGA GEOLOGY.

This was an account of his own observations and detailed the conditions of surface geology, especially as they occurred in the valley a half century ago.

Mr. C. E. Wheelock read the third paper, entitled:

THE ORISKANY SANDSTONE.

(Abstract.)

The Oriskany sandstone of Onondaga county would not be worth considering from an economic point of view, for it is nearly worthless for any useful purpose. It has, however, been used for building canal walls, and farm fences. In other places, it has been used for the manufacture of glass. (Notes on the Geology of Onondaga county, Schneider, page 26.)

To the geologist this rock is interesting on account of its position in the geological series, dividing conformably the two great limestone formations, the Lower Helderberg and Cornifer-

ous. Other interestng features are its variable thickness, peculiar fossils, its mineral composition, and its remarkable development of certain forms of marine life, especially the Brachiopods.

Beginning on the east side of the county at Manlius and proceeding nearly westward, there are many exposures of the rock. This line of exposure is approximately identical with the strike, except in some cases the rock is exposed along the sides of the north and south valleys, at points south of the line of strike. (See Geological map of Onondaga county, State Geologist's report, 1895.) It is always found covered by the Corniferous limestone and the points where it occurs are easily located. Its greatest thickness is thirty feet, in the southern part of the town of Elbridge. The minimum thickness is at the Split Rock quarries, where there is only a trace to be seen. The mineralogical composition, color, etc., are given in the descriptions of the different outcrops which follow.

At the quarry one-half mile east of Manlius, the formation is eight inches thick. The lower four inches is an imperfectly consolidated shale and, perhaps, should be referred to the Helderberg, but as there is a well marked line of division between it and the underlying limestone, it seems proper to include it in the Oriskany, especially as there are no fossils to determine the matter. This part is overlaid by a black concretionary, argillaceous sandstone, which is well preserved and full of fossils, mostly in the form of casts.

Rensselaeria ovoides, which is rare at other exposures further west, is plentiful here. *Strophomena rhomboidalis,* which is considered rare for this formation, also occurs here.

The underlying Helderberg contains corals, besides the characteristic species *Stromatapora concentrica* and *Lederditia alta.*

The overlying Corniferous limestone is peculiar in that it contains great quantities of flint distributed in nodules, which are arranged in layers parallel to the stratification. This feature of the Corniferous is usually confined to the upper part but in this case the flints are nearly in contact with the Oriskany.

The nodules at this place present a banded structure or alter-

nating white and blue concentric coats, with a geodetic cavity of quartz crystals forming the center of some of them.

At the Green Lake west of Jamesville this formation occurs as a thin bed of black concretions, three inches thick, with a small quantity of yellow sand. The exposure described is just west of the lake and is not easily located, owing to the talus which covers it at many points.

The fossils are few and poorly preserved. Parts of the casts of *Spirifera arenosus* and *Strophomena rhomboidalis* were seen.

At Britton's quarries on the eastern ridge of Onondaga Valley, four miles southeast of Syracuse, the sandstone outcrops on the southern side of the quarry. It is of a rusty red color, twenty-one inches thick, with many dark, globular concretions. The rock is quite fossiliferous; the lower part in particular, seems to be made up of the casts of the various species. The rock is disintegrating near the top and is darker in color. The overlying layer of Onondaga limestone contains some sandy nodules in the lower part. These nodules are quite often in contact with characteristic Corniferous Corals.

At Hibbard's quarry, one-half mile south of Britton's, the Helderberg and Corniferous limestones are separated by a thin bed of rusty sandstone, five or six inches thick. The black concretions are also present.

At Russell's quarry, just south of Hibbard's, the Oriskany is to be seen near the top of the eastern wall of the quarry, likewise the southern wall. The exposure, with six feet of Corniferous, passes beneath the over thrust Helderberg, at the line of fault which crosses the quarry at this point. It does not occur on the uplift farther south. The rock is about eight inches thick, the lower half being unconsolidated and including some thinly laminated clay not thicker than paper. The upper part is harder and exhibits many shades of grey and black colors. Dark colored concretions and fragments of rock are included in it. Some samples of the rock are decidedly calcareous. There are also a few white quartz pebbles as large as beans. A few fragments of fossils can be found here.

The layer of underlying limestone is sandy in the upper part.

The concretions are also to be seen in the overlying Corniferous. Near the fault line the overlying layers of limestone are brecciated. The cementing agent is calcite with some fluorite crystals.

On the Murry farm, one-half mile east of the Onondaga Castle hotel, the sandstone occurs near the roadside, just south of Mr. Murry's house. The stone is twenty inches thick. The black concretions are present in the lower part. The rock is full of fossil casts. The Onondaga above contains many black nodules, some of which are eight inches in diameter.

The underlying Helderberg is entirely composed of the characteristic fossils, *Stromatapora concentrica* and *S. rugosa.*

At the Dorwin Springs outcrop, five miles southwest of Syracuse, the Oriskany sandstone is about seven feet thick. It has been described by P. F. Schneider in his "Notes on the Geology of Onondaga County", and is also mentioned by Vanuxen in the State report for 1842 and by E. B. Knapp in " Glimpses of Geology of Onondaga County," 1886.

On the Crossett farm, four miles south of Syracuse and one mile north of Dorwin Springs, this rock again occurs. The exposure is near the top of the Valley ridge, along which it extends for three hundred yards, forming with the Onondaga a ledge which can be seen from the valley road quite distinctly, thus constituting a feature in the topography of the region, which is a rare thing for the Oriskany. The rock is first seen on the south, in a shallow ravine. At this point it is twenty-seven inches thick. There are many shades of color, but it is generally lighter than at Dorwin's. Fossils are rare.

The Onondaga above is quite sandy in the lower four inches, with many black nodules.

At a distance of 450 feet north of the ravine, the sandstone layer has gradually thinned out to thirteen inches. Going north 300 feet further, it has entirely dissappeared excepting the four inches which adhere to the Onondaga and as stated, this is mostly composed of black concretions. Thus the seven feet of sandstone at Dorwin's thins out to nothing on a north and south line not over a mile and a quarter in length and this is a very gradual diminution in thickness. The strata dip very uniformly

to the south. There are no sharp bends, such as are to be seen on the east side of the valley.

At the quarries one mile east of Onondaga Hill there are about three inches of black concretions separating the limestones. These are quite firmly consolidated by a calcareous cement. The underlying limestone contains great numbers of the Ostracoid crustacean, *Leperditia alta.* The Onondaga contains the black nodular concretions in the lower part of the layer.

At the Split Rock quarries there is only a trace of sand separating the limestones.

On the farm of Mr. Thomas Murphy, two miles northwest of Marcellus Falls, near the corner of the towns of Marcellus, Skaneateles, Camillus and Elbridge, there occurs one layer of coarse, variegated sandstone, three and one-half feet thick. The colors are white to rusty red. The black concretions are not present except a very few at the base of the Corniferous. The Stromatapora layer underlies. The lower part of the sandstone is very fossiliferous.

Two miles west of this exposure the rock again occurs on the farm of J. A. Foster, one mile south of Halfway station. The rock is exposed to the west of the highway and the lowest layer extends across the roadway. The rock is mostly concealed by drift and an accurate measurement is impossible. A trigonometrical estimate makes the thickness twenty-six feet. The rock is similar to that on the Murphy farm both in texture and color, except that one thin layer about eighteen feet from the base is much whiter than any other found in the county. There are no concretions except a few in the highest layer. A few small fragments of included rock are to be seen. The fossils are less numerous than at Murphy's.

According to Professor Schneider's "Notes on the Geology of Onondaga County," the sandstone occurs in the bluffs east of the Glenside Mills, Skaneateles village and is nearly twenty feet thick.

The Oriskany sandstone forms part of the glacial drift south of the town line of Elbridge. Many large boulders occur, just south of the outcrop, which the farmers have appropriated for

fences and in some few cases they have been used for foundation walls. Those observed seemed to be in a good state of preservation. The rock also occurs in the drift in the town of Spafford.

Dr. S. E. Crane reports finding fragments of sandstone in that locality containing specimens of *Orthis hipparionyx* and *Spirifer arenosus*.

It is reported that the Oriskany sandstone is twenty feet thick in the Tully salt wells. Luther publishes a section showing this in the State report, 1895.

The papers were discussed by Dr. C. W. Hargitt, and Mr. Horace W. Britcher.

April 21, 1899.

THIRTIETH REGULAR MEETING.

The president, Dr. John Van Duyn, in the chair.

About forty-five persons present.

The report of the council recommended:

(1) The payment of several printing bills amounting to $36.00.

(2) The election of Dr. W. P. Graham to active membership and Guy A. Bailey to associate membership.

(3) That the resignation of Dr. W. M. Beauchamp as councilor be accepted and that the secretary notify him of our regret at losing him as a director.

(4) That his successor be elected at the May meeting.

The report was adopted, and the candidates elected by formal ballot.

The program for the evening consisted of an examination of many low forms of life under the microscope. These were arranged for exhibition in the laboratory of the College of Medicine. Later in the evening the meeting adjourned to one of the lecture rooms where a series of microscopic slides were projected upon the screen. The slides were prepared by Dr. A. C. Mercer, Dr. J. Van Duyn, Dr. C. W. Hargitt, and Mr. C. G. Rogers.

May 19, 1899.

THIRTY-FIRST REGULAR MEETING.

The meeting was held in the Steele Hall of Physics, Syracuse University.

The vice-president, Prof. J. A. Dakin, in the chair.

Twenty-one persons present.

The council report recommended:

(1) The election of Miss M. L. Overacker as active member.

(2) The election of Mr. Sabine Meecham, and Mr. George Haight as associate members.

(3) The election of C. W. Hargitt as councilor to succeed Dr. W. M. Beauchamp.

The report was adopted, and the candidates elected by formal ballot.

Because of the unfavorable condition of the atmosphere for astronomical purposes, Dr. H. A. Peck announced that another evening would be given for this purpose in the near future.

The provisional programme was then taken up, consisting of an illustrated lecture by Dr. C. W. Hargitt, entitled:

MIMICRY AND ANAMOLOUS FORMS.

The lecture was illustrated with many beautiful lantern slides.

June 16, 1899.

THIRTY-SECOND REGULAR MEETING.

The meeting was held in the Steele Hall of Physics, Syracuse University.

Dr. C. W. Hargitt, in the chair.

Thirty-two persons present.

Prof. John A. Dakin delivered an address entitled:

VARIATIONS IN THE PLUMAGE OF BIRDS.

The lecture was illustrated with many specimens of birds by means of which the speaker showed how the form, size, and character of the birds and of their plumage varied under different conditions.

Additional remarks were made by Dr. C. W. Hargitt, Dr. H. A. Peck, Mr. George Lynch, and Mr. A. Perrior.

Mr. Perrior presented to the academy a copy of the report on the Migrations of Birds observed in this vicinity during the present season, which had been prepared for the U. S. Department of Agriculture.

Several hundred copies of an eight-page pamphlet, the second in the Science Series, entitled, " The Marcellus Fault," were presented to the academy for distribution by Philip F. Schneider.

The meeting adjourned to the Holden Observatory where Dr. Henry A. Peck explained the uses of the various astronomical instruments.

SEPTEMBER 22, 1899.

THIRTY-THIRD REGULAR MEETING.

The president, DR. JOHN VAN DUYN, in the chair.

Twenty-five persons present.

Mrs. L. Leonora Goodrich reported the discovery of a new plant,*Polygonum lapathi-folium,* during the summer.

Prof. John D. Wilson spoke about " Birds". He believed that if we were more thoughtful of them we would enjoy them better. He related experiences which were intended to show that if we make the birds feel that we are their friends they would readily associate with man.

Mr. Albert Perrior then read a paper, entitled:

ONEIDA LAKE HERONS.

This was a careful account of the breeding grounds of these birds near Oneida Lake, where about five hundred pair of heron nest in the swamp. Specimens of the birds and their eggs, together with numerous photographs illustrating their nesting habits were shown.

Prof. John A. Dakin then spoke about

ECONOMIC ORNITHOLOGY.

The true ornithologist is not a mere collector. There is more in a bird than can be found in the dead bodies and stuffed skins. The pleasure of studying their habits is the reward of the true naturalist. One can look for birds anywhere, even at our back doorstep, and never knows where he may make a rare discovery. The depopulation of our native birds is to be deplored, for the warfare which they constantly wage against the insects annually saves the country hundreds of thousands of dollars. The annual destruction of crops in the United States alone is placed at more than four hundred million dollars.

The paper was discussed by Dr. W. M. Beauchamp, who believed that the depopulation of the native birds of our state was due more to the changed conditions rather than to the demand for them for women's hats, as had been suggested.

OCTOBER 20, 1899.

THIRTY-FOURTH REGULAR MEETING.

The vice-president, JOHN A. DAKIN, in the chair.

Forty-one persons present.

Mr. John G. Coulter was elected to active membership.

Dr. C. W. Hargitt read a paper entitled:

THE APPEARANCE OF THE PERIODIC CICADA IN ONONDAGA COUNTY.

(Abstract.)

The name "seventeen-year-locust" usually applied to this insect is somewhat misleading as it is not a locust at all, belonging to an entirely different order, the Hemiptera, while the true locusts are members of the Orthoptera. The trus designation for our insect is *Cicada septendecim,* or the seventeen-year Cicada.

Several species of the insect are known, but only one is likely to be confused with it hereabouts, namely, the two-year species, *Cicada tibicen,* the "dog-day" Cicada, or harvest fly. When seen together the two insects are easily distinguishable, the latter being considerably larger and heavier in body, with distinctively green coloration where the former is reddish. The familiar song of the harvest-fly is the well known shrilling note so common in the hot days of July and August ringing from the trees of orchard or wood. An insect quite indistinguishable from the former, and known only as a distinct race is the thirteen-year Cicada, or *Cicada tredecim.* This is chiefly a southern variety and without distinct record in this section of the country.

Among the myriads of insect life there is perhaps none more interesting or anomalous than the Cicada, and this for several reasons among which may be mentioned:

1. The anomalous larval period of seventeen years. So strange is this considered that it has been, and even continues to be, discredited by not a few well informed people. The fact that there are various "broods" so-called, of the insect some of which overlap in their distribution the region of others, and so makes it appear as if the various broods were but erratic occurrences of the same insects at these varying times and circumstances, further adds to the incredulity.

Again the larval habit of seclusion and its slow growth and final transformation likewise add to the strange and apparently mysterious life history.

2. The anomalous life habit and condition of the adult is hardly less remarkable than its larval history. It is not to be overlooked that the comparatively brief period of adult life, rarely exceeding a month, as compared with the long and subterranean life of the larva is not without its fair counterpart among not a few insects. Such for instance as the May-fly, whose larval period of some two or three years is followed by an adult life period of hardly more than a day.

During its adult life this insect takes little or no food, tho this is a matter of some controversy and will be considered farther in a later connection.

3. The anomalous phenomenon of a second race, *Cicada tredecim*, not distinguishable morphologically from the former and often overlapping into the same regions and occurring at the same time in many cases has been a more or less perplexing problem, whose solution may even yet be considered unsettled. That its southern general range is in some way related to the shorter period seems not improbable, but in just what way is uncertain. If the one was derived from the other why may we not have instances of such mutations? But so far as is known there is no shred of evidence that such mutations occur. Experiments have thus far apparently failed to afford additional light.

4. Distribution. This is various, though limited somewhat closely within the range of deciduous forests, and excluded from the predominently coniferous forest ranges, hence we have no record within the coniferous regions of northern New York and Minnesota. Furthermore it does not extend beyond the limits of the Rocky Mountains. This range of distribution may be safely regarded as due to the lack of adaptation of either the adult or larva to ovipositing or food habit in a coniferous environment.

The occurrence of this insect in considerable numbers in our vicinity during the past spring, 1899, and the unique interest attaching to its nature as above noted makes fitting some review of its occurrence and history in this county. So far as records are available we are able to trace its occurrence back by the following stages:

1882, this occurrence will be recalled by many here present.

The early records are fragmentary. In Fitch's Reports are found records of 1865, 1848, and reference to 1831 and 1814, or even earlier citation from earlier observers. In addition to these dates, which refer to only a single "brood," there are other "locust years" which have been no less carefully recorded. It should be stated that there are no less than five rather distinct broods of this insect within the state, occurring at periodic times and in different localities. This occurrence of "broods" within limited localities whose period is just as invariable as the other adds an additional difficulty to that noted above. No less than twenty of these have been definitely recognized within the limits of the United States, members of the same brood occurring at remote localities at the same time, a fact somewhat difficult of explanation. Of these the following come within the state:

Brood VIII, Which seems chiefly distributed in the region of Long Island; its last occurrence being in 1889.

Brood XII, is chiefly eastern in its distribution, ranging from Albany down the Hudson to Staten and Long Islands; last occurrence 1894.

Brood XVII, chiefly in the region of Westchester and Staten Island, 1898.

Brood XX, chiefly in western New York, and apparently somewhat doubtful, due to occur in 1900.

Brood XXII, chiefly western part of the state, chiefly about Niagara and adjacent counties.

The brood under consideration here, known as XIX, is a comparatively small one and chiefly limited to this state, ranging from Onondaga county westward including Livingston, Madison, Monroe, and Ontario counties.

Its appearance in our vicinity was noted about May 25th, in comparatively small numbers at first, becoming quite abundant about June 10th, after which the numbers rapidly diminished, the insect being attacked by numerous enemies, English sparrows, blackbirds, robins, etc., and also by certain fungi, many specimens being found literally alive with fungoid filaments and spores, probably the same as pointed out long ago by Leidy and described by Professor Peck of Albany as *Massospora cicadina.*

By June 20th, comparatively few specimens could be found, indeed only occasionally could its characteristic note be detected where only a few days previous the air was resonant with the monotonous music. The damage done was hardy perceptible, very few twigs falling or showing dead leaves during the summer quite in contrast with the condition noted in connection with the 1885 brood in Ohio and Indiana where I had noted its presence last. That it is greatly on the decline in this region there seems no doubt, both from the small numbers of the present brood as compared with the earlier reports and from the imperceptible damage done in ovipositing. It may not be safe to turn prophet here, but unless signs fail we may expect that the occurrence of the 1916 will scarcely be noticeable to the average observer and wholly unknown to the general public.

The Cicada as an article of food has more than once been considered by students and by others as well. Professor Reily has himself made certain experiments as to its edibility, which while not promising for it an epicurean demand, seems to render altogether credible the various vagrant accounts of its use by Indians and primitive peoples. Fitch, in one of his early reports, 1855, p. 752, says that it is credibly reported to be used by the Indians, being roasted in a hot oven, carefully browned by constant stirring and said to be quite palatable. Dr. Wm. Beauchamp has also advised me that it has been so used by the Onondaga Indians, who take the insects as they emerge and after preparing them with a batter, cook them, and pronounce them very good indeed.

It is very well known that many domestic animals devour them greedily, pigs being said to fatten on them, as is also the case with poultry. Cats and dogs likewise feed upon them in many cases.

MORPHOLOGY OF THE ENTERON.

While much attention has been given to the general subject of the food habits of the periodical Cicada and not a little discussion indulged pro and con it has in the main been directed to its

manner and times of taking food, whether the adult ever feeds, whether both sexes are alike in this respect, nature of the food of the larva and pupa, etc. Into these phases it is not the purpose of the present paper to enter. The more particular purpose is the presentation of the observations made upon the morphology of the enteron of the adult as compared with the larva and pupa and some suggestions as to the probable functions of the several regions.

It has been a more or less current opinion for many years that the adult Cicada takes no food, and that therefore the enteron is, as a result, more or less rudimentary. During the occurrence of the insect here, occasion was taken to submit specimens to the class in zoology for dissection as a part of the regular course of laboratory work. Unusual difficulty was encountered by students in securing anything like satisfactory demonstrations of the alimentary system, and in many specimens anomalous cavernous spaces were found in the abdominal region, in some cases the entire region appeared to be little more than a thin shell-like structure comprising hardly more than the body walls. The subject seemed sufficiently interesting to call for further attention and members of the senior class were asked to undertake a detailed study of both the general morphology and histology of the tract, the results of which I have since reviewed with more or less care.

An examination of such literature as has been available fails to show any work of consequence upon the subject. Marlatt in his recent monograph refers to the adipose matter stored in the tissues as a probable source of food during adult life but gives no specific evidence in support of the suggestion.

The careful dissection of a large number of specimens showed only in two or three cases a continuous enteron from mouth to anus such as may be traced in the early larva. This degeneration, or atrophy, first shows itself in the pupa stage where the tract becomes more or less rudimentary in the posterior portion, the entire abdomen becoming packed with adipose matter from which oil droplets exude upon dissection of the insect. On emergence from the pupal skin there seems to be almost com-

plete atrophy of the hind gut, at any rate so far as to render its dissection extremely difficult.

During the late pupal condition and early adult there appears a somewhat anomalous metamorphosis of the mid gut, the first indication of which appears as a slight enlargement of the tract in this region and an internal vesicular cavity. This cavity increases in size with the growth of the Cicada to maturity after emergence and with increasing age it becomes the cavernous structure to which reference has been made above. Coincident with this change there was a decrease of the amount of adipose tissue which gradually dissappeared by absorption as will be subsequently shown. With the enlargement of this portion of the tract the convoluted character of its epithelium, so characteristic a feature during the larval period, gradually disappears almost entirely, the inner surface appearing quite plain and smooth as seen under the dissecting microscope. A histological examination of the tissue confirms this condition.

Coincident with these changes in form and size there is a corresponding change in the character of the tissues comprising the walls of the tract in this region. The muscular tissue degenerates, the tunica likewise grows thin and in places entirely disappears, leaving only the lining epithelium connected by slight strands of connective and mucous cells. It should be noted in this connection that these changes are restricted for the most part to the region of the abdominal tract, the walls of the crop retaining more of less clearly their normal histological features.

But the most distinctive aspects of this metamorphosis is shown in the cytological changes which accompany it. The epithelium which in the larval enteron is quite typical shows undoubted degenerative characters. Globules of oil appear here and there in the cells, becoming more abundant with the age of the insect, until the cells become literally packed with these fat globules. Associated with this condition are no less evident signs of degeneracy in the amitotic division of the cells and in their multinucleate condition in many cases.

Moreover, in many cases the nuclei showed the presence of vacuoles of varying shapes and size, and in certain of these could

be distinguished the same fat globules which packed the cytoplasm of the cells.

All in all, there seems to be exhibited here a rather remarkable set of cytologic facts confirming the suggestion made above that associated with this atrophy of the alimentary tract of the adult insect there is formed an adaptive organ of absorption by which the reserve fat of the larva becomes available as a source of energy to the adult. And it should be noted that even the malpighian tubules apparently participate in this work of absorption, their epithelium likewise becoming charged with fat drops.

Mr. Horace W. Britcher next spoke about

PROTECTIVE MIMICRY AMONG THE SPIDERS.

NOVEMBER 17, 1899.

THIRTY-FIFTH REGULAR MEETING.

The president, DR. JOHN VAN DUYN, in the chair.

About one hundred and fifty persons present.

