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THE  
 GEOLOGICAL  
 AND  
 NATURAL HISTORY SURVEY  
 OF  
 MINNESOTA.

THE FOURTEENTH ANNUAL REPORT  
 FOR THE YEAR 1885.

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 CALIFORNIA STATE  
 MINING BUREAU

Submitted to the President of the University, March 1st, 1886.

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THE UNIVERSITY OF MINNESOTA, }  
MINNEAPOLIS, MINN., MARCH 1, 1886. }

*To the President of the University:*

DEAR SIR:—The fourteenth annual report of progress of the geological and natural history survey of the state is hereby presented.

I have the honor to be, very respectfully,

Your obedient servant,

N. H. WINCHELL,

*State geologist and curator of the general museum.*

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# REPORT.

## SUMMARY STATEMENT.

The Legislature of 1885, not only made provision for the binding of the rest of the edition of vol. i., of the final report, but enacted a general law respecting the publication of other volumes. It reads as follows:

AN ACT RELATING TO THE PUBLICATION OF THE REPORT OF THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF THE STATE.

*Be it enacted by the Legislature of the State of Minnesota:*

Section 1. The governor, the secretary of state and the state geologist are hereby created a commission for the printing and publication of the reports of the regents of the university on the geological and natural history survey of the state.

Sec. 2. It shall be their duty to supervise the printing of the final reports of said survey, and the engraving of the accompanying maps and illustrations, in such style and manner as they shall determine and judge best calculated to exhibit to the people of the state, the natural resources of the state as required by the law creating the geological and natural history survey.

Sec. 3. They shall cause to be republished in the same manner the third (3rd,) fourth (4th) and fifth (5th) reports of progress of said survey, at as early a date as practicable, in an edition of two thousand copies.

Sec. 4. The volumes of the final report of said survey, as they may be prepared by the state geologist from time to time, shall be issued in an edition of five thousand (5,000) copies each, and shall be distributed, in the name of the board of

regents of the university, under the direction of the state geologist, to scientific and educational institutions, and to individuals, as follows: To the library of each chartered college and scientific institution in Minnesota, three (3) copies each; to each normal school, three (3) copies; to the libraries of the institute for the deaf and mute, the insane asylums, the state prison, and every public library in the state not otherwise designated, one (1) copy each; to each of the offices in the capitol, one (1) copy; to each member of the board of regents, three (3) copies; to the library of the state university, two hundred (200) copies; to the Historical Society, and to the Minnesota academy of sciences, ten (10) copies each; to each newspaper published in the state, one (1) copy; to each senator and representative of the present legislature, one (1) copy; to the governor and lieutenant governor, each one (1) copy; to each assistant on the survey who has furnished manuscript or illustrations published in the report, three (3) copies; to the general office of each railroad that has furnished aid to the survey, three copies; to the library of each high school, furnishing students fitted for the freshman class of the state university, one (1) copy; to the state library of each state in the Union, one (1) copy; to each state university and each college of agriculture and mechanic arts, one (1) copy; to geologists and naturalists of Minnesota, fifty (50) copies; to the geologists and naturalists of other states, two hundred (200) copies; to other colleges and scientific institutions in the United States, one hundred (100) copies; to foreign institutions and scientists, one hundred (100) copies; and to the state geologist, twenty-five (25) copies. The remainder shall be deposited in the state university, and shall be sold at such prices as the board of regents may determine, and the proceeds of such sales shall be used by said regents for the purchase of apparatus and books for the survey, and after its completion, for the departments of natural science at the state university.

Sec. 5. The expense of printing, engraving, binding and distribution of said reports shall be paid out of any moneys not otherwise appropriated, in the state treasury, on warrants of the state auditor approved by the governor and secretary of state.

Sec. 6. The commissioners hereby appointed shall perform the duties herein designated without further compensation than the payment of the actual expenses incurred in the discharge thereof.

Sec. 7. This act shall take effect and be in force from and after its passage.

Approved March 7, 1885.

The Legislature of 1885 also passed the following law transferring to the board of regents, for the survey, the indemnity lands granted by Congress.

AN ACT TO TRANSFER TO THE CUSTODY AND CONTROL OF THE BOARD OF REGENTS OF THE UNIVERSITY OF MINNESOTA THE LANDS GRANTED BY CONGRESS TO THE STATE BY AN ACT ENTITLED "AN ACT GRANTING LANDS TO THE STATE OF MINNESOTA IN LIEU OF CERTAIN LANDS HERETOFORE GRANTED TO SAID STATE," APPROVED MARCH THIRD (3rd), ONE THOUSAND EIGHT HUNDRED AND SEVENTY NINE (1879) TO AUTHORIZE THE SAID BOARD TO SELL SUCH LANDS AND DISPOSE OF THE PROCEEDS OF SUCH SALES.

WHEREAS, The state lands known as state salt lands, were by an act approved March tenth (10), one thousand eight hundred and seventy three (1873), chapter one hundred and thirty three (133), general laws of one thousand eight hundred and seventy three (1873), transferred to the custody and control of the board of regents of the University of Minnesota, to be by said regents sold, and the proceeds thereof held in trust by them, and disbursed in accordance with the law ordering a geological and natural history survey of the state; and

WHEREAS, It was found that certain parcels of such state lands had been otherwise disposed of by the United States to actual settlers upon such lands, for which indemnity lands have since been granted to the state by an act of Congress approved March third (3), one thousand eight hundred and seventy nine (1879); therefore

*Be it enacted by the Legislature of the State of Minnesota:*

Section 1. That the lands granted by Congress to this state by an act entitled "An act granting lands to the State of Minnesota in lieu of certain lands heretofore granted to said state," approved March third (3), one thousand eight hundred and

seventy-nine (1879), be and the same are hereby transferred to the custody and control of the board of regents of the university of Minnesota, which lands the said board may sell in such amounts as they may deem most expedient and beneficial, the proceeds thereof being held in trust by them, and only disbursed in accordance with the law ordering a geological and natural history survey of the state, and the said board shall make report of their doings in the premises, as provided by law.

Sec. 2. This act shall take effect and be in force from and after its passage.

Approved Feb 24, 1885.

The same Legislature appropriated a sum of money, (\$12,000) for the printing and engraving necessary for volumes 2 and 3 of the final report. Of these, volume 2 is now in press, and will probably be issued during the coming year.

On the return of the collections of the survey from the New Orleans Exposition, a great deal of labor was expended in re-arranging them in the museum. The rooms are more than full. Some of the cases which were returned from New Orleans are not placed in the rooms of the museum, but are stored, empty, in the Coliseum—where also are some of the specimens, because of a lack of room. At the same time the two rooms in the basement of the University which are used for general work and laboratory purposes, are very much crowded, and the progress of every department is retarded. The museum has again outgrown its accommodations. The accompanying list again will show the accessions during the year.

During July and August Mr. E. O. Ulrich was engaged in the examination of the collections of bryozoa, accumulated since the commencement of the survey. He made a good beginning in this work, and his report on the same will be found herein. There is much still to be done before a creditable and full presentation of this interesting class of fossils can be offered for final publication.

My son, Mr. H. V. Winchell, has resumed the work of collecting and listing the data of water-power utilized in the state, which was interrupted by the death of Mr. C. M. Terry. This is carried on in connection with other office and labora-

tory work, and work in the museum, and occupies but a portion of his time.

Mr. O. W. Oestlund, formerly a student of the University, and an assistant to Prof. Porter on the experimental farm, was engaged in April last, to serve as entomologist of the survey, and has been so engaged throughout the rest of the year. At a late meeting of the horticultural society of the state he was elected state entomologist to the society. Mr. Oestlund's second report is included herewith.

Mr. U. S. Grant, a student of the University has been at work casually arranging and cataloguing the collections of the survey pertaining to recent conchology. The list of recent shells found in the accompanying museum report and notes on the specimens, were prepared by him. He has had the assistance and counsel of Prof. R. E. Call, of Iowa, and of such meager literature as may be found in the University.

Mr. Warren Upham's work on the survey was terminated last April. His contributions to the geology of the state, particularly the glacial geology, have been voluminous and valuable. He has continued the same work in Dakota, in connection with the United States geological survey. A large amount of manuscript prepared by him, pertaining to the central drift-covered counties mainly, remains to be published. It will appear, according to present plans, in the second volume of the final report. Mr. Upham's careful diligence and clear-sighted apprehension of geologic facts and principles, make him not only a valuable assistant, but a reliable investigator.

Prof. J. C. Arthur, of Geneva, N. Y., was appointed botanist of the survey by authority of the board of regents, last March, but circumstances that could not be obviated have prevented him from engaging actively in this work. It is expected, however, that this department of the natural history of the state will be vigorously prosecuted during the coming year.

The manuscript reports of Dr. P. L. Hatch, on the ornithology of the state, and of Prof. C. L. Herrick, on the mammals, though not yet tendered, are understood to be in an advanced state of preparation, and will probably be completed during the coming year. In September and October, Mr. F. L. Washburn was engaged in making observations and collections for

Dr. Hatch in the northern part of the state, and has rendered some manuscript reports on his work, which has been turned over to Dr. Hatch.

The only geological field-work done in 1885, was that performed by myself in Hennepin, Ramsey, Washington, Dakota and Goodhue counties. This was intended to complete the work in those counties, and bring to a close, practically, the survey in the central part of the state. The palæontology of the primordial, Silurian and Cretaceous strata, however, is yet to be worked out fully before the geology of this part of the state can be said to be finished. Were it not for delays and interruptions incident to the publication of work already done, the field-work could be carried at once into the northern part of the state with vigor, and the survey could be brought to a close in a few years. It is hoped, however, that notwithstanding these interruptions, it will be possible during the coming summer to resume actively the work in the northern part of the state, which was interrupted in 1879.

## I

## NOTES ON SOME DEEP WELLS IN MINNESOTA.

BY N. H. WINCHELL.

*The West hotel well, Minneapolis.* This well was drilled by Mr. W. E. Swan in the summer of 1884. Its purpose was to secure a supply of good water for the West hotel. The water stands at twenty-four feet below the surface. The well is 622 feet deep. Pumping at the rate of 300 gallons per minute, lowers the water, according to Mr. Swan, about three feet in the pipe. The first water was encountered in No. 8, a white sandrock, at 168 feet, below a bed of four feet of red shale, the same that was met, with the same result, in the well at the Washburn C mill. The point of commencement of the West hotel well is from five to ten feet higher than that of the Washburn C mill. It is in the basement area, about ten feet below the surface.

		Feet.
1.	Mus. Reg. No 6072. Sand drift .....	18
2.	Mus. Reg. No 6073. Limerock (Trenton).....	10
3.	Mus. Reg. No. 6074. Green shales (Trenton).....	10
4.	Mus. Reg. No. 6075. White sandrock.....	91
5.	Mus. Reg. No. 6076. Yellow sandrock.....	30
6.	Mus. Reg. No. 6077. Yellow sandrock.....	5
7.	Red shale.....	4
8.	Mus. Reg. No. 6078. White sandrock (first water).....	10
9.	Mus. Reg. No. 6079. Yellow sandrock.....	18
10.	Mus. Reg. No. 6080. Gray sandrock.....	6
11.	Mus. Reg. No. 6081. Red quartzite, with calcareous cement, effervescing feebly.....	32
12.	Mus. Reg. No. 6082. Fine (crypto-crystalline) limestone, hard, drab siliceous.....	40
13.	Mus. Reg. No. 6083. Red limestone, siliceous, hard, fine, verging to the drab limestone of No. 12.....	10
14.	Limestone, with white sand intermixed, similar to No. 12, but rather yellowish-pink than drab in color.....	15
15.	Brown-red, hard rock, a calcareous quartzite, some of it being a fine siliceous limestone.....	6
16.	Fine, light-pinkish limestone, with numerous white quartz grains intermixed. The drillings are nearly half sand, but Mr. Swan thinks there is no sand in this rock (No. 16) but that the sand works in from above, which is probably true.....	30
17.	White sand (second water).....	5
18.	Fine, pinkish sand, very hard.....	1
19.	Rounded, coarse, white sand (water increased to 20).....	90
20.	Calcareous shale (?).....	45
21.	Green shale.....	104
22.	Hard, sub-crystalline shale, greenish, slaty.....	12
23.	White sandstone (third water.) Dresbach sandstone (?).....	30
Total depth.....		622

*The Lakewood Cemetery well, Minneapolis.* The drilling of the deep well at the Lakewood cemetery was continued to the depth of 2,118 feet. Samples of the drillings said to have come from this depth show a reddish-brown schistose or shaly rock, like much of that above in the same drill, and apparently belonging still in the Cupriferous.

The general summary of this well given on page 54, of the 13th annual report, would harmonize better with facts derived from the deep well at elevator B. St. Paul, and perhaps with others, if it were slightly modified. With this modification there is nothing in the record to interfere.

It would be as follows:

1. Drift, 1—256 feet.....	256 feet.
2. White sandrock, 256—318 feet. (St. Peter.).....	62 feet.
3. Dolomitic rock, 315—325 feet. (Shakopee.).....	10 feet.
4. Assuming that the unrepresented interval is made up of white sandstone. 325—360 feet. (Jordan.).....	35 feet.
5. Dolomitic rock, 360—403 feet. (St. Lawrence.).....	55 feet.
6. White quartz sandrock, 403—504 feet. (Madison.).....	101 feet.
	&c. &c. &c.

*The Hospital well, St. Peter.* Through the co-operation of Dr. C. K. Bartlett, superintendent of the hospital for the insane, the following record has been obtained of this well: It was drilled in the fall of 1885. This well begins at the foot of the river-bluff, not far above the level of high water of the Minnesota river. There had before been excavated here a reservoir for water and a pump-house erected for throwing the water to a higher level, for the use of the hospital. This reservoir was fed by springs issuing from the sandstone, of which the bluff is mainly composed. At the depth of 116 feet the water began to flow over the top of the pipe, which was driven into the rock to protect the drill, and rose above the ground about two feet. The flow gradually increased to the bottom of the well, which is 200 feet below the point of beginning. The water will rise in a tube seven feet above the ground, or some ten feet above the original level of the reservoir, and at least twenty-five feet above the level of low water in the river. This record is valuable, as it throws light on the stratigraphy of the upper part of the Cambrian in that part of the state. The record furnished by Dr. Bartlett is as follows:

1. Gravel and loose rock.....	15 feet.
2. Sandrock, (Jordan).....	65 feet.
3. Pink limestone. (St. Lawrence).....	70 feet.
4. Gray sandrock, hard.....	15 feet.
5. Pink limestone rock.....	10 feet.
6. Red sandrock.....	22 feet.
Total.....	197 feet.



This record was very carefully kept, according to Dr. Bartlett, by the man who drilled the well. The drillings were examined by him every four feet, as the work went on. No. 2. above, is seen in the river bluff adjacent to the pump-house, and rises about twenty feet higher than the top of the well, making its total thickness about 85 feet. The rest of the bluff consists of magnesian limestone, the same that is quarried at Kasota, and continues for some distance, having a thickness of about twenty feet. It is the same as that quarried formerly at the Hospital building, and was used in its construction. It was described in the third annual report, page 143, and considered to be the Shakopee. There remains, now, some doubt whether the stone quarried at Mankato is the equivalent of this upper limestone. It seems rather to agree in thickness with the lower one.

*The Mankato well*, was drilled in the early part of the year 1885, but unfortunately no drillings were preserved systematically, nor any record of the boring kept as the work proceeded. From Prof. A. F. Bechdolt the following information has been derived. The well is on the land of Mr. Carstadt, one-and-a-half blocks west of the oil-well, on Third street. It is situated within the general valley of the Minnesota, and west of the strike of the limestone bluff. It is ninety-six feet deep. The clay begins at 45 feet below the surface and is 28 feet thick. Water rose to the surface at once on penetrating through this clay, and continued to increase to its maximum, which occurred at 8 feet depth in the rock under the clay. This rock, which was entered 21 feet, is described by the owner as variable in hardness, having layers that were soft about six to twelve inches thick, alternating with hard ones that were from twelve to eighteen inches thick, the last hard layer being about three feet thick.

Prof. Bechdolt sent a single sample of the drillings from the rock below the blue clay, but from no definite horizon. They are very fine, light gray in color, homogeneous, and under the magnifier appear to be mainly quartz. When magnified about fifty diameters they show distinctly that they are mainly of angular grains of translucent quartz, not at all water-worn but pitted and reticulated. They also show a few brown scales of what appears to be some organic substance. On the application of hydrochloric acid the powder foams up somewhat, but this is due to the presence of some soluble grains, the great part of the powder being inert. The grains polarize like silica. They are not like any heretofore seen in the Cambrian, but are probably from the Cretaceous and were apparently washed from a clay or shale of that age. Museum Reg. No. 6115.

*The Herman well.* Mr. Charles Pullman drilled a well at Herman, for the convenience of his hotel. At 150 feet he sent a sample of gray syenitic rock containing a soft, soapy, foliated, light green mineral. At the depth of 152 feet the rock is essentially the same, but the drillings are finer and rusty. Museum Register Nos. 6116 and 6117.

*The Brown's Valley well.* This is an artesian well, made in 1884. It is located in the valley that runs between the Big Stone and Travers lakes, about 150 feet below the general level of the prairies in that part of the state. A stream about an inch in diameter flows from this well. The first overflow was had at the depth of 420 feet and the second at 425 feet. According to Mr. J. O. Barrett the strata in this well were as follows:

1. Blue clay, growing darker and denser to.....	360 feet.
2. Dark carbonaceous shale, hard and heavy, Museum Register, No. 6112.....	2 feet.
3. Gravel and sand, alternating with layers of blue clay.....	58 feet.
[At the bottom of this was the first artesian water.]	
4. "Quartz rock".....	5 feet.
[Under this was the present flow of artesian water.]	
5. Greenish, micaceous, kaolinic shale, or clay. Museum Register, No 6113.....	20 feet.
6. Rather coarse, angular quartz grains, apparently washed from the drillings. Museum Register No. 6114. These are generally white, opaque and wholly un-water-worn. They contain some olive-gray grains that appear to be made up of several smaller siliceous grains cemented, like some seen in the Tracy well.....	20 feet.
Total depth.....	465 feet.

The water flows steadily, about 225 barrels each twenty-four hours, and is said to have a pressure that would cause it to rise above the surface about 200 feet. It is soft and "soaps" profusely, and possesses certain curative qualities. The strata penetrated all pertain to the Cretaceous formation. For the chemical qualities of this water, the reader may consult the analysis of Prof. J. A. Dodge in another chapter of this report.

*The Milbank well.* This is at Milbank, Grant county, Dakota. The following information is given on the authority of Mr. J. W. Williams. The total depth is a little over 300 feet, but granite was struck at 283 feet, (Museum Register, No. 6125,) and was drilled into about 20 feet. The alternating strata were:

1. Blue clay.....	75 feet.
2. Shale.....	200 feet.
3. Gravel, "clamshells" and pebbles.....	8 feet.
4. Granite.....	20 feet.
Total depth.....	303 feet.

*The Rosenfeld Sta. well.* Following is the record of this well, as given by Mr. W. E. Swan who drilled it. It is on the Canadian Pacific railway, southwestern branch, twenty miles northwest of St. Vincent. It is interesting in view of the extension of the St. Vincent salt basin so far in that direction. It was from this well that was procured the boulder-clay in which were found Cretaceous microscopic fossils as described by Dr. G. M. Dawson in the last report, p. 157.

1. Black soil.....	4 feet.
2. Blue clay.....	111 feet.
3. Sand and gravel.....	10 feet.
4. Hardpan, yellow.....	4 feet.
5. Boulders.....	6 feet.
6. Gray slate.....	62 feet.
7. Yellow limerock.....	15 feet.
8. Red shale.....	5 feet.
9. Gray shale.....	10 feet.
10. Brown shaly limestone (flow of salt water).....	30 feet.
11. Gray sand-shale.....	40 feet.
12. Chalk, white.....	30 feet.
13. Red shale.....	160 feet.
14. Magnesian limerock (second flow of salt water).....	305 feet.
15. Red shale.....	75 feet.
16. Reddish sandrock.....	50 feet.
17. Red shale.....	50 feet.
18. Mixed red and gray shale.....	25 feet.
19. Gray shale.....	20 feet.
20. Red shale, quartzy.....	15 feet.
21. Granite.....	2 feet.
Total depth.....	1037 feet.

*The Sleepy Eye well.* This well is three miles southeast of Sleepy Eye, on the bank of the Cottonwood river. The following information is given on the authority of Mr. C. M. Phelps, who drilled the well. The granite struck at the bottom of this well is red and chloritic.

1. Drift, (soil &c.).....	28 feet.
2. Gravel, giving water about.....	2 feet.
3. Clay, without pebbles.....	30 feet.
4. Gravel and sand (with water), about.....	2 feet.
5. Clay like the last, (with water at 80 feet).....	18 feet.
6. Pebbly clay.....	100 feet.
7. Coarse gravel, about.....	2 feet.
8. "White clay," with no pebbles, containing one thin stratum of brownish red clay, 58 feet.	58 feet.
9. Clay similar to the last, but of somewhat darker color.....	21 feet.
10. Red granite—drilled.....	8 feet.
Total depth.....	269 feet.

Mr. Phelps also drilled a well about four miles southwest from New Ulm, on the farm of L. Meyers. This went through "clay" about two hundred feet, and then met with a coarse sand made up of a great variety of rock-fragments, though mainly of translucent quartz. Some of the grains are rounded as completely as in some of the Cambrian sand-stones, but the most of

them are but slightly, or not at all, water-worn. Some of the quartz grains are rose-red, some are opaque-white, some are yellowish, some are from a previously granular quartzite and contain many smaller grains, some are dark brown, some are translucent-gray, and some are of a light translucent-green. Amongst the quartz grains are also a great many that are olive-gray and opaque, like those mentioned already in No. 6 of the Brown's Valley well. The grains that are not of pure quartz, are of a dark-green to black color, and are of various kinds of hard, aphanitic rock. These dark grains constitute perhaps one-tenth part of the whole, making the mass present a pepper-and-salt aspect. The whole seems to come from the Cretaceous. Museum Register No. 6226.

*The Austin deep well.* The drillings from this well were presented by Mr. W. E. Swan, and were mentioned in the Museum report for 1881, page 162, with Mr. Swan's designations. The water rose to within nine feet of the surface, from a crevice which furnished water at the depth of one hundred and sixty feet. These drillings have the Mus. Reg. Nos. 4287 to 4295.

1. Black loamy soil. (4287).....	2 feet.
2. Yellow clay, with some quartz sand; drift, (4288).....	12 feet.
3. Drift gravel, coarse, (4289).....	20 feet.
4. Gray, or blue, Cretaceous shale, (4290).....	22 feet.
5. Limestone, light gray, nearly white, effervescing freely. Among these drillings are minute crinoidal beads, from one-half centimeter to one centimeter in diameter. Some of them are pentagonal, but the most are round. They have twenty-five ridges and as many grooves alternating, on each side.....	44 feet.
6. Finely arenaceous shale, light, greenish-gray, nearly white, hardly effervescing. ....	16 feet.
7. These drillings indicate a limestone conglomerate, with some calcite, and a very little pyrite; the interstices between the pebbles being filled with sand, some of it being rounded white quartz. Among these drillings also are small crinoidal joints. 64 feet.	
8. Light-gray, crystalline limestone, with fragments of fossils, including small crinoidal beads. Somewhat pyritiferous.....	80 feet.
9. Rounded pebble of light-gray magnesian limestone, two and one-half by three and one-half inches in diameter. This is from the depth of 160 feet, and hence from the foregoing conglomerate.	
Total depth.....	260 feet.