The speaker of the evening, Dr. J. M. Clarke, gave a most interesting address, entitled:

THE NEW GEOLOGIC NOMENCLATURE.*

He began by describing the early history of the New York State geological survey. The state was divided into four sections and each given into the hands of a competent geologist to survey. Onondaga county was in the third division and was under the supervision of Geologist L. Vanuxem, and the early study which it received was second to none in the state. Dr. Clarke gradually led up to the reasons for a new nomenclature and then explained

* For complete description see Science for December 15, 1899, pp. 874–875

in full the new system which had been worked out by Dr. Charles Schuchert of the United States Museum and himself.

After explaining the new nomenclature, Dr. Clarke spent some additional time in describing the "Transition Fauna of the Portage and Chemung Epoch." By means of maps and charts he showed that there was a gradual change in the forms in the different eras and that the fauna was varied in rocks of the same time in different parts of the state.

THE NEW YORK SERIES.

Era or System.	Period or Group.	Age or Stage.
Cambric or Taconic	Georgian	Georgia slates
	Acadian	
	Potsdamian	Potsdam sandstone and limestone
Champlainic (1) (Lower Silurian and Ordovician)	Canadian (3) (Paleochamplainic)	Beekmantown limestone (15) Chazy limestone
	Mohawkian (4) (Mesochamplainic)	Lowville limestone (16) Black river limestone Trenton limestone
	Cincinnatian (5) (Neochamplainic)	Utica shale Lorraine beds (17) Richmond beds (Ohio, Indiana)
Ontaric (2) or Siluric	Oswegan (6) (Paleontaric)	Oneida conglomerate Shawangunk grit Medina sandstone
	Niagaran (7) (Mesontaric)	Clinton beds Rochester shale Lockport limestone Guelph dolomite
	Cayugan (8) (Neontaric)	Salina beds Rondout waterlime (18) Manlius limestone (19)
Devonic — Paleodevonic	Helderbergain (9)	Coeymans limestone (20) New Scotland beds (21) Becraft limestone (22) Kingston beds (23)
	Oriskanian (10)	Oriskany beds
Devonic — Mesodevonic	Ulsterian (11)	Esopus grit (24) Schoharie grit Onondaga limestone
	Erian (12)	Marcellus shale Hamilton beds
Devonic — Neodevonic	Senecan (13)	Tully limestone Genesee shale Portage beds (Naples beds, Ithaca beds, Oneonta beds, local facies)
	Chautauquan (14)	Chemung beds (Catskill sandstone, (25) local facies)

DECEMBER 15, 1899.

THIRTY-SIXTH REGULAR MEETING.

The president, DR. JOHN VAN DUYN, in the chair.

Twenty-six persons present.

A vote of thanks was extended to Mr. Charles P. Ryan for chairs and services rendered at the November meeting.

Dr. W. M. Beauchamp spoke about

THE ARCHEOLOGY OF ONONDAGA COUNTY.

The early people that visited our county followed our streams in search of fish and game. This is shown by the soapstone kettles, etc., which they left behind them in their wanderings. The striped birds show that they came from the region of the Great Lakes. The Esquimaux was one of the early visitors. This is shown by the tusk of the walrus, and the strange knives only used by these people and which are occasionally found here. It is quite probable that the Northmen saw the Esquimaux here but not the Indian.

The advent of the Five Nations in this vicinity was about the year 1600. The forts at Cazenovia and Pompey are probably the only ones occupied by them. The barbed fish hook which is occasionally found shows that the Indian had at that time come in contact with the white man. The bone and horn implements must always be dug for, they are never found on the surface. Many bone harpoons have recently been found at Brewerton, which one site has given us more than all the rest of the country put together.

The evidences of early man in the county are (1) chipped implements, (2) polished implements, (3) pottery, (4) bone implements, (5) wampum.

The paper was discussed by Dr. G. W. Hinsdale. He gave additional statements describing the results of his search for bone implements. An island in Oneida Lake gave him the best results.

JANUARY 19, 1900.

FOURTH ANNUAL MEETING.

The vice-president, MR. JOHN A. DAKIN, in the chair.

Twenty-three persons present.

The report of the council recommended:

(1) The payment of certain bills.

(2) The election of Dr. J. M. Clarke as corresponding member.

(3) The election of W. G. Hinsdale, Charles M. Crouse, and H. M. Smith as active members.

(4) The election of Mrs. George J. Whelan to associate membership.

(5) The transfer of the name of George Lynch from the associate to the active list.

(6) The payment of two dollars to the elevator boy.

The report was accepted and the candidates elected by secretary's ballot.

The annual reports were then presented as follows:

SECRETARY'S REPORT.

The report of the secretary, Mr. Philip F. Schneider, is summarized as follows:

Stated meetings have been held regularly during the year with an average attendance of 39.

Papers have been delivered on the following subjects: Ornithology 2, Zoology 2, Geology 2, Photomicrography 1, Archeology 1, reports of officers 1, reports of sections 1.

One semi-popular lecture has been given during the year, the address of Dr. J. M. Clarke entitled, "The New Nomenclature of the State."

One pamphlet, a 24-page brochure, containing the constitution, president's address, etc., has been printed during the year.

Another, the second in the Science series, containing an account of the "Geologic Fault at Marcellus" was distributed in June.

Nine members have been added to the rolls during the year and one member lost. The present membership is: Active 36, associate 21, corresponding 1, total 58.

REPORT OF THE CORRESPONDING SECRETARY.

The corresponding secretary, Mr. H. W. Britcher, read his report, which is summarized as follows:

The corresponding secretary has sent reports of the meetings, with one exception, to "Science" in which paper they have been duly published. Copies of the constitution were mailed to members, and others interested in scientific investigation, also to all kindred societies. Many of the latter were requested to place the academy on their regular mailing lists. Quite a number have replied that they would.

TREASURER'S REPORT.

The treasurer, Miss L. W. Roberts, read her report for the year, of which the following is a summary:

Balance on hand, January 20, 1899	$ 67.46
Receipts from all sources	66.00
Total	$133.46
Disbursements during the year	59.94
Balance on hand, January 19, 1900	$ 73.52

LIBRARIAN'S REPORT.

The librarian, Miss Virginia L. Jones, reported the receipt of a large number of bulletins, and other pamphlets.

REPORT OF THE GEOLOGICAL SECTION.

Read by Mr. C. E. Wheelock, recorder of the section.

Since the reorganization of the section last autumn, it has been holding its meetings regularly on the first Friday evening of each month. These meetings are open to the public at large. As a

rule, two members are appointed in addition to the speaker to lead in the discussion of the paper.

The speakers and subjects for the entire year have been made out and a folder will be published containing this and other information.

The meetings thus far have been marked with interest and three valuable papers have been delivered.

At the November meeting, the chairman, Prof. Philip F. Schneider, gave a brief outline of the work already accomplished in this vicinity, and told of the problems still remaining for investigation.

At the December meeting Mr. C. E. Wheelock read a paper entitled, "The Marl and Tufa Deposits of Onondaga." It was an interesting account of the manner in which these deposits are formed, together with the location of the more important deposits. The speaker suggested the possibility of the deposits, especially those at an altitude of about 440 feet, being formed in lakes formed by the drying up of Lake Iroquois.

At the January meeting Prof. E. N. Pattee reported on the "Iron Ore Deposits of the Salina and other Formations." The fact was emphasized that although many of the formations contain more or less iron, it did not occur in quantities sufficient to make it commercially valuable at present. In the early history of the county, the bog-iron ore was obtained in the valley, and smelted at Muggles Furnace at Elmwood.

The present officers are Philip F. Schneider, chairman; Charles E. Wheelock recorder.

REPORT OF THE BOTANICAL SECTION.

Read by Mrs. L. L. Goodrich, chairman of the section.

One year has passed since our last annual meeting, and the ever natural question faces us, What have we accomplished? I am pleased to state that the Botanical section has not lain dormant and notwithstanding the summer's drouth, think we have accomplished more than during the previous year.

We commenced the season's excursions in search of trailing arbutus.

April 29, an excessively hot day, found us five miles north of Phoenix, in the same locality where we found it so abundant last year, searching only to find that almost the entire crop had been uprooted and carried away. Where then there were huge patches found, now only here and there a scattering branch. It was a lamentable and deplorable sight, convincing us that we should be cautious in our greed; not taking root and all, especially when collecting the rarer plants. We were obliged to go to another locality a mile beyond. The outing made in company with several university students and their professors was delightful, although the quantity and quality of specimens of arbutus were not all that might be desired, and of course at that season of the year there were no other plants in flower to supply the place of the beautiful and rare arbutus. Early in the summer those not confined in the school room determined to carry out Mr. Beauchamp's plan of searching among the salt works frequently during the season. The last week in May, two of us went beyond Solvay as far as cars could carry us, then walked to the first bridge where we crossed the canal, and searched back and forth between the long rows of salt vats for about three hours until we found ourselves opposite Solvay with nothing gained. From there we rambled over the low lands to the State Fair grounds. Nothing as yet. We next crossed the fields to the lake. Here we found a bridge over a little stream flowing into the lake. Down I went on my knees, peering under the bridge. In that imploring position I found *Ranunculus Aymbalaria,* or Seaside Crowfoot. Rare but not new, being the first plant of a saline nature we had seen. Except such plants as are common in every field, *Aymbalaria* was the only evidence of our day's research.

We have since made several excursions among the salt vats but not until very late in the fall did we find a really prolific spot, which locality will frequently call our rubber boots and rainy day skirts into requisition with benefit.

Several profitable trips have been made to Tamarac Swamp, Round Top, Hopper's Pinnacle, the valley, Orville woods, and other surrounding places, but the most satisfactory excursion was

to Beaver Lake, June 10, with Mr. Beauchamp, our ever-ready friend and co-worker, as guide. Beaver Lake is one of the richest botanical fields within easy access of Syracuse. In one day were found nine different orchids, fringed polygala, indian pipes, pitcher plants, two species of sun-dew, and many others, besides specimens of any or all of the bog plants of the surrounding swamps, and quantities of spiders, bugs, and various insects for Mr. Britcher's benefit.

Formerly we felt satisfied if we analized a flower, and found its name, now we wish to search into its more hidden and structural parts. How some of these carry on assimulation, the most essential function of the plant, converting inorganic matter into organic matter. The essential qualities of parenchima, which contains the grains of chlorophyl, may be regarded as the most important of all vegetable products, as in the chlorophyl, all ordinary assimilation takes place. The stomata, or breathing spores, guardian cells communicating with air chambers throughout the regular intercellular spaces which permeate the whole leaf and new branches. The effect of obstructions on these cells. The results from aphides, mealy bugs, and other injurious insects, all unite in forming one of the most fascinating and interesting studies of nature.

During the summer we met weekly, and during the winter bi-weekly, for class work. Once a month we spend an evening at the home of some member, and listen to a paper furnished by a designated member followed by discussions on the same. Nine such papers have been read, most of which have been not only entertaining but instructive.

Our experience with the variations in trilliums last year has led us to note the liability to variations in most plants, convincing us that very many of the so-called species are but variations of one species, and that the number of specific names of our plants will be greatly reduced in the future.

I now have a very unique variation in the trillium, one with petals, sepals, and leaves stalked. Those of the sepals and petals, three-fourths of an inch long, with broad blades.

We have found two more localities for *Glaucium glaucium,*

the horned poppy, discovered by Miss Roberts last year; also another locality for *Crepis virens,* more than a mile from where I discovered it last year.

I am informed by Mr. Britcher that a new locality for Scolopendrium has been discovered; I am greatly pleased. as every new locality for that rare fern adds laurels to our county. We have noted the adroitness with which seeds are dispersed in different ways by birds. By watching, for several weeks, the bees extracting honey from the pure white and fragrant flowers of my garden, I have, in my own opinion, exploded the theories of Grant Allen, Sorley, and others, *i. e.,* that bright colors are essential to attract bees and other insects, and that the lines in variegated and mottled flowers all point to the honey sac. We have been greatly interested in the study of fungi, as far as our opportunities permitted, and hope to be more successful next year. Our greatest achievement is the glory of having discovered three new plants. Mrs. T. J. Leach found *Hyssapus officinalis* between Elmwood and Onondaga Hill. I found *Polygonum lapathifolium,* a saline plant, in the first ward salt marsh last October, and *Chenopodium Anthemintícum,* about an old stoneyard near the canal. All have been verified by Professor Peck, who expresses much gratitude in getting the last named from a different location than as yet acknowledged by any botanist.

ELECTION OF OFFICERS.

The following officers were then elected: President, John Van Duyn; Vice-President, J. D. Wilson; Secretary, Ernest N. Pattee; Corresponding Secretary, H. W. Britcher; Treasurer, Miss L. W. Roberts; Librarian, Mrs. L. Leonora Goodrich; Councillors until 1903, Henry A. Peck, George A. Dakin; until 1901, W. M. Beauchamp.

MEMORIAL RESOLUTIONS.

Whereas, This organization has been called upon to mourn the untimely death of one of its most faithful and earnest members, therefore be it resolved

First, that in the death of Principal John A. Dakin, the Onondaga Academy of Science loses one of its first and firmest friends, one of its most earnest, faithful, and capable members,

Second, that we record our abiding sense of appreciation of his scientific spirit and zeal and our deep sense of loss in his death,

Third, that in his death the city has lost an enterprising and capable citizen, and science a worthy diciple and advocate,

Fourth, that we extend to his bereaved widow and friends our sincere condolence.

Charles W. Hargitt,
Louise W. Roberts,
Philip F. Schneider,
Committee.

February 23, 1900.

February 15, 1901.

DEFERRED FIFTH ANNUAL MEETING.

The meeting was called to order by Professor Ernest N. Pattee, and immediately proceeded to the election of officers with the following result:

President, Dr. W. M. Beauchamp; Vice-President, C. W. Hargitt; Secretary, H. W. Britcher; Corresponding Secretary, P. F. Schneider; Treasurer, Miss Louise W. Roberts; Librarian, Mrs. L. L. Goodrich; Councillors for three years, J. D. Wilson, Mrs. M. B. Ackerman.

President Beauchamp appointed the following program committee: C. W. Hargitt, Mrs. M. B. Ackerman, Miss L. W. Roberts.

The following annual reports were subsequently read and ordered filed:

SECRETARY'S REPORT.

The report of the secretary, Prof. E. N. Pattee, was read as follows:

Ten monthly meetings have been held during the year, no

meetings being held during July and August. Eight of these meetings were held in the Historical rooms and two in the Medical College.

The following are the programs:

January. Annual reports of sections.

February. "Professor Atwater's Experiments on the Nutritive Value of Foods," Dr. H. M. Smith.

March. "Stellar Astronomy," Dr. H. A. Peck.

April. "Inhibition," Dr. Gaylord P. Clarke.

May. "Wireless Telegraphy," Dr. W. P. Graham.

June. Miscellaneous program.

September. "The X Rays," W. H. Jakway.

October. "Tumors," Dr. J. Van Duyn.

"Root Fungi," Dr. J. G. Coulter.

November. "Gold Mining," Prof. E. N. Pattee.

December. "The Dwellings and Customs of the American Indians," Dr. F. W. Betts.

The changes in membership have been as follows:

Four persons have been elected to active membership, two have been changed from the associate to the active list, one has been changed from the associate to the corresponding list. One active member has died and one has resigned. The membership at the opening of 1901 is as follows: Active, 40; associate, 17; corresponding, 3; total membership, 60.

TREASURER'S REPORT.

The report of the treasurer, Miss Louise W. Roberts, is summarized as follows:

Balance on hand, January, 1900	$ 73.42
Receipts during the year	43.12
Total	$116.54
Disbursements for the year	27.50
Balance	$ 89.04

REPORT OF THE GEOLOGICAL SECTION.

Read by Mr. C. E. Wheelock, recorder of the section.

The section began the year by following the plan adopted last year of having regular monthly sessions, and listening to the reports of work and papers of the members. In accordance with this plan, subjects were assigned, work laid out, and the first meeting held. After this meeting it was discovered that there was a conflict of dates for the meeting nights of the scientific societies to which many of the leading members belonged, and as no time convenient for all could be found, the plan of work adopted was continued, although the regular meetings were discontinued. Several interesting conferences of the members have been held during the year. The most important work of the year was in the line of the "Gypsum and Plaster Deposits" and "The Detailed Study of the Pleistocene Geology of the Vicinity." The interesting fact was also announced that the children of a quarter of a century ago were in the habit of frequenting the glens and ravines on Prospect Hill, near what is now St. Joseph's Hospital, and gathering and eating a pinkish colored clay, which abounds in that vicinity. Most of the work assigned to the members has been completed, and the reports and papers on the same will be taken up in the regular meetings of the coming year.

REPORT OF THE ZOOLOGICAL SECTION.

The following "digest" of the work of the Zoological section was read by Dr. C. W. Hargitt.

The capture during the year of one specimen each of three additional salamanders, *Amblystoma jeffersonianum*, *Hemidoetylium scutatum*, *Plethodon glutinosus*. The finding on the Onondaga Reservation of *Uranidea gracilis* (Miller's Thumb) a representative of the fish known as star-gazers and distructive of the eggs of trout, etc. The identification of the cyclops like *Copepoda Canthocamptus* as occurring in "Branchippus" Pond and also at "the Darks." The identification of about 25 spiders new to the Onondaga county list, and the taking of about a dozen more which are as yet not identified.

The procuring during last winter and spring of all(?) the larval stages of *Branchippus gellidus* (Hay) and the collection during the spring of a quantity of eggs, some of which it was attempted to hatch during the summer and fall but without success.

Soil taken from the pond in September and after the middle of November and placed in acquaria, both gave algal life and several cypridae but no other forms of life have been noticed as yet.

The pond filled with water November 25-28 and on January 8 (six weeks later) Cyclops with eggs were abundant, also Cypridae; one male Branchippus, 3/8 inch long; Planaria, (green abundant, gray ones less so) two Corethra (phantom) larvae, two or three young Caddis larvae, small (young?) worms, and one water bug were taken. No signs of Daphnia or larval Branchippus. I suspect two species of Cyclops to occur in the pond but am not yet positive.

H. W. Britcher, Chairman

The members then proceeded to the lecture room of the Medical College where Dr. L. M. Underwood of Columbia University delivered an illustrated lecture upon "Botanical Gardens and their Influence."

The thanks of the academy were extended to the speaker.

INAUGURAL ADDRESS.

W. M. Beauchamp, S. T. D.

March 15, 1901.

It is now many years since a few persons of scientific tastes devised an Onondaga Academy of Science of a somewhat informal nature, with few meetings but possibly with much correspondence. I was to answer all questions from inquirers on conchology, Professor Underwood on botany, E. B. Knapp on the fossils of the Tully limestone and the Hamilton shales, and to others various departments were assigned. I, at least, had no questions to answer, and but little came of the attempt. With the

more successful founding and work of the present academy you are familiar.

The question of how best to carry on our work may well call for a few moments attention.

In Buffalo the Historical Society, the Academy of Science, and some kindred organizations are under the same roof, without any vital connection as societies, and sometimes partially encroaching on each other's field. In archaeological specimens the academy far outranks the Historical Society there, and I have twice lectured before it on subjects of this nature. In our city you will observe that the Historical Society is broad in its aims, in its constitution takes cognizance of some natural sciences, appointing committees on them, and has a collection of shells of much interest and extent. Harmonious action seems thus provided for at the outset, and the Botany Club has an understood relation to the older society. A botanical class meets here regularly, and there is a good basis for conchological study. Were there no other resource it would be admitted that all societies of this nature might profitably be united as auxiliaries of the Historical Association, in studying and preserving illustrative examples of the past history of this county, not only of its men, but of its animal, vegetable and mineral forms. Man is but the capstone of a great pyramid, and all things existing affect his work and well being. The Central City is that of the salt springs, abhorred by the aborigines, but valued by the whites, and the mineral wealth of our land not only supports great industries, but founds great towns. So men are interested in man's natural auxiliaries. I think the Historical Association never had a livelier session than when one evening it discussed local geology. Our county, the whole world, is a part of man's history. We are made by environment.

No man can study one science thoroughly without a knowledge of some others. I am giving much attention to archeological work, but in this every department of natural history helps me out. It is often of vital importance to know what a shell, a tooth, a bone, a piece of stone may be. So that a society like this ought to be an adjunct of any well equipped Historical Association. An

archeological friend, a physician of high reputation in New York, is studying the teeth and bones of quadrupeds this winter, because he will need this knowledge in field work next summer.

Just now there comes in a disturbing element in the way of joint efforts. The Historical Association expects a new building, but so does the city look for a new library, in which a society like this might gather and exhibit many things for the common good, in a fitting place always accessible. It is understood that suitable quarters will be provided for a loan Art Museum, and might be for others. I wish that in some way our artistic, scientific, and historical interests could be combined in one great educational project and center, resulting in a splendid endowment of valuable material worthy of a live city like this.

There are certain collections in Syracuse now which deserve passing attention. The admirably arranged geological cabinet of the High School I have not seen for many years, but it seemed just the thing such students need. So of the various collections at the University. They well illustrate the lessons there taught, and are intended for this. They are working cabinets for special uses.

An Academy of Science has other plans, if of a local character. It may indulge in anything curious, beautiful or strange, which it can obtain, but its great aim is to study and illustrate its own home field. For its purposes it may be said, "A man's best things lie nearest him, lie close about his feet." We want to know and collect our local treasures.

This local work often has rich results. Mrs. Treat said she found more in carefully studying a small space of ground than when she traversed broad acres. After the Skaneateles library was founded, a cabinet was thought desirable. Gifts were made, but there was local work. Boys and men came home with pockets full of rocks from shores and ravines, and the result was the naming of several fossils new to science. In this one field we have much yet to do. All Onondaga's problems are not solved, or its treasures exhausted.

In actual work my idea is that we want both a concentration and a division of labor. First, a division, in order that each one

may have something to do. The Botany Club used to have a rule that a family of plants should be assigned to each member for her summer's work. She might do all else she pleased, or get all the help she could in that, but on that work was expected a special report. Without determining the limits or nature of such personal division I would suggest that it might take some such form as this: All the members identify themselves with one or more of the various sections, as of geology and botany, and let them choose or have assigned the subjects they will study. Geologically it might be the Green Lakes of this county, the Tully lakes, the gypsum beds, the Hamilton shales, the gas wells, the mineral springs. A long catalogue could be made. Take in all else you choose, but study the subject assigned. The result will be a definite gain to the student, and possibly a gain to science itself. Let it be understood that a simple report by each one shall be made of observations at some proper time. In this way you have no wall flowers, no mere listeners, but a body of workers, helpful to all.

There are some old subjects not unworthy of notice. Pursh mentioned some plants here that are not otherwise on record in a wild state. These may be rediscovered. In the summer, in old times, the waters of Skaneateles creek almost disappeared in the crevices of the limestone ledge. What was the probable effect on the underlying strata? Bird life and fish life have changed here; what were the old conditions? Are game laws alone to be depended on? or are there other agents?

I spoke of concentration of work. Our flora and fauna, and partially our geology, have here a double division. There is the gradual descent from south to north, geologically and in altitude The lines of division in this cross the county from east to west. Some birds inhabit the southern towns which are rare in the northern, or vice versa. Many shells are nowhere found south of the canal. The same law applies in plants, and in fossils of course.

Then we have a second cause of division. Five great valleys run from south to north, until the canal is reached, and each one of these has peculiar features. The gypsum of Nine Mile creek

in its prominent crystalline forms, differs from that of Limestone creek. The fossils of Skaneateles creek are not those of Onondaga Valley in variety and abundance.