This well seems to pass across the horizon of superposition of the Devonian on the Silurian. Some of these limestone drillings appear like the Niagara limestone, particularly No. 5, and the conglomerate suggests the horizon of the Oriskany. The "Austin rock" seems not to appear, but its place is occupied by drift and Cretaceous shale. The shale, No. 6, very much resembles that mentioned on pages 361 and 362, of vol. i. of the final report, which occurs about a mile and a half north of Grand Meadow, in this county.

[These notes are continued in the appendix.]

## II.

# LIST OF THE APHIDIDÆ OF MINNESOTA, WITH DESCRIPTIONS OF SOME NEW SPECIES.

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By O. W. OESTLUND.

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But few remarks will be necessary as introductory to the following list of the Aphididæ of Minnesota. The extent of territory covered is Hennepin and Ramsey counties; and the time of observation extends over the greater part of the collecting season of the present year, with some special time given to it during September and October.

From the inability to preserve specimens of this family satisfactory for study, as can be done with most of the other families of insects, I have made it a practice to take as full notes as possible of the species from living specimens as soon as found. It is from these notes that the following list has been drawn up. Probably a more prudent plan would have been to continue these notes yet for one or more seasons, in order to verify many of the observations and to be able to present a more complete list of the locality. But if allowance be made for any short-coming that will be found on account of a too limited time of observation, I think it will yet be found to contain matter that will justify its immediate presentation.

The study of this family especially presents many difficulties that can not be overcome except by patient and long extended observations over the state, with the co-operation of many observers. It is in the hope also that the following list may induce some of our naturalists and others favorably situated to aid this department by their notes and observations, as has so successfully been done in the department of botany, that as soon as possible a complete presentation can be made, not only of this family but also of others, so far as our own state is concerned.

The economical value of this study I need not here mention. Every gardener, horticulturist and farmer who has in the least observed the work of these insects, will know to what extent their injury may accrue in spite of their small size and feeble appearance. But to be able to rightly interpret the economical relation of any family or order of insects, it will first be necessary to have a full and systematic knowledge of that family, not only in regard to the species, but especially of the life histories and habits, on which to base our conclusions. Prematurely drawn conclusions and advices are too often worthless.

Not a few of our American entomologists have given considerable attention to this family, but still we are only on the threshold, as the number of species for this country, without any doubt, will be more than doubled. Among the more important works of these writers may be mentioned:

*Fitch, Asa*, Valuable matter will be found in many of his entomological papers.

*Walsh, B. D.*, On the genera of Aphididæ found in the United States. (In the proceedings of the Entomological Society of Philadelphia, Dec. 1862.)

*Thomas, Cyrus*, Eighth report of the state entomologist on the noxious and beneficial insects of the state of Illinois, 1879. (The most complete work of all the American species that we have.)

*Riley C. V.*, and *Monell, J.*, Notes on the Aphididæ of the United States, with descriptions of species occurring west of the Mississippi. (In the bulletin of the United States Geological and Geographical Survey of the Territories, Vol. V., No. 1, 1879.)

The systematic classification both of the species and genera found in America is still very unsatisfactory. I can offer very few or no suggestions in this line, from my knowledge of the family being too limited, and from the want of some of the more important foreign works treating of this family. The lack of literature is probably the greatest want that the frontier naturalist has to encounter. The large libraries of this country are all far off in the East, and our own are still in their infancy; it therefore often takes months if not years to procure the desired work. Some of the species on a closer study and comparison will therefore probably be found synonymous with European species, but I think it will not be in many cases, as most of them are found on plants indigenous to this country, and can be considered as native species.

In two cases have I found it expedient to erect a new genus; if valid or not future work will have to show.

In regard to the life history of the family there are two facts that I would here, as briefly as possible, call attention to. Ever since the time of Reaumer, entomologists and naturalists, in speaking of the life history of the plant-lice, have invariably had the statement to the effect that the last brood in the fall is composed of winged males and females, and that after the sexual union of these the eggs are laid by the winged females. Even entomologists of our own time have fallen into the same error, although facts to the contrary are well known; errors that too many writers fall into from quoting authors and not nature. The relation of the different forms as now known to entomologists, and which is in accordance with my own observations, I find to be as follows: The first brood, or *spring brood*, as it might well be called, is altogether composed of the apterous viviparous females, whose sole object is the multiplication of the species, or rather the growth of the colony. But as the season advances and the warm summer days have come, a different brood begins to make its appearance, composed of the winged viviparous females, and can be called the *summer brood*. These not only continue to increase the colony in the same way as the foregoing form, but in addition thereto their object is the distribution of the species, and the founding of new colonies. So far males are very rare or not to be found at all, and they have no relation to the winged viviparous females. The last brood, or *fall brood*, is composed of winged males and apterous-oviparous females, and after the sexual union of these the eggs are laid by the females for the next season. This I find to be the general rule for the family, at least for all the higher genera, and I think will give us a more correct interpretation of the different forms; although a more detailed account will show many variations and some exceptions.

A second fact is in regard to apterous males. The occurrence of this form has been noticed before by some European entomologists, but the fact seems not so far to have been confirmed by our American entomologists. In the genus *Siphonophora* I have observed them in several different species, and in one (*Siphonophora frigida*, described in the following pages) this was the only form that could be found.

### I.—Genus SIPHONOPHORA, Koch.

Head narrow and sub-quadrate.

Antennæ on distinct frontal tubercles, approximate at base: longer or at least as long as the body; third joint long, always longer than the fourth; seventh setaceous and long, sometimes longer than the third.

Eyes with a distinct tubercle; ocelli present and usually conspicuous.

Beak moderately long.

Prothorax large, smooth or transversely wrinkled; with no lateral tubercle.

Wings very long and narrow.

Legs long and slender.

Honey-tubes very long, usually extending beyond the tip of the abdomen; cylindrical, never enlarged in middle or clavate.

Style long, usually curved upwards, often compressed, falcion-shaped.

Usually found in large colonies on herbaceous, or on the leaves of woody plants.

Typical American species, *Siphonophora roseæ*, Reaum.

#### 1. *Siphonophora rudbeckiæ*, Fitch.

Found abundantly throughout the season on *Solidago serotina*, Ait. and *Silphium perfoliatum*, Linn.

#### 2. *Siphonophora ambrosiæ*, Thomas.

Very abundant during August and September on *Ambrosia trifida*, Linn.

#### 3. *Siphonophora frigidæ*, n. sp.

*Habit.* Found on *Artemisia frigida*, Willd. A well characterized species on account of its shining dark-green color contrasting well with the white silky color of the plant it inhabits. In size smaller than *Siphonophora rudbeckiæ*. Winged specimens of viviparous females were seen during the summer, but no description was taken of them at the time. I can only say they were quite similar to the apterous form both in color and general appearance; the venation of the wings being as usual in this genus.

*Apterous form.* Of a very uniform shining dark-green color, somewhat of a metallic luster. Head narrow, subquadrate, usually slightly darker than the rest of the body. Eyes black, with a small and blunt ocular tubercle. Antennæ on prominent frontal tubercles, about as long as the body; III longest, IV a little shorter, V a little shorter than IV, VI about one-third of V, VII as long as III or sometimes longer; color black, except the base of III slightly paler. Beak moderately long, reaching



second coxæ; third joint rather long and strongly pointed; color black. Legs all black with the basal half of the femora slightly paler. Abdomen rather long, widest in the middle, cylindrical (or in oviparous females with the sides slightly emarginate,) with a row of small impressed dots of black along the margin above the insertion of the honey-tubes; dorsum is often slightly tuberculated, especially in young specimens, the tubercles giving rise to short and slender hairs. Honey-tubes black, cylindrical, reaching to the tip of the abdomen, as long again as the tarsi, not smooth, but appearing as if covered by short appressed scales when seen under the microscope. Style black, greenish at base, slightly narrowed in the middle, rounded at tip, about two-thirds as long as the honey-tubes. The anal plate of oviparous females is very long and conspicuous; black, hairy. Length of body, .08; the oviparous females are somewhat larger.

*Apterous males.* The occurrence of this form, as noticed by a few European entomologists, is still accepted with doubt. Why so few have observed this form is probably from the fact that they have been mistaken for larva or undeveloped specimens, and therefore no special attention been given to them. That the males as a rule are winged I think there is no doubt of, and the occurrence of wingless must be considered as an exception. Wingless males have been observed in both of the above mentioned species, and in one or two others belonging to this genus. In the species under consideration this form seems to be the rule and not the exception. During the summer when winged specimens were observed, only oviparous females were found, no males being seen at the time. I did not look specially for them as I felt confident they would be found further on in the season, but after a most diligent search for them during September and October, when the eggs were deposited, not a single winged specimen could be found. A great number of the wingless males, described below, were taken repeatedly during this time, and taken often in congress with the wingless oviparous females, so there can be no doubt of their being fully developed individuals.

*Description.* General color dark reddish-brown, in this respect differing much from the uniform greenish color of the other forms. Head of the same color with the body. Antennæ as

long as the body or usually a little longer, black, except the base of III which is slightly pale; III longest, IV and V subequal, VI one-third of V, VII as long as III, or sometimes longer. Eyes with the ocular tubercle short and blunt, no ocelli. Beak reaching second coxæ, third joint rather long and pointed. Legs black, except the base of the femora, and also the tibiæ sometimes slightly paler. Abdomen longer than broad, being rather longer and narrower than usual in males; flat above, sides margined, and with a row of black impressed dots above the insertion of the honey-tubes. Honey-tubes cylindrical, black, hardly twice the length of the tarsi, and not more than reaching to the tip of the abdomen. Style about two-thirds the length of the honey-tubes, black, narrowed at base and rounded at tip. The anal plates are black; the upper rounded at end; the lower divided into two diverging lobes or projections which are cylindrical, black, and very hairy on the under surface. Length of body, .08.

The eggs of this species are laid by the oviparous females during October in very great numbers between the leaves on top of the branches. Being tucked in between the hairy leaves they soon become firmly fastened to them by the hardening of the viscid substance that covers them when first laid, and as the leaves are persistent over winter they are well protected and in the very midst of food when the larvæ hatch the following spring. When first laid they are greenish, but soon become shining black by the hardening of the outer shell on exposure. In form oblong, cylindrical, as long again as broad, rounded at both ends, very smooth and shining; length about .03.

#### 4. *Siphonophora chrysanthemii*, n. sp.

*Habit.* Found on the flower-stalks and heads of *Bulens chrysanthemoides*, Michx. What relation this species has to the European *Aphis chrysanthemii* I can not at present say. It is probable that they may be the same.

*Winged form.* Head black or blackish. Eyes dark reddish-brown, with a prominent ocular tubercle; ocelli present, bordered by a ring of black. Antennæ on moderately prominent tubercles, about as long as the body or a little longer; I twice as large as

II, III longest and cicatrized, IV a little shorter and nearly smooth, V a little shorter than IV, VI about one-half of V, VII nearly or quite as long as III; color black with the base of III slightly paler. Beak reaching second coxæ and as usual. Thorax with all the lobes black. Wings hyaline, veins slender, brownish; third discoidal obsolete at base; stigmal vein not much curved, straight the greater part of its length; stigma long and narrow, pointed at both ends, forming a distinct angle at the origin of the stigmal vein, yellowish-brown in color. Legs pale except the apical half of the femora, and the tip of the tibiæ with the tarsi black. Abdomen greenish-black; honey-tubes reaching to the tip of the abdomen, cylindrical, slightly thicker at base and tip, black in color. Style about one-half as long as the honey-tubes, pale, slightly curved upwards, thickest in the middle. Length of body .10; to tip of wings .16.

*Apterous form.* General color greenish-black, varying to a pale greenish-brown. Eyes with ocular tubercle. Antennæ shorter than in the winged form, about one-half as long as the body, or not more than reaching to the base of the honey-tubes; III, IV and V subequal, VI shortest, VII longest; blackish except at base. Honey-tubes as in winged form, but somewhat shorter, black. Style about two-thirds the length of the honey-tubes, pale. Legs pale, with the tips of the femora and tibiæ with the tarsi black. Length of body .08 to .09; very young larvæ vary considerable in color.

##### 5. *Siphonophora granaria*, Kirby.

Found on the heads of cultivated wheat and oats, but not very often or in any great numbers. Also found more sparingly on *Phalaris canariensis*, L., or canary-grass, and on *Poa annua*, L.

##### 6. *Siphonophora ludoviciana*, n. sp.

*Habit.* Found on *Artemisia ludoviciana*, Nutt. Size large, body covered more or less by a white powder so as to be almost of the same grayish-white color as the plant, in this respect differing much from *Siphonophora frigidæ* as noticed above.

*Winged form.* Head straight or nearly straight in front; color pale yellowish-green. Eyes rather bright red; with the ocular

tubercle; ocelli present but not very conspicuous, and not bordered by a ring of black. Antennæ longer than the body; I twice as large as II, III very long, slightly cicatrized on the basal half, IV but a little shorter, V a little shorter than IV, VI one-half of V, VII usually very long; color black except the two first and the base of III; smooth, with very few scattered hairs. Beak long, slender, sharply pointed, black at tip; lobes of the thorax concolorous with the head. Wings as usual in this genus, third discoidal obsolete at base. Legs black or blackish, except the base of femora slightly paler. Abdomen green, but more or less covered by a white powder as in wingless form. Honey-tubes reaching to tip of abdomen, slightly thicker at base and truncated at tip; color black. Style long, widest in the middle, curved upwards, yellowish. Length of body .10; to tip of wings .17.

*Apterous form.* Size large, color pale green, but whole body rather thickly covered by a mealy substance. Eyes bright reddish-brown, with ocular tubercle. Antennæ as long as the body or longer, black; III longest, IV and V subequal, each but a little shorter than III, VI one-half of V, VII about as long as III. Beak reaching beyond second coxæ, basal half pale, rest black. Abdomen long, slightly margined, and with a row of impressed pits along the margin. Legs blackish except the base of femora. Honey-tubes and style as in the winged form. Length of body .12.

#### 7. *Siphonophora rosæ*, Reaum.

A single colony of this species was taken September 1st, on the cultivated rose.

#### 8. *Siphonophora erigeronensis*, Thomas.

Very abundant throughout the season on *Erigeron canadense*, L., or Canada flea-bane.

#### 9. *Siphonophora polygoni*, Walk.

What is probably this species was seen during the summer on the common knotweed. (*Polygonum persicaria*, L.)

**10. Siphonophora verbenæ, Thomas.**

Found rather sparingly on the underside of the leaves of our wild verbenas.

**11. Siphonophora pisi, Kalt.**

This species is undoubtedly one of the most common, being found on a great number of different plants, mostly of the garden, and on introduced weeds. What I consider to be the same was also taken on *Urtica gracilis*, Ait.

**12. Siphonophora achyrantes, Monell.**

Found on the leaves of *Amarantus albus*, L.

**13. Siphonophora corydalis, n. sp.**

*Habit.* Found on *Corydalis aurea*, Willd. This I believe is the first species found on this order of plants.

*Winged form.* General color pale yellowish-green, head and thorax of a deeper yellowish color than the rest of the body. Eyes bright reddish-brown, with ocular tubercle; ocelli present and bordered by a ring of black. Antennæ on conspicuous frontal tubercles, longer than the body, black or blackish, except at base where they are pale, rather smooth, the third joint slightly cicatrized at base; I very much larger than II, III long, IV but a little shorter, V a little shorter than IV, VI about one-fourth of V, VII longest, very long and setaceous. Beak moderately long and stout, reaching second coxæ, black at tip. Prothorax rather large, transversely wrinkled; mesothorax of uniform color throughout, usually of a deep yellow, as the head; the lobes smooth and shining. Wings hyaline, stigma long and narrow; stigmal vein strongly curved, the third discoidal obsolete at base. Legs long and slender, pale except at the joints and the whole of tarsi which are black. Abdomen rather long, gradually narrowed behind, greenish. Honey-tubes very long and narrow, cylindrical, reaching beyond the tip of the abdomen and almost to the tip of the very long style, pale at base, rest all black. Style very long, about two-thirds the length of the honey-tubes, greenish, thickest in the middle, slightly

curved, gradually tapering to a point. Length of body, (style not included,) .10; to the tip of wings .18 to .20. Honey-tubes about .03.

*Apterous form.* Body rather long and narrow. Color of a uniform pale green. Eyes rather bright red, with tubercle. Antennæ as long or longer than the body; very similar to the winged form, but usually quite pale, except at the joints and the whole of sixth black. Legs, honey-tubes and style as in the winged form. Length of body .10.

#### 14. *Siphonophora adianti*, n. sp.

*Habit.* Found on the underside of the fronds of *Adiantum pedatum*, L. The ferns, I believe, have generally been considered as entirely exempt from the attack of plant-lice, but this species, together with a second, described further on, will show that even this order has its peculiar species. Only apterous individuals have so far been taken. They seem to be rather widely spread, but never occurring in any great numbers; usually in small groups of five or six.

*Apterous form.* General color bright lemon-yellow, sometimes greenish; in size rather smaller than usual in this genus. Antennæ longer than the body, black or blackish, except the frontal tubercles and the first two joints, which are of the same color with the body; III long, IV and V subequal, VI about two-thirds of V, VII as long as III, or a little longer. Eyes reddish-brown, with tubercle. Beak very short and stout, not reaching to the second coxæ, rather bluntly pointed, hairy and black at tip. Abdomen rather wide and rounded behind. Legs pale, except the tips of the tibiæ and the tarsi, which are black. Honey-tubes long and slender, reaching beyond the tip of the abdomen and about twice the length of the tarsi, pale, except tip sometimes dusky. Style about one-half the length of the honey-tubes, rather thick and conical. Length of body .06 to 07.

Eggs of this species, taken during October, were deposited on the under side of the fronds. In form cylindrical, rounded at both ends, a little longer than broad, very smooth and shining. When seen they were pale in color, but undoubtedly became black on exposure as usual in this genus.

## II.—Genus **MACROSIPHUM**, g. nov.

Head more transverse and larger than in *Siphonophora*.

Antennæ on moderately large and not approximate frontal tubercles; longer than the body, (at least in the winged form); the third and seventh joint longest.

Eyes large and round, with a distinct tubercle; ocelli present and very conspicuous.

Beak moderately long.

Prothorax large, with a lateral tubercle.

Wings long and narrow; sometimes clouded at tip.

Legs long and slender.

Honey-tubes very long, extending far beyond the tip of the abdomen; usually much dilated in the middle and slightly curved.

Style long and conspicuous.

The species on which this genus has been founded is very similar to Kaltenbach's *Siphonophora rubi*, although apparently specifically distinct, and would therefore probably with it be included in that genus. But the dilated honey tubes, robust style, prothoracic tubercle and clouded wings (at least in the female) I think will justify a separation. What importance can be put on some of these characters I can not here discuss, but I have reason to believe that these together with other facts show a higher differentiation than even *Siphonophora*, and in a strictly systematic arrangement would come before that genus.

### 1. **Macrosiphum rubicola**, n. sp.

*Habit.* Found clustered around the tender twigs and underside of the leaves of *Rubus strigosus*, Mx. A very large and most elegant species.

*Winged form.* General color whitish or yellowish-white. Head transverse, straight in front, more or less dusky above. Antennæ as long as the body or often considerably longer, on moderately conspicuous frontal tubercles, not approximate at base; the frontal tubercles as well as the base of third joint whitish (sometimes the fourth and fifth joints are also pale at base), rest all black; I and II as usual in this section, III the longest, IV a little shorter, V a little shorter than IV, VI the shortest and about one-third or one-fourth of V, VII long and setaceous, often as long as III; III more or less tuberculate. Eyes large, reddish-brown, with a distinct tubercle; ocelli present and very conspicuous; bordered by a ring of black. Beak moderately long, reaching second coxæ, or slightly beyond, stout and rather hairy, whitish at base and dusky at tip. Prothorax very large, sides slightly emarginate, and with a distinct lateral tubercle,

rather robust. Lobes of mesothorax shining black above, the ventral of a dull black. Wings long and narrow; stigma very long and broad, pointed in front and behind, forming a distinct but very obtuse angle at the origin of the stigmal vein; dusky or almost black; tip of wings smoky, this clouded patch is between the third discoidal and the stigmal vein, extending partly into the stigmal cell; stigmal vein strongly curved at base, rest nearly straight. Legs long and slender, femora whitish with their tips black; tibiæ dusky with their tips, together with the tarsi, black. Abdomen longer than broad, sides parallel and but a little wider at the middle than the thorax; flat, with impressed pits along the slightly margined sides; color whitish with some green markings above, the ventral greenish-white. Honey-tubes very long, extending more than half their own length beyond the tip of the abdomen; slightly attenuated near the base, then gradually enlarging, becoming thickest above the middle, where they are at least twice as thick as at base, again more rapidly contracting near the tip, ending as usually in a flat rim. Being more strongly enlarged on one side they become slightly bent; color dusky especially at the base and tip, but transparent, the liquid globules being visible. Style cylindrical, or but slightly narrowed near the base, bent upwards, with but few hairs and of the same color with the body. In length about one-fourth the honey-tubes or about twice the length of the tarsi.

Length of body (style or honey-tubes not included) .10—.12; to the tip of the wings .18—.20.

*Winged male.* Found as late as November the 1st, together with the oviparous wingless females. Head transverse, considerably broader than long, black or blackish. Antennæ longer than the body, on rather prominent frontal tubercles; relative length of the joints the same as in females; all black. Eyes large and prominent, with tubercle; ocelli present, bordered by a ring of deeper black than that of the head. Beak reaching second coxæ, blackish. Prothorax well developed, as long as the head, lateral tubercle more or less obvious. Mesothorax shining black. Wings as in female, but the stigma is not so black, and the smoky patch at the tip of wings wanting. Legs all black, except the base of femora and tibiæ slightly paler. Abdomen blackish-green, short, with more or less black markings on the



dorsum. Honey-tubes very long, reaching beyond the tip of the style, sub-cylindrical, enlarged only at the very tip where they are trumpet-shape; black. Style as in females. Anal plates conspicuous, black, and very hairy, especially the lobes of the lower plate. Length of body .08; antennæ .12; to the tip of wings .20.

*Apterous form.* General color during summer very pale, whitish, becoming pale lemon-yellow late in the season. Head straight in front. Antennæ seem to vary much in length from much longer than the body to shorter, (especially all those examined late in the season had them shorter than the body,) the relative length of the joints as in foregoing forms; color the same with the body, with the tips of the upper joint and the whole of the sixth blackish. Eyes moderately large, dark reddish-brown with tubercle; no ocelli. Beak rather long and stout, reaching slightly beyond the second pair of coxæ; first and second joints subequal. Prothorax with a more or less obvious lateral tubercle. Abdomen long and narrow, widest at the insertion of the honey-tubes. Legs very pale, except the tips of tibiæ and the whole of tarsi, which are black. Honey-tubes as in the winged female, very pale or whitish throughout, or with the tips black, this being the case with all taken late in the season. Style shorter than in winged female, not much longer than the tarsi, cylindrical, with but few hairs, of the same color with the body.

### III.—Genus MEGOURA, Buckton.

Head broad; straight in front.

Antennæ much longer than the body; frontal tubercles large; remote at base; third joint longest; second twice the size of the first; fourth longer than the fifth; seventh setaceous.

Eyes with tubercle; ocelli present.

Beak rather short.

Wings and legs as in Siphonophora.

Honey-tubes long, dilated in the middle, expanded at the end, or trumpet-mouthed.

Style markedly long and thick.

Habit sporadic.

#### 1. *Megoura solani*, Thomas.

Found on the common tomato. This peculiar species is by no means rare in the gardens around Minneapolis, although never found in great numbers on any one plant.

## IV.—Genus MYZUS, Pass.

Head transverse.

Antennæ on moderately large tubercles; these gibbous on the inner side, as is also the first antennal joint; about as long as the body.

Eyes with a distinct tubercle; ocelli present.

Prothorax usually with the pronotum narrowed in the middle.

Legs moderately long.

Wings very much as in *Aphis*.

Honey-tubes reaching to the tip of the abdomen, cylindrical, or slightly enlarged toward the apex.

Style rather short.

Habit. Mostly found on the foliage of plants belonging to the rose family; some species causing the leaves to curl and become deformed.

Typical American species, *Myzus ribis*. L.

1. *Myzus cerasi*, Fab.

This species seems to be found wherever the cherry is cultivated. So far as I am aware it has not shown itself specially troublesome in this state.

2. *Myzus ribis*, Linn.

Found plentiful on the cultivated currants, causing the leaves to curl up, forming corresponding crispy swellings above. When they become very numerous on a bush they cause the leaves to turn yellow and to drop off, as I noticed in several instances.

3. *Myzus potentillæ*, n. sp.

*Habit.* Found on the underside of the leaves of *Potentilla anserina*, Linn.

*Winged form* (males). General color yellowish-green. Head rather broad, slightly convex in front, black or blackish. Antennæ longer than the body, black; the third slightly pale at the very base; tubercles moderately prominent, gibbous; I gibbous, II as usual, III very long and tuberculate on the underside, IV and V subequal, each shorter than III, VI one-half or one-third of V, VII as long as III or usually longer. Eyes large, reddish-brown, with distinct tubercle; ocelli present, bordered with a ring of black. Beak reaching second coxæ, pale at base, black at tip, last joint rather sharply pointed. Prothorax with the pronotum narrowed in the middle, blackish; membrane greenish. Mesothorax yellowish with the lobes and the scutellum shining black. Legs black, with the base of the femora and tibiæ paler.

The wings as usual. One specimen examined had one of the wings very abnormal, the first discoidal being completely obsolete, the second so except a very short distance near its origin, the third discoidal with but one branch. Abdomen greenish with more or less black on the dorsum in form of transverse bands. Honey-tubes cylindrical, reaching to the end of the abdomen, or in some beyond, pale, in length about three times the tarsi. Style very short, pale except sometimes at the tip, hairy. Upper anal plate of the same color as the body, lower blackish, at least the lobes. Length of body .06, wings included .10.

*Wingless form.* Oblong and rather convex. General color pale green; covered with small tubercles that give rise to strongly capitate or knobbed hairs. Some of these knobbed hairs are also found on the front of the head, on the frontal tubercles and on the first and second joints of the antennæ. Antennæ commonly a little shorter than the body, pale, but sometimes the apical joints are dusky; III, IV and V subequal, VI one-half of V, VII about as long as III. Eyes reddish-brown, with the tubercle. Legs pale, except tips of tibiæ and the tarsi slightly dusky. Honey-tubes pale, cylindrical, about three times the length of the tarsi. Style pale, short, about as long as the tarsi. Length of body .06 to .07.

*The eggs.* These are laid on the underside of the leaves, and as these do not fall off but remain attached to the plant over winter they afford a very good protection, and the young larva on hatching in the spring has but a short walk to make to find the new growth. They are pale green when first laid but soon become shining black; cylindrical, very smooth, rounded at both ends.

#### 4. *Myzus malvæ*, n. sp.

*Habit.* Found on the underside of the leaves of *Malva rotundifolia* Linn. This can not be *Siphonophora malvæ* of European authors, and I know of no *Myzus* ever found on this common plant.

*Winged form.* Head and thorax shining black; abdomen green. Head transverse, pointed in the front as in aphid. Antennæ about as long as the body, black, except base of third joint; on

distinct frontal tubercles, and these very much prolonged or gibbous on the inner side; I gibbous, II as usual, III longest, IV a little shorter, V a little shorter than IV, VI about one-half of V, VII setaceous, about as long as IV. Beak reaching second coxæ. Eyes dark reddish-brown, with prominent tubercle; ocelli present. Prothorax with the pronotum narrowed in the middle, black; membrane pale. Lobes of mesothorax shining black. Legs with the apical half of femora black, tips of tibiæ and the tarsi black, rest paler. Wings as usual in this genus. Abdomen not much longer than wide, sides rounded; color pale green with a large subquadrate patch of darker green on the dorsal side, and with a row of black spots along the margins above the insertion of the honey-tubes as in *Aphis mali*. Honey-tubes reaching to the tip of the abdomen or slightly beyond, cylindrical, or generally a little thicker towards the apex, more or less dusky, the liquid drops visible through it. Style about half as long as the honey-tubes or about as long as the tarsi, cylindrical or very slightly narrowed near the base and bent upwards, hairy. Length of body .06; to tip of wings .14.

*Apterous form.* General color pale-green. Antennæ about half as long as the body, not reaching to the base of the honey-tubes; pale at base, rest blackish. Eyes reddish-brown, with tubercle. Abdomen pale green, (with a middle and sometimes marginal longitudinal band of darker green); not tuberculate nor with capitate hairs. Honey-tubes and style as in winged form but usually quite pale. The frontal tubercles and first joint of the antennæ very gibbous.

#### V.—Genus DREPANOSIPHUM, Koch.

Antennæ on frontal tubercles, usually longer than the body; third and last joints longest; fourth and fifth equal.

Eyes large and with a distinct tubercle; ocelli present.

Beak short.

Prothorax with no lateral tubercle.

Wings long and narrow; marginal cell elongated towards the apex of the wing.

Legs moderately long.

Honey-tubes moderately long, enlarged beneath towards the base.

Style inconspicuous or none.

Habit sporadic.

1. *Drepanosiphum acerifolii*, Thomas.

This peculiar species is by no means rare on the soft maple (*Acer dasycarpum*, Ehrh.) in and around the city of Minneapolis.

VI.—RHOPALOSIPHUM, Koch.

This genus is mostly characterized by American entomologists simply as similar to *Aphis* or *Siphonophora*, but with the honey-tubes distinctly clavate. As far as our American species are concerned, this is probably one of the most difficult genera to define in the family. If we on one hand take *Rhopalosiphum rhois* as a type, we have a species that is similar to *Aphis*, and could well be put in that genus with the exception of the clavate honey-tubes; if on the other hand we take *Rhopalosiphum nabali* (described below) as a type, we have a species that could well be put in *Siphonophora* but for the distinctly clavate character of the honey-tubes. If *Rhopalosiphum ribis*, Koch, prove to be a distinct species as found on our native currant (*Ribes nigrum*, L.), from *Myzus ribis*, L., as found on the cultivated currant, we have still another species that shows a close relation to *Myzus*. Wherefore we have to rely almost exclusively on but one single character. Now if this clavate character of the honey-tubes prove to be constant, so that we can rely on it in all cases, the genus could well be accepted to include all the species that I have included in the following; but if this character should be found to vary, as I have reason to believe, most of the following species will have to be located in other genera.

1. *Rhopalosiphum rhois*, Monell.

Found rather common on the underside of the leaves of *Rhus glabra*, Linn.

2. *Rhopalosiphum* ~~ri~~ *ribis*, Koch.

Found on the underside of the leaves of wild currant (*Ribes nigrum*, Linn.), and as far as I observed not causing the leaves to cup as in the case with *Myzus ribis*, Linn., found on the cultivated currant. It is probably but a variety of this last named

species, though the honey-tubes are distinctly clavate and would locate it here.

### 3. *Rhopalosiphum sonchi* n. sp.

Found on *Sonchus asper*, Vill.

*Winged form.* Head transverse, straight in front, or but slightly convex, more or less black above. Antennæ about as long as the body, black except the base of the third joint slightly paler, on rather small frontal tubercles, and these somewhat gibbous or enlarged on the inner side; I much larger than II, III long, IV a little shorter, V a little shorter than IV, VI about one-third of V, VII as long as III or often very short; III and IV are strongly tuberculated and cicatrized, especially on the under side. Eyes large, reddish-brown, with a distinct tubercle; ocelli present and conspicuous as a glassy point bordered by black. Beak as usual, reaching second coxæ, pale except at tip. Prothorax with the pronotum narrowed in the middle, black; membrane greenish. Lobes of mesothorax all shining black. Wings hyaline; costal veins yellowish, the rest brownish; third discoidal obsolete at base. Legs pale except at the joints, where they are dusky or black; tarsi black. Abdomen pale green, with a marginal row of black spots, and in the middle a large subquadrate patch of black, as wide as the distance between the honey-tubes; ventral uniformly greenish. Honey-tubes reaching to the tip of the style, narrow at base, then expanding, becoming widest a little above the middle, where they are at least twice as wide as at base, again contracting near the tip ending in a flat rim; color pale, dusky only at the tip. Style about half as long as the honey-tubes, cylindrical, point rounded, hairy and bent upwards, yellowish. Length of body .08; to tip of wings .16; honey-tubes .02.

*Wingless form.* General color pale-greenish. Antennæ as in winged form, but pale, or joints dusky only at tips. Legs pale, tarsi black. Honey-tubes the same but somewhat thicker, and not so distinctly clavate.

### 4. *Rhopalosiphum nabali*, n. sp.

*Habit.* Found on the flower-heads of *Nabalis albus*, Hook.

*Winged form.* Head broader than long and nearly straight in

front; color brownish-black. Antennæ on rather short frontal tubercles, about reaching to the honey-tubes; III longest, IV a little shorter, V a little shorter than IV, VI short, about one-fourth of V, VII seems usually to be short, not longer than VI, in only one specimen out of a dozen did I find one that had it as long as III, black in color, and III and IV rather strongly tubercular as in the foregoing species. Beak reaching second coxæ, or but slightly beyond it, pale except at tip. Prothorax with the pronotum narrowed in the middle; color shining brown or blackish, as are the lobes of the mesothorax. Eyes reddish-brown, with tubercle; ocelli present, bordered by black. Wings with the costal veins yellowish, rest brownish; stigma long and narrow; third discoidal obsolete at base. Legs blackish except basal half of femora. Abdomen greenish with a longitudinal middle and marginal band of blackish. Honey-tubes reaching beyond the tip of the style, strongly club-shaped, narrow near the base, then enlarging, becoming at least twice as wide as at base, again contracting more moderately near the tip, ending in a flat rim, brownish or black, base usually paler. Style rather long, about one-half the honey-tubes, slightly enlarged in the middle, bent upwards, hairy and yellowish in color. Length of body .10; to the tip of wings .20.

*Wingless form.* General color a dusky-green with head and thorax usually yellowish-green. Antennæ about two-thirds the length of the body. Honey-tubes and style as in winged form. Legs pale except at the joints, where they are slightly dusky. Wing-pads of the pupæ pale yellow.

This species comes nearer to *Siphonophora* than *Aphis* in size, color and general appearance, but the honey-tubes are distinctly club-shaped, and the frontal tubercles are but moderately large and hardly approximate.

## VII.—SIPHOCORYNE, Pass.

Head transverse, rounded in front.

Eyes with a distinct tubercle; ocelli present.

Antennæ on no perceptible frontal tubercles; shorter than the body and usually strongly cicatrized and tuberculated.

Beak moderately long.

Wings and legs as in *Aphis*.

Honey-tubes distinctly clavate; moderately long.

Style short.

Typical American species: *Siphocoryne xanthu*.

**1. *Siphocoryne xanthii*, n. sp.**

*Habit.* Found on the leaves of *Xanthium canadense*, Mill. (*X. strumarium* of Gray's Manual).

*Winged form.* General color yellowish-green, some more decidedly green than others. Head transverse, rounded in front, more or less dusky above. Antennæ on no perceptible frontal tubercles, about one-half the length of the body, or a little longer, blackish except near the base; III longest and as long as IV and V together, IV and V subequal, VI about one-half of V, the setaceous VII about as long as III; III and IV strongly tubercular. Eyes reddish-brown, with tubercle; ocelli present, bordered by a ring of black. Beak short, not reaching second coxæ; last joint short and pointed, dusky. All the lobes of the thorax blackish. Wings hyaline, and venation much as in *Siphonophora*. Legs pale, except at the tip of the joints blackish. Abdomen oblong, yellowish-green with transverse markings of darker green; ventral uniformly greenish. Honey-tubes reaching to the tip of the abdomen or slightly beyond, pale, basal half slender, then enlarging in the middle to nearly twice the diameter at the base, again contracting near the tip, ending in a flat rim. Style short, about as long as the tarsi, pointed, curved upwards, hairy. Length of body .08; to tip of wings .14.

*Apterous form.* Color pale greenish, with dorsal markings of darker green; ventral uniformly green. Body with short capitate hairs. Antennæ one-half as long as the body, pale. A red variety is also seen among very young specimens.

**2. *Siphocoryne archangelicæ*, n. sp.**

*Habit.* Found on the umbels of *Archangelica atropurpurea*, Hoffm. It is possible that this is *Aphis archangelicæ* of Linnæus, but I have no access to his description at present.

*Winged form.* Head transverse, pointed in front, brownish-black. Antennæ on no frontal tubercles, not more than one-half the length of the body, black or blackish; III longest and about as long as the three following joints taken together, IV, V and VI being subequal, VI being slightly the shortest, the setaceous VII also very short; III, IV and V are strongly tubercular, III especially so. Eyes dark reddish-brown, with



tubercle; ocelli present, but not very conspicuous. Beak moderately long and slender, reaching to the second coxæ. Pronotum of the prothorax narrowed in the middle, concolorous with the head; membrane greenish. Lobes of thorax shining black. Legs pale, dusky at joints. Abdomen rather long, sides straight, yellowish-green with a large subquadrate patch of black in the middle; ventral uniformly colored. Honey-tubes reaching to the tip of the style, enlarging in the middle to about twice the diameter at the base, again becoming narrow near the apex, where they are about as wide as at base, ending in a flat rim. Style rather short and acute, pale. Length of body .09; to tip of wings .17.

*Apterous form.* General color yellowish-green. Antennæ very short, not one-half the length of the body; joints proportional very much as in winged form. Honey-tubes reaching to tip of abdomen, dusky, in form as above. Style short and conical. Beak reaching second coxæ. Legs rather short and stout. Length of body .08 to .09.

### VIII.—Genus APHIS, Linn.

Head transverse, rounded in front; seldom straight.

Eyes moderately large or large, with a more or less distinct tubercle; ocelli present, but usually not very distinct.

Antennæ remote at base, not on frontal tubercles, or on very inconspicuous ones; usually smooth, and generally shorter than the body.

Beak moderately long.

Pronotum of prothorax usually narrowed in the middle, and often with a lateral tubercle.

Wings deflexed, and of the usual form.

Legs generally short and stout.

Honey-tubes cylindrical or sub-cylindric, moderately long, very rarely none.

Style usually short, very rarely none.

Usually found in large colonies on annual plants.

Typical American species: *Aphis mali*, Fab.

Although this genus has many times been restricted, it is still one of the most unwieldy in the family. A well defined subdivision would therefore be very desirable, but it will require a very careful and special study of the whole genus as found in America. At present I can offer no suggestions in this line, and will only attempt to define as fully as possible the apparently new species, without any satisfactory order of arrangement.

**1. *Aphis frondosæ*, n. sp.**

*Habit.* Found on *Bidens frondosa*, Linn. Usually in very great numbers.

*Winged form.* Head transverse, rounded in front, black. Antennæ about as long as the body, black, on no frontal tubercles, as seen from the side, but on the inner side with rather strongly projecting lobes, as seen from above; III longest, IV and V subequal, VI about two-thirds of V, setaceous VII about as long as III; smooth, but III, IV and V are cicatrized, having a row of regularly placed spots on the under side, V with but a few, and rather far apart. Eyes reddish-brown, with tubercle; ocelli present. Thorax of uniform black. Abdomen greenish and more or less mottled with black markings above, forming a subquadrate patch not well defined. Honey-tubes reaching tip of abdomen, cylindrical, black. Style greenish-yellow, cylindrical, slightly curved upwards, about one-half the length of the honey-tubes, or about as long as the tarsi. Legs black with the front femora pale, and the tibix more or less pale in the middle. Wings hyaline, with narrow blackish veins; origin of the second branch nearer to the tip of the wing than to the origin of the first branch. Length of body .07; to tip of wings .14 to .15.

*Apterous form.* The pupa has the antennæ about as long as the body, blackish. Thorax greenish, wing-pads blackish. Abdomen pale green, yellowish around the honey-tubes, with a large subquadrate patch of dull green in the middle blending with the pale green of the body. Honey-tubes black, thickened slightly at base. Style short, conical. Length of body .07.

**2. *Aphis ageratoidis*, n. sp.**

*Habit.* Found on the flower-heads of *Eupatorium ageratoides*, Linn.

*Winged form.* Head transverse, slightly pointed in front, black. Antennæ on very inconspicuous frontal tubercles seen as lobes on the inner side, about two-thirds the length of the body, black; III long, IV a little shorter, V a little shorter than IV, VI about two-thirds of V, VII the longest; III and IV are regularly cicatrized on the under side, but not as promi-

nently so as in the foregoing species. Eyes reddish-brown, with tubercle; ocelli present. Beak reaching second coxæ, pale. Prothorax with the pronotum much narrowed in the middle and with a distinct lateral tubercle, black; membrane greenish; rest of thorax of a rather dull black. Wings as usual. Legs black except at the joints. Abdomen pale yellow, or sometimes light brownish, with a patch of dark green in the middle which is much longer than broad; ventral pale yellow. Honey-tubes reaching the tip of the style, blackish. Style rather slender, cylindrical, hairy, pale yellow and about as long as the tarsi. Length of body .06; to tip of wings .12.

*Apterous form.* General color pale yellow. Antennæ pale at base, rest blackish. Eyes with ocular tubercle; the pupa with brown uniform spots as rudiment of the future ocelli. Beak black at tip. Wing-pads of the pupa black, except at base. Legs pale except the apex of the tibiæ. Abdomen with a patch of dark green in the middle, this patch much longer than broad. Honey-tubes black, slightly thickest at base. Length of body .06. This species is very close to *Aphis frondosæ*, but in size it is somewhat smaller, in color paler and the patch of the abdomen is always longer than broad, while that of *frondosæ* is subquadrate and not so well defined, but blending with the general color of the body.

### 3. *Aphis eupatorii*, n. sp.

*Habit.* On the flower-heads of *Eupatorium perfoliatum*, Linn.

*Winged form.* Head transverse, nearly straight in front or but a little rounded. Antennæ rather short, not more than two-thirds the length of the body, black except the base of the third joint; III longest, IV and V subequal, each considerable shorter than III, VI shortest about two-thirds of V, VII as long as V, III and IV cicatrized but not regular nor as well marked as in the two foregoing species. Eyes large, reddish-brown, with a very prominent ocular tubercle; ocelli present. Beak rather long and slender, reaching nearly to the abdomen. Prothorax with the pronotum narrowed in the middle; sides with a very distinct mammiform tubercle, black; membrane paler; rest of thorax black. Legs pale or of the same color with

the body, with the joints blackish. Abdomen yellowish or greenish-yellow, with a marginal row of black spots, and the last segments more or less blackish. Honey-tubes rather short, hardly reaching tip of the abdomen, and not much longer than the rather long tarsi, cylindrical, ending in flat rim, pale. Style conspicuous and nearly as long as the honey-tubes, cylindrical, curved upwards, hairy, yellowish in color. Length of body .07 to .08; to tip of wings .14.

No description was taken of the wingless forms at the time, so I can say nothing in regard to them, but the species can easily be recognized from the two foregoing from a somewhat larger and more robust form, the form of the antennæ, and the rather short honey-tubes but long style.

#### 4. *Aphis marutæ*, n. sp.

*Habit.* Found on the flower-stalks of *Maruta cotula*, D. C.

*Winged form.* Head transverse, rounded in front. Antennæ on inconspicuous frontal tubercles, but these slightly prolonged on the inner margin, nearly as long as the body, all black except base of third joint; III long, IV but a little shorter, V a little shorter than IV, VI about one-half of V, VII as long as III; III and IV quite tubercular, especially on the under side, but very slightly and indistinctly cicatrized. Eyes dark reddish-brown, with tubercle; ocelli present. Beak reaching second coxæ, blackish. Thorax uniformly black; pronotum of prothorax narrowed in the middle with no lateral tubercle. Legs with the base of femora and tibiæ pale, rest black. Abdomen pale green, with more or less black markings above; ventral uniformly pale green. Honey-tubes rather short and stout, cylindrical or slightly enlarged in the middle, black. Style short, conical, concolorous with abdomen slightly dusky. Length of body .06; to tip of wings .12.

Abdomen greenish, with a marginal row of black spots above the honey-tubes, in the middle a large subquadrate patch of black.

*Wingless form.* General color greenish. Antennæ about one-half the length of the body, basal half pale, rest blackish. Pupa with the tips of wing-pads black. Honey-tubes short and usually a little thicker at the base, blackish.

This species is very similar to *Aphis eupatorii*, but is easily recognized by the large patch of black on the abdomen, and that the prothorax have not got the lateral tubercle found in the three foregoing species.

**5. *Aphis mali*, Fab.**

This species has been found very abundant throughout the season on the common apple, crab-apple, and also on the mountain ash. As far as I am aware it has not been noticed on the last named before. Wherever noticed the eggs were laid very numerous during October and November, on the trunks, twigs and annual shoots of the trees. It would be well to have the annual shoots and supernumerous twigs burnt in the fall or early spring before the eggs hatch, if they are found to be thickly stocked with eggs, as it would go so far towards diminishing their numbers. The eggs are pale green when first laid but soon become hard and black, very smooth, cylindrical, about as long again as broad.

**6. *Aphis pruni*, Koch.**

This species was noticed once on a young plum tree, but not very numerous.

**7. *Aphis maidis*, Fitch.**

This species, found on the Indian corn, is probably found now wherever corn is cultivated.

**8. *Aphis apocyni*, Koch.**

A species found on *Apocynum cinnabinum*, I take on Dr. Thomas' authority as identical with the European species as I neglected to take any notes or make comparison when found.

**9. *Aphis ripariæ*, n. sp.**

*Habit.* Found on the underside of the leaves of *Vitis riparia*, Michx.