The moraines of this valley have no such representatives elsewhere. Every botanist knows that there are similar differences in the plants. The prevailing types are the same, but each valley has individuality. The separating hills are like garden walls, restraining or excluding plants and sometimes animal life. A mere suggestion of this fact is enough.

Now we might profitably take a tier of towns from east to west, and observe their scientific facts, or we might concentrate our study on one of these valleys, as seems to me better. When one is mastered, it will be simpler work to differentiate the others. In its physical features Syracuse lies in the most interesting of the five. Its salt springs and marshes give it an unusual character, the prominent quarries afford fossils in profusion, its evidences of glacial action are unusually fine, a great city becomes the starting place of some naturalized plants, and Onondaga Lake is visited by birds seen nowhere else. It would seem that a concentration of observation and study on this, our central valley, would be productive of good results. Nearly all parts are very easy of access, and this is a great necessity in studying some forms of life. In their season and in that line we might gain some knowledge merely by observing what kinds of game are brought here for sale.

I used to have an idea of writing a monograph on Onondaga lake. Its fish and shellfish I know; its Indian relics I have seen in large part, and have often trod its early sites. Many of its plants I have observed but not all. So my plan was once a week through the summer to make its circuit, and observe all that was new. When a couple of trips had been made, the rest would be easy. That done I could write my paper.

It would lack one thing. We have fairly good maps of the lake, and a fair idea of its bottom, but all might be done with more accuracy, and a yacht club should know the soundings and perhaps give its aid. In the Skaneateles library hang two maps of Skaneateles lake. One was a free hand drawing by Capt.

Benjamin Lee, made seventy-five or more years ago, but having one valuable feature. Near the village he gave the soundings three times across at intervals of a quarter mile, then of a half mile, then in every mile in the middle of the lake, his last sounding being ten miles up. All the way he recorded the kind of bottom.

The other map was made by the Cornell University engineering class, with the best instruments, and with ample time and care, and is a fine piece of work. The contour of the hills, ravines, the points and streams, the surroundings and other things are there. A far less elaborate work would it be for a class from the High school or university to give us a similar map of Onondaga lake. Perhaps it would not be difficult enough. It is worth doing, however, and members of this academy could see it done.

There are some questions of interest about animals which once lived here. In this city strange bones and horns have been reported from excavations. I saw some fine elk horns not long since from this vicinity, and have drawn a tooth of the fossil elephant which once dwelt here. As time goes on more of these traces of early animals will be found, and a society like this will see them cared for. For lack of one much has been lost. Let us hope that a permanent home for future material will soon be ours.

You will observe in this that I have passed over some important branches of science. "The heavens declare the glory of God, and the firmament showeth his handiwork." To my mind there is nothing so elevating, so plain an evidence of the Creator's wisdom and power, so suggestive of the endless enjoyments of an eternal life, as considering the heavens as they appear, or their greater glories as seen through the glass. Earthly things become insignificant; earthly life is as nothing.

We may not be able to do much here, astronomically, but the mere machinery and work of the Syracuse Observatory, well explained, would be of great interest to some. How much more to all would be occasional addresses on the more striking phenomena of the heavens.

We have not overlooked the skill of the physician and sur-

geon. I owe a great deal to some merely popular lectures of this kind which I have heard in my earlier days. In a city which has a notable Medical College and a Medical Society of high reputation, the deeper problems of disease and remedy will naturally find an appreciative hearing, but there are those of great interest which less trained minds can hear and enjoy. My predecessor in office has a high reputation in his line and we have listened to him with profit and pleasure. Whatever his surgery may be his remarks are not cutting, and I hope for a West India lecture on his return, as genial and delightful as his own nature.

Folk lore now takes rank as a science, and is a pursuit well adapted to many. The collection of old tales, proverbs and signs, is not necessarily a vain employment. I have done something in Indian lore, not without value, but there is a wide field open to many in such work here. Our many nationalities, religious beliefs, our life in city and country, give great opportunities here for research of this kind. What are our weather signs? On what foundation do they rest? Does the full moon affect vegetation, or fishing, or the pork in the barrel? Do weather signs have a real value? Old probability says yes, and so do many good observers. In mere superstitions you will find many curious things. Those connected with funerals have sometimes caused me inconvenience, but some had a good reason at their origin. It is a large subject which I can only mention now.

I am no profound scientist; perhaps more a forager than a cultivator, but I have greatly enjoyed much desultory work. To give needed attention to one, I have now to lay them aside except in a holiday sort of way. My archaeological work seems a little apart from the objects of this society, but it is a study of fossil men as distinguished from corals and shells. In this study of early American life we have gained vastly in a score of years, and a comparison of facts is continually correcting our errors and enlarging our vision. So it is in everything. No one man and no one age will master all knowledge. Columbus-like, we look ahead on undiscovered seas, leading the way and making charts for those who come later.

If we labor, let us also hope that all will not be in vain, but that other men will enter into the fruits of our labors.

GLACIAL CLIMATE.

T. C. Hopkins, Ph. D.

April 19, 1901.

One of the difficult questions that confronts the student of glacialogy to-day is to give a satisfactory explanation for the change in climate that would produce glaciation at low levels in northern United States. It might appear at first glance that the investigations of recent years which have added greatly to our knowledge of glacial phenomena would have simplified the question but such is not the case. The investigations have added additional conditions to the problem in even greater proportion than positive information has been gained towards an answer.

A few years ago it was only necessary to account for one glacial period, now he who would give an acceptable explanation must account for several, he knows not how many. Some of the leading glacialogists tell us that there were not less than five or six glacial periods in Pleistocene time while others contend that there was only one. Previous to the glacial period of Pleistocene time there were probably other periods of glaciation but it is not safe at the present time to say how many. It appears to be well established that there was a glacial period at or near the close of the Carboniferous age, which produced glaciers on both sides of the equator between 20 and 30 degrees. Between that period and this there was a mild climate in high latitudes during a considerable portion of Mesozoic time. More-over there are periods of aridity during Triassic, Permian and Silurian times that indicate great climatic changes that are probably more or less closely related to glacial climatic changes.

Hence any explanation for the glacial climate that would not permit a number of recurrences would not be received with much favor by many of the glacial students. Quite a number of hypotheses have been advanced to account for the different climatic changes, some of which are purely speculative and some are based on sound principles and have been received with considerable favor. While some of these explanations have been received

wiht favor no one of them appears to give full satisfaction, as strong objections have been brought against each one and not one of them can be said to be established satisfactorily.

Among the different hypotheses might be enumerated the following: 1. The earth in its passage through space may have passed through colder portions that would produce glacial climate and warmer portions that would produce interglacial periods.

2. The sun is said to be a variable star and the glacial period may correspond to one of the periods of decrease of the sun's heat.

3. The earth's axis of rotation is not fixed and it may have shifted sufficiently to move the frigid zone into the now North Temperate latitudes.

These three hypotheses might be put in the same category as they are all purely speculative without any positive evidence in their favor. They are now working hypotheses and have never been received with much favor by the scientific world.

Among the explanations that have been received with more favor might be mentioned: 4. The elevation of the land area in northern latitudes which might cause the accumulation of snow and thus cause a glacial climate. The evidence in favor of the elevation is found in the deeply eroded river channels of the north. All through northern United States are many old stream channels now filled to a depth of several hundred feet with glacial debris. We are now standing or sitting over one of these old valleys. We are told that wells have been sunk at least 400 feet in the glacial debris in the old Onondaga Valley in Syracuse. It has been argued, however, with some show of reason that this elevation was not sufficient to cause glaciation, nor is it definitely known that this elevation did not take place a considerable length of time before the glacial period. While, in the light of our present knowledge on the subject, the elevation of the land does not appear in itself to be a sufficient cause to account for glaciation it is probable that either directly or indirectly it is an important influence and possibly deserving of greater credit than is ordinarily given to it.

5. Croll's hypothesis, named from one of its ablest advocates, has been received with much favor. It postulates a change in the ellipticity of the earth's orbit along with a precession of the equinoxes. It is an attractive explanation and has probably been received with greater favor than any of the others, yet there have been some grave objections brought against it. It places the last glacial period too far away, and there does not appear to have been the regular recurrence that the hypothesis demands. Becker's mathematical investigations of the hypothesis lead him to the conclusion that maximum ellipticity is the most unfavorable for glacial accumulation instead of the most favorable as involved in the hypothesis. While Becker's conclusions are based on mathematics advocates of the hypothesis may question some of his premises on which the reasoning is based.

6. An attempt is now being made by some of the students of glacialogy to establish a working hypothesis for the cause of the glacial climate on an atmospheric basis. It is not entirely independent of some of the explanations already offered, nor can it be said to be wholly new. It attempts to put in concrete shape principles that have been known for many years. More than fifty years ago Tyndall urged that a variation in the content of CO_2 in the atmosphere was sufficient for a glacial climate, but the statement received scarcely more than a passing notice until quite recently, when it has been elaborated and presented in such detail and in such concrete form as to command the attention of all persons interested in the subject.

It has long been known that CO_2 and water vapor are the chief agents in retaining the heat radiated from the earth's surface, but apparently no effort was made to consider the quantitative effect upon the temperature of the atmosphere by any given change in the content of CO_2 until a few years ago when it was undertaken by Prof. Svante Arrhenius*. He explains that the air retains heat in two ways: 1. The heat suffers selective diffusion as it passes through the air. 2. The gases themselves have the power of absorbing selectively the light and heat of certain wave lengths. The CO_2 and the water vapor have this power

* Phil. Magazine and Journal of Science. V. 41. (5th series.) 1896.

to a greater extent than any of the other gases. The results of his investigations leads Professor Arrhenius to the conclusion that if the CO_2 is increased 2.5 to 3 times its present value, the temperature in the Arctic regions must rise 8 to 9 degrees C and produce a climate as mild as that of the Eocene period. A decrease of .65 or .55 of its present value would cause a fall of from 4 to 5 degrees C and produce a glacial climate.

Professor Chamberlin took up the subject at this point endeavoring to show geological relations that might produce such atmospheric changes. It is he says an attempt to frame a working hypothesis of the cause of glacial periods on an atmospheric basis.

Along with the fact that the increase of CO_2 in the atmosphere tends to raise the temperature and a decrease to lower it, it has been shown that the increase of CO_2 tends to equalize the temperature while a decrease tends to intensify the variations or differences in temperature between (1) low and high latitudes, (2)day and night, (3) the seasons, (4) land and sea, (5) the upper and lower portions of the atmosphere. Hence, a decrease would lead to (1) greater local heat as well as greater local cold, (2) to greater local dryness as well as greater local moisture, (3) to more intense movements of the atmosphere in the effort to restore equilibrium, (4) to lower the average temperature.

On the assumption that the increase and decrease of CO_2 in the atmosphere causes corresponding change in the temperature along with corresponding equalization or intensification of the variations it next becomes necessary to find the agencies that can produce the increase or decrease. The agencies of both increase and decrease may be divided into permanent and the temporary.

The permanent loss consists (1) in the carbonation of the silicates, that is a change of the silicates of the igneous rocks to the carbonates of the sedimentary series. This is accompanied by the formation of oxides, sulfates, phosphates, etc., but that does not change the fact that large quantities of CO_2 are used up in the formation of the limestones and the dolomites. (2) By plants and the fixation of large quantities of carbon in the

form of coal, petroleum, natural gases, etc.—some of the hydrocarbons may have an inorganic origin.

Source of temporary loss of CO_2: (1) The locking up of CO_2 as bicarbonates in the solution of the limestones and the dolomites. T. M. Reade estimates that this is annually 1350 million tons as compared with 270 million tons in original carbonation. (2) Absorption in sea water. (3) Some CO_2 may be used in decomposing sulfates by organisms.

Sources of permanent gain: (1) The CO_2 inclosed in the crystalline igneous rocks set free by disintegration, (2) that brought up by volcanoes, (3) possibly some brought in by meteorites.

Sources of temporary gain: (1) chemical action—the setting free of the second CO_2 in the bicarbonates by the action of organisms, (2) by dissociations, (3) by setting free or diffusion into the air of the CO_2 in the sea water due to a rising temperature and (4) by the decomposition of organic matter.

These fluctuations of carbonic acid are correlated with the elevation and extension of the land on the one hand and the advance of the sea on the other. During extensive land elevation the silicates are changed to carbonates more rapidly and the dissolved limestones carried to the sea more rapidly, both processes using up CO_2 from the atmosphere. Correlated with this is a lessening of the sea area, particularly of the continental shelf which is the habitat of the lime-secreting forms. Limitation of the lime-secreting forms retards the process of freeing the CO_2. The result is a reduction in temperature which increase the capacity of the sea for holding CO_2.

In periods of sea extension and land reduction the shallow water area is increased giving acceleration to the agencies that set CO_2 free from the ocean, at the same time the land area being diminished the carbonation of the silicates would go on more slowly as likewise the solution of the limestone thus acting conjointly to increase the CO_2 in the atmosphere.

Application. To apply the hypothesis to our last glacial period is the next step. It is noted that there was a marked elevation and extension of the land at or near the close of the Plio-

cene period. This uplift as already mentioned has been cited as the cause of the glacial climate. In the present hypothesis it is an incident rather than the sole cause as previously advocated. This uplift is known in modern literature as the Ozarkian or Sierrian. Its extent is shown by comparing the estimated area of that period 65,000,000 square miles with the 44,000,000 of the middle Tertiary and the 54,000,000 at the present time, an increase of 47 percent. over the mid-Tertiary. This indicates a necessarily great change in the effective contact of the atmosphere with the surface of the earth. This is greater than would appear at first sight if we consider the contact on the surfaces of grains, pores and fissures. This contact becomes a rapidly increasing one by the sinking of the ground-water surface which was at first carried up by the uplift, but would be lowered by the trenching of the streams.

Along with the increased land area there was a corresponding decrease in the sea area and a very great decrease in the shallow water areas, almost to obliteration, thus producing a great lessening in the rate of freeing CO_2 to co-operate with the increased consumption on the land in hastening the depletion of the atmosphere.

There was a lowering of the temperature from these causes which would tend to further check the lime-secreting life of the ocean and at the same time give the ocean greater absorptive power.

Assigned Causes of Glacial Oscillation. The assigned causes are self accellerating the effect of which is to push the results to an extreme from which reaction will take place. For example: (1) A necessary consequence of the increased rate of transmission of CO_2 to the sea along with a decreased rate of its release would be an accumulation of CO_2 in the sea.

(2) The cooling of the sea waters reduced the dissociation of the bicarbonates and hence they were more abundant than before.

(3) With the increase of the snowfields there would be increased reflection and a decreased absorbtion of the sun's rays.

(4) With increasing cold there would be less rapid decay of

organic matter and less CO_2 set free; however this may be offset by the reduction in the amount of carbon locked up in the living organisms. These agencies, particularly the first three tend towards the acceleration of the refrigeration through the earlier stages but the process involved the conditions of its own arrest.

Beginning of the Reaction. (1) The ice sheet itself was probably an important agency in checking the loss of CO_2 as at its maximum it covered nearly 8,000,000 square miles, or 15 per cent. of the land area. Perhaps another area at the border but outside of the ice sheet would be affected by prolonged freezing so as to check if not prohibit carbonation.

(2) If the reaction once started the rising temperature would cause the release of more of the CO_2 in the seawater and this would further hasten the process.

(3) The increasing warmth would call forth more lime-secreting life forms in the sea which would hasten the process.

(4) The increase of water from the melting ice would increase the shallow water zone.

(5) The increased decay of organic matter would develop CO_2. This may be offset by increased growth.

(6) The increase of water vapor would increase the thermal capacity.

Interglacial Epochs. If the land areas remained high and large nothwithstanding local depressions attributed to the weight of the ice the conditions would again prevail for a renewal of the glaciation. So glaciation and deglaciation might follow each other until the general causes disappear. That is in so far as the continental land masses settle back toward sea level or are worn away the conditions would disappear.

Intercurrent Agencies. Glacial oscillations on the atmospheric basis might be interrupted or disturbed by other outside influences: (1) Any movement of the land which affected the aggregate atmospheric contact might disturb the rhythm.

(2) Any notable change in the supply of CO_2 by volcanic or other agency might affect it to a considerable extent.

(3) The precession of the equinoxes has a rhythm of its

own that might or might not coincide with the atmospheric one, likewise the change in the eccentricity.

It remains to consider whether the time necessary for these changes falls within working limits. If we take Reade's estimate of the amount of CO_2 in the atmosphere and the amount annually consumed in bicarbonates we find that it takes only 926 years to exhaust half of the CO_2 in the atmosphere now and only 17,500 years to exhaust half of the CO_2 of the atmosphere and the sea. There is a considerable variation in the estimates of the length of time involved in and since the recent glacial period, but all the estimates that have met with any favor are consistent with the figures given, viz., 17,500 years.

A FAMILY OF BLUE BIRDS.

PRINCIPAL JOHN D. WILSON.

JUNE 14, 1901.

The scarcity of suitable nesting places is a cause for the diminution of our native birds, which has not received the attention which it deserves.

Sparrows are versatile architects. They can nest anywhere. That is why they breed so fast.

Hollow stumps and trees which formerly furnished homes for blue birds, wrens, and chimney swifts, are rapidly being cleared away. The place of these might be easily supplied by artificial devices which would largely increase the number of birds in a very few years. Those who have never tried the experiment will be surprised at the readiness with which birds respond to assistance.

Early this spring, the recollection that, when a boy, I had often found a blue bird's nest in a hollow stump led me to make an attempt to entice a pair to locate in my garden.

On the 12th day of April I took four pieces of common house-siding about four inches wide and nailed them in the shape of a hollow, square prism. The opposite sides were respectively twelve and fifteen inches in length. I nailed a little strip across

the bottom, stuffed in a piece of newspaper, nailed another little board over the top, placed a cross piece projecting about three inches on each side for a perch, and fastened the device securely on the top of a grape arbor about fifty feet from my house. The device when finished was four inches square, fifteen inches high, with two, opposite, three inch openings just under the roof, and having about two inches of newspaper in the bottom.

I did not expect tenants this year; but I was happily disappointed. On the afternoon of April 26th a pair of beautiful blue birds made a brief, informal call. Saturday, the 27th, while I was working in my garden, they were in and out all day, though I did not see them carrying material for a nest. The following week I was away in the North Woods. On my return home, my first inquiry was about the blue birds. The report was that they had not been seen, and I reached the conclusion that the house did not suit. I kept a close and quite watch, however, and soon learned that they were still making frequent visits. By the 12th of May, I felt quite sure that the female was sitting. She would remain in the nest for several hours at a time and then leave it for only a few minutes. During this time the male bird was usually perched on some high point, sometimes on the telephone wire, overlooking the nest. When the female would come out, he would hop up and down on his perch and flap his wings like a little rooster, then he would dart down and peer into the nest. He did not sing in the vicinity of the nest during the time his mate was sitting.

By May 23rd, it was evident from the increased activity of the pair, that a brood had been hatched. The female was visiting the nest about fifteen times an hour. The male less frequently. He rarely entered the nest except when the female was present. On May 25th, between 3 o'clock and 3.30, the female made seven visits and both made three visits, a total of thirteen in half an hour. I soon learned that the business of the male bird is to carry refuse out of the nest, while the female does the feeding.

It is a curious fact that the mother bird almost invariably entered the nest at the south door, apparently just as one forms a habit of always sitting at the same place at table.

We soon began to hear the little ones every time the mother bird entered.

Saturday, June 1st, was a cold, rainy day. The old birds were rarely seen and the little ones could not be heard. I rapped on the post which supported the nest. No response. I feared they had perished. To satisfy myself, I got a step-ladder, removed the top of the box and looked in. There were five plump, fat fellows, snug and warm, and all feathered out except their tails.

Last Sunday, June 9th, as soon as I returned from church, I went out to see my pets; and as the mother bird left the nest, one of the little fellows hopped up to the edge of the opening and looked out. I knew at once that the day of departure was near, so I returned to the house so as not to hasten their exit.

I did not go out again till six o'clock when I saw one in a cherry tree, and two perched in the openings of the bird house, one on each side. I returned to the house and went to an attic window overlooking the garden, where they could not see me. I saw one little fellow fly from the nest to the top of a tree at least ten feet higher than the point from which he started. So his first flight was upward. They were soon all out, flying from tree to tree, picking among the leaves or holding their mouths open to be fed. By seven o'clock they were all away, just forty-four days from the time the old birds made their first visit.

On Monday morning I saw one of the little ones receiving breakfast from its mother in a nearby tree. I have not seen them since. I really miss them for I enjoyed their interesting ways.

The sparrows paid no apparent attention to the bird house during the period of nesting. It was too deep for them.

On the afternoon when the little blue birds were coming out, about a dozen sparrows and two robins came over to see what was going on. These the parent blue birds immediately attacked and drove away.

Had I fed and handled these little birds while they were helpless in the nest, it would have tamed them and induced them to remain near me all summer, but I reasoned that such treatment would weaken them, and that they would be stronger in the struggle for existence if I kept myself out of their life.

FAUNA OF THE AGONIATITE LIMESTONE OF ONONDAGA COUNTY, N. Y.

JOHN D. WILSON.

OCTOBER 18, 1901.

The transition from the Corniferous limestone, 9c of the geological series, to the Marcellus shale, 10a, is abrupt. Going eastward along the Jamesville and Manlius road in front of the new penitentiary, one may travel for a quarter of a mile on a smooth, natural pavement, the top of the Corniferous. At the burying ground, east of Jamesville, there is a sudden rise in the road. Upon inspection the hill is found to be composed of a black, fragile shale so highly charged with bituminous matter that will often blaze for a time if thrown upon a fire. In this shale which is almost destitute of fossils, at a distance above the Corniferous, varying from a few inches to fifteen or twenty feet, occurs what is now known as Agoniatite limestone. The formation is composed of two layers joined by a horizontal, suture-like, seam which is extremely difficult to open unless the rock has been exposed for some time to the weather.

It extends from Schoharie county on the east to Ontario county on the west. In Onondaga county, where the formation is best known, and where it probably has its fullest development, the lower layer is twenty-eight inches in thickness, and the upper one six inches. The lower layer has no cleavage lines. It is composed of irregular nodules of very hard substance, interspaced by softer material. It contains but few fossils and these are not well preserved. The upper layer has cleavage lines which form an angle of about thirty degrees with the connecting suture. This makes it difficult to separate fossils from the matrix, for they lie in a horizontal plane.

Both layers bear abundance of iron, have a distinct petroleum odor when first broken, and soon disintegrate when exposed to the atmosphere.

The upper six inch layer abounds in fossil remains, the most abundant being *Agoniatites expansus* and *Orthoceras Marcellense.*

These when whole lie in a horizontal position and are so numerous that they are, in places, touching one another.

If a goniatite is tilted, it is sure to be only a fragment, or a very small specimen. Those lying horizontally are usually whole on the lower side. The upper side is rarely preserved, probably having been worn away by the elements before the mud in which it was deposited hardened into stone. The orthocerata are usually whole; but because of the striae on the outside, the test generally adheres to the matrix when the fossil is removed from the rock.