*Winged form.* Head slightly pointed in front, of a dull black. Frontal tubercles very inconspicuous, only a slight projection on

the inner side. Antennæ about as long as the body, black except base of third joint; III longest, IV and V subequal, VI about two-thirds of V, VII nearly as long as III, setaceous; III and IV moderately pustulate on the under side not apparently cicatrized. Eyes reddish-brown, with ocular tubercle; ocelli present. Beak reaching second coxæ. Prothorax with the pronotum narrowed in the middle, black; membrane greenish; sides with a prominent tubercle. Thorax dull black. Second branch rather short, nearer to the tip than origin of the first. Legs pale except at the joints, black. Honey-tubes reaching tip of abdomen, about twice as long as the tarsi, cylindrical, or but slightly thickest at base, black. Style about as long as the tarsi, cylindrical, rounded at tip, hairy, pale in color. Length of body .08; to the tip of wings .15

*Wingless form.* General color pale yellowish-green. Antennæ about one-half the length of the body or a little longer, and usually quite pale. Legs pale except at the tips. Honey-tubes as in winged form, slightly dusky at tip. The joints of the antennæ are nearly equal in length, except the last usually being the longest; the division of joint III and IV is very indistinct. General form of the body rather long and narrow, in this respect, showing same relation to Siphonophora.

#### 10. *Aphis polanisiæ*, n. sp.

*Habit.* Found on the seed-pods and occasionally also on other parts of the plant of *Polanisia graveolens*, Raf. The first species found on a plant of this order I believe.

*Winged form.* Head strongly transverse, rounded in front, black. Antennæ one-half or not more than two-thirds the length of the body, black, on very inconspicuous frontal tubercles; III longest, IV about two-thirds of III, V a little shorter than IV, VI one-half of V, VII about as long as III; III and IV strongly tubercular and cicatrized. Eyes blackish with a large ocular tubercle; ocelli present. Prothorax with a moderately distinct lateral tubercle; thorax as a whole black. Wings as usual in the genus, but coming near to the type of *Siphonophora*; stigmal vein but slightly curved. Legs rather long and slender; femora pale at base; tibiæ rather pale except at apex together

with the tarsi which are all black. Abdomen greenish-black. Honey-tubes rather short and thick, not reaching tip of abdomen, and hardly twice the length of the tarsi. Style about as long as the tarsi, and as usual. Length of body .06; to tip of wings .12 to .14.

This species, like the one found on the common tomato, have often got their feet clogged with the viscous substance of the plant, so as to appear club-footed.

*Wingless form.* These are usually found on the pods, congregating in small colonies, and rather uniformly of the same green color as the pods.

#### 11. *Aphis annuæ*, n. sp.

*Habit.* On the leaves and flowering-stem of *Poa annua*, L. found together with *Siphonophora granaria*, but this species generally was found only on the leaves and lower part of the plant, while the aphid on the upper.

*Winged form.* Head and thorax of a shining black; abdomen of a dull green. Head transverse as usual, and rather strongly pointed in front. Antennæ a little shorter than the body, on no frontal tubercles but only a small projection on the inner side taking the place of it, all black; III long, IV a little shorter, V shorter than IV, VI about one-half of V, VII as long as III or sometimes longer, setaceous; the middle joint but moderately tubercular and indistinctly cicatrized. Beak as usual, black at tip. Eyes with ocular tubercle; ocelli present. Prothorax with no lateral tubercle, and as well as the rest of thorax shining black. Wings rather long and narrow; stigmal vein but moderately curved; second branch of the discoidal very short and near to the tip. [One specimen examined had the second branch missing on one of the wings, the other being normal.] Legs more or less pale. Abdomen of a dull green, sometimes with a marginal row of black spots, but usually quite uniformly colored throughout. Honey-tubes short, hardly twice the tarsi and not reaching tip of abdomen, cylindrical or slightly narrower on the basal half and near the tip, tip ending in a flat rim, color black. Style short, cylindrical, about as long as the tarsi, black. Length of body .07; to tip of wings .14.

*Wingless form.* The larvæ are rather short with the abdomen wide and strongly rounded behind, of a dark dusky green. Antennæ reaching base of honey-tubes, dusky.. Honey-tubes as in winged form but usually pale at base. Style very short, conical. Length of body .06 to .07.

This species is readily recognized from the closely related species by the very short second branch of the wings.

**12. *Aphis asclepiadis*, Fitch.**

Found in colonies on the upper leaves of *Asclepias cornuti*, Linn.. Apparently *Aphis* and not *Siphonophora* as Doctor Thomas considers it. This I found to be very common in this part of the state.

**13. *Aphis brassicæ*, Linn.**

It can usually be found on the cabbage wherever it is cultivated. They occur in small colonies distributed over the outer leaves, and for the last season have been found very numerous in certain localities of this state.

**14. *Aphis ceracifoliæ*, Fitch.**

Found on the upper leaves of *Prunus virginiana*, Linn., causing them to twist and curl.

**15. *Aphis loniceræ*, Monell.**

This very peculiar species was once taken on *Lonicera glauca*, Hill.

**16. *Aphis phragmitidicola*, n. sp.**

Found on the leaves of *Phragmitis communis*, Linn., in small colonies along the midrib. It is possible that this may be the Linnean species *arundinis*, but at present I have no means to ascertain this and will therefore describe the species as found here.

*Winged form.* Rather long and narrow, somewhat flattened. Head and thorax black and with a slight pulverulent. Antennæ about as long as the body, dusky except at base, on no frontal



tubercles or only a very slight lobe seen on the inner side; I sometimes slightly gibbous, III longest, IV a little shorter, V a little shorter than IV, VI about one-half of V, VII usually as long as III; smooth and apparently not cicatrized. Eyes reddish-brown, with ocular tubercle; ocelli present. Beak rather short and blunt, not reaching second coxæ, pale except at tip. Thorax with the lobes black; prothorax rather large, green in color, with a very small and inconspicuous lateral tubercle. Wings with the stigma long and narrow; stigmal vein but moderately curved; third discoidal obsolete at base. Legs moderately long and slender, pale except at joints, where they are slightly dusky. Abdomen long and narrow, sides straight, tapering behind, flat; color uniformly pale green. Honey-tubes short, hardly as long as the tarsi, and but a little longer than broad, cylindrical, rounded at tip, slightly dusky. Style larger and more conspicuous than the honey-tubes, about as long as the tarsi, cylindrical, sometimes slightly curved upwards, hairy. Length of body, .06; to tip of wings .12.

*Wingless form.* Long and narrow, flattened. Color pale green, with marginal and a middle band of dark-green; more or less covered with a white powder. Beak short and thick, not reaching second coxæ. Legs pale except the tips of the tibiæ and the tarsi. Honey-tubes and style as in the winged form. Antennæ a little shorter than the body or else as in the foregoing form. This species has the honey-tubes situated rather far up on the abdomen.

#### 17. *Aphis middletonii*, Thomas.

This interesting species was taken abundantly during the summer on the roots of *Erigeron canadensis*. This species is usually protected by some colony of ants, who will take them up and carry them off to some safe place as soon as disturbed. If this is but a dimorphic form, as Doctor Thomas suggests, it will probably develop another interesting page in the life history of this family. But as far as my own observations go I can add nothing to it. The winged form so far has never been found. This species, although living under ground, is not exempt from parasites, as some species of *Aphidius* penetrate even to their deep abode and

sow destruction among the colony. A plant pulled up, containing a colony of this species, had almost every one affected, more than half of the colony still clinging to the roots with a wide hole on the abdomen from which the imago had made his escape. One imago was taken apparently busy in laying its eggs in the few still remaining. They were first seen in early part of September, when they were found under almost every plant in the sandy soil along the river, but later on in the fall when the plants had died, I could not find any trace of them, even where they had been very plentiful a short time before.

### 18. *Aphis frigidæ*, n. sp.

*Habit.* Found together with *Siphonophora frigidæ* on *Artemisia frigida*, a very characteristic species in some respects, but undoubtedly a true *Aphis*. So far only the wingless form has been observed.

*Wingless form.* General color varying from a pale to a rather dark reddish-brown; the whole body being covered by a white pulverulent. The body is also covered by a rather thick pubescence of fine and short white hairs, not seen without the aid of a glass. Head transverse, straight in front; a medio-longitudinal suture is seen from the front of the head running down some distance of the body. Antennæ shorter than the body, sometimes reaching the base of the honey-tubes, on no perceptible frontal tubercles, pale at base, apical half more or less blackish, smooth; I and II subequal and as usual; III, IV and V subequal, or III slightly the longest; VI two-thirds of V; VII the longest, longer than III. Beak rather long and sharply pointed, reaching the third pair of coxæ; first joint pale, second and third black, third very narrow and sharply pointed. Abdomen oval, convex, or in oviparous females the tip is usually much drawn out. Legs rather short, pale except the tips of tibiæ and the tarsi, black; coxæ often also black. Honey-tubes long, reaching tip of the abdomen, longer than the femora, and about three times the tarsi, cylindrical, ending in a very conspicuous round knob, which is as wide again as the width of the honey-tubes. Of a great many specimens examined all presented this character, which as far as I know is peculiar to this species. Color pale and

transparent, or but slightly dusky. Style about as long as the tarsi, cylindrical, rounded at end. Anal plate of oviparous females black and hairy. Length of body .05 to .06.

The habit of this species is more active than any *Aphis* with which I am acquainted, in this respect coming nearer to *Siphonophora*.

**19. *Aphis rumicis*, Linn.**

Found occasionally on the common dock (*Rumex*).

**20. *Aphis atriplicis*, Linn.**

Found on *Chenopodium album*, Linn.

**21. *Aphis*<sup>\*</sup> *cornifoliæ*, Fitch.**

This species is rather common on the dog-wood.

**22. *Aphis setariæ*, Thomas.**

Found very common on the heads of *Panicum crus-galli*, Linn., and *Setaria glauca*, Beauv. What is apparently the same species was also taken on *Ampelopsis quinquefolia*, Michx.

**23. *Aphis carduella*, Walsh.**

Found on *Cirsium lanceolatum*, L.

**24. *Aphis aparines*, Fab.**

Found on *Galeum aparine*, Linn., and probably identical with the European species, the plant it inhabits being common to the two continents. But as I have no description of this species as found in Europe, I give one as found here.

*Winged form.* General color shining black. Head slightly pointed in front. Eyes dark-brown, with a well developed tubercle; ocelli present. Antennæ about as long as the body, black, on moderately developed frontal tubercle, especially as seen from the inner side, where they are slightly gibbous; III long and slightly pale at base, IV and V subequal, VI about one-half of V, VII as long as III or sometimes slightly longer, setaceous; III—V slightly tubercular, cicatrized with small and

irregularly placed spots. Beak moderately long reaching second coxæ. Prothorax with no lateral tubercle, shining black but transversely ridged, with membrane slightly pale; rest of thorax all black. Wings with stigmal vein strongly curved on its basal half; third discoidal obsolete at base; stigma slightly dusky, long and narrow. Legs with the femora pale at base, tibiæ pale except at tip, tarsi all black. Abdomen black. Honey-tubes reaching tip of abdomen, about twice the length of the tarsi, cylindrical, black, ending in a flat rim. Style short. Length of body .06; to tip of wings .12.

*Wingless form.* General color a dull dark brown or black. Pupæ with the thorax and wing-pads slightly paler, the tip of wing-pads black. From the front of the head there is seen a medio-longitudinal line extending down nearly the whole length of the body. Antennæ reaching the base of the honey-tubes; relative length of the joints as above, but they are smooth and slightly paler; frontal tubercles rather more gibbous. Eyes dark reddish-brown, with a prominent tubercle. Legs and honey-tubes of the same color with the body, or somewhat darker.

This species shows some characters of Siphonophora, but in habit and general appearance is undoubtedly a true Aphis.

### IX.—Genus CHAITOPHORUS, Koch.

Head rather broad and straight in front.

Eyes with ocular tubercle; ocelli present.

Antennæ not on frontal tubercles, usually shorter than the body, distinctly pilose or hairy.

Beak moderately long.

Wings as in *Aphis*, but the veins sometimes bordered by black.

Style tubercle-like.

Honey-tubes reduced to mere tubercles, hardly longer than thick, or rarely obsolete.

Body of the apterous form usually tuberculated, and with long slender hairs.

Usually found on the leaves of trees.

Typical American species, *Chaitophorus populicola*, Thomas.

#### 1. *Chaitophorus populicola*, Thomas.

Found on the under side of the leaves of *Populus monilifera*, Ait.

#### 2. *Chaitophorus negundinis*, Thomas.

This species is probably one of the most injurious in this locality, the apple plant-lice probably excepted. It is found very common on the box-elder (*Negundo aceroides*, Moench.), caus-

ing the leaves to turn black and become unsightly by puncturing them. During October, when the leaves are falling, the apterous oviparous females can usually be seen in very great numbers around the limbs and twigs busy depositing their eggs around the winter buds and in every crevice, especially on the under side of the limbs, where they can find a safe place to deposit.

### 3. *Chaitophorus nigrae*, n. sp.

*Habit.* Found on the leaves of *Salix nigra* as late as October 26th.

*Winged form.* Similar to *Aphis* in general appearance. Entire insect with long white hairs. Head black, rather straight in front. Antennæ about as long as the body, black except base of III; I and II as usual and subequal, III longest, IV a little shorter, V a little shorter than IV, VI about one-half of V, VII as long as IV, setaceous; III—V moderately cicatrized. Eyes dark reddish-brown, with a prominent tubercle. Beak rather short, hardly reaching second coxæ, pointed. Thorax all black, prothorax well developed, pronotum not narrowed in the middle. Wings as usual. Legs with the femora more or less blackish, and the tibiæ pale. Abdomen wholly black or slightly pale, brown along the sides. Honey-tubes tuberculiform, not longer than broad, thickest at base, usually paler than the body. Style tubercle-like, or even knobbed as in *Callipterus*. Length of body .06; to tip of wings .10.

*Wingless form.* General color a dull blackish-brown. Body flat, obovate or oblong, quite hairy and tubercular in young specimens, becoming smooth in full grown. Antennæ about one-half the body or a little longer, pale at base, dusky towards the apex; relative length of the joints as in winged form; joints with long white hairs, not very numerous. Abdomen usually with the middle and the margins slightly paler. Honey-tubes as in the above form. Length of body .06.

### 5. *Chaitophorus spinosus*, n. sp.

*Habit.* Found on the under side of the leaves of the oak. A very characteristic and well marked species. The species seems to confine itself to the higher parts of the tree, as I never found

it on the lower limbs that I observed during the summer, where *Callipterus discolor*, Monell, was always found; and it was not until the 17th of October, when several oaks were cut on the campus that I found this species. Only the wingless form has so far been observed.

*Wingless oviparous females.* Head subquadrate in outline, straight in front, pale red or orange colored, with blackish spines in front and above like those on the abdomen. Antennæ very remote at base, about one-half the length of the body; I and II as usual, III longest, IV a little shorter, V a little shorter than IV, VI hardly one-half of V, VII not longer than VI or shorter; basal joints pale, apical black, with long white hairs as usual in this genus. Eyes large and round, with a distinct tubercle; the facets are reddish-brown, the space between them whitish, giving the eye the appearance of a ripe raspberry just picked with the bloom still on; no ocelli in this form. Beak not more than reaching second coxæ, stout and hairy, pale except at tip; second joint widest. Abdomen widest in the middle, tapering into a very long ovipositor behind, strongly convex above. Color pale yellow, uniformly so on the ventral; last segments sometimes reddish as the head; above with grass-green markings, generally in the shape of a ring, leaving a large patch in the middle of the same color as the abdomen, with projections as follows: one in front, one behind, and two on either side, the one behind reaching down between the honey-tubes. These green markings give an outline somewhat similar to that of a turtle with its head, tail and feet all spread out, but they are sometimes more or less obscure. Above the abdomen has transverse rows of spine-like hairs, black in color and very rigid, usually disposed in groups of one to four, but the spines of each group are rather far apart. The abdomen as well as the entire body has the usual long white hairs of this genus disposed between the spines. Honey-tubes short and thick, about as long as thick, and not quite as long as the tarsi, of the same color with the body. Style short and thick, tuberculiform, hairy. Legs are pale except the tips of the tibiæ and the tarsi, which are black. Length of body .10—.12. As stated above, this form has the abdomen very much drawn out so that the average length of the apterous form probably will not exceed .10.

**X.—Genus CALLIPTERUS, Koch.**

Head broad and straight in front.

Antennæ not on frontal tubercles, or else on very short ones, seven-jointed; transition from the sixth to the seventh very gradual.

Eyes large and round, with a distinct tubercle, usually of a bright red color; ocelli present.

Beak short.

Wings deflexed; front wings with the stigmal vein much curved, not robust, usually more or less hyaline; cubital vein springing from near the base of the stigma; second discoidal sinuous. Hind wings with two discoidals.

Honey-tubes short, often hardly perceptible.

Style short, enlarged at apex

Body elongate, slender, of very pale colors.

Habit sporadic.

Typical American species, *Callipterus discolor*, Monell.

**1. Callipterus ulmitolii, Monell.**

Found on the underside of the leaves of *Ulmus americana*, L.

**2. Callipterus asclepiadis, Monell.**

Very common on *Asclepias cornuti*, L.

**3. Callipterus discolor, Monell.**

This species together with *Chaitophorus spinosus* are the most common and abundant on the oaks around Minneapolis.

**4. Callipterus betulæcolens, Fitch.**

Found on *Betula papyracea*, Ait. Dr. Fitch is apparently entitled to this species.

**5. Callipterus caryæ, Monell.**

On *Carya amara*, Nutt. Very rare as far as observed in this locality.

**XI.—Genus LACHNUS, Illiger.**

Head small and narrow.

Antennæ not on frontal tubercles, usually quite short, seventh joint not longer than the sixth, and often reduced to a minute spur at the tip.

Eyes large and round, with tubercle; ocelli present.

Beak long and rather slender, extending to and even beyond the posterior coxæ.

Wings with third discoidal twice forked; stigma long and narrow, more of a linear shape; stigmal vein nearly straight or but slightly curved. Posterior wings with two branch veins.

Honey-tubes usually very short, sometimes almost obsolete.

Style obsolete, or very short.

Usually found on branches of trees.

Typical American species, *Lachnus salicicola*, Uhler.

1. *Lachnus salicicola*, Uhler.

This is the only species so far observed in this state, yet I do not doubt that most of those found in America will eventually also be found here, as they usually inhabit trees that are common over the greater part of the state. The species has been found very common and abundant on several varieties of willow from early May to late in November. Once also taken on the young twigs of a poplar (*Populus*). In early spring especially they exude very abundantly a clear watery fluid, but it seems not to have that sweet quality usually found in the family of plant-lice, as no ants were ever observed to feed on it. On being crushed they stain the hand a deep red.

The eggs are laid in October and November on the limbs, and especially around the winter buds.

XII.—Genus *MASTOPODA*, g. nov.

Head transverse, rounded in front.

Antennæ on no frontal tubercles, remote at base; about as long as the body; six-jointed (very probably by the union of the third and the fourth); the third and setaceous seventh longest.

Eyes with inconspicuous tubercle; ocelli present.

Beak long, reaching third coxæ.

Wings as in *Aphis*, but the venation quite variable.

Legs moderately long; tibiæ all truncated at the tip, and with rudimentary tarsi, only a short mammiform tubercle with no claws, takes the place.

Honey-tubes moderately long, cylindrical.

Style short and tubercle-like.

Found in large colonies as *Aphis*.

Typical species, *Mastopoda pteridis*.

The anomalous species for which this genus has been erected will not fall into any of the genera so far as known to me. In size, form and habit, it comes nearest to *Aphis*, and as to the six-jointed antennæ it could be put in *Sipha* together with *Sipha rubifolii* of Doctor Thomas. But the peculiar form of the tibiæ and the rudimentary tarsi will exclude it from either. I confess that I am unable to account for this peculiar structure, or what importance should be assigned to it. There seems to be nothing analogous to it either in this family or order of insects under consideration.

Although the form of the antennæ will put it in the section *Lachnini* I think it could be put in *Aphidini* with as much pro-



priety, especially if we take into consideration the setaceous and long character of the last joint, and the probable union of the third and fourth joint forming the third in this species.

### 1. *Mastopoda pteridis*, n. sp.

*Habit.* Found in large colonies on the underside of the fronds of *Pteris aquilina*, L., or common brake.

*Winged form.* Head transverse, rounded or slightly pointed in front as in *Aphis*, flat above with a slight impression in the middle, black or blackish. Eyes dark-brown; the ocular tubercle hardly perceptible; ocelli present and conspicuous, bordered by a ring of deeper black. Antennæ not on frontal tubercles, remote at base, about as long as the body; 6-jointed, black; I and II subequal and slightly narrower at base; III very long and thick, narrow at the insertion with II, longer than IV and V together; IV about one-half of III, similar to it; V short about one half of IV, narrower and smooth; VI long and setaceous, usually as long as III. Beak long, reaching third coxæ, pale except at tip. Pronotum of the prothorax narrowed in the middle, with no lateral tubercle, black or blackish with the membrane greenish. Thorax all black, slightly shining. Wings as in *Aphis*, but the venation varies a great deal; third discoidal obsolete at base; second branch about as far from the margin as from the origin of the first; second pair of wings with two discoidals, but the second sometimes obsolete, and with two rather long and slender hooklets. Legs pale brownish or more or less dusky with only the tips of tibiæ quite black; tibiæ are rather long and somewhat enlarged at the tip, which is truncated and apparently hollow and with no tarsi proper; a short mammiform tubercle, rounded at end, with no claws, from the inner side of the hollowed tibiæ is all that can be found as a rudimentary tarsus. I have examined a great many specimens in all stages and at different times, but have not found the slightest variation in this respect. Apparently they walk on the perpendicular surface of glass with more ease than any other species in this family. Abdomen pale green or yellowish-green, more or less dusky in the middle, sometimes forming a well defined sub-quadrangle patch; ventral uniformly pale. Honey-tubes compara-

tively long, about as long as the distance between them, cylindrical, dusky or black. Style very short and tuberculiform, hairy, concolorous with body. Anal plates hairy; the upper transverse and usually pale, the lower concave on the inner side and usually dusky. Length of body (males) .05 to .06; to tip of wings .10 to .11.

*Apterous forms.* The pupa-form is very conspicuous by its reddish-yellow head and thorax, the abdomen being pale yellow; tip of wing-pads pale. Antennæ as in foregoing form, reaching honey-tubes. Eyes large, but the tubercle is not very conspicuous; ocelli rudimentary as brown spots. Honey-tubes reaching tip of abdomen, usually pale, sometimes dusky. Legs pale; tarsi rudimentary as above. Larvæ are slightly smaller, pale yellow, with tortoise-shell markings on the abdomen. Legs and honey-tubes pale. Length of pupa .07. Length of larvæ .05.

The venation of this species probably varies more than in any other so far as known. I give the result of 14 specimens taken at chance and examined in reference to this.

Six had both wings normal.

Three had one wing normal and the other with the third discoidal but once branched.

One with the stigmal vein nearly straight in both, and with one-half of the second forkal obsolete in one of the wings.

One specimen with the second branch obsolete in one of the wings, and the same rudimentary in the second.

One specimen with one wing normal; the second with the forkal of the first branch rudimentary.

One specimen with the stigmal vein in one of the wings once-branched.

One specimen with the third discoidal three times branched in one of the wings, and the stigmal vein once.

### XIII.—Genus SCHIZONEURA, Hartig.

#### 1. *Schizoneura americana*, Riley.

Found on the white elm (*Ulmus americana*, L.) causing the leaves to curl and become disfigured. Very common especially on young trees.

#### 2. *Schizoneura panicola*, Thomas.

This very peculiar species, from its inhabiting the roots of grasses, is found rather common in this locality on *Panicum glabrum*, L., *Setaria glauca*, Beauv., and *Eragrostis pectinacea*,

var., *spectabilis*, Gray. The winged form was observed plentiful September 20th. Ants were generally found to herd this species.

**3. Schizoneura querci**, Fitch.

What was taken to be this species was taken on oak, but only apterous form so far seen.

**XIV.—Genus COLOPHA**, Monell.

**1. Colopha compressa**, Koch.

The cock's-comb gall of the white elm. (*Ulmus americana*, L.) So far I have not found it very common in this locality.

**XV.—Genus PEMPHIGUS**, Hartig.

**1. Pemphigus populicaulis**, Fitch.

Found rather common on *Populus monilifera*, Ait. I have also this species from Nicollet county.

**2. Pemphigus populi-transversus**, Riley.

Like the last found on *Populus monilifera*, Ait. along the river-bank. Sometimes the two were taken together on the same tree.

**3. Pemphigus vagabundus**, Walsh.

The unsightly black galls of this species too often disfigure the poplars in and about Minneapolis as they remain over winter. Young trees seem especially to be effected, and often almost every twig ends with one of these galls.

**4. Pemphigus rhois**, Fitch.

Found rather sparingly on *Rhus glabra*, L.

## XVI. —Genus TYCHEA, Koch.

1. *Tychea radicola*, n. sp.

A few very peculiar specimens were found on the roots of *Ambrosia trifida*, L., September the 14th, but as I did not succeed to find it again, I am not quite satisfied as to its generic position. I will give my notes as taken at the time.

*Apterous form.* Head nearly as broad as long, rounded in front; two small spots of black, these probably are rudiments of eyes. Antennæ 5-jointed (or 6-jointed counting the spur on the last as one), pale or only slightly dusky towards the tip; I and II short and subequal, III longest and about as long as the two first, IV but a little shorter, V as long as III counting the spur, or else about as long as IV; smooth, or with a few short and slender hairs near the apex of each joint. Beak very long reaching to the middle of the abdomen; first joint longest reaching slightly beyond the third coxæ, second short, last but a little longer than second, gradually narrowed to a point but not sharply so; two last joints slightly dusky. Abdomen suborbicular, very convex above, color whitish (as is the whole insect), the margin with a row of small tufts of white flocculant matter. No honey-tubes apparent. Style short, globular, with some rather long and curved hairs. Length of body .06.

The University of Minnesota, Dec. 1, 1885.

### III.

## REPORT ON THE LOWER SILURIAN BRYOZOA WITH PRELIMINARY DESCRIPTIONS OF SOME OF THE NEW SPECIES.

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By E. O. ULRICH.

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The bryozoa are unusually abundant in the Lower Silurian strata of Minnesota. This is especially true of the Trenton shales, in which they constitute about two-thirds of the entire fauna. Many of the species are extremely abundant, and the thin slabs of limestone are largely composed of their fragments. The shales immediately succeed the "Buff limestone," in which but few remains of this class of fossils occur. Those observed, moreover, are so badly preserved that it was found impossible to determine the species. Just below this limestone and resting on the St. Peter sandstone, is found the building stone commonly used at Minneapolis. This limestone does not appear to belong to the Trenton group, and, judging from the fossils, seems rather to indicate an equivalence with the Chazy, or, perhaps, Black River. These strata are not present in the sections studied in Wisconsin and Illinois, where the "Buff limestone" rests on the St. Peter sandstone, but at High Bridge, Ky., they are represented by a mass of rock several hundred feet in thickness. The beds in the neighborhood of Lebanon, Tenn., seem to belong to the same age. The shales which are here called Trenton, are assigned in some preceding reports to the "Hudson River" group, but the fossils contained in them, notably the bryozoa, show conclusively that that is not their true position. Of the eighty-three species of bryozoa obtained from them, no less than twenty-five are identical

with species occurring in the Trenton of New York, Canada, and Tennessee. That they really belong to the Trenton is further shown by the fact that they are superseded by the Galena.

In the following list are noted all the species so far studied. More extended investigations will, I do not doubt, swell the number some twenty or thirty more. Because of other engagements I did not have the time required to write out descriptions of all the new species, but this is scarcely a cause for serious regret, since the survey proposes to publish, at an early date, full descriptions and illustrations of all the species found in the state.

#### **BERENICEA MINNESOTENSIS, n. sp.**

Zoarium attached to foreign bodies, consisting of extremely thin patches, irregular in outline. Zooecia partially immersed, the exposed portion appearing as broadly-elliptical convex spaces, about 1-95th of an inch in their longest diameter. Apertures somewhat oblique, contracted, circular, 1-200 of an inch in diameter, and surrounded by a barely perceptible rim or peristome. The arrangement of the cells is usually more or less regular in curved diagonal lines; not infrequently, however, the specimens show considerable variation in the number occupying a given space, while here and there, a small non-celluliferous spot may be detected. From six to nine may be counted in the length of .1 inch, but the average number is about seven.

The relations of this species appear to be almost exactly intermediate between the two Cincinnati group species *B. primitiva* and *B. vesiculosa*. From the former it differs in having its cells less immersed, and the apertures less prominent but more distinctly contracted. In distinguishing *B. minnesotensis* from *B. vesiculosa*, the same differences become apparent, but reversed in their application.

*Formation and locality:* Not uncommon in the shales of the Trenton group, at Minneapolis, Minn.

*Register No.* 5925.

**ROPALONARIA PERTENUIS**, n. sp

Zoarium adnate; cells uniserial, very elongate-elliptical, about four in the length of .1 inch; from the proximal end, which is very slender and always more so than the anterior, the cell gradually increases in size until at the center or some point nearer the anterior end, it has assumed a diameter of about 1-130th of an inch. This point is marked by the presence of the subcircular aperture, which is surrounded by a very faint peristome, and has a diameter of less than 1-200th of an inch. At every fourth or fifth cell the series bifurcates; this cell is more abruptly swollen and larger than those intervening, while it differs still further in having its aperture situated quite near the anterior end.

This species is closely allied to the *Stomatopora* (*Ropalonaria*) *elongata*, Vine, from the English Wenlock deposits. Its relation to the type of the genus, *R. venosa*, Ulrich, from the Cincinnati group of Ohio, is however, still more intimate. The former it resembles in its growth, and the latter in the shape of its cells.

*Formation and locality:* Rare in the Trenton shales, at Minneapolis, Minn.

*Register No.* 5926.

**HELOPORA DIVARICATA**, n. sp

Zoarium segmented; segments cylindrical, poriferous on all sides, obtusely pointed at each end, and varying in length from two to four-tenths of an inch; their diameter varies between .02 and .03 inch. Zoecial apertures oblique, ovate, spreading anteriorly, and arranged in troughs between strong longitudinal ridges, six in the length of .1 inch. Passing around and forming the posterior border of the aperture is a faint ridge that on each side is obliquely directed across the longitudinal keels, where it meets a similar line proceeding from one of the cells in the adjoining series. These divaricating lines give to the strong vertical ridges the appearance of being marked by a succession of  $\Delta$ -shaped furrows and elevated lines. Eight or nine rows of cells suffice to pass around a segment.

Beyond the fact that the zoecia are tubular and radiate in all directions from a central axis, the internal structure is unknown.

This species is clearly congeneric with *Helopora fragilis*, Hall, and *H. spiniformis*, Ulrich. The last species was originally placed by me in the genus *Arthroclema* of Billings.\* At that time I had not yet succeeded in obtaining satisfactory sections of the type species of *Helopora*. Through the kindness of Mr. Arthur H. Foord, who sent me better material of the species than I had yet seen, I have since been enabled to work out its structure. In nearly all respects it is identical with that of *H. spiniformis*. This being the case, the question whether *Arthroclema* could be distinguished from *Helopora* by characters of more than specific importance at once presented itself. While I am not yet prepared to assert that the differential characters observed are really of generic value, still I believe that, provisionally, the best plan is to keep them separate. One of the most striking external features of the three species of *Helopora* now described, and two other species known to me, is found in the arrangement of the zoecial apertures between vertical ridges. These ridges are not obvious in the Canadian specimens of *Arthroclema pulchellum*, nor in the Minnesota examples at present doubtfully identified with that species. Instead, we find two or three more or less flexuous lines and grooves marking the inter-zoecial spaces. A more important difference is found in the reproduction of the segments. In the species of *Helopora* this is only terminal; while in *Arthroclema pulchellum* it is both terminal and lateral, there being two "sockets" situated just opposite each other on the opposite sides of each of the main segments for the articulation of the smaller lateral branches. The form of zoarium resulting from this mode of growth resembles that of a feather in having a strong central rib and more slender lateral branches. On the other hand, the mode of growth of *Helopora* seems to be precisely like that of *Arthronema*, Ulrich, in which each segment gives off from its upper termination one or two similar joints. Whatever course may be finally adopted in the disposition of *Helopora* and *Arth-*

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\*Amer. pal. bry., Jour. Cin. Soc. Nat. Hist., vol. v, p. 161, pl. 6, fig. 10, 1 a, 10b.



*roclema*, enough of their structure is known to make their reference to the fam. *Arthronemidæ* almost unquestionable.

Specifically, *H. divaricata* is distinguished from *H. spiniformis* by its slightly larger cells, more distinct longitudinal ridges, and their peculiar ornamentation.

*Formation and locality:* Rather rare at the base of the Trenton shales, at Minneapolis, Minn.

*Register No.* 5928.

#### PHYLLOPORA? CORTICOSA, n. sp.

Zoarium flabellate to funnel-shaped, undulating and irregular in growth, composed of anastomosing branches having a width varying from 0.015 to 0.035 inch. Poriferous side presenting the appearance of a *Fenestella* with carinate and more or less rigid branches, and much depressed dissepiments. On each side of the sharp and usually spiniferous median ridge, there are two rows of rather irregularly alternating circular cell-apertures, thirteen or fourteen of which occur in the length of 0.1 inch. The depressed dissepiments are short and carry two or three rows of cells. In rare instances this division of the frond into rigid branches and dissepiments is not recognizable. In such fragments, or portions of elsewhere normally constructed specimens, the branches anastomose rather irregularly and are simply convex, not carinate, the median ridge being apparently absent. Branches on the non-celluliferous side of frond faintly striated, and tending, though not so obviously as on the poriferous face, to form longitudinal ridges. Fenestrules varying in outline from elongate-elliptical to sub-circular, with a width rarely more, usually a little less than that of the branches, and a length from one to three times the width. Measuring transversely, from six to eight occupy 0.2 inch; longitudinally, from two and a half to four occur in the same distance.

Tangential sections, cutting the frond through the plane of its expansion and near the middle of its thickness, show that the branches are divided into approximate halves by an obscurely double wall, thicker than those of the tubes, diverging from it toward each side. The tubes have thin walls, are long,

and divided by distinct straight diaphragms in their outer portion. Where the section divided the tubes just below their apertures they are seen to be subcircular, with slightly thickened walls, and partially separated from each other by angular interstitial or abortive cells, that may be considerably smaller or even a little larger than the true zooecia. Here and there, along the middle of the branch, one of the spiniform tubuli may be detected.

Vertical sections show that the zooecial tubes also arise from a thick basal membrane, from which they diverge in an upward and outward direction, that their approach to the celluliferous surface is very gradual in the lower half of the branch, and somewhat less so in the upper half. Here they are crossed by two or three unmistakable diaphragms, and their number increased by gemmation. These shorter tubes I am inclined to regard as representing the angular interstitial (abortive?) cells noticed in describing the tangential section.

In transverse sections the branches are sub-rhomboidal, the lateral diameter being the shortest. The median ridge is represented by an obscurely double vertical wall, dividing the branch into two nearly equal portions. Between the two laminae forming this wall I can detect a series of very minute tubuli, such as are found between the median laminae of many of the *Stictoporidae*. The lateral portion of the circumference of the cells, (*i. e.* the half directed toward the sides of the branches,) is rounded or semi-circular, while the opposite half is wedge-shaped.

This species, though in many respects very peculiar, is unquestionably allied to such bryozoa as *Intricaria reticulata*, Hall, *I. clathrata*, S. A. Miller, *Retepora trentonensis*, Nicholson, *R. angulata*, Hall, *R. asperatostriata*, Hall, and *Phyllopora variolata*, Ulrich. These species are all congeneric, but there is no established genus to which they can be referred with certainty. In an earlier writing\* I placed two of the species in King's genus *Phyllopora*, but, at present, I am inclined to believe that the type of that genus will prove to be quite a distinct form. Judging solely from Prof. King's figures and description the affinities of *P. ehrenbergi* seem to be not far

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\*"Amer. pal. bry." Jour. Cin. Soc. Nat. Hist. vol. v, p. 160.

removed from *Polypora*, McCoy, and *Lycopora*, Hall. Should this be the case, then it would be necessary to establish a new genus for the reception of the species above cited, as their relation to those genera is only very slight. In fact, I doubt that their peculiarities of structure will admit of their being arranged in the same family. Still until something further is learned of the structure of *P. ehrenbergi*, I have concluded to defer the erection of a new genus, and will, provisionally classify them with *Phyllopora*, adding the usual question mark.

Specifically, *P.?* *corticosa* is readily distinguished from other species of the genus, by the carinated character of the branches. A species, at present doubtfully identified with *P.?* *trentonensis*, Nicholson, occurs in what is called the building rock. These beds are the same as those occurring in the gorge of the Kentucky river at High Bridge, Ky., and at Lebanon, Tenn., and most probably represent the Chazy. The *P.?* *reticulata*, Hall, is quite common in the Trenton shales at Minneapolis.

*Formation and locality:* Trenton, at Oxford mills, Cannon Falls, Goodhue Co., Minn., where it is associated with *Strep-telasma corniculum*, Hall, *Prasopora conoidea*, n. sp., and other fossils characteristic of the Trenton shales about Minneapolis.

*Register No.* 3495.

#### **PTILODICTYA SUBRECTA**, n. sp.

Zoarium consisting of an unbranched, flattened, two-edged, straight or slightly curved frond, that gradually expands from the acutely-pointed articulating "head" upward from 0.2 to 0.5 of an inch, the edges of the rest of the frond being parallel, or nearly so. The greatest width varies in different examples from 0.05 to 0.15 of an inch. The total length is generally about one inch, though it is not uncommon to find specimens of nearly twice that length. The thickness rarely exceeds 0.04 inch. Cells rhomboidal, with acutely-elliptical apertures, arranged in intersecting diagonal lines, the regularity of which is sometimes interrupted along the narrow, but distinct non-poriferous margin, where they are slightly larger than over the central portions of the frond, and have a tendency to form

longitudinal series. For a short distance above the pointed basal termination the zoarium is sub-cylindrical, and the cell apertures, being extremely elongated and apparently confluent, give this portion the appearance of being finely striated. Measuring diagonally, eleven cells occur in the length of 0.1 inch; transversely sixteen, and longitudinally six, occupy the same space.

This form takes the place of *P. (Escharopora) recta*, Hall, in the western exposures of the Trenton group. It is quite rare in Kentucky and Tennessee, but common in Minnesota. If I am right in my identification, it also occurs in the lower beds of the Cincinnati group (Utica shale<sup>1</sup>) in Ohio. Its geological and geographical ranges are therefore quite extended, and make it desirable that it should be held as distinct, although it is, unquestionably, very closely allied to both *P. recta* and *P. fal-ciformis*, Nicholson. It is narrower and generally smaller than either of those species, while its nearly straight form and more acute basal termination will serve to distinguish it from the latter. The type specimens of *P. recta* are sub-cylindrical, but should this peculiarity prove to be due to extreme age, then the points of difference between the three forms would be reduced to less than specific importance, in which event I should classify them as varieties of the same species.

The genus *Ptilodictya* as defined by me, naturally divides into two groups: (1) the section containing the type species, *P. lanceolata*, Goldf., in which the cells have a plumose arrangement; and (2) another section containing the three species or varieties in question, in which the cells are arranged in intersecting diagonal series. The first or typical section of the genus commences its existence near the top of the Cincinnati group, when the second section has become about extinct, and is best represented in Upper Silurian deposits. That its species are, however, direct descendants from those of the second section, cannot be doubted; *P. plumaria*, James, (as fig. by Ulrich), and *P. magnifica*, S. A. Miller, being clearly transitional forms. Should it become desirable to separate the two groups, Hall's genus *Escharopora* would include the second section.\*

\* The Lower Helderberg species referred to, *Escharopora*, by Hall are unequivocal members of the typical section of *Ptilodictya*.

*Formation and locality:* A common species in the Trenton shales, at Minneapolis, and other localities in Minnesota. It also occurs in the Trenton limestone of Kentucky and Tennessee.

*Register No.* 5929.

### ARTHROPORA SIMPLEX, n. sp.

Zoarium jointed, segments fragile, unbranched, acute-elliptical in transverse section, from 0.4 to 0.7 inch long, from 0.04 to 0.07 inch wide and not exceeding 0.04 of an inch in thickness. The first segment is sometimes irregularly branched, but that condition does not appear to be normal. The base of this joint is obtusely pointed and striated, the striae extending above the articulating shoulder one-tenth of an inch or more. The extremities of the succeeding segments are smooth or faintly striated, and slightly swollen. Zooecial apertures, of the younger segments, with the margin distinctly elevated so as to leave a narrow interstitial sulcus between them. Their arrangement is very regular in transverse and intersecting diagonal series; transversely, seven occur in 0.05 inch; diagonally, five occupy the same space; width of interstitial space less than the shortest diameter of the apertures. Non-poriferous margin narrow and obliquely striated. On the older and especially the first segments, the cell-apertures are smaller and circular, and the width of the interstitial spaces from one to three times their diameter, the non-poriferous margin wide, and the whole inter-apertural space marked with fine, flexuous, and faintly granular striae.

In tangential sections the cells are oval, thick-walled, and each surrounded by one or two rows of very minute tubuli.

On account of the condition of the specimens, both the vertical and transverse sections are unsatisfactory.

This species clearly belongs to the genus *Arthropora*, and in the structure and appearance of its cells, differs but little from *A. shafferi*, Meek. The unbranched condition of the segments, however, will distinguish *A. simplex* from that species as well as from any other form of the genus known to me.

*Formation and locality:* The detached segments of this spec-

ies are very common in the Trenton shales, at Minneapolis and other localities in the state where these beds are exposed. Segments of the Trenton variety of *A. shafferi* are also, though rarely, met with.

*Register No. 5933.*

### STICTOPORA MUTABILIS, n. sp.

Zoarium variable in size and superficial aspect. Typically, it consists of branches dividing dichotomously at intervals of 0.3 to 0.4 of an inch; width of branches varying from 0.10 to 0.18 inch; thickness of same, from 0.03 to 0.06 of an inch; edges somewhat acute, with non-poriferous margin very scant, or wanting. Cells arranged in from sixteen to twenty-five rows, between rounded and but slightly elevated longitudinal lines; walls thick, apertures small, narrow, elliptical.

In old examples the apertures are scarcely recognizable, the surface appearing as simply striated. Measured transversely, sixteen rows occupy the space of 0.1 inch; longitudinally, seven and a half or eight cells suffice to fill the same space.

Sections show that the walls are extremely thick, that they are divided into longitudinal series by straight rows of very minute but distinct tubuli, and that a variable number of the latter also occur between the ends of the cells. In transverse sections these tubuli are quite conspicuous between the median laminae of the zoarium. In vertical sections, the spur or diaphragm occurring at the base of the thick portion of the tube walls, gives to the lower region of the zooecia the form of a semi-circle.

The above sufficiently describes the typical form of this species. The two extremes of variation may be designated, provisionally, as varieties *major* and *minor*.

#### Var. MAJOR, n. var.

The zoarium of this variety differs from the typical form of the species in having a more robust appearance. The branches attain a width of 0.3 inch, and a thickness of 0.12 inch. Along

the center of the branches, at rather irregular intervals, occur finely striated non-celluliferous spots, which tangential sections show to be occupied by an aggregation of the minute tubuli. The rows of cells in the neighborhood of the edges of a branch are usually directed obliquely outward.

**Var. MINOR**, n. var.

This variety is distinguished by its smaller size, thinner branches, and more distinctly developed non-poriferous margin. Its branches vary in width from 0.07 to 0.10 inch, while the thickness rarely exceeds 0.02 inch.

This species, as well as the two species next described, are congeneric with *Rhinidictya nicholsoni*, Ulrich. When I proposed the genus *Rhinidictya*, it was under the impression that Hall's *Stictopora fenestrata*, the type of the genus, was closely allied to his *S. acuta*. Although I have failed in obtaining authentic examples of *S. fenestrata* for comparison, I am, nevertheless, convinced by the study of specimens identified with that species from the Chazy limestones of Kentucky and Tennessee, that I was in error, and that the species is really more nearly related to my *R. nicholsoni*. The name *Rhinidictya* may therefore be erased from the list of genera, while *Stictopora* must be re-defined and restricted so that it will cover about the same ground lately occupied by the abandoned genus. In its restricted sense, *Stictopora* is typified by *S. fenestrata*, Hall, *S. mutabilis*, Ulrich, and *S. nicholsoni*, Ulrich. The cells of *S. acuta*, Hall, and its near ally *Ptilodictya fenestelliformis*, Nicholson, have the structure of *Pachydictya*, Ulrich, to which genus I now refer them.

In the upper shaly layers of the Kentucky exposures of the Trenton group, *S. mutabilis* is a common fossil, but the two varieties, *major* and *minor*, seem to be peculiar to the Minnesota beds. Young specimens are not readily distinguished from *S. nicholsoni*, but there is no difficulty in separating the fully matured examples, the cell walls being thicker and the branches larger and much heavier than in that species.

*Formation and locality:* Extremely abundant in the Trenton shales about Minneapolis, and St. Paul, Minn.

*Register Nos.* 5938, 5939, 5956.

**STICTOPORA FIDELIS**, n. sp.

Zoarium branching dichotomously at intervals of about 0.5 inch. Branches from 0.08 to 0.11 of an inch in width; thickness of same varying from 0.03 to 0.06 of an inch; edges less acute than usual; non-poriferous margin narrow. Zooecia with comparatively thin walls and slightly oblique, sub-ovate or quadrangular apertures, arranged in from nine to twelve longitudinal series, between sharp though but slightly elevated lines. Measured longitudinally, eight or nine cells occur in the length of 0.1 inch; transversely, six or seven rows occupy 0.05 inch.

In tangential sections dividing the cells just below their apertures, the cell walls are rather thick, and the tube cavities elliptical, while the longitudinal elevated lines of the surface are represented by a straight dark line. A good section will show this line to contain a series of very minute tubuli, the same as occur between the divisional laminæ of the two sides of the zoarium. At a lower level in the zoarium the cells are subquadrate near the center, and rhomboidal toward the edges of the branch; the walls are thin, the anterior one convex.

Longitudinal sections show that the tubes arise abruptly from the divisional laminæ on each side, and that their course to the surface forms an angle with the median line of about 55 deg.; the anterior side of the walls is concave in the lower portion, while the posterior side is nearly straight throughout. A complete or only partial diaphragm is occasionally developed at the termination of the concave portion of the cell wall.