The fossil fauna of the Agoniatite limestone is unique, being distinctly different, except in rare instances, from the forms found imbedded in the rock both below and above. A very few of the forms appear higher in the Hamilton shales. While fossils are numerous, species are comparatively few. In twenty years of effort, I have obtained about twenty from rock in place. I have at the present time eighteen species: Cephalopoda, nine; gasteropoda, three; branchiopoda, one; pteropoda, one; pisces, one; lamellibranchiata, two; plantae, one; crustacea, none.

The fish remains are too meagre to indicate anything except that they were large.

The single pteropod, *Coleolus acicula,* is described by Hall in Vol. 5, Natural History of New York, page 187.

Brachipoda are represented by one species, *Leiorhynchus limitare,* the *Orthis limitaris* of Vanuxem, Vol. 4, page 356. *Leiorhynchus limitare* is usually found inside of the shell of an agoniatites or an orthoceras, sometimes as many as one hundred in a single shell. This is probably due to a gentle movement of the water in which the little creatures lived. Lamellibranchiata are rare. I have found but two: *Lunulicardium curtum,* Hall, Vol. 5, and *Panenka ventricosa,* Hall, Vol. 5, page 417.

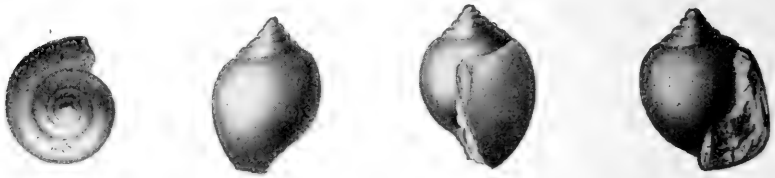
Gasteropoda are represented by *Loxonema delphicola,* common in the higher Hamilton shales, Hall, Vol. 5, page 47; *Euomphalus planodiscus,* Hall, Vol. 5, page 57, and a new species described and named by Dr. John M. Clarke in museum bulletin No. 49, page 127 as follows:

"*Macrochilina onondagaensis, sp. nov.* Shell rotund with

short acuminate spire having incurved slopes, its length being about one-quarter of the entire length of the shell, or that of the body whorl. Whorls largely concealed. Surface convex, sutures impressed; body whorl very high, somewhat abruptly convex near the suture where the surface of the penultimate whorl is overlapped for 4-5 of its width. Non-umbilicate but with the columellar lip well defined and slightly twisted; aperture entire, outer lip but slightly thickened. Surface smooth, shining, bearing only fine concentric lines. Internal cast smooth.

Dimensions: Height 22 mm.; width across body whorl 17 mm.; height of body whorl 18 mm.

Locality: Agoniatite limestone, Manlius. This very pretty species has been found by Prin. John D. Wilson of Syracuse, who has considerately presented the type specimen to the state museum. It is unlike any species known from the New York Devonic in its short, concave spire and very large body whorl, features which also distinguish it from other forms of the genus."



The above views of *Macrochilina onondagaensis*, which were printed in Museum Bulletin No. 49, were furnished to the Academy through the courtesy of state paleontologist, J. M. Clarke.

The cephalopoda are large, numerous, and interesting. *Agoniatitites expansus* and *Orthoceras marcellense* are the most common. *Goniatites discoideus, Nautilus discites, Orthoceras constrictum, Gomphoceras fischeri, Gomphoceras solidum,* and *Gyroceras transversum* are not so abundant, though occasional specimens of all these may be counted on.

Thoracoceras wilsoni is a new cephalopod named and described by Dr. John M. Clarke in museum bulletin No. 49, page 126, as follows

"*Thoracoceras wilsoni, sp. nov.* The shell has a slight cyrtoceran curvature, notable chiefly in the distal apertural region.

The cast of the interior shows a very decided prismatic appearance, there being ten well defined prism faces with flat or at times slightly concave surfaces. Of these faces that on the inner curvature of the dorsal surface is the broadest and is well defined over the body chamber, where the other faces become faint or quite extinguished. The body chamber shows a slight constriction at about one-half its length. In two of the casts in which the body whorl and aperture are entirely preserved, this chamber has a length of 45 mm., which is equal to the depth of 6.5 chambers.

On the exterior the surface is ornamented by fine concentric or horizontal imbricating or engraved lines, which are bunched together into low concentric annuli and are crossed vertically by ridges of about the same size. These are ten in number to correspond with the prism angles. Where these cross the annuli, they are raised into projections which appear for the most part to be short, stout and blunt but in some vertical sections of the shell are apparently extended, acute and spiniform. The exterior markings become fainter on the body whorl, but are plainly visible to the aperture, in this respect contrasting to the condition of the internal surface. The aperture is sinuous with a marked channel on the left lateral margin.

Dimensions: The specimens observed have an apertural diameter of 30 to 40 mm., and bear 16 septa in a distance of 100 mm., from the last downward. The approximate entire length of these shells was 250 mm.

Locality: Manlius; John D. Wilson, collector and donor."

Because of the fragile shale both overlying and underlying, and its own unstable character when exposed to the atmosphere, exposures of Agoniatite limestone, satisfactory for study, rarely occur. Out-crops are common enough, but they are generally meagre. Those best known to me are the following:

At the road side about half a mile southeast of Marcellus village, on both sides of Onondaga Valley from one to three miles south of the city line, and in several small ravines south of the road between Jamesvile and Manlius.

In the foregoing paper, I have mentioned only fossils collected by myself from rock in place in this county.

I have seen and have had at times others. Some years ago I found a large cephalopod in the form of an open coil.

Prof. P. F. Schneider reports *Pleurotomaria regulata** and a small trilobite**, and Hall in the state reports gives several species as occurring in Agoniatite limestone, which are not here enumerated.

CEPHALOPODIA; *Agoniatites expansus, Agoniatites discoideus, Nautilus discites, Orthoceras marcellense, Orthoceras constrictum, Thoracoceras wilsoni, Gomphoceras fischeri, Gomphoceras solidum, Gyroceras transversum.*

GASTEROPODA; *Loxonema delphicola, Marcrochilina onondagaensis, Euomphalus planodicus.*

BRACHIOPODA; *Leiorhynchus limitare.*

LAMELLIBRANCHIATA; *Lunulicardium curtum, Panenka ventricosa.*

PTEROPODA; *Coleolus acicula.*

PISCES; spines.

PLANTAE; leaves.

SOME FUNGI OF ONONDAGA COUNTY, NEW YORK.

MISS MINNIE L. OVERACKER.

DECEMBER 20, 1901.

Our class work in the fungi began with the early colonies of *Coprinus micaceous* found so frequently by roadside and pavement wherever a center of decaying wood offers foothold and food supply. This little Coprinus that came early and stayed late, has a conical tan-colored cap sprinkled with shining particles like mica, and is edible though somewhat thin.

*Since writing the above Principal Wilson also found the pleurotomaria in rock, unquestionably agoniatite, he has also discovered a third species in this rock. It is no doubt a variety of gasteropod, and has been forwarded to State Paleontologist Clarke for classification and description.

**This tribolite, according to Professor Schneider's "Notes on the Geology of Onondaga County," is *Proetus Haldemani.* Mr. Schneider has found it in considerable numbers at one exposure, the cutting in the roadside at the hill just before reaching the Vandemark homestead on the turnpike going east from Jamesville to Manlius. He also reports the same specimen from Oriskany Falls about 33 miles east of Syracuse.

Cop. atramentarius, noted for the whole plant dissolving in age into a black inky fluid—came about the same time and was smoky or silvery gray in color. The most striking Coprinus however is *C. comatus*—tall, barrel-shaped, and covered with shaggy scales,—and this species to a mycophagist, is a dainty morsel.

Among other dark-spored species, we found abundant Hypholoma, both the common creamy *H. appendiculatum* and the brick-red *H. sublateritium*— lasting from May to October.

Stropharia semiglobata was not uncommon, but its relative *S. aeruginosa* was a dainty rarity with its delicate robin's-egg blue cap and pale chocolate gills.

In this brown spored division is also the genus Agaricus: *Agaricus campestris* being the common mushroom of culture caves and shops. In the latter part of summer came an interesting series of Agarici—the broad-topped, delicately scaly species *placomyces,* the horse-mushroom *A. arvensis,* the delicate little wood form, *A. silvicola,* and the fine, stout, crimson-gilled *A. rodmani.* It is especially interesting with mushrooms, so difficult at best to determine accurately,—to be able to examine a series of related species and note the minor points of difference together with the typical characters of the genus.

The largest group of Agarics is the section having white spores. Here we studied the most poisonous of all mushrooms, the Amanitas, and found numerous species: the beautiful *A. phalloides,* pure white or tinted with gray or buff; tall, with graceful white collar and distinct cup at base. Some of these we watched with great interest, developing from the egg. Closely related is the smaller *A. verna,* called the destroying angel—its exquisite purity together with its fatal principle giving sufficient warrant for the poetic term.

Then *A. virosa, A. velatipes,* (properties untested but probably vicious), the little *A. floccocephala,* the bright orange *A. muscaria* called the fly-mushroom, and the reddish-tinted *A. rubescens.* Amanitopsis is closely related and lacks only the collar on the stem; we found that with gray and salmon-tinted caps.

Next in order of relationship comes Lepiota the parasol

mushroom—lacking the volva at the base of the stem and, like Amanitopsis, quite harmless. Several species of Lepiota came to our hands. Of the genus Pleurotus which includes the oyster mushroom and other plants highly prized for their edible qualities, we found at least six species. *P. sapidus,* a large, fleshy, attractive looking mushroom, though classed with the Leucosporae, has beautiful lilac-tinted spores.

Collybia is a distinct genus of this group; we found four species, of which *C. radicata,* with the deep, tapering, root-like projection of the stem, seemed the very commonest among the mushrooms; it was found growing in all sorts of places.

Among the pink-spored Agarics,*Plutcus cervinus* was commonest and usually easily recognized by its ball and socket joint between cap and stem. Claudopus, Entoloma, Leptonia, and Clitopilus were other genera found.

The genus Pholiotâ, distinguished among the ochre-spored agarics by its distinct ring on the stem, was abundant in several species. Late in Autumn, a large cluster of the bright yellow *P. adiposa* was found growing on a decaying stump at Dorwin's Spring. Species of Naucoria, Inocybe, Tubaria, Crepidotus, Galera, and Cortinarius were frequently found. The violet Cortinarius is a beautiful plant and one easily recognized in that difficult genus. Paxillus, found in two species, proved very interesting as presenting a transition state from gills to pores.

Owing to the long weeks of rain in the early part of the spring and summer, this past season of 1901 was remarkably favorable to mushroom growth. Species new to us appeared at every turn; in groves and pastures, on grassy hillsides and sandy banks, by roadside and street, in lawn and garden—almost any where one might catch glimpses of fresh Agarics peeping up. Mushroom hunting has this decided advantage over collecting flowering plants, that the same locality may be visited day after day and yield each time fresh plants whose existence was not before hinted at—or if so, the hint was imperceptible. So while a wide range of territory is not to be disdained, a very limited hunting ground will often yield fresh material indefinitely.

Kimber's Springs, Dorwin's, the woods near the Sugar

Loaf, Long Branch, the woods toward Jamesville, the vicinity of Baldwinsville, were all cherished haunts of this year's mushroom hunters. In a few hours collecting over some wooded hillsides and damp meadows near the Split Rock road, one hundred and twenty-five species were counted, and these of course of the more evident varieties; for the most part, we left Ascomycetes, Myxomycetes, etc., severely alone.

A fact noted, due no doubt to the favorable season, was that measurements of many species far exceeded those given in books of reference. For example, *Armillaria mellea* grew 25 cm. tall, instead of 15 cm. as it was said to do.

In those same Split Rock woods, we found many very interesting plants,—among them the black, shaggy Strobilomyces, one of the pore-fungi said not to be very common; the indigo Lactarius where the ordinary milky juice, characteristic of the genus is replaced by a bright blue fluid. A number of other Lactarii were found—the golden brown *L. volemus* and *L. corrugis,* the yellow-spotted *L. chrysorrheus,* the zoned *L. deliciosus,* and the white *L. piperatus* with an extremely hot flavor of pepper. Russula is an allied genus, easily recognized and usually beautiful. We studied five or six species of that,—the dull brown capped *R. adusta,* the delicate green *R. virescens,* the crimson *R. emetica* (said to be poisonous), *R. fragilis* and *R. alutacea.* A very unusual specimen of the last was found near the St. Lawrence river, having a small perfect plant growing directly from the pileus of a large one. Some dead leaves had drifted across the larger plant but the small plant was firmly attached and seemed part of the other. Professor Atkinson wrote that he had never observed a case of the kind. Something similar was noticed in *Tricholoma personatum* where the large plant was partly covered with straw and bore two small imperfect pilei on its upper surface. In neither case could it have been parasitism, for the small plants were clearly of the same species as their supporters.

While we studied Agarics chiefly, we identified occasional species belonging to genera of the Polyporaceae,—especially Boletus, Polyporus, and the beefsteak fungus, Fistulina. Also

several interesting species of Hydnum, Clavaria, Stereum, and Craterellus.

A number of species of puff-balls were found in abundance, and some appetizing repasts reported based on the largest one, *Lycoperdon giganteum.*

But to give a somewhat detailed description of the species of fungi studied in one season by our beginners' class would demand far more space than can be taken here,—the whole number of species positively identified reaching a total of one hundred and eighty. Whence it is clear that, given a favorable season and the penetrating eyes of a few active mycologists, Onondaga county need not fear to compete in the abundance, variety, and interest of her fungus-flora with the rich Adirondack region itself.

FUNGI COLLECTED NEAR SYRACUSE, 1901.

Agarics (white spored).

Amanita floccocephala September 9.
" Frostiana, September 9.
" muscaria, June 17.
" phalloides, September 9.
" velatipes, July 26.
" verna, July 26.
" virosa, September 7.
Amanitopsis vaginata, September 7.
Armillaria mellea, September 1.
Cantharellus aurantiacus, September 1.
" cibarius, September 1.
" cinnabarinus, September 1.
Clitocybe candida, September 15.
" cyathiformis, October 20.
" infundibuliformis, July 26.
" laccata, June 15.
Collybia dryophila, June 8.
" platyphylla, June 15.
" radicata, May 25.
" velutipes, May 25.

Hygrophorus coccineus, May 25.
" conicus, July 15.
" miniatus, September 1.
" psittacinus, June 10.
" puniceus, September 1.
Lactarius chrysorrheus, September 14.
" corrugis, September 14.
" deliciosus, September 9.
" fulginosus, August 14.
" indigo, September 5.
" piperatus, August 5.
" volemus, July 26.
Lentinus lecomtei, June 3.
" lepideus, September 14.
Lenzites betulina, November 2.
" crataegi, September 14.
" sepiaria, August 5.
Lepiota cristata, August 9.
" naucina, May 27.
" procera, September 1.
Marasmius campanulata, August 8.
" capillaris, June 15.
" oreades, June 15.
" rotula, June 15.
Mycena cyanothrix, September 1.
" epipterygia, June 8.
" galericulata, May 23.
" haematopa, October 26.
" polygramma, June 8.
" pura, August 14.
Omphalia campanella, August 14.
" epichysium, June 8.
Pleurotus dryinus, June 10.
" ostreatus, June 10.
" petaloides, November 12.
" sapidus, November 2.
" septicus, November 2.
" serotinus, October 26.
" sulphuroides, June 15.

Russula adusta, September 7.
" alutacea, June 15.
" fragilis, July 25.
" virescens, September 7.
Schizophyllum alneum, August 8.
Tricholoma personatum, August 8.

(pink spored.)

Claudopus nidulans, November 2.
Clitopilus prunulus, September 5.
Entoloma grayanum, August 14.
" strictius, September 9.
Leptonia asprella, August 14.
Pluteus cervinus, June 11.
Volvaria bombycina, August 31.

(ochre spored.)

Cortinarius cinnamomeus, July 25.
" ochroleucus, September 7.
" violaceus, September 7.
Crepidotus applanatus, May 15.
" fulvotomentosus, May 15.
" haustellaris, October 7.
" versutus, October 26.
Galera ovalis, July 25.
Galera tenera, July 25.
Inocybe entheloides, July 25.
Naucoria abstrusa, May 15.
" semiorbicularis, May 15.
Paxillus atrotomentosus, July 15.
" involutus, September 14.
Pholiota adiposa, October 20.
" aegerita, October 20.
" dura, May 22.
" marginata, October 20.
" praecox, May 28.
" squarrosa, June 14.

(brown spored.)

Agaricus arvensis, September 7.
" campestris, May 27.
" placomyces, September 5.
" Rodmani, June 3.
" silvicola, October 13.
Hypholoma appendiculatum, May 15.
" sublateritium, May 15.
Stropharia aeruginosa, October 30.
" semiglobata, July 14.

(black spored.)

Coprinus atramentarius, May 20.
" comatus, June 3.
" micaceus, May 20.
Panaeolus papilionaceus, May 31.
" retirugis, July 14.
Psathyrella disseminata, May 20.
" prona, November 11.

Polyporaceae.

Boletinus porosus, September 7.
Boletus Americanus.
" badiceps.
" castaneus.
" chrysenteron.
" edulis.
" felleus.
" granulatus.
" luteus.
" obsonium.
" retipes.
" vermiculosus.
Daedalea confragosa, July 25.
" quercina, October 20.
" unicolor, May 25.

Favolus alveolarius, June 9.
Fistulina hepatica, August 5.
Fomes applanatus, October 20.
Fomes fomentarius, October 20.
Gleoporus conchoides, November 2.
Polyporus brumalis, July 25.
" elegans, July 25.
" gilous, July 25.
" lucidus, July 25.
" picipes, November 3.
" resinosus, October 26.
" sulphureus, September 3.
" tomentosus, September 3.
Polystictus cinnabarinus, May 25.
" cinnamomeus, September 14.
" hirsutus, May 25.
" perennis, October 20.
" pergamenus, May 15.
" versicolor, May 15.
Strobilomyces strobilaceus, September 5.

Hydnaceae.

Hydnum aurantiacum, September 30.
" caput-ursi, October 3.
" flabellatum, October 20.
" repandum, September 7.
Irpex mollis, September 30.
Phlebia radiata, November 2.

Thelephoraceae.

Craterellus cantharellus, September 9.
" clavatus, September 9.
" cornucopioides, September 9.
Stereum spadiceum, September 9.
Thelephorum Willeyi, August 9.

Clavariaceae.

Clavaria botrytes, September 9.
" cinerea, September 9.
" cristata, September 9.
" formosa, September 9.
" pistillaris, September 9.

Tremellineae.

Leotia lubrica, September 4.
Tremella lutescens, June 8.

Gasteromycetes.

Crucibulum vulgare, November 2.
Dictyophora duplicata, September 23.
Geaster mammosum, November 2.
Lycoperdon cyathiforme, September 7.
" gemmatum, June 15.
" giganteum, September 7.
" pyriforme, October 7.
Tulostoma mammosum, November 2.

Ascomycetes.

Hypoxylon coccineum, November 2.
Morchella conica, May 15.
Morchella esculenta, May 15.
Peziza badia, May 15.
Peziza coccinea, May 23.
Xylaria polymorpha, September 5.

THE GINSENG INDUSTRY OF ONONDAGA CO., N. Y.

Miss Louise W. Roberts.

December 20, 1901.

One member of the *araliaceae* family, *Panax quinque folium,* now rarely greets us from its shady nook in the ravine and forest but more often from its artificially shaded and highly cultured fields.

The history of ginseng is unique, and its fabulous cost is surprising when we remember that only one nation makes use of it to any extent.

For hundreds of years the roots have been cherished by the Chinese as a panacea for all their ills, and a prized article for presents. The roots are often forked or branched and grow in imagination, to resemble the human form, hence its name, ginseng, signifying man. They imagine the parts representing the arms will cure the diseases of the arms and so on. The more nearly the root resembles the human form the more expensive it is. The highest grade is raised in Manchuria in the royal gardens and hunting grounds, and carefully watched. Death is the penalty paid for dealing in it without a government license. The price of the Manchurian roots ranges from $40 to $200 a pound. The next in value is the Rorean species which our *Panax quinque folium* so closely resembles. The roots of the Kurean plants range from $15 to $35 a pound.

When the Europeans learned of these fabulous prices they began searching for it in North America where the French, through the description given them by Father Jartoux, who for a long time was a Jesuit missionary among the Chinese, discovered a plant in Canada which answered the description. It was our *Panax quinque folium.* This plant was discovered in the year 1716.

The Iroquois soon found great quantities in their lands. They called it ga-ren-to-quen, signifying legs, thighs.

So the French ,aided by the Indians, collected and exported great quantities. The demand increased, and for some time it

was one of the important articles of trade between these two countries. A company from India in 1757, eager for gain, sent agents in every direction collecting it in a wholesale manner. So many roots of an inferior quality were gathered and marketed that it destroyed the trade for some time. New localities, principally west of the Mississippi, were found producing better quality roots which helped to revive the trade.

The price varies according to the demand and supply. In the year 1900 good quality roots brought about seven dollars a pound. The appraisal of the American exports for the year 1900 was $4,000,000.

This American species is an erect perennial herb from elongated, aromatic roots with five leaves palmately arranged.. The flower stalk is from two to five inches long, bearing in June or July an umbel of small flowers. These are soon followed by fruit which developes rapidly, remaining green until the middle of August, when it begins to turn red. Each berry bears two or three seeds.

In cultivated plants 75 to 100 seeds are the usual number, although as many as 152 seeds have been gathered from a single plant. The wild plant generally bears only about 50 seeds.

The forest ginseng only propagates by seed which lies in the ground eighteen months before germinating. In some states the laws are stringent for its protection, prohibiting its being gathered excepting at certain times of the year. The autumn being considered the most profitable time for it to be gathered.

Its properties are demulcent, slightly stimulent. Its taste mucilaginous and sweet. It is strange that a plant with no stronger properties should be the means of such great revenues. Some of the wild roots have been sent from this and adjoining counties. It was while Mr. George Stanton, trying to recuperate his health by being out of doors, became interested in gathering it and while doing so thought " the supply will soon be exhausted, why not cultivate it?" So by way of experiment he planted some roots in a starch box and placed it in the cellar until spring and then planted them in the ground. This was the first cultivation of ginseng in America. Onondaga county being the pioneer

county and Mr. George Stanton the pioneer cultivator. He has enlarged his beds and is now in correspondence with nearly all parts of the new world and much of the old on this subject; for the craze to enter the business is spreading, stimulated by the fabulous prices paid for both roots and seeds. Mr. Ready of the Amber ginseng gardens received in November $9 a pound for the cultivated roots, and from $6 to $7 for the wild roots.

The seeds are greatly in demand. Four years ago the seeds sold for $1 an ounce, now they are being sold for prices ranging from $5 to $20 an ounce. Mr. Stanton expressed his satisfaction with $5 or $6 an ounce, as during the year 1901, he sold from one-fourth acre 50 pounds at that price, making that fourth of an acre to yield $4,500 in one year. About that same time he sold 70 pounds of roots for $593.69, and also 224 pounds for $1,344.-37, which was the product of twelve square rods. Many of the beds had borne but one crop before.

The principal growers are Mr. George Stanton at Apulia, Mr. Ready of Amber, Mr. Mills of Rose Hill, Mr. Timmerman of Apulia, Mr. Meara of Tully.

Its culture has become one of Onondaga's industries.