This species is distinguished from *S. mutabilis* by its slightly wider cells and comparatively thin walls. The cell apertures are consequently much larger than they are in that species, being besides nearly quadrangular instead of narrow-elliptical. Sections show *S. fidelis* to be clearly distinct from, though allied to *S. nicholsoni*, Ulrich.

*Formation and locality:* Not uncommon in the Trenton shales at Minneapolis, Lanesboro, and other localities in Minnesota.

*Register No.* 5936.



**STICTOPORA PAUPERA**, n. sp.

Zoarium small, fragile, very slender below, where it is attached to foreign bodies by a rather diminutive basal expansion; above this it gradually expands until at a distance of about 0.3 of an inch above the base, it has attained its mature width, varying in different examples from 0.06 to 0.09 of an inch; here also occurs the first bifurcation, the second occurring about 0.25 inch above the first, while a third division, at nearly the same distance from the second, is occasionally met with. The entire height of the zoarium is, therefore, rarely more than one inch. The greatest thickness does not exceed 0.02 of an inch. The angle of bifurcation is about 70 degrees, and quite the same in all the specimens. Cells with small, narrow, elliptical apertures, arranged in from ten to twelve longitudinal series, between slightly elevated lines; the cells in one or two of the outermost rows are directed obliquely outward. Measuring longitudinally, nine cells occupy the space of 0.1 inch; transversely, eight rows occur in 0.05 inch. Non-poriferous margin very narrow, only recognizable in good specimens.

This species is also a common fossil in the shaly layers of the Trenton group in Kentucky, where it is associated with *S. mutabilis* and other bryozoa marking this horizon. It also occurs in the Trenton rocks of Canada. The small size of its zoarium will distinguish it from other species of the genus.

*Formation and locality:* Trenton shales, at Minneapolis and other localities in Minnesota.

*Register No.* 5935.

**STICTOPORELLA? CRIBROSA**, n. sp.

Zoarium forming thin flattened expansions, composed of branches which inosculate at short intervals till there is produced a broad frond perforated at rythmical intervals by circular or elliptical fenestrules. Both sides of frond celluliferous and consisting of two equal layers of cells that have grown together back to back, each layer, however, preserving its own concentrically striated epithecal membrane. Fenestrules usually inclined to be elliptical, their longest diameter varying

from 0.03 to 0.10 of an inch, but the prevailing size has a diameter of about 0.06 inch. Width of branches about 0.09 inch; thickness of same, varying from 0.02 to 0.06 inch. Zooecia with subcircular or broadly ovate apertures, arranged in quite regular diagonal series, nine or ten in the space of 0.1 inch. Interstitial spaces becoming thicker with age, till the zooecial apertures are separated by a distance a little greater than their diameter. Interstitial pits numerous interpolated between all the cells. Around the fenestrules there is a band 0.02 of an inch, more or less, in width, solely occupied by them.

Tangential sections show that the polygonal boundary of the zooecia is marked by a dark line, which, the evidence at hand, is not clear enough to prove to have contained a series of extremely minute tubuli. The visceral cavity is small, ovate, or subcircular. The interstitial pits are numerous, of irregular shape and unequal dimensions, often completely filled, or only preserving a very small central cavity.

Vertical sections show that the divisional laminae are flexuous, that the tubes are at first thin-walled and prostrate, that they subsequently bend abruptly outward, and that their walls at the same time are much thickened and marked with oblique lines parallel with the form of the apertures. The interstitial pits, wherever observed, were entirely filled by a concentric deposit of sclerenchyma. No diaphragms appear to have been developed.

The cells of this, and the two species next described, in all the essential points of structure, are precisely like those of *Stictoporella interstincta*, Ulrich. The characters of the genus as typified by that species, are entirely peculiar, and bear but little resemblance to those of *Stictopora*. In fact, so far as the microscopic structure is concerned, *Stictoporella* is more nearly allied to *Ptilodictya* than to *Stictopora*, but whether the peculiarities of the genus will necessitate a removal from the family *Stictoporidae*, I am not yet prepared to assert. At any rate, the structural distinctness of the genus is firmly established by the addition of the three species in question. A most striking peculiarity is presented by these species. I refer to the great difference in the form of the zoaria, when compared

with the remarkable similitude of the internal structure. Indeed it is highly improbable that any one, giving them only a superficial examination, would have classified them as nearly related species. Sections, however, prove beyond any reasonable doubt that their relation to each other is really very intimate, although distinguished from each other by very obvious differences in their respective methods of growth.

An inosculating bryozoan has been described by Hall from the Trenton rocks of Wisconsin, under the name of *Clathropora flabellata*. The description and figures are both entirely inadequate for anything even approaching a positive identification. This style of zoarium pertains to at least three Palaeozoic genera, and the species might belong to any one of these. That the species which I have above described is distinct from Hall's species is evident. His figure represents a more robust zoarium, the branches and fenestrules being over twice as wide as those of *S. cribrosa*.

*Formation and locality*: Abundant in the Trenton shales at Minneapolis, Minnesota.

*Register No.* 5944.

#### **STICTOPORELLA ANGULARIS**, n. sp.

Zoarium dividing dichotomously at intervals varying from 0.15 to 0.30 of an inch. Branches usually about 0.08 of an inch in width; frequently they are narrower, while on the other hand, a single fragment apparently referable to this species is twice as wide. The thickness is generally about 0.03 inch, and never, so far as observed, exceeds 0.05 of an inch. Transverse section of branch elliptical, the margins being rarely acute, and usually rounded. Cells polygonal or sub-rhomboidal, with sub-circular apertures placed at the bottom of a sloping "vestibule," arranged in somewhat irregular intersecting diagonal series, nine in the space of 0.1 inch; measured longitudinally, seven and one-half cells occupy the same space. Here and there over the central portions of the branch, though never in sufficient number to constitute a conspicuous feature, may be detected an interstitial pit. On the rounded margins of the zoarium, however, they are always present.

Here they form a series on each side of the median laminae. Sometimes they are very shallow and obscured by a secondary deposit of sclerenchyma.

In tangential sections, the visceral chambers of the zoecia are oval, the interspaces thick and divided in the middle by a thin, sharply defined, dark line, marking the boundary line between adjoining cells. Each cell somewhat irregularly hexagonal. A few interstitial pits, here entirely filled by sclerenchyma, may be detected.

Vertical sections demonstrate that the tubes are at first prostrate and with thin walls. At the point of bending outward in their course to the surface, the walls suddenly become very thick and marked with oblique lines, representing the form of the campanulate aperture at previous stages of growth. Diaphragms have not been observed.

The angularity of the cell apertures sufficiently separates this species from *S. interstincta* from the Cincinnati group, while the same character, and the diagonal arrangement of the cells, will serve to distinguish it from a the species of *Stictopora* occurring in the same beds. It cannot be confounded with its much larger and nearest ally *S. frondifera*.

*Formation and locality:* Not uncommon in the Trenton shales at Minneapolis, Minn., but apparently restricted to the lower portion.

*Register No. 5943.*

### **STICTOPORELLA FRONDIFERA, n. sp.**

Zoarium, consisting of large, thin, irregularly branching, flabellate or undulate expansions, which are celluliferous on both faces, and have rounded and minutely pitted margins. Cells arranged more or less regularly in diagonally intersecting series nine or ten in the space of 0.1 inch. The cell apertures vary from sub-circular to sub-rhomboidal. Interstitial spaces rather thick. Interstitial pits, variously distributed among the zoecial apertures, or aggregated so as to form clusters or "maculæ." These clusters are always quite irregular in both size and distribution. Thickness of frond apparently never exceeding 0.10 inch; usually it is not more

than half that thickness. Entire height of zoarium three or four inches.

The sections of this species are almost exactly like those of *S. angularis*, and do not require a detailed description. One of the tangential sections, however, shows clearly that the boundary line between adjoining cells is occupied by a closely arranged series of very minute tubuli. The evidence afforded by the sections of *S. angularis* and *S. cribrosa* is not sufficiently clear to allow me to assert positively that these tubuli are also present in those species, but that they are is highly probable.

*Formation and locality:* Rather abundant in the lower part of the Trenton shales at Minneapolis, Minn. It also occurs at Lanesboro and Fountain in Fillmore county.

*Register Nos.* 5945-5947.

#### **PACHYDICTYA FOLIATA**, n. sp.

Zoarium growing from an attached basal expansion into erect, thin, undulating and often palmate fronds, both sides of which are celluliferous; the height and width may be two inches or more, though it is rare to find specimens more than one inch square; their thickness is usually about 0.05 of an inch; very old examples may attain a much greater thickness, it being in some not less than 0.13 inch. Margin of fronds acute, and always more or less distinctly non-poriferous. Cell apertures large, oval, and arranged in regular intersecting series, in which six or seven occur in the length of 0.1 inch. Measuring longitudinally (*i. e.* across their larger diameter) four or five occupy the same space. On a few specimens the zoecial apertures are surrounded by a thin rim or peristome. This feature may indicate a particular stage of development, or only an exceptional state of preservation. Inter-apertural space only moderately thick, generally smooth, it being only in rare instances that the really numerous interstitial cells can be detected at the surface. At intervals of about 0.15 of an inch the surface presents smooth spots or maculæ. Usually, these are not elevated above the general plane of the surface, but in a few cases they are rather prominent.

In vertical sections the tubes arise somewhat abruptly from the median laminæ, near which their walls are thin. The interstitial tubes are developed almost immediately, and in their lower portion are crossed by numerous very distinct diaphragms, that, as the surface is approached become entirely obsolete, or at least much obscured by a deposit of sclerenchyma. In the "maculæ" which contain only interstitial tubes, the diaphragms are decidedly vesicular. The true zoecia are crossed at intervals about equalling their diameter, by from two to four complete diaphragms. These recur at about the same level in all the tubes.

In tangential sections near the central axis, the zoecia have thin walls, are broadly ovate, and more or less completely separated from each other by a series of angular interstitial cells. Nearer the surface the walls of the tubes become thickened and ring-like, but the original boundary remains distinct as a sharply defined dark line. Within this line there is a series of extremely minute tubuli. Just below the surface of fully matured examples the "maculæ" are marked with a number of series of the same kind of tubuli, while in the ordinary interspaces between the zoecia they arrange themselves into two flexuous and often interrupted lines. It is, however, only in exceptionally preserved spots that these tubuli are recognizable, they being generally represented by apparently structureless dark lines.

In good transverse sections dividing the zoarium vertically but at right angles to the direction of growth, these tubuli are very plain between the divisional laminae.

This fine species is clearly distinct from any other species of the genus known to me, while in its generic characters it is as typical of *Pachydictya* as is *P. robusta*, the type of the genus. Its foliaceous zoarium will distinguish it from all the associated species, with the exception of *Stictoporella frondifera*. That species occurs on the same slabs, and a careless collector might confound them. Still, after a little study, the differences in the size and shape of their cells will become so evident that they may be distinguished at a glance.

*Formation and locality.* Apparently restricted to the lower

layers of the Trenton shale, in which it is abundant, at Minneapolis, Minn.

*Register No. 5948.*

### **PACHYDICTYA OCCIDENTALIS**, n. sp.

Zoarium ramose, or subpalmate towards the base, dividing above into small branches; width of branches varying from 0.13 to 0.40 of an inch. Cross section of branches acutely elliptical, about 0.05 inch in thickness centrally. Margins sharp with a narrow, smooth or finely striated, non-poriferous border. Cells arranged in longitudinal, and more or less regular intersecting diagonal series; apertures ovate, slightly longer than broad. About six cells in 0.1 inch, measured longitudinally, and eight in the same space measured diagonally. The wider specimens exhibit along the center of the branch a series of smooth and apparently solid spots, which vary considerably in size. All the examples noticed present at least one of these spots, situated just below the bifurcation of the branches.

Internal structure as in other species of the genus.

This species is closely allied to both *P. acuta*, Hall, sp., and *P. fenestelliformis*, Nicholson, sp., and is of interest, principally, because it represents an unequivocal connecting link between those species.

*Formation and locality.* Not uncommon in the upper layers of the Trenton shales, at St. Paul, Minn.

*Register No. 5949.*

### **PACHYDICTYA FIMBRIATA**, n. sp.

Zoarium small, ramose, dividing dichotomously at variable intervals. Branches thin, rarely more than 0.02 of an inch in thickness, and from 0.09 to 0.18 of an inch in width. Non-poriferous margin, obliquely striated, very wide, extremely thin and sharp, and wavy or ruffled. Over about one-half the surface along the middle of the branches the cells are arranged in regular alternating or sub-alternating longitudinal series, in which six to seven occupy the space of 0.10 inch; measuring transversely five rows occur in 0.05 inch. The two or three

rows between these and the non-poriferous margin are not so regular in their arrangement, their apertures being, besides, separated by somewhat wider interspaces, and, usually at least, directed obliquely outward. Cell apertures broadly elliptical, longer than wide, and, in perfectly preserved examples, surrounded by a faintly elevated, thin border. Inter-apertural spaces about half as wide as the longer diameter of the cell-mouths, smooth or faintly striated longitudinally.

Internal structure as in *P. acuta*, and other species of the genus.

Good examples of this species cannot be confounded with any other species known to me, as the wavy or ruffled appearance of the wide non-poriferous margin gives them a very peculiar and characteristic aspect. In other respects the species is very closely related to *P. acuta*, Hall, and less closely to *P. occidentalis*, Ulrich.

In the higher layers of the Trenton shales at St. Paul, I have noticed a number of specimens, which, while it does not seem probable, may still prove to belong to a robust variety of this species. In these the non-poriferous margin is wide, but not wavy, and the cell-apertures smaller and narrow, while the walls or interspaces are thick and usually wider than the apertures, and more distinctly striated. The branches have an average width of 0.18 inch, and a thickness of 0.06 inch or more. Should these differences prove constant then they ought to be considered as of specific importance.

*Formation and locality:* Rather common in the lower part of the Trenton shales, at Minneapolis, Minn.

*Register No.* 5950.

#### PACHYDICTYA CONCILIATRIX, n. sp.

Zoarium consisting of triangular stems, celluliferous on the three concave sides, and constructed on the same general plan as *Prismopora*, Hall. Margins sharp, non-poriferous, and faintly striated. Branching takes place by the development of a non-celluliferous ridge in the centre of one of the sides, which, rising gradually, eventually forms one of the non-poriferous margins of the new branch or stem. Cell apertures sub-



circular to oval, arranged in longitudinal series in the central third of the sides, while those nearer the margins are larger and directed obliquely outward and upward. Interstitial spaces of somewhat variable thickness, usually equaling about one-half the diameter of the apertures; surface minutely granular, and where the cells have a regular arrangement, the granules form rows. Measured longitudinally, six or seven cells occupy 0.1 inch. Width of branches varying from 0.13 to 0.18 of an inch.

This very interesting and I might say prophetic species, demonstrates what I have only suspected heretofore. That is, the relationship of *Pachydictya* with the *Cystodictyonidae*. In fact, the genus lacks only the small "lip" to be a typical member of the family, and it is questionable whether this deficiency is of sufficient importance to exclude the genus.

*Formation and locality:* Trenton group at Cannon Falls, Goodhue county, Minnesota, where it is associated with *Phyllopora? corticosa*, Ulrich, and *Streptelasma corniculum*, Hall.

*Register No.* 5952.

#### CREPIPORA IMPOLITA, n. sp.

Zoarium large, solid, irregularly ramose, or simply nodulated. Branches from 0.2 to 0.8 of an inch in diameter. Height from two to four inches. Cells large, and rather regularly arranged, eleven in the space of 0.2 inch. Walls thin. Apertures direct, polygonal to sub-rhomboidal, with the lower margin very slightly elevated, and showing, in good specimens, the ends of the two vertical lamellae or teeth on the inside of the aperture. Interstitial cells, always few, usually absent. When present they are gathered together so as to form small "maculae."

In tangential sections the walls are seen to be thoroughly amalgamated, and the vertical lamellae or "teeth" usually represented by two spots on one side of the tube, that are of a conspicuously lighter color than other portions of the wall. In better sections their normal appearance may be observed. This is crescentic or horse-shoe-shaped, with the ends projecting into the cell-cavity.

In longitudinal sections, the tubes are gently curved, apparently throughout their length, and crossed at remote intervals, by exceedingly thin, straight diaphragms. The walls seem to have been perforated by numerous connecting "foraminae" and are composed of rapidly alternating dark and lighter shades of sclerenchyma.

The transverse section is very nearly like the tangential; proving that the branches are not divided into differentiated "mature" and "immature" regions, but that the zoarium is really of the nature of massive or parasitic species.

This very abundant species is readily distinguished from all the associated forms, by its irregular growth and large cells.

*Formation and locality:* Trenton shales at Minneapolis, Lanesboro, and other localities in the state.

*Register Nos.* 5958 to 5962.

#### MONTICULIPORA GRANDIS, n. sp.

Zoarium irregularly massive and often tending to become sub-ramose. Cells polygonal, thin walled. Surface without monticules but exhibiting at intervals of 0.2 of an inch conspicuous groups of large cells, that are often nearly twice the size of those of the ordinary dimensions. Eight or nine of the smaller occupy 0.1 inch; the average diameter of those in the groups is about 1.55th of an inch.

In vertical sections the tubes proceed to the surface in straight or curved lines according to the form of the zoarium. They are provided with thin walls, and usually two, more or less closely arranged series of cystoid diaphragms, one on each side of the tube, the intervening space being crossed by an equal number of straight diaphragms.

Tangential sections show that the cells are polygonal and thin-walled; the opening left by the cystoid diaphragms is large, ovate, or sub-circular, and while it is usually lateral in position, it is not infrequently central. The angles of junction of the cells are a little thickened, and there is some evidence to show that they contained very small spiniform tubuli.

This fine species resembles in its growth the more irregular examples of *M. laevis*, Ulrich, from the Cincinnati group. The

cells of *M. grandis*, are however larger and the internal structure quite different.

*Formation and locality*: Fragments of this species are rather rare in the lower portion of the Trenton shales, at Minneapolis, Minn. The vertical range of the species is apparently not more than six or eight feet.

*Register No.* 5969.

#### HOMOTRYPA MINNESOTENSIS, n. sp.

Zoarium ramose, branches cylindrical or sub-cylindrical, from two to four tenths of an inch in diameter, and branching at rather long intervals, that are rarely less than one and a half inches and often more than two inches. Surface smooth, no monticules having been observed in any of the numerous examples studied. Cells of conspicuously larger size than the average are collected into groups, of which the centers are about 0.13 of an inch apart. The cells composing the groups enlarge gradually, those near the middle being about twice as large as the ordinary cells occupying the intervening spaces. Center of groups often marked by a small sub-solid or pitted space. Ordinary cells polygonal, with thin walls, and, sometimes, very oblique apertures; more commonly they are nearly direct, while in a few of the large specimens they are really so. About eleven of the smaller or ordinary cells occur in the space of 0.1 inch.

Vertical sections show that the peripheral or "mature" region is very narrow, that the tubes are long and vertical in the axial region, and that their course to the aperture forms a very gentle curve. The walls in the axial region are extremely thin and wavy. Near the surface they are appreciably thickened. Diaphragms wanting in the axial region, but present in the peripheral portion of the tubes, where they recur at intervals of from one-fourth to one tube diameter. Along the upper wall is the characteristic series of cystoid diaphragms. The obliquity of the cell-apertures and the extreme brevity of the matured portion of the tubes, render the preparation of satisfactory tangential sections very difficult. The more successful ones show that the cell walls are compar-

atively thin, that a variable number of interstitial cells is interpolated among the ordinary zoecia, while here and there, somewhat obscure traces of the connecting foraminae may be detected.

Transverse sections show the greatly disproportionate development of the axial region as compared with the peripheral. They also show that in the axial region the tubes are provided with extremely thin walls, and that near the surface they are flattened and their size considerably reduced.

This is a true species of *Homotrypa*, and is nearly related to *H. obliqua*, Ulrich, from the Cincinnati group of Ohio, but still closer in its affinity with an undescribed species occurring in the upper half of that formation. From the first, *H. minnesotensis* is distinguished by its smooth and sub-cylindrical branches, and other less obvious, differences.

*Formation and locality:* Common in the Trenton shales at Minneapolis, St. Paul, Lanesboro, and other localities in the state.

*Register Nos.* 5970 to 5975.

#### HOMOTRYPA EXILIS, n. sp.

Zoarium ramose, branches slender, cylindrical, about 0.15 of an inch in diameter, and dividing at intervals of one inch or more. Entire height of zoarium from one to three inches. Surface smooth. Cells with rounded, direct apertures, and moderately thick walls. Ten or eleven of the ordinary size occur in the length of 0.1 inch. Groups of cells, slightly larger than the average, are present, but do not constitute a conspicuous feature. Interstitial cells rather numerous, especially between the cells of the groups just mentioned. Diaphragms, wanting in the axial region, but present in the short, abruptly bent peripheral region, where the walls are also thickened, and a short series of cystoid diaphragms is developed.

At first I was inclined to regard this species as the young of *H. minnesotensis*. But this is evidently not the case, as the specimens have a more matured look than many much larger specimens of that species. The walls get thicker and the apertures more rounded than is the case in even the most matured examples of *H. minnesotensis*.

*Formation and locality:* Not uncommon in the lower portion of the Trenton shales at Minneapolis, Minn.

*Register No.* 5976.

### HOMOTRYPA SUBRAMOSA, n. sp.

Zoarium sub-ramose, branches sub-cylindrical or slightly flattened, with the upper extremities rounded and expanded.— Branches varying in diameter from 0.2 to 0.4 of an inch; apparently dividing but once or twice, the entire zoarium being rarely more than one inch and a half in height. Surface without monticules. Cells with moderately thin walls, and polygonal and direct apertures; nine or ten occupy the space of 0.1 inch. At irregular intervals the surface presents inconspicuous clusters of cells that are slightly larger than the average. Well developed spiniform tubuli occur at most of the angles of junction between the cells. They constitute a marked feature on all good specimens.

Longitudinal sections show that the tubes proceed from the axial region to the outer surface in a gentle but gradually increasing curve; that at unequal intervals several parallel convex lines of diaphragms cross the branch; that between these the diaphragms may be absent or scattered and infrequent; that the walls throughout the axial region are thin and decidedly wavy; that they are moderately thickened in the peripheral or "mature" region, and are there provided with a more or less closely arranged series of cystoid diaphragms, the extent of which, of course, depends entirely upon the age of the specimen.

In tangential sections the walls are moderately thin, the cell-cavity is sub-angular, and exhibits usually at one side the crescentic opening left by the cystoid diaphragms. The spiniform tubuli are large, and as the walls are comparatively thin, they are more striking than usual with species of the genus.

This is not closely related to either of the preceding species, but finds its nearest allies in several undescribed species of Ohio and Kentucky.

*Formation and locality:* Not common in the Trenton group at Minneola, Goodhue Co., Minn.

*Register No.* 5980.