The seeds are ruined if allowed to dry, so when gathered they are packed in dry sand and placed in a cool place.

There is a demand for the neck of the roots from which plants are also raised by cultivation.

To what the craze for its cultivation will lead none can tell, nor of the future financial prospects for as yet only one nation makes much use of it, and the demand there may be more from sentiment than for any real virtues in this plant. When that nation shall have become more enlightened on medical remedies their high estimate of ginseng may wane and the fabulous prices be a thing of the past.

January 17, 1902.

SIXTH ANNUAL MEETING.

The president, Dr. W. M. Beauchamp, in the chair.

The minutes of the December meeting were read and approved.

The name of Guy Bailey was proposed for membership.

The report of the council recommended:

(1) The election of Dr. E. H. Kraus to active membership.

(2) The payment of bills amounting to two dollars.

(3) The transfer of the name of Dr. I. H. Levy from the active to the corresponding list of members.

The report was adopted, the bill ordered paid, and the candidates elected by secretary's ballot.

SECRETARY'S REPORT.

In the absence of the secretary, Mr. H. W. Britcher, the work of the year was summarized by the corresponding secretary, P. F. Schneider as follows:

Eight regular meetings have been held during the year, there being no meetings in January, July, August, September.
tanical Gardens and Their Influences," L. M. Underwood, Ph.D.

The speakers and their subjects follow:

February 15. "Botanical Gardens and Their Influences," L. M. Underwood, Ph. D.

March 15. "President's Inaugural Address," Dr. W. M. Beauchamp.

April 19. "The Goniatite Limestone," J. D. Wilson; "Glacial Climate," T. C. Hopkins.

May 17. "Conditions in Porto Rico," Dr. John Van Duyn; "The Marine Life of Porto Rico," Dr. C. W. Hargitt.

June 14. "Bird Notes," Charles G. Rogers; "Hawks," George D. Lynch; "A Blue Bird Family," J. D. Wilson; "Pond Life," H. W. Britcher.

October 18. "The Fauna of the Agoniatite Limestone," J. D. Wilson; "Notes on the Butternut Dike," T. C. Hopkins and Philip F. Schneider.

November 15. "The Chemistry of Onondaga Rocks," Ernest N. Pattee; "Modern Explosives," H. Monmouth Smith.

December 20. "Some Fungi of Onondaga County," Minnie L. Overacker; "The Ginseng Industry of Onondaga County," Louise W. Roberts; "The Chemical Composition of the Cocoanut," J. E. Kirkwood.

The lecture of February 15, by Dr. L. M. Underwood was popular in character and attracted a large audience.

The present membership is: active 43, corresponding 4, associate 17, total 64. The average attendance at the regular meetings has been twenty-four.

TREASURER'S REPORT.

The treasurer, Miss Louise W. Roberts, gave her annual report which is summarized as follows:

Balance in treasury, January, 1901	$ 89.04
Receipts from all sources	51.47
Total	$140.51
Disbursements	32.75
Balance on hand	$107.76

The corresponding secretary and librarian gave short verbal reports.

BOTANICAL SECTION.

Mrs. Leonora Goodrich for the Botanical section reported that the "Fungi" had been the special subject for the past year. In view of the full report from this section at the last regular meeting no detailed written report was offered.

ZOOLOGICAL SECTION.

In the absence of Mr. Britcher, chairman of this section, Dr. C. W. Hargitt, reported on the work accomplished during the

year. His report showed valuable work accomplished on the protozoa, mollusca, amphibians, and birds.

GEOLOGICAL SECTION.

The report of this section was read by its chairman, Prof. P. F. Schneider. It showed that a second species new to science had been found in the Goniatite Limestone by Principal J. D. Wilson, and the name *Thoracoceras Wilsoni* has been suggested for the same by the State Paleontologist, J. M. Clarke. Another important piece of work was that of Dr. S. E. Crane of Onondaga, who sees in the east and west channels of our county (extinct watercourses) the key to our complicated surface geology. Mr. Charles E. Wheelock has contributed an interesting paper on the subject of our pleistocene geology. Two new exposures of intrusive dikes have been discovered in this county during the year and drawings and descriptions of the same have been made and preserved. Full reports on these will be given at some future meeting of the academy.

The election of officers resulted as follows:

President, Dr. W. M. Beauchamp; vice-president, Charles W. Hargitt; secretary, Philip F. Schneider; corresponding secretary, T. C. Hopkins; treasurer, Miss L. W. Roberts; librarian, Mrs. L. L. Goodrich; councillors for three years, Ernest N. Pattee, Franklin H. Chase.

Meeting adjourned.

NOTES ON THE FOOD HABITS OF BIRDS.

CHARLES W. HARGITT.

MARCH 21, 1902.

Birds have from time immemorial appealed to human observation and interest. Their mode of life, grace of form, richness and variety of coloration, all having conspired to endear them to the lover of nature. From this too, they have probably been among the first of a given fauna to enlist critical attention at the hand of the scientific observer. Such observations in America

date from almost the dawn of settlement, though it was not till early in the eighteenth century that anything approaching systematic, or scientific observations could be said to have begun, in such records and descriptions as Catesby's Natural History of Carolina, 1731; Bartram's Travels in 1791, and Barton's Fragments of the Natural History of Pennsylvania, in 1799.

With the work of Wilson and Audubon early in the nineteenth century the distinctive aspects of systematic ornithology may be considered as fairly established, though of course greatly extended by many noted ornithologists even up to the present time.

This however partook but slightly of what may be designated as economic ornithology, or that phase of the subject concerned with the economic relations which birds sustain to the varied aspects of organic nature, particularly to that of agriculture. Such were the aspects of the earlier inquiries and reports of several of the state agricultural societies, as those of Ohio and Illinois, of Allen's Birds of New England, Elliott's Game Birds of the United States; the last dealing more particularly with the aspects of birds as food.

The only one of these earlier inquiries which proceeded upon modern lines of investigation seems to have been a report made to the Massachusetts Horticultural society in 1858, by Jenks, based chiefly upon observations made upon the robin; and included a systematic examination of the food contents of stomachs of birds killed at stated intervals during the year.

The devastations of the Rocky Mountain locust during the period from 1870 to 1880 called out extended observations on the food habits of various animals in their possible relations to the locust plague.

Notable among these was the report of Aughey in 1878*, and included both critical observations made upon the feeding habits of birds in the fields, as well as upon the food contents of the stomachs of those taken for that purpose, and was up to that time one of the most valuable contributions made to the subject.

The work of Professor Forbes, of Illinois, whose contributions to this subject at various times from 1880 to 1890 mark a

noteworthy advance in the subject both in methods of observation and estimation of relative food values of items concerned, as well as the relative importance of factors in the problem, which he termed "*Beneficial,*" "*harmful,*" and "*neutral.*"

From that time up to the present work has been prosecuted by individual or organized activity, the latter chiefly under state or national supervision and support.

Without in the least discrediting the work of individual investigation along this line, nor that of state entomologists and experiment stations, many of which have been important, it is not too much to say that the contributions from the United States Department of Agriculture have been noteworthy to a degree unequalled by any similar organization in the world, so far as I am aware.

These reports, as separate documents, or as substantial components of the Annual Reports of the Department, have extended to almost every phase of bird life, so that data are available for estimating with reasonable approximation, the specific economic relation of a large proportion of our avifauna, and from a comparison of habits affords grounds for approximate estimates of almost all.

Aside from the general faunal relations of birds, concerning which it is not the purpose here to inquire, the economic aspect of birds presents an important problem which is two fold in its nature:

1. That of the food consumed, and its direct commercial value, as for example, the rice of the bobolink, fruits and berries of robins, corn and other grains by crows, etc.

2. That of the indirect problems involved in the relations of insects to vegetation, crops, etc., as modified by birds.

While somewhat distinct problems they will be seen to stand closely related in a very large majority of cases and hence will of necessity have a generally coincident consideration.

In the usual course of nature we might leave all such adjustments to the methods of nature; that is, in the struggle for exis-

*Report U. S. Entomological Commission, Vol. I.

tence it usually comes to pass that a healthy balance is maintained on the principle of the survival of the fittest.

We do not have to be reminded however that in the problems before us there is no longer a natural or free " struggle for existence," since man and his methods have so obtruded themselves upon the scene as to greatly disturb the balance so easily recognized in wild nature. No single factor within the entire history of life has so disturbed the natural course of balance and adjustment as man,—this forest destroying, soil ravishing, bloodthirsty, or sport-craving maniac, so-called " civilized " man.

It is therefore under conditions associated with this changed condition of things that our problems become such. And here they receive their significance and importance in the bearing they come to have on man's conceptions of economy. It is moreover under the altruistic and humanistic spirit which has come to fruition in these later times and which looks both forward and backward as well as downward, recognizes an obligation and righteousness and equity in the constitution of nature, that these with kindred problems have come to their rightful recognition.

The present method of investigation is so far as I now recall due to the scientific spirit and aim of Prof. S. A. Forbes, of the Illinois State Laboratory of Natural History, from which in other lines as well, have come many of the best products of such investigations.

It consists essentially in a critical investigation and determination of the food contents of the stomachs of birds in sufficient numbers and seasons to warrant an inference as to their actual and average food proclivities.

A second method and one not without its advantages, though lacking to some extent in the elements of exactness characteristic of the former is that of direct observation of the actual feeding habits of birds in open nature. It has the added advantage, which is great, that it does not involve the destruction of the life of the bird, which generally should be saved. It is constantly open to the objection that it can seldom be relied upon except when made by those trained by critical observational habits, for ordinarily the personal bias or equation of the observer is so dom-

inant as to prejudice his conclusions. But with all its disadvantages it remains an always open field for the critical observer and if done by the aid of good field glass, or by the aid of the camera during the feeding of young, may become fruitful of excellent results.

That neither of these methods alone is sufficiently conclusive is evident in that neither has found perfect agreement in the hands of different observers. It may be well to point out in this connection some of the sources of error in the first as has also been done in the second.

One of the first difficulties encountered in an examination of the stomach contents of birds is the promiscuous mixture and mutilated and semi-digested condition of much of the food contents which in many cases renders actual indentification largely impossible. To estimate the number or amount of insect food from the fragments of a few elytra or disarticulate segments of legs can best only be an approximation. A further difficulty and one more serious to my mind than the first is the almost impossible task of making any equitable comparison as to the relative importance and equivalence of beneficial or harmful elements.

Certainly a comparison of bulk in most cases would be manifestly absurd. For example, the bulk of a single blackberry would outmeasure a thousand plant aphids or chinch-bugs, yet as to economic balance of the two masses it would be glaringly absurd to claim equivalence. So too of cut worms or strawberries, May-beetles and May cherries. To presume upon an equivalence here, or to meet out praise or blame, as the one or the other element might predominate, would be hasty and uncritical.

Again it seems to me that it is equally unscientific to institute a comparison and contrast even between the so-called beneficial elements as against injurious or neutral. To class all berry seeds as among the beneficial is uncritical. Who will presume to distinguish between the seeds of the wild and cultivated berry? How much of the wild fruit under present conditions is to be claimed as of economic importance and value? A very large measure of it must under the most favorable conditions go to waste unless used by birds or other fruit eating animals, and to

place this under the essentially beneficial is as unwarranted as to place all insects under that of harmful. While an effort is made in the last to distinguish between the two this has not been to any considerable extent in the former.

After some personal practical experience and a more or less critical review of the facts now fairly numerous and common, I am constrained to submit that the showing under this method, while generally not appealed to as discrediting birds as economic factors, is yet incorrectly placed too often on the wrong side of the balance sheet, at least in part.

Another factor apparently overlooked, or left out of consideration in these estimates is that of the enormous capacity for multiplication through propagation shown by most of the so-called "injurious" elements.

When, for example, a May beetle has been estimated on the same quantitative basis as a May cherry, what account has been made for the gorged ovaries of the former which only awaited favorable conditions for oviposition? None whatver. And what is presumptively true in this case is demonstrably true in innumerable other instances. To cite a single case of recent observation in our immediate vicinity, the females of the periodic Cicada were so closely captured by insectivorous birds as to greatly lesson the damage done to shrubs and trees through ovipositing, to say nothing of subsequent injuries of larvae, or a subsequent generation of adults.

The same principle holds for a large proportion of noxious insects. For it must not be overlooked that the season of greatest activity among destructive and ovipositing insects is likewise that of corresponding activity among insectivorous birds. This must be true in the nature of the case, the latter depending largely upon the former.

I am aware that these reflections are applicable alike to beneficial as to injurious insects. An insect-feeding bird is no respector of persons on economic or ethical grounds. But by so much as the beneficial insects are in marked minority, will the objection be invalidated.

Again, not a few of the pedacious insects are, like the birds,

not over-scrupulous as to their prey, beneficial preying upon others of similar qualities. Hence, if we should limit the utility of birds on this account we may likewise apply the same restrictions to the so-called " beneficial " among insects.

A point which has come to be noted by many observers is that so far as bird injuries to fruits are concerned it is largely by the young for a short time after flight from the nest. This has been remarked specially with reference to the robin. It probably applies with equal justice to the thush, red-head, and others. Since this period is usually a brief one, tho it be coincident with the ripening cherries and berries, and hence not lessening this feature of damage, it should not be overlooked that these birds must live and have a being dependent upon other diet for at least nine-tenths of the year, and that during this time the food is largely of insect, or similar nature. It should not be overlooked therefore that even allowing some loss at times to the horticulturist and agriculturist, there are over-balancing and preponderating compensations difficult to over-estimate.

It is not implied in this conclusion that no precautionary or protective measures should be employed against the fruit-eating birds at this season. It does not however, seem necessary that they should go to extent of actual destruction of the birds. Where " scare-crows " are ineffective a small boy with a pocketful of rocks, or with perhaps a gun and some blank cartridges to add to his interest, might prove adequate for reasonable protection. Or where these may not be practical I have known nets thrown over trees or bushes to effectually protect the fruit and spare the birds.

To the recurring query whether we not only may facilitate the restrictive value of birds against insect depredations by their adequate protection, as is now done in most of our states, but by importing birds of known insectivourous habits, it must be replied that while this is always possible it should be done only after careful investigation. The mischievous results following the introduction of the English sparrow are too well known to need emphasis in this connection.

On the other hand there are not lacking cases of equally important value in such introduction. Among such is that of the Indian "Meina" brought to the Island of Mauritius and proved effectual in exterminating the locust pest which had become intolerable. (Cf. Insect Life, Vol. III, p. 344.)

Later reports concerning this bird do not seem to confirm the anticipation entertained concerning it. (Cf. Report U. S. Dept. Agr., 1899, p. 290.)

All in all, there seems little doubt as to the fact that the consesus of scientific opinion points unmistakably to the high economic importance of birds from almost every point of view.

Both observation and somewhat extended experience conspire to suggest extreme caution as to introduction of foreign birds, or other faunal factors.

It is not beyond reasonable expectation that continued agitation and distribution of reliable information may do much toward the protection of our avifauna from the cruel rapacity of thoughtless sportsmen and pot-hunters, and from the heartless vanity of a barbarous fashion.

THE GEOLOGY OF THE SERPENTINES OF CENTRAL NEW YORK.

PHILIP F. SCHNEIDER.

APRIL 18, 1902.

Igneous rocks in the horizontally stratified Paleozoic beds of Central New York are too rare to pass unrecorded; and when, recently, excavations in Syracuse for the Butternut street trunk sewer disclosed another of these occurrences in a new locality and at so great a depth that ordinary excavations had not reached it because of the thickness of the overlying drift, it became important that some permanent and available record should be made of the same.

The eruptive rock was first noticed April 16, 1901, some three days after it was penetrated. At this point, a short dis-

tance, beyond the place where the sewer crosses Highland street, the eruptive rock occurred in the bottom of the trench and was dug into only to a depth of some two feet. It was overlaid by nearly three feet of decomposed peridotite, which had been entirely changed to a soft greenish-yellow earth. As the excavation progressed to the east of Highland street, the workmen penetrated deeper into the rock, which for some distance presented a slightly stratified appearance suggesting a sheet branching from the dike proper, which subsequent excavations proved to be the case.

The dike itself was first encountered 126 feet east of the center of Highland street, and was so hard and firm as to be removed with great difficulty. The width of the dike is 36 feet and it comes up to within ten feet of the natural surface. From its location in the trench, which was five feet in width, the strike of the dike appeared to be N. 5 degrees E. There was scarcely any sheet to the east of the dike, but to the westward it extended over three hundred feet.

The rock in the main dike, with the exception of the upper two feet, is perfectly hard and firm. It is of a dark green color, some of it being almost black, and contains an abundance of apparently jet black crystals. The upper portion, immediately beneath the drift, had changed to a soft greenish-yellow earth, in some places to a yellowish earth. The fact that the lower portion of the drift contained much of the serpentinous earth mixed with it would suggest that a considerable area was covered with eruptive matter. The typical rock contained few inclusions as compared with that at Dewitt, N. Y., or even that in the Syracuse dikes at Green street. The softer rock of the sheet, however, contained many of them. No prominent fossils were found in any of these inclusions, whereas in the rock at Dewitt they were very abundant. No traces of the enclosing walls of the dike could be found. Sheet material banked it on the west, and heavy pleistocene clays with quicksand beyond them formed the eastern border. At Green street the enclosing walls are perfectly shown, and it was hoped that further excavations would open up other exposures showing the contact phenomena, but this did not occur.

The other excavations, where the strike of the dike would seem to indicate its existence, were all on higher ground with heavy mantles of drift which even this deep sewer did not penetrate.

One other opening occurred in a return sewer on Highland street. The excavations passed for 180 feet through rock which was thought at that time might be merely sheet material from the dike, but I am now convinced that it was another parallel dike. This rock, while almost as difficult to excavate as that of the first dike, decayed very rapidly after a few days exposure. It also had more or less of a massive wedged appearance in the trench like the first dike, and quite unlike the banded appearance of the sheet, and furthermore contained many inclusions. It also contained numerous small red crystals, the "rubies," which the neighboring school children collected in abundance. None of these peculiar forms were found in the Dewitt, or in any of the Syracuse dikes at Green street. Some of them appeared to be perfectly crystallized garnets, but so rapidly did this rock break up, especially when dry, that they usually fractured soon after being exposed. A few crystals of greenish color were also obtained from the same rock, but none of either kind were noticed in the hard firm variety. All of these facts would seem to indicate a second dike more or less parallel to the first and less than 250 feet away. Through this second dike the excavations must have passed very nearly longitudinally, while the sewer proper crossed the main dike at nearly right angles. As the return sewer stopped when connection had been made with the sewer proper, and as the excavations up to this point did not pass through to the farther side of the dike, no facts as to its width can be given. The proximity of these dikes to those at Green street, which are less than a mile away, suggests some underground connection, and inasmuch as their general direction is the same they may be merely a continuation of those dikes. The intervening space has frequently been trenched, and at such times the excavations have been carefully watched for evidence of the dikes without revealing any trace of them.

THE GREEN STREET DIKES.

The prominence which has ever been attached to the Syracuse Serpentines proper, since their discovery by Vanuxem in 1839, together with the fact that the original locality has long been lost but is now known, will warrant a brief description of the dikes.

For several years past the dikes which must have been the source of the intruded sheet in James street, (the original Foot street of Vanuxem) has been locally known as the Green street dike. This was because the grading of Green street, which parallels James street 600 feet to the southward, cut into the dike and left a permanent exposure, sometimes referred to in the local dailies as the Green street volcano. When this entire section was piped for city water in 1894, three additional and nearly parallel dikes, not previously known to exist, were temporarily exposed. As the excavations to a depth of eight feet were in progress through this entire section at the same time, and as they remained open for over a week it gave an excellent opportunity of locating the dikes and of tracing them to other localities as well. The following facts were obtained at that time.

Dike I. The water trench is situated on the north side of Green street, and extends in a northeasterly direction, cutting through all of the dikes at nearly right angles. Dike No. 1 begins at 283 feet east of the east crosswalk on Lodi street. It is nine paces in breadth and even in the trench had been entirely altered to greenish-yellow earth. This was the decomposition product of the peridotite. I have traced this dike but forty feet south and five feet north of the trench.

Dike II. At the top of the trench this dike and the preceding would appear to be one, but there is a little doubt that a widening of the fissure in its upper part causes a contact here of two distinct dikes. In the very bottom of the trench a mass of hard limestone, two feet across, separates them. This dike is 14 paces in width and contains practically nothing but the greenish-yellow serpentinous earth. Southward I have traced it to excavations in the rear of Clinton school, northward to a point twenty-five feet beyond James street, a total distance of 1050 feet.

Dike III. begins at 138 feet east of No. 2 and is but five feet broad. It contained merely the serpentinous earth, and was traced to the southward about 25 feet.

Dike IV. is by far the most interesting of this series. It is the only one that contains any quantity of unaltered rock, and is so situated as to be permanently exposed on the north side of Green street. This is due to the lowering, some years ago, of the grade of the street about fifteen feet at this point. The section is most favorable for study, crossing the dike at right angles, and showing not only the dike proper, but a small branch of the same, an overflow spreading over the adjoining shales for some distance, the uplifting and flexing of the adjoining shales and limestones, contacts which are most clear and distinct, and a slight discoloration of the immediately adjoining shales. This dike is 25 feet east of No. 3 and is 14 feet in width in the trench. In this excavation there is from 18 to 24 inches on either side where the rock had changed to earthy matter resembling the material in the adjoining dikes but for fully ten feet at the center it was hard and firm rock. In the permanent exposure above the present roadway the width of the dike is more than twice its width in the trench. Here the exposed surface of the rock is much altered but back in the hillside it is quite firm. There is little question but that the "intruded sheet" which was made so much of in the earlier descriptions and which led to Hunt's "Chemical Precipitation Theory" for the formation of serpentine, was derived from this dike; or, more properly, the facts now known seem to warrant the statement that the seemingly intruded sheet was really the dike itself. The James street hillside, sloping to the westward, formerly exposed the edges of the horizontal layers of Salina rock. Striking northward a part way up this hillside is the dike. To a person climbing the hill what would be more natural than to suppose that this band of greenish crystalline rock apparently lying between horizontal calcareous layers, seemingly above and below it, was the edge of some corresponding layer? Sixty-five years ago, when this rock was first noticed, this region was open, uninhabited, and contained little or no vegitation on the slope, and the dike could be easily distinguished.

At present it is one of the oldest, most fashionable, and most exclusive districts in town, and covered with well kept lawns which prevent careful observation. Thus was its location lost. Nevertheless to one constantly on the field to take advantage of small excavations, as the removal of trees and the transplanting of flowerbeds, finding the direction of the dike is not at all difficult. That it was not a horizontal sheet was further evidenced by a quotation from William's paper "An excavation fifty feet further up the hillside did not pass through it at all."

I have traced dike No. 4 northward from Green street across James street to Highland Place, beyond which it is entirely lost. South of Green street it was noticed about sixty feet. The entire distance over which it has been noticed is more than a quarter of a mile. As plotted on the city map the strike is N. 14 degrees E. A great anticlinal fold, produced by the igneous matter forcing its way through the horizontal rock, was especially noticable in the trench on account of the existence there of a heavy limestone band among the thinner shales. The same thing, though less noticable, can be seen in the thinner bedded shales of the permanent exposure.

THE DEWITT DIKE.

Until some two weeks ago, I had secured but few additional facts concerning the relations of this dike, outside of those contained in Dorton's paper.*

An exposure on the southern side of the hill, 250 feet southwest of the reservoir, seemed to indicate the direction of the dike but in the absence of other evidences in this direction this could hardly be taken as conclusive evidence of its strike. It is also safe to say that the slight disturbance 600 yards north of the reservoir mentioned in that paper, together with another in the field a quarter of a mile farther north, have no connection with the dike but were produced by the action of salts whose presence in the partially hardened layers produced a wrinkling of the same. Quite recently, however, I have found the extension of the dike to

*American Journal Science, Vol. XLIX, June, 1895.

the eatsward of the reservoir. It strikes E. 10 degrees N., and by making small excavations across the adjoining field it can be traced in this direction to the north and south road connecting Messina Springs and Orville. Here the serpentinous earth composing the dike can be readily found in the gutters on either side of the road and is easily distinguishable from the heavy red clay and greenish shale of the Salina rock through which it has forced its way. Continuing into the pasture to the eastward its strike can be followed with little trouble to a place about one-third of a mile east of the reservoir where the harder gypseous shales form a small bluff over the lower reddish shales. In the lower lands beyond I have as yet been unable to trace the dike. In the east side of the bluff it is quite distinct, its width as indicated by the yellow earth being 105 feet. In the absence of any distinct contacts it is probable that the width of the dike is less than this. Darton's paper quotes the contractor as saying 'that the entire bottom of the reservoir, 200x250 feet, was covered with the greenish-yellow earth' also, 'that the blocks of rock varied greatly in size, some being 20x50 feet.' My experience with these dikes convinces me that it is unlikely that any one of the great wedge-shaped blocks into which the cooling peridotite contracted would be as much as 20x50 feet in size. On the other hand it is improbable that an intelligent contractor would be greatly mistaken in his figures in regard to this mass, especially as it was a hard, tough mass of rock making its excavation extremely difficult. Therefore it is altogether likely that this was a section of the dike itself extending across the excavation, and which to the workmen would seem like a great block imbedded in the softer serpentinous matter, or even in the argillaceous or calcareous Salina shales which make up a part of the excavated hill. According to this supposition the width of the dike did not greatly exceed 20 feet. The other blocks which were thrown out from the excavation in such quantities were undoubtedly the farther extension of the dike across the reservoir. These blocks furnished sufficient rock for building up the walls of the reservoir, a considerable surplus remaining. Because of the tendency of the peridodite to alteration it is surprising to see how well this rock is wearing in the

walls, where it has been since 1892. It may also be of interest to know that the surplus peridotite was crushed and used for road material in Dewitt with satisfactory results. The rock was hard enough to wear well and still sufficiently soft to produce a finely packed bedding. Of course there was scarcely enough of the material used to pronounce upon its value as a road metal, even that which was used being mixed to some extent with the wall rock, inclusions, and an occasional bowlder thrown out in the excavations. The larger number of fossils which were obtained from the inclusions and partly altered adjoining rocks in connection with this dike are surprising. In fact not a few of them indicate geological formations which are now found in place only some distance to the southward, and in higher geological horizon.

THE MAMMALIA OF ONONDAGA COUNTY, N. Y.

HORACE W. BRITCHER.

JUNE 21, 1902.

So far as I am aware the mammals of Onondaga County have never been critically studied. I have taken a few mice, shrews and bats, but the data from which the present list is compiled, are chiefly check marks of species which I have identified by the use of Jordan's "Manual of the Vertebrates." The attempt is here made to follow the nomenclature used in the "Preliminary List of New York Mammals" by Gerrit S. Miller, issued in 1899 as Bulletin 29 of the New York State Museum.

Onondaga County is situated in the transition zone but the difference in elevation, about 1,500 feet, between the northern and some of the southern towns, with the presence of deep, cool gorges and ravines, and the conditions prevailing at Beaver Lake, Cicero Swamp, the Green Lakes and Labrador and Carpenter Ponds, would seem sufficient warrant for expecting to find such characteristic forms of the Canadian zone, as the red-back mouse, Canadian white-footed mouse and smoky shrew.

The county has been under settlement about one hundred

and ten years. From Clark's "History of Onondaga County" we learn that deer were so plentiful in the early days as to be sometimes a nuisance, and in the various towns bears, wolves, panthers, wild cats, otters and beavers were more or less common. In Cicero two moose were killed by Indians in 1789. Probably other transition forms such as the lynx, wolverine, fisher and wapiti also occurred. It is doubtful if the opossum, occasionally offered for sale in our markets and reported two or three times from nearby counties, ever occurred here otherwise than as an "escaped convict" or possibly an abnormal straggler. In this last category must be placed the harbor seal shot in Onondaga Lake some eighteen years ago. The former presence within the county of the bison and the fossil elephant is attested by skull, teeth and bones at present in the University and High School museums.

EXTANT SPECIES.

Sciurus hudsonicus loquax, Bangs. Southeastern red squirrel.

Sciurus carolinensis leucotis, Gapper. Northern gray squirrel. Common in Oakwood. Hunted too much to be common elsewhere, but generally distributed through the southern towns.

Tamias striatus (lysteri?), Richardson. Northeastern chipmonk.

Arctomys monax, Linnaeus. Woodchuck.

Sciuropterus volans, Linnaeus. Southern flying squirrel. A specimen in Mr. Perrior's collection is probably this species. Flying squirrels are said to be common about Onondaga Hill, Pompey Hill and elsewhere.

Mus musculus, Linnaeus. House mouse.

Mus decumanus, Pallas. House rat.

Peromyscus leucopus noveboracensis, Fischer. Northeastern white-footed mouse. Taken at Jamesville and Tully.

Peromyscus canadensis canadensis, Miller. Canadian white-footed mouse. One specimen taken at Tully probably this form.

Microtus pennsylvanicus pennsylvanicus, Ord. Eastern field

mouse. Taken at Jamesville and Tully.

Fiber zibethicus zibethicus, Linnaeus. Muskrat.

Zapus hudsonius hudsonius, Zimmermann. Meadow jumping mouse. One specimen at Tully.

Erethizon dorsatus, Linnaeus. Canada Porcupine. A straggler shot in Tully in 1900. Once common.

Lepus floridanus transitionalis? Bangs. Northeastern cotton tail.

Lepus americanus virginianus, Harlan. Southern varying hare.

Vulpes fulvus fulvus, Desmarest. Red fox.

Mephitis mephitica mephitica, Shaw. Skunk.

Putorius vison lutreocephalus, Harlan. Southeastern mink. Our mink is probably this form.

Putorius noveboracensis noveboracensis, Emmons. New York weasel. One specimen killed at Pompey Hill. Weasels are found throughout the county but the form is not distinguished.

Procyon lutor, Linnaeus. Raccoon.

Sorex personatus personatus, St. Hilaire. Masked shrew. One specimen taken at Tully.

Blarina brevicauda, Say. Short-tail shrew. Taken at Jamesville and Tully.

Scalops aquaticus, Linnaeus. Naked-tailed mole.

Parascalops breweri, Bachman. Hairy-tailed mole. A specimen thought to be this species was seen at Tully but it succeeded in evading capture.

Condylura cristata, Linnaeus. Star-nosed mole.

Myotis lucifugus, Le Conte. Little brown bat. One specimen taken in the " cave " at Indian Reservation.

Myotis subulatus, Say. Say's bat. One specimen taken at Tully Lake.

BATRACHIA AND REPTILIA OF ONONDAGA COUNTY.

HORACE W. BRITCHER.

BATRACHIA.

Order: *Proteida.*

Necturus maculatus, Rafinesque. Mud puppy. Has been found in Erie Canal and Onondaga Creek.

Order: *Urodela.* (Salamanders.)

Amblystoma punctatum, Linnaeus. Spotted salamander. Found in ponds and ditches as soon as the ice melts in the spring. Taken about Jamesville and Onondaga Valley. Reported from Tully.

Amblystoma tigrinum, Green. Tiger salamander. A specimen apparently this species was seen upon lifting a large stone near Jamesville, but it escaped into a hole before it could be secured.

Amblystoma jeffersonianum (var. *jeffersonianum*) Green. One specimen taken from Branchippus pond, on the Jamesville road.

Hemidactylium scutatum, Tschudi. Four toed salamander. One specimen taken in sphagnum moss in swamp on the Jamesville road.

Plethodon cinereus (var. *erythronota*) Green. Red-backed salamander. Beneath logs and stones. Marcellus, Onondaga Valley, Pompey, Jamesville, Onondaga Hill.

Plethodon cinereus (var. *cinereus*) Green. Found occasionally in similar places.

Plethodon glutinosus, Green. Viscid salamander. One specimen beneath stone, Onondaga reservation.

Gyrinophilus porphyriticus, Green. Purple salamander. Two immature specimens in swamp, Pompey Hill.

Spelerpes bilineatus Green. Striped-backed salamander. Beneath stones and logs in wet places. Pompey Hill, Onondaga Valley, Jamesville.

Spelerpes ruber, Daudin. Red triton. In mud at bottom of springs and brooks. Pompey Hill.

Desmognathus ocrophaca, Cope. One specimen, probably this species, beneath loose bark of hemlock log, Apulia.

Desmognathus fusca, Rafinesque. Dusky salamander. Beneath stones in brooks, etc. Pompey Hill, Onondaga Valley.

Diemyctilus viridescens, Rafinesque. Newt. Triton. Common in ponds. Syracuse, Jamesville, Pompey, Tully.

Diemyctilus viridescens (var. *miniatus)* Rafinesque. Red foot. In woods. Active after rains and in wet weather. Tully, Jamesville, Onondaga Valley, Manlius.

Order: *Salientia.* (Toads and frogs.)

Bufo lentiginosus, Shaw. Hop toad. Common everywhere.

Hyla versicolor, LeConte. Common tree toad. Long Branch, Branchippus pond.

Hyla pickeringii, Holbrook. Little tree toad. Pompey, Tully, Onondaga Valley, Branchippus pond.

Rana virescens (var. *virescens)* Kalm. Common frog. Common everywhere.

Rana palustris, LeConte. Pickerel frog. Less common than virescens.

Rana sylvatica, LeConte. Wood frog. In moist woods. Usually the first frog to deposit eggs in the spring. Possibly two varieties occur.

Rana clamata, Daudin. Green frog. In streams. Tully, Cicero, Jamesville.

Rana catesbianca, Shaw. Bull frog. Seneca River, Kirkville.

REPTILIA.

Order: *Ophidia.* (Serpents.)

Storeria occipitomaculata, Storer. Red-bellied snake. Common, but less so than the following.

Storeria dekayi, Holbrook. Little brown snake. Common.

Eutainia saurita, Linnaeus. Riband snake. Rather rare. One specimen taken at Long Branch.

Eutainia sirtalis, Linnaeus. Garter snake. Abundant, the varieties *ordinata,* Linnaeus; and *dorsalis,* Baird and Girard; and possibly *obscura,* Cope, being found.

Natrix fasciata sipedon, Linnaeus. Common water snake. Common. Seneca River, Kirkville, Tully.

Liopeltis vernalis, DeKay. "Green snake." Grass snake. Common. Syracuse, Pompey, Jamesville.

Zamenis constrictor, Linnaeus. Black snake. Jamesville, Kirkville, Manlius.

Diadophis punctatus, Linnaeus. Ring-necked snake. Rare. Near Oakwood, Dr. L.M. Underwood; at Tamarac Swamp, Dr. C. W. Hargitt.

*Osceola doliata, (*var. *triangulata,)* Boie. Milk snake. Spotted adder. Common. Pompey, Jamesville, Onondaga Valley.

Order: *Testudinata.* (Turtles.)

Chelydra serpentina, Linnaeus. Snapping turtle. Seneca River, DeWitt, Tully.

Chrysemys picta, Hermann. Mud turtle. Common. Tully, Otisco, Seneca River, DeWitt.

Chelopus guttatus, Schneider. Speckled tortoise. Rare ? One specimen at White Lake, near Jamesville.

The localities given are those in which specimens have been taken and in no way limit the range of species.

The cave salamanders and the musk turtle have been found in nearby counties and may occur here. The ground snake, easily confounded with the red-bellied snake, and the striped water snake, closely resembling the common garter snake, should be sought for as well as also the following, with less probability, however, of success, the swamp tree toad, the wood tortoise and the brown lizard.

THE SPIDERS OF ONONDAGA COUNTY.

HORACE W. BRITCHER.

There have been very few local lists of spider faunas published in the United States. Dr. George Marx has collected 370 species in the District of Columbia and listed 308 of them, the remaining 62 being undescribed. Dr. Nathan Banks has listed 278 species from the neighborhood of Sea Cliff, Queens county, N. Y., and 363 species from the region about Ithaca. Mr. J. H. Emerton has briefly described 343 species from the New England States. The present list is composed of 159 identified species and 8 species, probably new, identified only as to genus. It does not contain the smaller spiders of the family Theridiidae, of which a large number have been collected and only a few identified. Many Drassidae and Clubionidae and some Lycosidae, Thomisidae and Attidae remain unindentified. Of the spiders collected those belonging to the family Epeiridae have probably been more completely identified than those belonging to any of the other larger families. Of this group the county has 37 species as against 43 for Ithaca and 53 for New England. It seems reasonable to believe that a fairly complete list of the spiders of the county would enumerate considerably over 300 species.

The collecting has been done chiefly in the towns of Onondaga, Salina, DeWitt (about Jamesville), Pompey and Tully. The eastern, northern and western towns have been almost entirely unvisited.

For the sake of uniformity the nomenclature used is that of Dr. Marx's Catalogue of Described Aranae of Temperate North America published in 1890 by the Smithsonian Institution. The descriptions by Dr. Banks, the arachnologist of the National Museum, Mr. Emerton's description of New England Thomisidae and Attidae and Dr. J. H. McCook's descriptions of Epeiridae have been published since that date. At present the nomenclature of the entire group is in a very unsettled state and it is to be hoped that the near future may yield a revised list of North American spiders with synonomy to date and with keys to the genera of the different families.

FILITELARIAE.

Family: *Dysderidae.*

Dysdera crocata, C. Kock. One specimen in a cellar, Syracuse.

Family: *Scytodidae.*

Scytodes thoracica, Latr. In dark corners in houses.

PLAGITELARIAE.

Family: *Pholcidae.*

Pholcus phalangioides, Fuesslin. In cellars in Syracuse.

TUBITELARIAE.

Family: *Drassidae.*

Micaria longipes, Em. Ant-like spider, in grass and under stones.

Micaria montana, Em. Ant-like spider, under stones.

Drassus robustius, Em.

Drassus saccatus, Em. Under stones.

Prosthesima atra, Hentz. Under stones.

Prosthesima depressa, Em. Under stones.

Prosthesima ecclesiastica, Hentz. Under bark and in buildings in woods.

Prosthesima rufula, Banks. Under stones.

Gnaphosa conspersa, Thorell. Under stones.

Poecilochroa bilineata, Hentz. One specimen, Spafford.

Family: *Dictynidae.*

Dictyna muraria, Em. On buildings and walls.

Dictyna rubra, Em.

Dictyna volucripes, Keys. On plants in fields.

Dictyna volupis, Keys. On plants in fields.

Amaurobius ferox, Walck.

Amaurobius sylvestris, Em.

Titanoeca americana, Em. Under stones in dry localities.

Family: *Clubionidae.*

Auyphaena incerta, Keys.
Clubiona ornata, Em. On plants.
Trachelas ruber, Keys. On plants.
Thargalia bivittata, Keys. Under stones and in grass.
Thargalia crocata, Hentz. Under stones and in grass.
Thargalia pinnata, Em. Under stones.
Coriuna sp.? Lives with small black ants under stones and logs.
Agroeca pratensis, Em. Among leaves in woods.
Prurolithes alarius, Hentz. Among leaves in woods.
Prurolithes sp.? Among leaves in woods.

Family: *Agalenidae.*

Agalena naevia, Walck. The common grass spider.
Tegenaria derhami, Scopoli.
Coelotes medicinalis, Em. In cellars.
Hahnia bimaculata, Em. Among leaves.
Hahnia radula, Em. Among leaves.

RETITELARIAE.

Family: *Theridiidea.*

Theridium differens, Em. On plants and bushes.
Theridium frondeum, Hentz. On bushes in woods.
Theridium globosum? Hentz. Two specimens in moist woods.
Theridium murarium, Em. On plants.
Theridium rupicola, Em. Crevices in cliffs.
Theridium sexpunctatum, Em. Among ground hemlock in wet woods.
Theridium spirale, Em. On plants.
Theridium tepidariorum, C. Kock. Common about ceilings.
Theridium sp.? Among well stones, Onondaga Valley.
Theridium sp.? On plants, Tully.
Steatoda borealis, Hentz.
Steatoda nigra, Em.

Teutana triangulosa, Walck.

Lithyphantes marmoratus, Hentz.

Ariamnes fictilium, Hentz. Among underbrush in swamps.

Argyrodes argyrodes, Walck. In cedar trees.

Argyrodes cancellatus, Hentz. One specimen, Indian Reservation.

Asagena americana, Em. Under stones.

Mimetus interfector, Hentz. In trees and bushes.

Mimetus epeiroides, Em. In stone piles, Pompey Hill.

Theridula sphaerula, Hentz. Lower branches of hemlock, Apulia.

Ulesanis americana, Em. In cedar trees, Jamesville.

Crustulina sticta, Em. Under stones.

Euryopis funebris, Hentz. In moss and lower branches of cedar trees.

Linyphia bucculenta, Clerk.

Linyphia communis, Hentz. In trees, especially hemlock, Pompey.

Linyphia mandibulata, Em.

Linyphia marginata, C. Kock. In underbrush in woods.

Linyphia nebulosa, Sundevall.

Linyphia phrygiana, C. Kock. In bushes and trees in woods.

Linyphia (Drapetisca) socialis, Sundevall. In trees.

Linyphia (Drapetisca) sp.?

Tapinopa bilineata? Banks. In underbrush in woods.

Erigone florens, Cambridge.

ORBITELARIAE.

Family: *Epeiridae.*

Argiope argyraspides, Walck. In meadows.

Argiope cophinaria, Walck. In meadows.

Ordgarius bisaccatus, Em. One male, Eastwood.

Epeira arabesca, Walck. In meadows.

Epeira benjamina, Walck. In fences, etc.

Epeira cornuta, Clerk. In fences, etc.

Epeira corticaria, Em. In grass in moist meadows and woods.

Epeira displicata, Hentz. In bushes and trees.

Epeira eustala, Walck. In trees in woods.

Epeira gibberosa, Hentz. In grass.

Epeira labyrinthea, Hentz. In woods, Baldwinsville.

Epeira marmorea, Clerk. In bushes in woods and meadows.

Epeira nordmani, Thorell.

Epeira placida, Hentz. In bushes and trees.

Epeira sclopetaria, Clerk. The "round web spider" in windows, etc.

Epeira silvatica, Em. In trees in woods.

Epeira stellata, Walck. On plants and bushes in meadows.

Epeira thaddeus, Hentz. In small trees and bushes.

Epeira trifolium, Hentz. In bushes in meadows.

Cyclosa conica, Walck. In woods, common.

Cyclosa turbinata, Walck. One specimen with very distinct shoulder humps, Tully.

Singa maculata, Em. Tully, Jamesville.

Singa pratensis? Em. Pompey Hill.

Singa variabilis, Em. Tully.

Argyroepeira hortorum, Hentz. Among ferns, etc., in woods.

Meta menardi, Latr. In cellars and dark cavities in woods.

Theridiosoma radiosa, McCook. Jamesville.

Tetragnatha elongata, Walck. In bushes near streams, Pompey.

Tetragnatha extensa, Linnaeus. In bushes near streams, Pompey.

Tetragnatha laboriosa, Hentz. In grass.

Tetragnatha sp.? In cedar trees in swamp, Jamesville.

Eugnatha straminea, Em.

Eucta caudata, Em. In swampy meadows, Tully.

Pachygnatha autumnalis, Keys. Syracuse.

Pachygnatha brevis, Keys. Syracuse, Tully.

Hyptiotes cavatus, Hentz.

Uloborus plumipes, Lucas.

LATERIGRADAE.

Family: *Thomisidae.*

Xysticus gulosus, Keys. On the ground, under stones, etc.

Xysticus limbatus, Keys. On the ground, under stones, etc.

Xysticus quadrilineatus, Keys. On the ground, under stones, etc.

Xysticus stomachosus, Keys. On the ground, under stones, etc.

Coriarachne versicolor, Keys. On fences and trees.

Misumena oblonga, Keys.

Misumena vatia, Clerk. On flowers, etc.

Thomisus alcatorius, Hentz. On golden rod, etc.

Thomisus asperatus, Hentz. On golden rod, etc.

Tmarus caudatus, Hentz. On trees and bushes.

Ebo latithorax, Keys. On small trees, etc.

Tibellus duttoni, Hentz. On grass, bushes, etc.

Tibellus sp.? (possibly a variety of *duttoni*).

Thanatus sp.? (possibly a variety of *T. lycosoides,* Em.) Onondaga Valley.

Philodromus lineatus, Em.

Philodromus ornatus, Banks. On plants, etc.

Philodromus pictus, Em. On plants, etc.

Philodromus vulgaris, Hentz. On fences, beneath bark, etc.

CITIGRADAE.

Family: *Lycosidae.*

Lycosa carolinensis, Walck. Under stones.

Lycosa communis, Em. In fields.

Lycosa frondicola, Em. Among leaves in woods.

Lycosa nidicola, Em. Under stones.

Lycosa nigroventris, Em. Under stones.

Lycosa pratensis, Em.

Lycosa rufiventris, Banks.

Tarantula kochii? Keys.

Pirata insularis, Em. In fields.

Pirata minuta, Em. In fields and woods.

Pardosa albopatella, Em. In fields.
Pardosa lapidicina, Em. In dry fields, etc.
Pardosa nigropalpis, Em. In fields.
Pardosa pallida, Em. In fields and woods.
Aulonia aurantiaca, Em. In swamps.
Ocyale undata, Hentz. Among leaves.
Ocyale (Micromata) subinflata, Hentz. Possibly a variety of *undata.*
Dolomedes sexpunctatus, Hentz. About edges of ponds, etc.
Dolomedes tenebrosus, Hentz. Near streams in woods.
Dolomedes scriptus? Hentz.

SALTIGRADAE.

Family: *Attidae.*

Phidippus galathea, Walck.
Phidippus morsitans, Walck.
Phidippus rufus, Hentz.
Dendryphantes capitatus, Hentz. In bushes and trees.
Icius elegans, Keys. On plants.
Icius lineatus, C. Kock. Under stones, etc.
Icius mitratus, Hentz. On plants.
Icius palmarum, Hentz. On plants.
Hasarius hoyi, Peckham. On plants.
Habrocestum peregrinum, Peckham.
Habrocestum splendens, Peckham.
Saitis pulex, Hentz. Among leaves, etc.
Astia vittata, Hentz. On plants.
Epiblemum scenicum, Clerk. The "tiger spider" common on buildings.
Marptusa familiaris, Hentz. On fences and tree trunks.
Mememerus binus, Hentz. On plants in swampy meadows at Long Branch, where both sexes are common. The male was described by Banks as *Icius formosus* from a single specimen from Ithaca.
Neon nellii, Peckham. Among leaves.
Zygoballus bettini, Peckham. On plants.