**HOMOTRYPA INSIGNIS**, n. sp.

Zoarium sub-ramose, from one to two inches in height; branches sub-cylindrical or flattened, often lobate, or throwing off short branches, the distal extremities of which are concave. Diameter of branches varying from 0.15 to 0.30 of an inch. Surface smooth, without monticules. Cells with very thin walls, and shallow apertures. These two conditions conduce to give the cell-apertures, especially those of the younger specimens, the appearance of being extremely oblique, when in fact they are but slightly so, and in old examples not at all. An explanation of this peculiarity is found in the fact that the cystoid diaphragms occur just beneath the top of the thin cell-walls, and the least wearing will remove the wall all around the cell excepting at the small posterior opening left by the cystoid diaphragms. Groups of cells of larger size than the average, occur at intervals of about 0.12 of an inch. Ten or eleven of the ordinary cells occupy 0.1 inch.

Tangential sections show that the walls are thin, that small spiniform tubuli occupy many of the angles of junction, and that the sub-circular opening or tube left on the posterior side of the cell by the cystoid diaphragms, is comparatively small, and unless sharply defined, may be overlooked.

In vertical sections the tubes in the axial region are not provided with diaphragms excepting in special zones, where they are numerous. In the peripheral region they are crowded, and although greatly resembling ordinary straight diaphragms, they are, nevertheless, of the nature of cystoid diaphragms. Their posterior portion is in most cases abruptly bent inward, but at a point so near the wall of the tube that it may be overlooked.

The distinguishing features of this species are the thin walls, the shallowness of the cells at their apertures, and the large size and number of the cystoid diaphragms. Slightly worn examples are readily identified by the peculiar obliquity of the cell-apertures, which for the reasons given in the description, appear to be very small, the larger portion of the surface being occupied seemingly by wall-substance.

*Formation and locality:* Rather rare in the Trenton shales near Fountain and Lanesboro, in Fillmore Co., Minn.

*Register Nos.* 5977 to 5979.

**HOMOTRYPELLA**, nov. gen.

Zoaria somewhat irregularly ramose, rarely frondescent; monticules wanting; small maculae of interstitial cells usually present. Zoecia small, with moderately thick walls and cystoid diaphragms. Interstitial cells numerous, often completely isolating the true zoecia; diaphragms straight. Spiniform tubuli very numerous, of medium size, and frequently encroaching upon the visceral cavity of the zoecia.

Type: *H. instabilis*, n. sp.

The above characters are represented in at least six species now before me. They are all new to science with the exception of one, a description of which has been published by me under the name of *Chaetetes grameliferus*\* It is a common species in the Trenton shaly limestones of Kentucky. Of the remaining five species, three occur in the Cincinnati group of Ohio, one in the same formation in Illinois, and the last in the Trenton shales of Minnesota. Judging from the aggregate of characters, the position of the genus is intermediate between *Peronopora*, Nicholson, and *Atactoporella*, Ulrich, on the one side, and *Homotrypa*, Ulrich, on the other. The genus is also related to *Leioclema* and *Batostomella*, Ulrich, but differs in the tabulation of the zoecia.

**HOMOTRYPELLA INSTABILIS**, n. sp.

Zoarium ramose, branches rounded, sometimes irregularly nodular or lobate, and varying in size, some being slender and not more than 0.18 of an inch in diameter, while others are much heavier and in several instances exceed 0.3 inch in diameter. Superficial aspect of cells presenting a variety of appearances depending upon the age and preservation of the specimens. In well preserved younger examples the cells are comparatively thin-walled, subcircular, and surrounded by slightly smaller, angular, interstitial cells. When a little worn, and this is especially the case in the larger specimens, the walls appear very thick, the cell-apertures, sub-circular or irregularly inflected, and the interstitial cells scarcely recognizable as such; or the visceral cavities of the latter are filled solid, and the observer is apt to

\*Jour. Cin. Soc. Nat. Hist. vol. 2, p. 128.

suppose that they are absent. In well preserved and fully matured examples the interstitial cells are again obscured by the spiniform tubuli. These are rather small but numerous, there being two or three to each cell. Small "maculae" of interstitial cells, usually appearing as non-poriferous smooth spots, may occur at intervals of about 0.12 of an inch. Eleven or twelve of the true zoëcia occupy 0.1 inch; the diameter of their apertures is about  $\frac{1}{80}$ th of an inch.

In tangential sections the polygonal line of contact between the cells is nearly always sharply defined. The interstitial cells are numerous and of unequal size, though usually of much smaller size than the true zoëcia. The walls of both kinds of cells are of equal thickness, the portion of same immediately surrounding the visceral cavity, being also of darker hue than beyond. Visceral cavity of true zoëcia often sub-circular or ovate, but more commonly with an irregular outline, due to the encroachment of the conspicuous spiniform tubuli. These are nearly or quite as large as the interstitial cells, and differ from them only in having their central portion entirely filled by a dark deposit of sclerenchyma. Their number varies from one to three times that of the true zoëcia. At unequal intervals the section presents small irregular aggregations of the interstitial cells. The cystoid diaphragms are not present in these sections excepting when they are prepared from very young examples or cut the zoarium at a deep level.

In the axial region of a vertical section the walls of the tubes are thin and undulated, the diaphragms straight and remote, and the direction of the tubes, from their point of origin to where they enter the "mature" or peripheral region, forms an angle of about twenty degrees with the imaginary central axis of the branch. In the peripheral region this angle is gradually increased until the maximum of about seventy-five degrees is attained. At the same time the walls are much thickened, and the numerous interstitial cells and spiniform tubuli are developed. The former are distinguished from the true zoëcia by the fact that they are intersected by straight, complete diaphragms only, while the true zoëcia have the superior wall lined in a portion of their length by a series of cystoid diaphragms. These structures number from eight to fifteen in each tube, and are developed only in the



region intervening between the fully matured peripheral and the immature axial region. Beyond them the diaphragms are crowded and essentially horizontal. In the interstitial tubes they are scarcely more crowded than in the true zoëcia, and, especially in the outer portion, more or less obscured by sclerenchyma.

It is highly probable that the above description embraces more than one species. Both extremes in size present, besides some important differences in internal structure. These have not been noted in the descriptions of the sections, the character of what I regard as the typical form alone being given. Until I can give more time to the examination of the relative importance of the variations noticed, I have deemed it, in the meantime, advisable to describe them under one specific name.

*Formation and locality:* Rather common in the Trenton shales, at Minneapolis and other localities in the state of Minnesota.

*Register Nos.* 5025, 5981 and 5982.

#### PRASOPORA SIMULATRIX, n. sp.

Zoarium discoid when young, hemispheric or depressed sub-conical when adult; base more or less concave, and covered with a concentrically striated epitheca; upper surface celluliferous; height of zoarium varying from one-fourth of an inch to two inches; diameter from one-half of an inch to four inches. Zoëcia or true cells with sub-circular apertures, and comparatively thin interspaces that are occupied by rather numerous small angular interstitial cells. Groups of cells of a slightly larger size than usual occur at intervals of 0.15 inch, measuring from center to center. Between these the interstitial cells are always more numerous than elsewhere, and not infrequently form a small "macula" in the central portion of the clusters. In the spaces between the "maculæ" the interstitial cells might be overlooked, although as shown by sections, they are really numerous. Diameter of apertures of one of the ordinary cells about 1-105th of an inch, while nine of the same occupy 0.1 inch.

In tangential sections the true zoëcia are sub-circular, or more strictly speaking, polygonal, the walls very thin, and the

visceral chamber invariably intersected by the crescentic edge of the cystoid diaphragm. The opening left by the cystoid diaphragms is either lateral or sub-central, but more commonly the former. The zoëcia are in contact only at limited points, and the interspaces between them are filled by the small interstitial cells. These are somewhat variable in number, and greatly so in size, but always decidedly angular. They are furthermore, collected at intervals into small sub-stellate groups or "maculæ."

Vertical sections show that the cystoid diaphragms form a continuous series on one or both sides of the tubes, according as they extend all around the circumference, or take in only a portion of the same, while an equal number of straight diaphragms crosses the remaining portion of the tube. The interstitial tubes are crossed by about twice as many simple horizontal diaphragms. The cell-walls throughout are very thin.

This species in many respects closely resembles *P. Selwyni*, Nicholson, but they differ so decidedly in the internal structure that I must regard them as distinct. In the true, or what Dr. Nicholson calls the typical form of *P. Selwyni*, the cystoid diaphragms are isolated, and never form connected series as they do in *P. simulatrix*, *P. grayæ*, Nich., and Eth. jr., and a number of other species. A similar and even more marked isolation of the cystoid diaphragms pertains to *P. oculata* and *P. affinis*, described by Foord from the Trenton of Canada. None of the Canadian species of the genus, so far as known, occur in the Trenton rocks of Kentucky and Tennessee, nor in the equivalent strata of the northwest, and it is singular that all the American species have the cystoid diaphragms in more or less crowded continuous rows, while in the Canadian species the isolated condition of these structures prevails. Nicholson's variety *hospitalis*, of *P. selwyni*, is more nearly related to *P. simulatrix*, but differs in having spiniform tubuli, and an attached zoarium. But why *P. hospitalis* should be called a variety, is more than I can understand. The parasitic habit of growth, spiniform tubuli, and mode of tabulation distinguish it, at least specifically, from *P. selwyni*.

*Formation and locality:* In the Trenton shales, but apparently not common in any locality in the state. It has been found at Minneapolis, St. Paul, Lanesboro and Mantorville. In the shaly

limestones of the Trenton in Kentucky and Tennessee the species is exceedingly common, and grows to a larger size than the Minnesota specimens.

*Register Nos.* 4041, 5124, 5532, 5986 to 5988.

**PRASOPORA CONOIDEA**, n. sp.

Zoarium depressed, conical; base rather deeply concave, and covered with a concentrically wrinkled epitheca; height varying from 0.2 to 0.6 of an inch; diameter from 0.4 to 0.8 of an inch. Upper surface celluliferous and exhibiting, at intervals of 0.12 inch, more or less prominent monticules, mainly occupied by groups of cells larger than the average. The summits usually appear to be sub-solid, but sections show that this portion of the monticules is occupied by an aggregation of small interstitial cells. Zoecia with sub-circular or polygonal apertures; ten of the ordinary size occur in the length of 0.1 inch.

Both the vertical and tangential sections resemble those of *P. simulatrix* to a marked degree. In fact they are identical in all respects, excepting that the tangential section of *P. conoidea* shows a few spiniform tubuli, and usually fewer interstitial cells, though the maculæ between the groups of large cells are generally of greater dimensions than we find them in such sections of *P. simulatrix*. As the differences in internal structure are so slight, the external characters, such as the form of zoarium and monticules, must mainly be relied upon in distinguishing the two species. In nearly one hundred specimens of *P. conoidea* examined, the small size, sub-conical form, more or less developed monticules; and concave base, are very persistent characters, and sufficient to distinguish specimens of the two species at a glance.

*Formation and locality:* At Oxford mills near Cannon Falls, Goodhue county, associated with *Phyllopora? corticosa*, Ulrich, *Streptelasma corniculum*, Hall, and *Pachydictya conciliatrix*, Ulrich.

*Register No.* 3483.

**PRASOPORA CONTIGUA**, n. sp.

Zoarium hemispheric, base flat or slightly concave, usually one-

half or three-fourths of an inch in diameter, and rarely one inch or more; a single specimen, apparently belonging to this species, is, however, about four inches in diameter. Zoëcia with thin walls and polygonal apertures; nine of the ordinary size occupy 0.1 inch. Groups of cells of somewhat larger size than usual occur at intervals of 0.15 inch. Their diameter rarely exceeds  $\frac{1}{70}$  of an inch. Interstitial cells scarcely detectable at the surface.

Tangential sections show that the zoëcia are polygonal, and thin-walled; that they are in contact excepting at their angles, where one or two small interstitial cells are wedged between them; that in the centre of the groups of large cells there is usually a small aggregation of the interstitial cells; and that a few spiniform tubuli are developed. The tubular opening left by the cystoid diaphragms is of medium size, and more often excentric than central in its position within the tube cavity.

Vertical sections are remarkable mainly, because they exhibit a marked decrease in the number of interstitial cells, when compared with other species of the genus.

The superficial aspect of the celluliferous surface of this species is very much like that of species of *Monotrypa*, and to a less degree, also resembles that of *Prasopora simulatrix*. Still, after a little practice they are readily distinguished by the thinner cell-walls of *P. contigua*. Tangential sections will immediately prove their distinctness. The same species, very slightly modified, occurs in the Cincinnati group at Cincinnati, Ohio, about three hundred feet above the Ohio river.

*Formation and locality:* In the Trenton shales at localities in Goodhue and Dakota counties.

*Register Nos.* 5301, 5989, 5534.

#### DIPLOTRYPA INFIDA, n. sp.

Zoarium discoid, sometimes approaching hemispherical. Base flat or slightly concave; height from one to three tenths of an inch; diameter from one-half an inch to one inch. Zoëcia varying in form from polygonal to sub-circular, the shape depending upon the number and size of the interstitial cells. In some specimens these cells are almost certain to be overlooked, as the

zoëcia are angular and seemingly in perfect contiguity. In others the interstitial cells are large and very obvious between the true zoëcial apertures, which in these specimens are circular. At intervals of 0.15 inch, measuring from center to center, there are conspicuous clusters of zoëcia of larger size than usual, the diameter of the apertures of the ordinary cells being only about 1-110th of an inch, while that of those forming the clusters varies from that size to 1-65th inch. Nine or ten of the ordinary zoëcia occupy the space of 0.1 inch.

Tangential sections vary somewhat in the appearance they present, according to the depth below the surface at which they divide the zoarium. When taken just below the surface of a specimen with angular zoëcial apertures the interstitial cells, although numerous, are small and wedged in between the zoëcia, the walls of the latter being largely in contact with each other. Spiniform tubuli of moderate size are developed at most the points of junction between the zoëcia. At a deeper level the zoëcia are sub-circular, and from their shape alone are necessarily in contact with each other only at limited points. The interstitial cells are, moreover, much larger, and somewhat more numerous than they are in the region just described.

In vertical sections the tubes are everywhere perpendicular to the basal epithelial membrane. Their walls are not excessively thin, being slightly thicker than is usual with species of the genus. The interstitial tubes are more conspicuous in the lower half of the section than in the upper where the true zoëcia are often in contact. That condition is less frequent in the lower region. The diaphragms in the zoëcia are numerous but extremely variable, some being horizontal, some more or less oblique, while others are curved and overlapping, and occasionally present the appearance of short irregular series of cystoid diaphragms. The diaphragms in the interstitial tubes are crowded and horizontal. The thick-walled spiniform tubuli are rather conspicuous in these sections.

It is difficult to determine whether this species has more affinity with *Prasopora* or *Diplotrypa*. The only important character distinguishing the two genera is found in the cystoid diaphragms. These structures are not present in the typical species of *Diplotrypa*, but in *D. regularis*, Foord, the diaphragms are usually

oblique and often curved, while *D. infida* goes but a step farther in having some of them overlap like cystoid diaphragms. In tangential sections, however, the appearances presented are more like those of *Diplotrypa* than *Prasopora*, the interstitial cells being somewhat larger than is usual in the latter genus, and the very striking appearance of the cystoid diaphragms of *Prasopora*, when cut transversely, is either absent or occurs only here and there in isolated instances. So, while the species is undoubtedly intermediate between the two genera, the greater affinity seems still to be with *Diplotrypa*.

*Formation and locality:* In the Trenton shales of Goodhue and Fillmore counties.

*Register No.* 5993.

#### ASPIDOPORA PARASITICA, n. sp.

Zoarium adhering to foreign bodies, upon which it forms thin sub-circular patches usually about one-half an inch in diameter, and from one to three hundredths of an inch in thickness. In a few instances noticed, the shell upon which the zoarium had commenced its growth proved too small, and the under side of the colony, where it projects beyond the encrusted body, is covered by a faintly wrinkled epitheca. Zoœcia with oval or circular apertures, moderately thin walls, and a regular arrangement in curved series around groups of cells larger than usual; about ten of the cells in the spaces between the "clusters" occur in 0.1 inch. Interstitial cells numerous, but, as a rule, they are obscure at the surface and readily overlooked. Spiniform tubuli rather numerous and recognizable at the surface of all well preserved examples.

Vertical sections show the extreme tenuity of the zoarium. The zoœcia are at first somewhat prostrate, but they soon bend upward and open at the surface with direct apertures. One large cystoid diaphragm is, apparently always present at the bottom of the cell, and I do not doubt that with age, a short series of them is developed. The interstitial tubes expand very rapidly above their point of origin, which is just above the basal or epithecal membrane. They are crossed by from five to ten close-set horizontal diaphragms.

In tangential sections the zoecia are sub-circular or oval, and in contact with each other at two, three, or four points, the sub-rhomboidal or irregular spaces intervening being occupied by the interstitial cells. Walls of zoecia thin. Spiniform tubuli of moderate size occur at nearly all the points of contact between the zoecia.

The parasitic habit of the species distinguishes it from all other species of the genus known to me. Otherwise it is closely allied to both *A. newberryi*, (*Prasopora newberryi*, Nicholson) and *A. calycula* (*Diplotrypa calycula*, Nicholson), from the Cincinnati group of Ohio. I know of no associated species sufficiently resembling it to require a close comparison.

*Formation and locality:* Not uncommon in the Trenton shales at Minneapolis, St. Paul and other localities in the state of Minnesota.

*Register Nos.* 5994, 5995.

#### AMPLEXOPORA WINCHELLI, n. sp.

Zoarium irregularly ramose; branches cylindrical, but oftener more or less flattened, and varying in diameter from 0.2 to 0.35 of an inch. Entire height of zoarium, apparently, not more than two inches. Monticules are absent, though, now and then, the surface is very slightly undulating. The cells are small, thick-walled, of nearly equal size, rather irregular in their arrangement, and when well preserved the walls show at the angles of junction the elevated points of the spiniform tubuli. Interstitial cells sparingly developed, or wanting. On an average nine cells occupy 0.1 inch.

In longitudinal sections the tubes in the "immature" or axial region are thin-walled, and crossed by complete diaphragms from one to three tube diameters distant from each other. In the peripheral or "mature" region they bend outward rather abruptly, and proceed directly to the surface. As they enter this region their walls become much thickened; in some sections this thickening of the walls is extreme. As usual, the diaphragms are also more numerous, often crowded, and not infrequently exhibit a tendency to coalesce with each other.

Tangential sections exhibit considerable variation in the thick-

ness of the cell walls. This variability is due, apparently, to the different ages of the specimens sectioned. In the younger examples the thickness of the walls equals about one third of the diameter of the cell-cavity, while in very old specimens the cavity may be reduced by additional deposits of sclerenchyma to a diameter equaling scarcely more than one-third the thickness of the walls. The boundary line between adjoining cells is distinctly defined by a dark line. Each of the angles, and often points between them, are occupied by a spiniform tubulus of medium size. When in a good state of preservation the central lucid spot of the spiniform tubuli is seen to be larger than usual with species of this genus.

In some respects this species is related to the *A. canadensis*, described by Foord from the Black River and Trenton formations of Canada. But the branches of that species are much larger, while the thickness of the cell walls does not approach that observed in matured examples of *A. winchelli*. They also differ in the tabulation and direction of the tubes, as well as in the size and number of the spiniform tubuli. Associated with this is a common species having all the characters, save one, ascribed to *A. superba*, Foord. In the Trenton rocks of Canada the surface of that species presents small monticules. These are wanting in the Minnesota specimens, but as the presence or absence of monticules, especially in the genus *Amplexopora*, is of small importance, I think I am justified in regarding them as specifically identical with the Canadian specimens. The larger cells and more robust zoarium of *A. superba*, readily distinguish that species from *A. winchelli*.

The specific name is given in honor of Prof. N. H. Winchell, the accomplished chief of the survey.

*Formation and locality:* Common in the Trenton shales at Minneapolis, Minn.

*Register Nos.* 5999 to 6001.

### **BATOSTOMA FERTILIS, n. sp.**

Zoarium large, varying from ramose to sub-frondescent, or palmate; branches usually more or less compressed, and varying in thickness from 0.2 to 0.4 inch; width of same, from 0.3 inch



to 1.2 inches; height, so far as observed, not exceeding 2.5 inches. Cell-apertures varying from polygonal to circular, according to the thickness of the walls, and the size and number of the interstitial cells. In some specimens having sub-circular cells and the apertures surrounded by a slight rim, the interstitial cells are very numerous in the depressed inter-zoöcial spaces. This condition is, however, not common, yet in no instance have I found it difficult to recognize the interstitial cells, as they are more or less numerous in all the specimens. Spiniform tubuli numerous but very small, and only rarely presenting their superficial terminations. At intervals of about 0.12 inch, the surface usually presents small sub-stellate maculae, around which the zoöcia are generally somewhat larger than usual. Seven or eight cells of the ordinary size occupy 0.1 inch.

In vertical sections the tubes have thin, and somewhat irregularly fluctuating walls in the axial region of the zoarium. They proceed toward the surface in a gentle curve, and as they near the same, their walls become appreciably thickened, but never to any great extent. The interstitial tubes are abruptly developed, and constricted at the points where they are crossed by the diaphragms. These occur at but slightly shorter intervals than those in the peripheral regions of the true zoöcia, where they are separated by distances equaling from one-third to one tube diameter. In the axial region the diaphragms are either very remote, or more commonly, are entirely absent.

Several tangential sections show that the zoöcia are always more or less angular; that they have thin walls, and often are in contact with each other on all sides, but usually more or less separated by angular interstitial cells; that the interstitial cells are especially developed, both in size and number, at rhythmical intervals corresponding to the small "maculae" observed at the surface; and that the spiniform tubuli, though numerous, are small and only faintly defined, so that, unless searched for, they may be overlooked.

This species is not closely related to either of the other species of the genus now known from the Trenton formation of Minnesota. Both *B. ottawaensis*, Foord, and *B. irrasa*, Ulrich, have, when matured, very thick-walled cells, while those of *B. fertilis*, are, except in rare instances, comparatively thin-walled. Their

internal characters are too distinct to require comparison. A more closely allied species occurs in the upper beds of the Cincinnati group of Ohio, and another in the Utica slate of Canada, and the equivalent formation in Kentucky. As no descriptions of these species have yet been made public, it would be useless to institute comparisons.

*Formation and locality:* Abundant in the lower half of the Trenton shales at Minneapolis and other localities.

### BATOSTOMA IRRASA, n. sp.

Zoarium, consisting of small, sub-cylindrical or compressed, and frequently divided branches, usually less, rarely a little more, than 0.3 inch in their greatest diameter. Cells with polygonal apertures and thin walls when young, and with smaller, oval or sub-circular apertures, and thick walls in the fully matured examples; seven or eight occur in the length of 0.1 inch. The spaces between the cell-apertures appear solid in the mature specimens, but in some of the younger examples, with also angular zoecial apertures, a variable number of irregularly shaped interstitial cells may be recognized. Spiniform tubuli numerous, two or more to each cell; they are large and constitute a conspicuous external feature of mature examples. In such specimens, certain small sub-stellate, smooth spots are most distinct.

Vertical sections show that the tubes have thin and irregular fluctuating walls in the axial region, but less thin than usual; that in this region they are crossed by remote complete diaphragms; that near the surface the diaphragms are nearly straight, but often incomplete and less than a tube diameter apart; that their course from the point of origin to their apertures forms a nearly equally curved line; that their walls become but slightly thickened until just below the surface, where the apertures are contracted by a deposit of sclerenchyma, and many of the walls separate to make room for some very short interstitial tubes or cells, the latter are usually filled by a secondary deposit.