Zygoballus terrestris, Em.

Attus palustris, Peckham.

Synemosyna formica, Hentz. An ant-like spider. Common on spice bush plants at Indian Reservation in 1900.

Synageles picata, Hentz. An ant-like spider which frequently thrusts forward its second pair of legs and moves them about as an ant does its antennae.

NOTES ON SOME ERUPTIVE DIKES NEAR ITHACA.

Philip F. Schneider.

September 19, 1902.

The upper end of Cayuga Lake lies in a depression several hundred feet below the surrounding surface, so that the streams which flow into it have produced deep gorges with excellent exposures of the Hamilton, Tully, Genesee, and Ithaca formations.

In several of these gorges narrow dikes of igneous rock occur and it is probable that a careful examination of all would furnish numerous additional exposures to the list given below.

These dikes were first mentioned by Vanuxem, in the Report of the Third District of New York, page 169. He says: "Near the Tully limestone in the fissures of the slate (Genesee) are two narrow veins of semi-crystalline rock of a blackish-brown color, becoming olive by alteration. It appears to be a mixture chiefly of serpentine and limestone having the appearance of a Trap rock. There are also two similar sets of veins near the foot of the second falls, in the same ravine. Both sets of veins traverse the creek at nearly right angles to its course."

They are again mentioned by Dr. J. F. Kemp in a paper entitled, "Peridotite Dikes in the Portage Sandstones, near Ithaca, N. Y." in the *American Journal of Science,* November, 1891, page 410. He quotes Vanuxem and adds that he "had recently visited the locality but only the two dikes near the upper falls of Vanuxem could be found. They are each about one inch wide and only show over a short space as they disappear above and below. They were inaccessible and from the distance of a few

feet their igneous nature was not conclusively shown. The other two could not be found."

Being in the vicinity of Ludlowville recently I undertook to rediscover the dikes mentioned by Vanuxem and was unusually successful in locating the same. This was probably due to the fact that the summer has been the most rainy in many years and not only were the streams badly swollen, but the rock forming the sides of the gorges had been freshly broken off and washed down thus furnishing an excellent opportunity for study.

The best results were obtained in the gorge of Townley's Creek, a branch of Salmon River, on land owned by Mr. Howell, between the series of cascades locally known as The Indian Falls. Although this ravine could not be identified as Vanuxem's "third ravine east of Ludlowville," the appearance of the falls answered so closely to his discription that it left little doubt in my mind that it was the original locality. If this be the case, subsequent erosion has exposed more of the dikes for this careful observer speaks of but four dikes in all, while seven distinct dikes are now visible in this gorge, as follows:

Dike I. About 75 yards east of the first falls, that flowing over the Tully limestone, this dike may be found, crossing the bed of the creek at nearly right angles. It occurs in one of the joint planes of the Genesee slate, as do all of the others of this locality.

It strikes N. 10 degrees E., magnetic.

It is one-half inch in thickness in the shales on the north bank of the creek, becoming thicker as it crosses the bed of the creek to the southward. Twelve feet from the north bank of the stream (as far south as it was accessible) it was 6½ inches wide and apparently increasing in width toward the opposite side of the stream. This was easily ascertained as the dike forms a noticeable depression in the bed of the stream, which at the deepest point measured was 16 inches below the adjoining shale rock. On the south side of the stream this depression was 15 inches in width, which is of course somewhat thicker than the actual breadth of the dike. Its width could not be accurately obtained because of the depth of water in the stream at this point and the detritus filling the depression. In the cliff a short distance to the

southward, the dike could not be traced at all, due to the talus and overgrowth of weeds.

Dike II. This occurs five feet east of No. 1, and is parallel to it. It is 1¼ inches wide at the level of the stream on its north bank, but unlike No. 1, it grows thinner and seems to pinch out toward the center of the stream. It grows thicker as we ascend the bank to the northward, and six feet above the level of the stream has increased to five inches in thickness. It no doubt grows wider as we ascend but is inaccessible in this direction.

Dike III. Following up stream to the foot of the second falls above the Tully limestone, we come to another set of dikes. The first of these that we reach in ascending the stream, is best seen on the south bank. It is from 6 to 7 inches wide at the level of the water and can be distinguished crossing the bed of the stream at nearly right angles and with practically the same width. The south wall of the gorge is nearly vertical at this point, and makes an excellent place to study the dikes. Dike 3 strikes exactly north and south, magnetic. In the cliff, 16 feet above the level of the stream, the dike has become four inches in thickness and sub-divides into two parts, each less than an inch in width. These continue upward a few feet, gradually pinching out.

The fresher rock is of a dark green color, resembling the rock of the Green street locality at Syracuse quite closely, except that the jet black particles are very much smaller. No inclusions were noticed in the rock. Where weathered it is lighter in color, and when badly decomposed is of a greenish-yellow color. There is about one inch of greenish-yellow serpentinous earth on either side of the comparatively hard five inch center of this dike. Lining the sides of the fissure and adjoining the dark colored shales is a layer of white crystalline calcite 3-16 of an inch in thickness.

Dike IV. Two feet east of No. 3, another parallel dike, 1¼ and then thins out again, disappearing at 15½ feet above the level of the stream and extends upward a short distance beyond the upper extremity of dike No. 3. Three feet above the water and fifteen inches east of dike No. 3, two small dikes, an inch apart and ½ and ⅛ inch in thickness respectively, occur. They

extend upward but a few feet and no doubt represent the lower portion of this dike.

Dike V. Eighteen feet above the level of the stream and eleven inches east of No. 4, this dike occurs. It is 2¼ inches in thickness and has entirely changed to a light-greenish colored earth. It extends upward toward the top of the cliff clearly discernible as far as the eye could reach. A half dozen minute seams of igneous matter, not more than 1-20 of an inch in thickness, extend along parallel to this dike and on either side of the same.

Dike VI. Eight feet above the level of the stream and twenty-six inches east of dike No. 5, a thin seam of igneous matter occurs, which gradually grows thicker as it extends upward. and then thins out again, disappearing at 15½ feet above the level of the stream. It is the smallest and narrowest of the dikes, its maximum thickness being only ⅝ of an inch.

Dike VII. About eighteen feet above the level of the stream and twelve inches east of dike No. 6, the last dike in this gorge was noticed. It is a badly disintegrated mass of greenish-yellow color, about an inch in thickness and is easily distinguished from the adjoining black shale as it extends toward the top of the cliff.

That some of these dikes also occur on the north side of the gorge is unquestionable, but the large amount of talus here prevented any study of the same.

In the first ravine to the southeast of Townley's creek, we have other traces of the dikes. They occur about midway between the first and second falls, or 300 yards east of the falls over the Tully limestone.

Dike I. is best seen on the north bank of the stream where it is 1½ inches wide. It maintains this thickness across the entire width of the stream.

It strikes north and south, magnetic

It has changed to a lightcolored earthy substance slightly different in appearance from the decomposition product of the other dikes.

Dike II. Six feet and three inches east of No. 1, a second dike occurs. It is 1¼ inches wide in the center of the stream,

thinning out to ¼ inch of an inch on the north bank and probably doing the same toward the south. This end was covered with detritus and not observable.

DIKE III. About a foot east of No. 2, a third dike was observed, visible only for about two feet near the center of the bed of the stream. The ends were covered with detritus. It is parallel to the others and is not more than 1¼ inches in thickness. The strike of these dikes would seem to indicate that they are the continuation of the series near the third falls in the Townley ravine. No traces of the first series near the Tully Limestone could be found. It is quite possible that these were the dikes noticed by Kemp, as they correspond to his descriptions in the paper quoted.*

The large ravine, which cuts through the Hamilton shales just south of the last mentioned gorge, did not reveal any trace of the dikes. It probably does not extend far enough to the eastward to expose them.

A visit was also made to Ithaca, ten miles south of Ludlowville, where the dikes are also exposed. The locality studied was in the gorge of Cascadilla Creek, between the entrance to the Cornell campus and the street car trestle.

DIKE I. occurs between the trestle and the new bridge over the creek. It forms a noticeable depression in the rocky walls of the creek but is difficult to study because the water from the raceway of the reservoir follows this depression in its descent to the creek. This has succeeded in eroding a larger channel for itself than the natural width of the dike and prevents access to the same. In places, pieces of the comparatively hard dike rock can be broken off through the dashing water, and these show it to be a peridotite of dark green color with numerous crystals of olivene.

In general appearance it closely resembles the Syracuse serpentine. Owing to the peculiar conditions, it was impossible to tell the exact width of the dike but it could not have been more than 28 or 30 inches thick. The adjoining sandy shales of the Portage group have weathered down with the dike, and been eroded by the stream, so that the depression in which the dike

*_Amer. Jour. Sci._, Nov., 1891, p. 410.

occurs is much wider than this, and might easily lead to an erroneous inference concerning its width.

The depression corresponding to the dike can be readily traced across the bed of the stream where it is filled with detritus to a similar depression in the north bank of the gorge, which is filled with earth and overgrown with weeds. Its strike was not taken but it was very nearly parallel to the adjoining dikes which occur but a few rods to the westward.

Dike II. This occurs a short distance west of the new bridge and between the two falls. It is from 2½ to 3 inches wide. It differs in color quite materially from the other dikes, which have a general family resemblance. This rock is of a light gray color with numerous small white particles disseminated through it. Besides these there are many lenticular inclusions of dark black color giving the mass when freshly broken an earthy appearance quite different from the dark green crystalline peridotites of the adjoining dikes.

It strikes N. 10 degrees W. (?)

Dike III. Twelve inches west of No. 2 a third dike occurs. It is six inches wide and strikes parallel to No. 2. It is different in appearance from No. 2, having the general aspect of the other peridotites, and resembling especially the glistening crystalline appearance, so characteristic of the Dewitt dike.

Dikes two and three were traced a few feet across the stream through water high at the time, and while they may occur on the north bank a rather cursory examination failed to disclose them.

There is little question but that a careful examination of the gorges of Six Mile* and Fall Creeks which extend parallel to Cascadilla Creek at this locality, would reveal other traces of these dikes whose discovery would amply repay a search for the same. It is also probable that other glens farther north and south than these points might furnish additional exposures.

*Kemp in the *Amer. Jour. Sci.*, Nov., 1891, p. 410, mentions a peridotite dike occuring in the gorge of Six Mile Creek, about two miles from the Cornell campus. Like the others he says that this dike occurs in the north and south joints which are so abundant in the shaly sandstones; that it crosses the stream like a narrow ribbon; and that it pinches out a few feet above the surface of the water. It has a light brown, or drab color.

The age of these intrusives is a matter of considerable interest. That the dikes occurring at Manheim, Syracuse, Dewitt, Ludlowville, and Ithaca, all date from the same general disturbance can scarcely be doubted, when we consider their striking similarity as shown by the microscope and otherwise. The Manheim intrusion is known to be newer than the Utica slate; the Syracuse dikes penetrate the Upper Group of the Salina shales; the Dewitt rock cuts through the gypseous Salina shales, although the Oriskany and Helderberg formations were also thrown out in the excavations as indicated by the fossils; the Ludlowville dikes penetrate the Genesee slate; and the Ithaca dikes, the Portage group. Hence they are no doubt later than the Devonian.

Smith,* however, has shown that the Manheim dike occurring as it does in one of a series of parallel faults which have affected the rocks from the Archean gneisses to the Utica slate, and which it is generally believed mark the western extension of the forces of the Appalachian uplift, no doubt dates from the close of the Carboniferous, and suggests this as the date of the others also. He adds that " Diller has also suggested this as the age of the Elliot Co., Ky., peridotite, cutting through Carboniferous strata, although he considers a later date more probable."

THE OIL WELLS OF THE UNITED STATES.

Mr. John T. Kilham.

November 21, 1902.

I will try and make a sketch in crude oil, which will be only an outline, for we lack the time to go into the detail of colorings, shades and tints that are required to produce a finished picture in oil.

Oil is a slippery subject, and this is literally true in more ways than one. The study of oil should be classed with the Fine Arts, for like art, it has but one end, the beginning.

Amer. Jour. Sci., April, 1892, pp. 322-327.

If one cares to take up this study in any other than a practical way, he will soon find that there is a scarcity of books and printed articles on the subject, and many of such as are found, have been written by persons not familiar with the industry, which can readily be detected by experienced oil men, by the errors and want of technical terms used.

It is simply presumption for a writer to try and post himself in a couple of weeks, on a subject that takes us ordinary mortals a life time to gain a fair knowledge of.

In a recent article in one of the leading magazines, the tools used in drilling oil wells are thus described: "The auger-stem is some twelve or fifteen feet long, and as heavy as a man can lift." As a matter of fact, the auger-stem is about forty feet long and weighs some two or three tons. I suppose the author was not really writing about the auger-stem, but was trying to describe the drill proper, that we call the bit, which is about three or four feet long, and weighs from three to six hundred pounds, and is screwed on to the lower end of the auger-stem.

When an author does not thoroughly understand the subject in hand, he does the reader a great injustice; and I am inclined to think it is better not to know anything about a given subject, than to be poorly posted on it;—that is, to know somethings about it right, and some things wrong, and at the same time, not to know which are right, and which are wrong.

It is pity that such a great and interesting industry as the production of oil, has really no literature of its own. I suppose this comes from the fact that the oil men are the busiest people on earth, for they drill and pump both night and day, and have not the time to write matters up; while outsiders simply could not, as but comparatively few have the opportunity of studying the subject in a practical way. This is why I cheerfully meet with you to-day to talk about oil,—a subject that is full of interest, for there is no lack of material, the difficulty lies in making a wise choice, and I wish I knew just what would interest you most. I will first give a brief history of the industry, then I will take up the oil fields of the United States from physical and financial standpoints.

We are all aware that the discovery and use of crude oil is nothing new. It was known to the ancients, and found in many eastern countries. In America it was produced to a certain extent by a pre-historic race. On Oil creek, French creek and on the Allegany river in Pennsylvania, are pits that were dug for the collection of oil. Some of them are still cribbed with timbers down to the rock, which is about twenty feet below the surface, and they contain ladders made of a small tree, with the trunk thick set with branches. These were cut off four of five inches from the trunk, and thus formed steps by which the well owner could go down and collect the oil that accumulated on the surface of the water; just as was done by the old oil producers on the banks of the Caspian and the Irrawaddy. These tree-ladders are similar in every way to those commonly found in the ancient copper mines of Lake Superior, and perhaps the oil and copper industries were both carried on by the same people. Some of these old oil pits are over-grown by trees four feet in diameter, proving that the pits have been abandoned for at least five hundred years. It remained for Yankee ingenuity to discover and produce oil, which has now grown to be an industry second to none, and with a history whose every page teems with dramatic interest.

Crude oil is carbon and hydrogen in various combinations, and is formed by the subterranean decomposition of organic matter.

About 1849, Samuel M. Kier, a druggist of Pittsburg, began to bottle and sell crude petroleum extensively as a "cure all." It was called "Seneca oil" and was obtained from his father's salt wells on the Allegany River. The labels on the bottles contained a cut of a derrick used in sinking salt wells, which picture of a derrick suggested to Colonel Drake the idea of drilling for oil.

In 1853, J. D. Angier made the first oil lease, with Brewer, Watson & Co., lumbermen, to gather oil on shares from their spring near Oil Creek, Pennsylvania. The next year Dr. F. B. Brewer, son of the senior member of the firm, went to Hanover, New Hampshire, on a visit, taking with him a bottle of oil, which his solicitous mother probably packed into his grip, think-

ing it might be useful in case of accident, or illness; and it was to obtain a supply of oil like this sample bottle for medicial purposes that induced Bissell, Eveleth, Townsend and Drake, to undertake the drilling of the first well on Oil Creek, near Titusville, Pennsylvania. They started out under the name of "The Pennsylvania Rock Oil Company," which was later merged into " The Seneca Oil Company." Colonel Edward L. Drake put the well down under great difficulties and discouragements. There was then no railroad in that part of the country. Colonel Drake went twice to Pittsburg to engage men who worked on salt wells to come to Titusville and drill an oil well for him, and each time the drillers backed out and failed to come, as they thought Drake was crazy to drill for oil. At last he secured William A. Smith, commonly called " Uncle Billy " Smith, and his two sons, James and William, of Freeport, Pennsylvania, to drill the well. All the machinery had to come in wagons from Erie, a distance of forty miles, and he had to send there for everything; once for a couple of common shovels, the store at Titusville being unable to furnish them. Colonel Drake soon spent the money advanced him by the company, and they refused to furnish more. He had also exhausted his credit, and could not get trusted for the value of a hemlock plank. Here it was that Drake showed the qualities of a true oil man, which are indomitable energy, and untiring perseverence. He was thought to be insane, and people called him " crazy Drake." His workman were unpaid and discontented, and his enterprise must have failed when on the verge of success, had not two gentlemen of Titusville, R. D. Fletcher, and Peter Wilson, come to the rescue. They had faith in the man and his work, and endorsed his paper and loaned him money.

Saturday, August 28th, 1859, the Smith boys measured up just before shutting down for the night, and found that they were down 69½ feet. Then they washed up, put on their coats, took their dinner pails and went to their boarding house as usual. The next day was Sunday, and " Uncle Billy " went over to the well in the afternoon for a stroll. He found there was fluid in the hole, nearly to the derrick floor. He got a piece of tin spouting, closed up one end, and lowered it into the hole. Drawing it up

he found it full of the precious fluid. *They had struck oil.* This well pumped about twenty barrels a day, and twenty barrels was more oil than had ever been gathered or dipped in any one year before. Colonel Drake's well was the beginning of an industry that has furnished more romances in real life, than the most fertile imagination ever conceived.

In 1864, the government tax of $1.00 a barrel on crude oil, amounted to ten thousand dollars a day. At the present time, the oil and natural gas industries together, are producing half a million dollars worth of raw materials every day, in the United States alone.

Not long ago, Mr. H. H. Rogers, of the Standard Oil Company, to whom Colonel Drake was a friend in the pioneer days, erected a seventy-five thousand dollar monument over his grave at Titusville; but this is not the only monument erected to his memory. There are about one hundred and seventy-five thousand others, in the shape of derricks, which are scattered all over this vast country, from the head waters of the Alleghany River westward to the Pacific Coast, northward to the Great Lakes, and southward to the Gulf. In some places they cluster thick together, like the masts of ships in a great harbor. Then again, an isolated one is seen crowning some distant hill top like a lonely sentinel, and the very wind as it blows through the hollow ribs of this vast army of headless skeletons says: "*Don't forget poor Drake.*"

The news of Colonel Drake's well spread over the country like wild fire, causing what is now known as "The oil excitement on the creek," and never in the history of the world, has there been anything to equal it. Men went oil mad, and such was the rapidity of their plunges in this wild speculation, that it was no uncommon thing for a man to make and loose several fortunes in a single day. Thousands sold their all for what they could get, and rushed to Oil Creek to promptly loose the money they took there. A little oil for medicinal purposes was a good thing, but soon the early operators discovered that they had too much oil; that it was "An elephant" on their hands, and that there was practically no demand for it, consequently it was almost worthless. They tried to burn it in lamps that gave a little light, lots

of smoke, and more smell than either, and which sputtered and exploded.

Yankee ingenuity is a great thing. It took hold of this problem with a right good will, and worked at it, and experimented with it, analyzed and refined the oil, separating it into its component parts, and again combining them in various ways, until to-day we have one hundred and fifty useful and beautiful substances of value in science, mechanics, medicine, domestic economy, and the arts, that are produced from crude oil. Lamps were made that were perfectly adapted to the burning of refined oil, and from the little spark that Colonel Drake made when he struck the first oil well, has grown the flame that has practically lighted the world for nearly half a century.

It has been truthfully said, that "Facts are stranger than fiction," and the history of the oil industry abundantly proves it. In 1860, James Farrell, a teamster, bought thirty acres of stony land on the east side of Oil Creek for two hundred dollars, in the southwest corner of what is now Oil Creek township. Orange Noble leased sixteen acres of this tract for six hundred dollars and one-fourth royalty. In five months, with a "spring pole," the primitive method of putting down wells, a well of one hundred and thirty feet deep had been drilled without finding any signs of oil. For three years the hole was abandoned, but in the spring of 1863, Noble associated with George B. Delamater, (who was defeated by Robert E. Pattison for Governor of Pennsylvania,) and L. L. Lamb, made a contract with a man by the name of Fertig, to sink the well down to five hundred feet, hoping to find the third sand, which had been successfully drilled to, in other sections of the Oil Creek territory. Fertig's agreement was to take one-sixteenth working interest as part payment. At a depth of four hundred and fifty feet, a crevice was encountered, and Fertig fearing the loss of his tools, consulted with the owners, and it was decided to go ahead with the drilling, and on the 27th day of May, drilling was again resumed. Two of the partners, Noble and Delamater had received an offer of one hundred thousand dollars for one-half of the well, which they refused. In less than an hour after the drill was started, oil was struck, and

the well produced three thousand barrels in the first twenty-four hours. The price of oil rose about this time from four to thirteen dollars a barrel, and the total production of this one well was over four millions of dollars. In less than two years, the four thousand dollars, which represented the cost of the lease and well, was repaid one thousand times. One million dollars of this sum went to the family of the poor teamster, he having died shortly after his phenomenal strike. Thirteen additional wells were drilled on the Farrell tract, and one hundred fortunes were the result. At one time the income from the first well amounted to thirty-nine thousand dollars each day.

In 1861, William Phillips drilled a well on the Tarr farm that was called "The Albino," which held the record for longevity, as it produced oil for twenty-seven years, and stopped its flow on the night that James Tarr, the owner of the farm died. "The Albino" produced over one million barrels of oil, some of which sold from three dollars to thirteen dollars a barrel.

In this connection permit me to tell you about a well that C. K. O'Hara drilled on the Silas Richardson farm on Sugar Run, Pa., in which I carried a quarter interest in the well completed.

O'Hara started the well in the fall of 1881, and things went from bad to worse, and when money became scarce he went to work on the well himself. They had a series of streaks of bad luck, and were obliged to pull the casing fifteen or twenty times before they got below the fresh water. Then they had fishing jobs, and they came often, and in bad places, till the money was all gone; then he hung the boys for their wages as long as he could, and one after another stopped work until he was left entirely alone. Let me say right here that afterward every man received the money due him. O'Hara lost heavily, his last dollar was buried in that worthless hole, while he had conceived the idea that it might be worth a million if he could only get it down. He pawned his overcoat and some books in Bradford and got a little grub and went to work to try and get the well down alone. He had no money to buy coal, so he chopped wood and carried it on his back to fire the boiler, and thus he worked night and day. It's a pretty hard thing for one man to do the work of two. He be-

came very blue and discouraged but still kept at it and would no sooner get to running before something would break and he would be obliged to shut down and fix it up as best he could. He kept at it, however, in this fashion for three months—proving the truth of the old adage, "Continual dropping wears a stone." Finally when he had the hole down within one hundred feet of the oil sand, in sheer desperation, he sold three-eighths interest in the well for three hundred dollars. With this money he soon finished her up, and she came in dry, and there have been hundreds of similar experiences in the oil business.

In January, 1865, the Frazer well on the Holman farm at Pithole, Pa. was struck. This was the first of a series of rich strikes in the way of flowing wells, and they acted like powerful magnets drawing restless spirits from every quarter. Pithole grew as by magic. Natural gas had turned night into day and in the evening contracts were let to have houses completed by sunrise next morning. All the beds were doing double duty and as soon as any were empty the second relief turned in. Within a few months Pithole grew from nothing to a city of 20,000 inhabitants. It also had a $75,000 hotel, a fire department, daily newspapers, a fine opera house, churches,, etc., and it was the third postoffice of importance in Pennsylvania, being outranked only by Philadelphia and Pittsburg. To-day there is not a building to mark the site of this ephemeral city; it came and disappeared like a phantom of the imagination.

The question of how to handle the oil and get it to the refineries was one of vital importance. In 1862 a mechanical genius named Hutchingson of New Jersey laid the first pipe line from the Tarr farm to the Humbolt refinery. Teamsters and roustabouts were the uncompromising enemy of the pipe lines, and they repeatedly tore them up to prevent competition with the hauling of oil. The first lines were made of iron with lead joints. The jar of the pumps would loosen the joints, and cause them to leak, so they were impracticable. In 1864, Samuel Van Sickle also of New Jersey, solved the problem and laid a two inch iron line with screw joints from Pithole to the Miller farm. This was capable of running eight hundred barrels of oil a day. There are

now pipe lines running to Buffalo, Baltimore, Cleveland, Toledo, Pittsburg, Chicago, and to the seaboard at Bayonne, New Jersey. In all over one hundred refineries are connected with the wells in various oil fields, requiring about 80,000 miles of pipe for transporting oil, and about 20,000 miles more for the use of natural gas, making a total of 100,000 miles of pipe-line in the United States.

The first oil operators were pioneers struggling with the dangers and difficulties incident to a new and unknown industry. They had no past experiences to guide them, and worked with crude and imperfect implements. As the industry increased in importance, there came improved methods, until to-day there is to be found a greater per centage of skilled labor among workmen who produce oil than in any other industry. It is also the best paid, as the drillers and tool dressers receive about five dollars a day. I wish I had the time to tell about some of the skillful things drillers do. Sometimes the tools get stuck down in a hole 2,000 feet below the surface, and cannot be loosened in any way. Formerly such holes were abandoned; to-day only the tools are abandoned, the hole being switched over and drilled down at the side of the tools that are stuck. There are some 250,000 men engaged in the various branches of the oil industry. There are no labor unions and we never have a strike. Drilling deep wells is an art for the conditions and complications are constantly changing. The casual observer has been heard to say, as he sat on the bellows in the derrick of the drilling well,—" How clumsy everything is." That's so, they have to be heavy and strong; they are made for use not beauty. But they are perfectly adapted to the uses for which they are intended. There is so much money involved in the production of oil that the best American skill has been brought to bear upon the mechanical part of the industry. A machine that with the aid of skilled workmen is able to drill a hole six and one-quarter inches in diameter and over one-hundred feet deep in twenty-four hours, as is frequently done, is a triumph in mining engineering. It is an established fact that the drilling of wells about a mile deep in the solid rock is prominent among the wonderful mechanical achievements of modern times.

The deepest well ever drilled was put down at West Elizabeth, near Pittsburg, by the Forest Oil Company, and was 5,530 feet deep, or 250 feet over a mile.

In the early days about a thousand wells a year were drilled, now the holes are going down at the rate of about a thousand wells a month. There have been something like 170,000 wells drilled for oil and natural gas in the United States.

In 1901, the United States produced 53,000,000 barrels of illuminating oil. It is so easy to speak the word millions and so hard to really comprehend its meaning. Let us look at this vast volume in another way. If we put the oil produced into barrels, and then placed those barrels end to end, we have enough to reach all around the world and some to spare. After making a second row from New York to San Francisco we have not used all yet; so let us pile up what barrels remain one upon the other, and the top one is more than 10,000 miles above the earth. But this is really only about half the oil that was actually produced, for the fuel oils of California and Texas amounted to about 50,000,000 barrels more. The Lucas well at Beaumont is estimated to have started off at 100,000 barrels a day. To store and handle this ocean of oil 2,000 iron tanks, as large as a circus tent, each holding 35,000 barrels and 20,000 tank cars are required, also 150 immense tank steamers to carry it across the seas to Europe, Africa, India, China, Japan, and Australia.

Because oil was first found under Oil Creek, the pioneer operators thought it was only to be found under water courses, and they drilled wild-cat wells on what they called surface indications. After a number of years of this kind of experimenting, during which some oil fields had been found (more the result of accident than anything else) it was noticed that they had a general direction of northeast and southwest and that they ran on a forty-five degree line. The oil fields are not all on the same line for there may be any number of parallel forty-five degree lines, but the general trend is from northeast to southwest and they are about twice as long as wide.

In drilling in wild-cat territory there is no one who can tell just where to drill as is proven by the fact that the men who

have done the most of this kind of drilling have drilled the most dry holes. Our knowledge along this line is of a negative nature and enables us to steer clear of places where there is no possibility of striking oil. The novice, however, might start his well on the granite, which was created before the oil and gas, and contains no organic matter, as it was produced by the agency of fire.

The early operators were looking for repititions of what had already been found; to-day we are looking for surprises, for we have learned that every new field has certain conditions peculiar to itself, and what may hold good in one section may not hold good in another.

The oil is right in the pores of the rock. There are no actual veins, pools, or ponds of oil but a porous rock saturated with oil. The oil rises in the rock to a fluid level, for if we strike oil here at 2,000 feet and locate the next well on a hill whose rise is 200 feet above the first, we will strike the oil at 2,200 feet if at all.

The average life of oil wells is about fifteen years. The Allegany field in this state has been the best field ever struck in point of staying qualities. It was struck in 1880 and is still producing. The Bradford field has been the largest field as regards area. The West Virginia oil fields are the most expensive to operate as many wells in them cost $10,000 each, and some wells more. They are from two to three thousand feet deep but this is not the reason that they cost so much. It is because in places the rock slacks like lime when water comes in contact with it and caves are formed, which have to be cased off, and it is no uncommon thing to finish a well with six or seven strings of casing. I have seen wells that had over two miles of pipe in the single well.

The Grayville oil field in Monroe County, Ohio, is what we call a "glycerine production," for the wells show scarcely a sign of oil till they are shot; then they start off at about a hundred barrels and settle to ten or twenty barrels a day. In some fields, and under some conditions, we now use as heavy as 700 quarts of nitro-glycerine to a shot. To see a well on a bright day respond to a shot and make a big flow of oil is a very beautiful sight. It is better than fireworks. The yellow oil glistens in the sunlight like a fountain of molten gold.

East of Findlay, Ohio, is what is called the "Big Salt Water District." I have seen wells in this district that have pumped a three inch stream of salt water, and no oil, for six months night and day; then they would get to oil and start off at 300 or 400 barrels of oil a day. It takes grit to operate this kind of territory.

The oil field around Marion, Indiana, was a natural gas field until about two years ago. At that time the gas pressure became low and the wells went to producing oil, and last year about 1,000 wells were drilled for oil in that section. Along the Licking River in Kentucky, an oil is produced that has an asphalt base, and is as black as tar. In a fairly good field it requires about one well to every five or ten acres to get the oil out of the rock to best advantage.

Most oil wells flow from gas pressure, but it looks as if the great wells at Beaumont were flowing from a water pressure on the artesian well plan, and as the oil is lighter than the water, it is on top and being thrown out first. These wells have no gas to speak of.

The wild speculations in the oil territory around Beaumont last year put the "Tales of the Arabian Nights" in the shade. Charles Ingalls owned seven acres on which he lived at "Spindle Top." A "Gusher" was drilled near his property and when anyone would attempt to talk to him about selling he woud walk off and leave them, saying, "don't bother me, I'll have nothing to do with this oil business." Finally he was disturbed so much that he made up his mind that he would end the whole thing by putting such a price on his property that no one would think of buying it at his figures. So when he was next asked to sell, he replied, "I'll take $2,000," and the bargain was closed at once. When the buyers came to get the wife's signature to the deed Ingalls laid the deed down on the table, saying to his wife, "put your fist to that." She replied, "I will not, what are you doing?" "I've sold the place for $2,000 spot cash." Mrs. Ingalls insisted that it was not enough, and that she must have some money for herself or she would not sign. So she received $2,000 for herself and the Ingalls's were happy. The seven acres were thrown

upon the market and went flying around like a ping pong ball. One day an old neighbor met Ingalls and told him that the seven acres he sold out at Spindle Top had just sold for $800,000, and asked him what he thought of that? Ingalls took a fresh chew, and said, " I don't care if it has sold for eight hundred millions of dollars, I got $4,000 spot cash and that was $3,500 more than the darned old place was worth." The widow Sullivan owned twenty-five acres near " Spindle Top." It was known as the "Swill cart place," for she used to go to Beaumont every day with a cart for swill. She sold twenty acres for $10,200, and it proved to be dry, and was offered back to her for $300, but she declined, saying, " what do I want to buy the place for, when I can get the use of it for nothing."

At present Pennsylvania oil is quoted at $1.39. This does not mean just the oil that is produced in that state, but includes the oil produced in the Allegany field of New York, the oil of Monroe County, Ohio, and the entire production of Wset Virginia, all of which is known in the trade as Pennsylvania oil, because it is of the same grade, and produced from sandstone.

January 23, 1903.

SEVENTH ANNUAL MEETING.

The regular meeting was held in the Historical Rooms, the president, Dr. W. M. Beauchamp, in the chair.

The report of the council recommended:

(1) The payment of bills amounting to $3.50.

(2) The printing of the postals for the coming year.

(3) The appointment of the secretary and the treasurer as a membership committee.

The report was accepted and adopted.

SECRETARY'S REPORT.

The report of the secretary, Mr. Philip F. Schneider, was next read, and is summarized as follows:

Meetings have been held regularly during the ten months of the year, with an average attendance not including the popular lecture of thirty-five. In place of the customary meeting in May, a joint excursion with the Science Association of Syracuse University was taken to Pratt's Falls, Pompey.

The following list of programs was given during the year:

January 17. Reports of officers and sections.

February 21. "The Peopling of Early America," W. M. Beauchamp, S. T. D.

March 21. "Bird Migration and Food Habits," Charles W. Hargitt, Ph. D.; "Traits of Birds," Prof. Guy A. Bailey.

April 18. "The Geology of the Serpentines of Central New York," Philip F. Schneider, Ph. M.; "The Mollusks of Onondaga County," W. M. Beauchamp, S. T. D.

May 17. "The Geology of Pratt's Falls, Pompey, N. Y.," T. C. Hopkins, Ph. D.

June 20. Miscellaneous program. "A Syracuse Bison," C. W. Hargitt, Ph. D.; "An Onondaga Elephant," P. F. Schneider, Ph. M.; "An Onondaga Mastodon," W. M. Beauchamp, S.T.D.

September 19. "Notes on Some Eruptive Dikes near Ithaca, N. Y.," P. F. Schneider, Ph. M.

October 17. "The Natural History of Our Giant Salamanders," Albert M. Reese, Ph. D.; "The Vicissitudes of a Bluebird Family," Charles W. Hargitt, Ph. D.

November 21. "The Gas and Oil Wells of the United States," Hon. John T. Kilham.

December 19. "A Trip Through the Dinosaur County," W. M. Smallwood, Ph. D.

A popular lecture was given in Assembly Hall, University Block, March 15, to about two hundred persons by Dr. F. H. Herrick. It was entitled, "The Wild Bird at Arm's Length," and was illustrated with many beautiful lantern slides and did much to awaken an interest in the subject of birds throughout the city.

Through the courtesy of President Beauchamp many of the members received copies of two pamphlets, Bulletin No. 50 of

the State Museum entitled, "The Horn and Bone Implements of the New York Indians," and "Onondaga Plant Names";and from the secretary, "New Exposures of Eruptive Rock at Syracuse, N. Y."

Six active and two associate members were elected during the year, and two members placed on the corresponding list. Our membership now stands: Active, 49; associate, 16; corresponding, 8; total, 73.

LIBRARIAN'S REPORT.

The treasurer, Miss Louise W. Roberts, read her report for the year which is summarized as follows:

Balance on hand, January, 1902	$107.76
Receipts during the year	46.61
Total	$154.37
Disbursements	50.67
Balance on hand	$103.70

LIBRARIAN'S REPORT.

The librarian, Mrs. L. Leonora Goodrich, gave a detailed report showing the accessions to the library during the year.

REPORT OF THE GEOLOGICAL SECTION.

Philip F. Schneider, chairman of this section, read a report showing the following things accomplished by the members of the section:

Relief map of the county constructed. T. C. Hopkins.

Location of branch of Green street Dike. T. C. Hopkins.

Butternut street Dike described and accounts published. P. F. Schneider.

Ithaca dikes described. P. F. Schneider.

Goniatite knowledge advanced. A third new species found. J. D. Wilson.

Knowledge of ancient water courses advanced. S. E. Crane.

Geology of our Niagara group advanced. C. E. Wheelock.

Caves explored and investigated. T. C. Hopkins and others.

ZOOLOGICAL SECTION.

The report of this section was given by Dr. C. W. Hargitt. The most important work was the completion of the list of spiders of the county. This with the list of mammals and reptiles are now ready for publication.

BOTANICAL SECTION.

Mrs. L. L. Goodrich announced that during the summer the Torrey Botanical Club of New York together with many noted scientists had been guests of the section and spent several days examining the rich flora of this vicinity. Two specimens new to the county had been discovered during the year. The section is now studying the trees of the county.

The election of officers resulted as follows: President, Edward H. Kraus; vice-president, John D. Wilson; secretary, Philip F. Schneider; corresponding secretary, Thomas C. Hopkins; treasurer, Miss Louise W. Roberts; librarian, Mrs. L. Leonora Goodrich; councillors for three years, W. M. Beauchamp, John Van Duyn.

MEMBERSHIP, 1903.

HONORARY.

SMITH, CARROLL E., LL. D.....Syracuse, N. Y.

CORRESPONDING.

CLARKE, J. M., PH. D.....Albany, N. Y.
GLASS, JOSEPH.....Syracuse, N. Y.
HAANEL, EUGENE, PH. D.....Canada.
HARLOW, GERTRUDE MOOREHOUSE.....Kibbe, Conn.
HARRIS, S. G., PH. D.....Newburgh, N. Y.
LEVY, I. HARRIS, M. D.....Syracuse, N. Y.
NEWMAN, W. W.....South Onondaga, N. Y.
TARR, RALPH S., PH. D.....Ithaca, N. Y.
UNDERWOOD, L. M., PH. D.....Columbia College, N. Y.

ACTIVE.

ACKERMAN, MRS. MATTIE B.....206 West Beard avenue.
BAILEY, GUY A.....Onondaga Valley, N. Y.
BEAUCHAMP, WILLIAM M., D. D.....204 Maple street.
BOYNTON, MRS. MARY A.....1019 South Salina street.
BRITCHER, HORACE W., B. C. E.....707 South West street.
CALTHROP, REV. S. R., D. D.....1571 South Salina street.
CAMPBELL, MISS JOANNA M.....334 Westcott street.
CHASE, FRANKLIN H. 302 Stinard avenue.
CHATFIELD, D. S.....312 Gifford street.
CLARK, GAYLORD P., A. M., M. D....619 West Genesee street.
CRANE, STEPHEN ELLIS, M. D.....Onondaga Valley, N. Y.
CROUSE, CHARLES M.....416 West Genesee street.
DAKIN, GEORGE A.....Herald building.
DIDAMA, H. D., M. D.....424 South Salina street.
DOUGLASS, MISS BELLE.....220 West Castle street.
GOODRICH, MRS. L. LEONORA.....505 East Willow street.
GRAHAM, WILLIAM P., PH. D.....504 University Place.
HAIGHT, GEORGE.....Onondaga Valley,N. Y.
HALL, WARDNER.....316 East Onondaga street.

HARGITT, CHARLES W., PH. D.....909 Walnut avenue.
HARRIS, MISS ADA A.....201 Elliott street.
HARTER, FRANK L., M. D.....300 Hawley avenue.
HILL, MISS MARY E.....509 James street.
HINSDALE, WILLIAM G., M. D.....546 Seymour street.
HOPKINS, T. C., PH. D.....103 Marshall street.
HUNTINGTON, MISS JESSIE G.....311 Howard street.
JONES, MISS VIRGINIA L.....403 Howard street.
KENYON, OSCAR C.....110 Lancaster avenue.
KIRKWOOD, J. E.....112 Raynor street.
KNOWLTON, FRANK P., A. M.....309 Orange street.
KRAUS, EDWARD H., PH. D.....907 East Adams street.
LYNCH, GEORGE D.....906 Irving avenue.
MEAD, FRANK L., A. M.....701 South Beech street.
MEECHAM, SABINE.....Onondaga Valley, N. Y.
MERCER, A. CLIFFORD, M. D., F. R. M.S..324 Montgomery st.
MILLS, W. H., M. D.....926 West Genesee street.
OVERACKER, MISS M. L.....138 Linden street.
PATTEE, ERNEST N., M. S.....402 Euclid avenue.
PECK, HENRY A., PH. D.....307 Waverly Place.
PERRIOR, ALBERT.....316 East Kennedy street.
PRICE, GEORGE M., M. D.....412 South Warren street.
REESE, ALBERT M., PH. D.....709 South Crouse avenue.
ROBERTS, MISS LOUISE W.....500 Roberts avenue.
ROGERS, CHARLES G., A. B.....907 University avenue.
ROSENTHAL, MISS MARTHA, B. S.....901 Grape street.
SAUNDERS, FREDERICK K., PH. D.....313 South Beech street.
SCHNEIDER, PHILIP F., M. PH.....319 Jackson street.
SMALLWOOD, MARTIN, PH. D.....609 South Crouse avenue.
SMITH, H. MONMOUTH, PH. D.....701 University avenue.
SOULE, MRS. ALFRED.....1019 South Salina street
THWING, CHARLES B., PH. D.....121 Phelps Place.
TOTMAN, D. M., M. D.....303 Montgomery street.
VAN DUYN, JOHN, M. D.....318 James street.
WHEELOCK, CHARLES E.....110 Cathers avenue.
WILSON, JOHN D.....1508 Grape street.
WRIGHT, MARY E., M. D.....1609 West Genesee street.

PROCEEDINGS

OF THE

ONONDAGA ACADEMY OF SCIENCE

VOLUME I.

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THE PUBLICATION COMMITTEE.

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1903.

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OFFICERS, 1902.

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Edward H. Kraus.....Syracuse High School

VICE PRESIDENT

John D. Wilson.....Putnam School

SECRETARY

Philip F. Schneider.....319 Jackson street

CORRESPONDING SECRETARY

Thomas C. Hopkins.....Syracuse University

TREASURER

Miss Louise W. Roberts.....500 Roberts avenue

LIBRARIAN

Mrs. L. Leonora Goodrich.....505 East Willow street

COUNCILORS

TERMS EXPIRING IN 1904

John D. Wilson and Mrs. Mattie B. Ackerman

TERMS EXPIRING IN 1905

Franklin H. Chase and Ernest N. Pattee

TERMS EXPIRING IN 1906

W. M. Beauchamp and John Van Duyn

OFFICERS OF SECTIONS

GEOLOGY

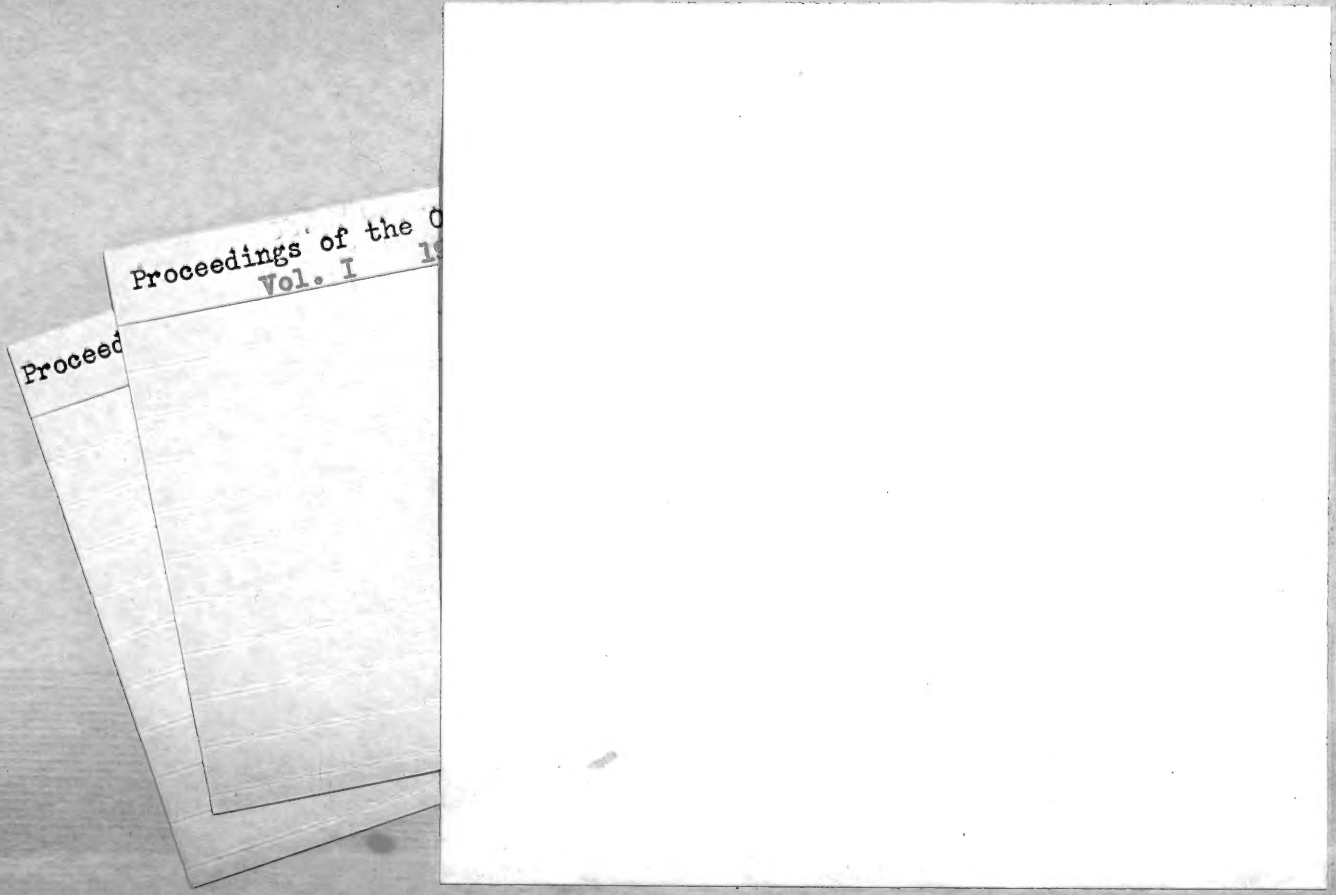
Philip F. Schneider, chairman
Charles E. Wheelock, recorder

BOTANY

Mrs. L. L. Goodrich, chairman
Miss L. W. Roberts, recorder

ZOOLOGY

Horace W. Britcher, chairman
Charles W. Hargitt, recorder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