The matured region being very shallow, it is difficult to prepare

satisfactory tangential sections. A very good one shows that the cells just below the surface have thick ring-like walls, that their form is oval or sub-circular, and that they may be in contact or separated by very irregular and unequal interstitial cells, which have been more or less completely filled by an homogeneous deposit of light-colored sclerenchyma. The spiniform tubuli are numerous, and, as is usual in this genus, have the central cavity large and distinct. Where the section cuts the zoarium at a deeper level we observe that the cells were angular and mainly in contact with each other, the interstitial cells being as yet small; while the spiniform tubuli are hardly perceptible.

This very neat species is quite distinct from any heretofore described. In having a few incomplete diaphragms it resembles *B. ottawaensis*, Foord, but otherwise they are quite different. In size of zoarium it approaches *B. implicata*, Nicholson, but the cell walls are not inflected by the spiniform tubuli as in that species, nor do they resemble each other in their vertical sections.

*Formation and locality:* In the lower portion of the Trenton shales at Minneapolis, Minn. In the excavation for the St. Paul and Northern Pacific bridge pier on the eastern bluff of the river, these layers were exposed and many interesting bryozoa were obtained from them. Of these *Pachydictya foliata*, *Stictoporella angularis*, and *S. frondifera* occur on the same slabs of shale with *Batostoma irrasa*.

#### CALLOPORA UNDULATA, n. sp.

Zoarium ramose, branches small, slender, about 0.12 of an inch in diameter, and dividing dichotomously at intervals of about 0.4 inch or more. Surface with rounded monticules, that usually coalesce laterally and form, more or less complete, transverse ridges, five in 0.4 of an inch. In some specimens the monticules are separate, while in a few they are almost obsolete. Zoecia with moderately thin walls, and sub-angular apertures. Interstitial cells comparatively few, very small, readily overlooked. Zoecial apertures nearly equal in size over all portions of the surface; nine occur in the space of 0.1 inch.

In tangential sections the zoecia are oval or sub-angular, the

walls of moderate thickness, and preserving the original line of junction between adjoining cells. Interstitial cells though small, are yet larger and more numerous than one is led to believe from an examination of the exterior. Nearly all the angles of junction between the true zoëcia are occupied by them.

Vertical sections present no marked differences from other species of the genus. In fact the species of *Callopora* are remarkably persistent in their internal structure, and the points mainly to be relied upon in distinguishing the species are external. As usual the tubes are closely tabulated for a short distance above their point of origin in the axial region of the zoarium. Subsequently the diaphragms are remote, and it is only just below their apertures that they are again numerously developed. The interstitial tubes are short and closely tabulated. The tube walls are some what thinner throughout the zoarium than is usual.

Transverse sections present the characteristic features of the genus. In the axial region the zoëcia are of two sizes, the larger being sub-circular or polygonal, and, from their shape, in contact with each other only at limited points. The intervening spaces are occupied by more angular cells in every stage of development so far as size is concerned. At the periphery the tubes are cut longitudinally. Here the walls are of moderate thickness, and divided in the center by a dark line. But few interstitial cells are to be seen in this style of section.

The rounded, transverse ridges or annulations will distinguish this species from any other form of the genus described. When these are, as is sometimes the case, but faintly developed, care must be taken in distinguishing it from a small undescribed species of *Monotrypella*, occurring in the same beds.

*Formation and locality:* Not uncommon in the Trenton shales at Minneapolis Minn.

#### **CALLOPORA INCONTROVERSA, n. sp.**

Zoarium ramose; branches smooth, sub-cylindrical, from 0.18 to 0.30 of an inch in diameter, and dichotomously divided at intervals of about 0.5 inch. Zoëcia with oval or sub-circular, rarely polygonal apertures, and rather thin walls. Small groups of slightly larger size than the average are occasionally present.

These are never conspicuous and occur at irregular intervals. Eight or nine of the usual size occupy 0.1 inch. Some of the apertures preserve the opercula. The central perforation is larger than usual and surrounded by a distinct rim. Interstitial cells generally numerous, but varying somewhat in distribution and number in different specimens.

Tangential sections show that the zoecia are nearly circular or broadly elliptical, that their walls are of moderate, but somewhat variable thickness, and that, usually, they are in contact with each other at as many points as their rounded form will admit. The interspaces are occupied by the interstitial cells. At unequal intervals a few of the latter form small irregular groups. The true zoecia in the immediate vicinity of these groups are also of somewhat larger size than the average.

In vertical sections the tubes form a gradual but rather short curve to the surface. The tabulation and appearance of the proximal ends of the true zoecia, are so much like that of the interstitial tubes that it is reasonable to believe that their functions were also alike. From the point of origin till it has attained nearly its mature size, the tube is crossed by twelve or more closely and regularly arranged diaphragms; when suddenly they cease. Near the surface they again become numerous but irregular, while in the intervening portion they occur only at remote intervals, or are entirely absent.

When in a good state of preservation, even small fragments of this species are readily recognized by the characters above described. In the worn condition they may be confounded with an associated species of *Homotrypa*. Sections will, of course, immediately distinguish them.

*Formation and locality:* Rather rare in the Trenton shales at Minneapolis, Minn.

### **TREMATOPORA PRIMIGENIA, n. sp.**

Zoarium ramose; branches sub-cylindrical or compressed, from 0.06 to 0.12 of an inch in diameter, and dichotomously divided at intervals of 0.2 inch or more; the attached basal expansion is comparatively large, and usually supports several branches;

entire height of branches apparently not exceeding one inch. Superficial aspect of zoecia varying with age. In the younger examples the apertures are oblique, with only the posterior border elevated, and the interstitial spaces of less width than the diameter of the apertures. With age the apertures become somewhat smaller, sub-circular, and more direct, and the peristome or rim nearly equally elevated all around, while the interstitial spaces are widened, till in some examples they are equal to twice the diameter of the zoecial orifice. Most specimens present irregular spots or maculæ, where the zoecia are of larger size than usual and separated by wide interspaces. In some the maculæ form circumscribed, seemingly solid, spots, thus furnishing a conspicuous feature to the surface; while, on the other hand, in a few, otherwise typical examples, only traces of them can be detected. On the whole, therefore, the arrangement of the zoecia is irregular. Diameter of apertures varying from  $\frac{1}{25}$ th to  $\frac{1}{15}$ th of an inch. From ten to fourteen occupy the length of 0.1 inch, but twelve is the prevailing number. As usual with species of the genus, the orifices of the interstitial cells are closed by a membrane. Sections prove them to be numerous, and that they more or less completely isolate the zoecia. Spiniform tubuli very small and generally worn away.

Sections present the usual characters of the genus as restricted by me.\* In the final report on the palæontology of the state, they will be fully described and illustrated. In this communication it will suffice to state that all the essential characters of *Trematopora* are represented.

The large basal expansion, small branches, rounded cell apertures, and the somewhat depressed, wide, and smooth interstitial spaces, and "maculæ," are the distinguishing features of the species.

*Formation and locality:* Common at Minneapolis and other localities of the state, in the Trenton shales.

*Register Nos.* 6010, 6011.

### TREMATOPORA ORNATA, n. sp.

The zoarium of this species, in its growth and general appear-

\* Jour. Cio. Soc. Nat. Hist., vol. vi, p. 257.

ances, so closely resembles that of *T. primigenia*, that a detailed description will scarcely be deemed necessary. They differ as follows: The zoecia of *T. ornata* are more closely, as well as more regularly arranged, the interstitial spaces narrower and more depressed, and the "maculæ" absent. When in a good state of preservation, the elevated border around the apertures is surrounded by a closely arranged series of granules or blunt spines, which impart a very ornamental appearance to the magnified surface. A variable number of somewhat larger spines also occurs in the interstitial spaces. The greater development of the spines is the most obvious and important difference, and when preserved, should distinguish the two species immediately.

I am not entirely satisfied that the generic affinities of the species have been correctly determined. Future investigations may prove it to belong to *Bythopora*, Miller.

*Formation and locality:* Rather rare. Associated with the much more abundant *primigenia*, at Minneapolis, Minn.

#### BYTHOPORA HERRICKI, n. sp.

Zoarium ramose, less than two inches in height; branches slender, cylindrical, from 0.03 to 0.10 of an inch in diameter, and divided dichotomously at intervals varying from 0.3 to 0.5 of an inch. Zoecia arranged in somewhat irregular longitudinal series, with thick walls, narrow and very oblique apertures, the upper end of same being drawn out and shallow. Interspaces or walls sometimes channeled, or with elongate shallow pits. Measured longitudinally about seven cell-apertures occur in 0.1 inch; transversely eight rows occupy 0.05 inch. Spiniform tubuli small, few, and but rarely preserved.

The internal structure of the species has not been determined satisfactorily, being obscured, or entirely destroyed by crystallization. Still the superficial characters of the cells are so much like those of *B. fruticosa*, Miller, the type of the genus, that I feel no hesitancy in referring the Minnesota specimens to the same genus. When in a good state of preservation, *B. herricki* can not be confounded with any of the associated species, the extremely narrow cell-apertures being quite distinctive. The

branches are, besides, more slender and cylindrical than those of *Trematopora primigenia* and *T. ornata*.

*Formation and locality:* Fragments of this species are quite common in the Trenton shales of St. Paul and Minneapolis, Minn.

*Register Nos.* 6012, 6013.

### MONOTRYPELLA MULTITABULATA, n. sp.

Zoarium consisting of irregularly divided, cylindrical or slightly compressed branches, varying in diameter from 0.15 to 0.4 of an inch. Surface usually presenting more or less elevated monticules, at intervals of 0.1 inch, measuring from center to center. In the Minnesota specimens the monticules are often absent, and instead, we find groups of cells of larger size than ordinary. Zoecia polygonal, eight or nine in the space of 0.1 inch; walls rather thin. Interstitial cells not to be detected at the surface. Spiniform tubuli wanting.

In tangential sections the zoecia are seen to be regularly polygonal, in contact at all points of their circumference, and provided with only moderately thickened walls. Further, each is separated from the other by a distinct boundary line, which is often conspicuously thickened where three or more cells come in contact, so as to resemble spiniform tubuli. Here and there occurs a small cell whose nature is doubtful. They are most probably abortive or young, though they may prove to be interstitial.

Vertical sections show that the tubes are provided with an excessive number of diaphragms. In the axial region these structures recur at intervals varying from one to three tube-diameters, while in the peripheral portions of the tubes they are extremely crowded. Many of the diaphragms in this region are slightly curved, and they often join with one another. The duplex character of the walls is preserved throughout the "mature" region, where they are also appreciably thicker than in the axial region. In a few instances the section passes through some small tubes, which present the usual appearance of interstitial tubes.



The distinguishing feature of the species is found in the extremely numerous diaphragms. The thin polygonal cells, and absence of spiniform tubuli, will separate it from the associated ramose bryozoa.

*Formation and locality:* This is a common species in the Trenton formation of Kentucky. It also occurs rather abundantly in the shales at Minneapolis, Lanesboro, and other localities in the state.

## DISTRIBUTION OF SPECIES.

	Cincinnati group.	Trenton shales.	Limestone, Chazy, Black River and Birdseye.	Register No.
1. Stomatopora inflata, Hall		*		5924
2. Berenicea minnesotensis, Ulrich		*		5925
3. Ropalonaria pertenuis, Ulrich		*		5926
4. Arthroclema pulchellum? Billings.		*		5927
5. Helopora divaricata, Ulrich		*		5928
6. Helopora spiniformis, Ulrich		*	*?	
7. Helopora, sp. undesc.		*		
8. Phyllopora? sp. undet.			*	5954
9. Phyllopora? reticulata, Hall		*		5955
10. Phyllopora? corticosa, Ulrich		*		3495
11. Ptilodictya subrecta, Ulrich		*		5929
12. Ptilodictya nodosa, Hall		*		5931
13. Ptilodictya ramosa, Ulrich		*		593J
14. Arthropora shafferi, Meek		*		5932
15. Arthropora simplex, Ulrich		*		5933
16. Stictopora fenestrata? Hall			*	5934
17. Stictopora paupera, Ulrich		*		5935
18. Stictopora fidelis, Ulrich		*		5936
19. Stictopora nicholsoni, Ulrich		*	*?	
20. Stictopora mutabilis, Ulrich		*		5938, 5939, 5956
21. S. mutabilis, var. minor		*		5941
22. S. mutabilis, var. major		*		5940
23. Stictopora, sp. undesc.		*		
24. Stictopora, sp. undet.		*		
25. Phaenopora multipora, Hall		*		5942
26. Stictoporella angularis, Ulrich		*		5943
27. Stictoporella cribrosa, Ulrich		*		5944
28. Stictoporella frondifera, Ulrich		*		5945-5947
29. Pachydictya foliata, Ulrich		*		5948
30. Pachydictya acuta? Hall		*		
31. Pachydictya occidentalis, Ulrich		*		5949
32. Pachydictya fimbriata, Ulrich		*		5950
33. Pachydictya conciliatrix, Ulrich		*		5952
34. Pachydictya, sp. undet.		*		
35. Phyllodictya frondosa, Ulrich		*		5953
36. Ceramoporella, sp. undesc.		*		
37. Ceramoporella? sp. undet.		*		
38. Crepipora impolita, Ulrich		*		5958-5962
39. Cheliporella, sp. undesc.		*		5963, 5964
40. Spatiopora? areolata, Foord		*		5965, 5966
41. Crepipora? sp. undet.	*			
42. Monticulipora wetherbyi, Ulrich		*	*	5967
43. Monticulipora, sp. undesc.		*	*	5968
44. Monticulipora grandis, Ulrich		*		5969
45. Homotrypa minnesotensis, Ulrich		*		5970-5975
46. Homotrypa exilis, Ulrich		*		5976
47. Homotrypa insignis, Ulrich		*		5977-5979
48. Homotrypa subramosa, Ulrich		*		5980
49. Homotrypa, sp. undet.		*		
50. Homotrypa? sp. undet.		*		
51. Homotrypa, sp. undesc.	*	*		
52. Homotrypella instabilis, Ulrich		*		5925, 5981, 5982
53. Atactoporella, sp. undesc.		*		5983, 5984
54. Atactoporella, sp. undesc.		*		5985
55. Prasopora simulatrix, Ulrich		*		4041, 5124, 5532
56. Prasopora conoidea, Ulrich		*		5986, 5987, 5988
57. Prasopora contigua, Ulrich		*		3483
58. Prasopora, sp. undesc.		*		5301, 5534, 5989
59. Diplotrypa infida, Ulrich		*		310, 5990-5992
60. Aspidopora parasitica, Ulrich		*		5993
61. Amplexopora superba, Foord		*		5994, 5995
62. Amplexopora winchelli, Ulrich		*		5996-5998
63. Amplexopora, sp. undesc.		*		5999-6001

DISTRIBUTION OF SPECIES—*Concluded.*

	Cincinnati group.	Trenton shales.	Limestone, Cbezy, Black River and Birseeye.	Register No.
64. Amplexopora, sp. undet.....		*		
65. Batostoma ottawaensis, Foord.....		*		6002
66. Batostoma irrasa, Ulrich.....		*		
67. Batostoma fertilis, Ulrich.....		*		
68. Batostoma, sp. undesc.....		*		
69. Batostoma? sp. undet.....		*		
70. Batostoma sp. undet.....		*		
71. Batostomella gracilis, Nicholson.....	*			
72. Batostomella sp. undesc.....		*		5541, 6009
73. Trematopora primigenia, Ulrich.....		*		6010, 6011
74. Trematopora ornata, Ulrich.....		*		
75. Bythopora herricki, Ulrich.....		*		6012, 6013
76. Bythopora, sp. undesc.....		*		
77. Bythopora? sp. undesc.....		*		
78. Callopora, sp. undesc.....		*		6014
79. Callopora, sp. undesc.....		*		6015
80. Callopora incontroverta, Ulrich.....		*		Not entered.
81. Callopora undulata, Ulrich.....		*		..
82. Idiotrypa, sp. undesc.....		*		..
83. Dekayia trentonensis, Ulrich.....		*		..
84. Dekayia, sp. undesc.....		*		..
85. Dekayella ulrichi, ? Nicholson.....		*		..
86. Dekayella, sp. undesc.....		*		..
87. Petigopora petechialis, Nicholson.....		*		..
88. Petigopora, sp. undet.....		*		..
89. Leptotrypa, sp. undesc.....		*		..
90. Monotrypella multitabulata, Ulrich.....		*		..
91. Monotrypella, sp. undet.....		*	*	
92. Monotrypa, sp. undesc.....		*		

REMARKS UPON THE NAMES CHEIROCRINUS AND  
CALCEOCRINUS, WITH DESCRIPTIONS OF  
THREE NEW GENERIC TERMS  
AND ONE NEW SPECIES.

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BY E. O. ULRICH.

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In 1860, in the thirteenth report of the regents of the N. Y. State University, Prof. James Hall proposed the generic name *Cheirocrinus* for a very anomalous group of palæozoic crinoids. Unfortunately this name had already been proposed in 1856, for a genus of cystideans by Eichwald\*, and in 1859 Salter† applied the same name to a species apparently congeneric with the species defined by Hall. The subject is complicated still further by the fact that in 1852 Hall‡ applied the name *Calceocrinus* to some triangular crinoidal plates, now supposed to be the basal piece of a crinoid belonging to the same group as those subsequently referred by the same author to *Cheirocrinus*. So far as I have been able to ascertain, this supposition has not yet been verified, and rests solely upon the resemblance first suggested by Shumard. Admitting the resemblance, I would still protest against the use of *Calceocrinus* instead of *Cheirocrinus*, for the following reasons: (1) According to modern rules of nomenclature, *Calceocrinus* cannot be regarded as an established genus, since it was not founded upon a named nor described species. (2) The triangular plates so designated may belong to any one of at least three distinct generic groups, and as these basal pieces are so nearly alike in all, it is quite impossible to determine from

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\*Bullet, Soc. Nat. Moscou, p. 69.

†Siluria, 3d edit., p. 535.

‡Pal. N. Y., vol. II, p. 352.

the description and figure, for which of the groups the name would be entitled to stand, in case the first objection is ruled out.

After a careful examination and comparison of the various species of this peculiar family of crinoids now known, I have come to the conclusion that they fall naturally into three distinct and easily distinguished groups. These are separated by such well-marked and constant characters that I feel justified in regarding them as of generic importance. Had I found it possible to determine to which, if any, of these three genera the original specimens of *Calceocrinus* belong, I would have been willing to overlook the objections raised against the use of that name. Being, however, unable to do so, I am obliged to ignore it, when dealing with species whose characters are sufficiently known to make their generic affinities clear, while I would suggest that the name be used temporarily for the reception of such species as are too little known to admit of unquestioned classification, and yet are unequivocal members of the family.

The classification proposed is briefly defined as follows:

#### CREMACRINIDÆ, n. fam.

Natural position of body and arms drooping. Basal plate subtriangular, composed of several anchylosed pieces, and articulating with the body plates in such a manner as to allow of more or less movement. Columns attached to the lower angle of the basal piece. Plates of body unsymmetrical, consisting on the dorsal side of two large dorso-lateral pieces, and two often much smaller central plates; on the ventral side of three generally completely anchylosed pieces which form an arch adapted to the shape of the movable basal piece. Arms unequal, but developed symmetrically on each side of a centro-dorsal arm, usually much the strongest. Ventral tube long; its supporting plates rest upon the ventral arch.

(Figs. 1, 2 and 3.)

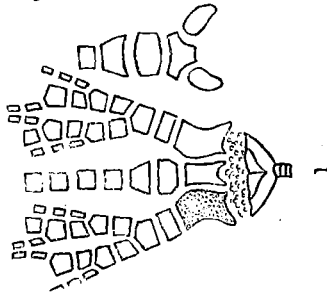
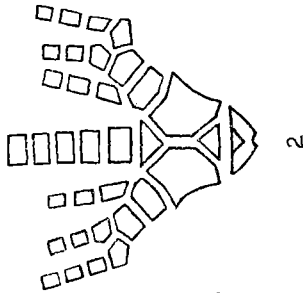
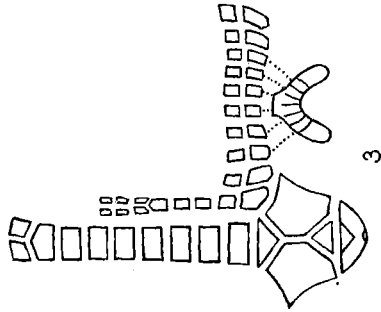


Fig. 1. Diagram showing structure of body and arms of *Cremacrinus punctatus*, n. gen. et sp.

Fig. 2. Diagram showing structure of *Deltacrinus*, n. gen.

Fig. 3. " " " *Halysiocrinus*, n. gen.

**CREMACRINUS**, n. gen.**Cheirocrinus**, Hall, (non Eichwald.)

Base composed of four anchylosed pieces which together form a sub-triangular or semi-elliptical plate, and to the lower angle of which the round column is attached. Body above the base composed of seven plates, four on the dorsal and three on the ventral side. The dorsal plates are separated from the basal piece by a large number of minute plates, seeming to have been imbedded in an articulating ligament. The lower centro-dorsal plate is more or less narrow and separates the two dorso-lateral plates. The upper central plate varies in form from sub-triangular to transversely oblong-subquadrate, and rests upon the lower central, and the upper sloping<sup>g</sup> faces of the dorso-lateral pieces. The latter are much larger than the central plates, higher than wide, subquadrate or sub-rhomboidal in outline, and curved in their upper half around toward the ventral side. The outer margin of each is concave and articulates with one of the sub-ovate lateral pieces of the ventral side. These two pieces incline toward each other, and with the central piece of this side form an arch that corresponds in outline with the lower margin of the basal plate. The central piece is larger than the sub-oval lateral pieces, wider above than below, and four-sided or hexagonal. It supports a series of large but rapidly diminishing plates that form the posterior side of a long and slender ventral tube. The dorsal arm is strong and simple, and rests upon the upper central piece of the body. The first piece of each of the two lateral rays is supported by the upper side of the dorso-lateral plates. The second piece is axillary and supports two equal arms, which are more or less divided above, the divisions being, however, apparently always unequal.

Type: *C. punctatus*, n. sp.

**Cremacrinus punctatus**, n. sp.

Body small, compressed antero-posteriorly. Basal piece sub-triangular, nearly three times as wide as high, straight along the upper margin, faintly convex on the lower sides, and pointed at the lateral extremities. It is composed of four unequal and

completely anchylosed pieces; the combined outline of the two small upper pieces, which are separated by an impressed central suture, is about parallel with that of the whole piece. The column is small and round, and attached to the slightly truncated lower end. The space between the basal piece and the dorsal plates is filled by numerous small and irregularly distributed plates. The body above the base is comparatively short, about 0.4 inch wide at a point near the middle of the lower half, 0.3 inch at the top, and about 0.2 inch high.

The dorso-lateral plates are sub-quadrate in outline, with all the margins excepting the upper one slightly curved; the upper half is deflected back toward the ventral side. The convex lower centro-dorsal plate extends nearly to the top of the dorso-lateral pieces, is slightly concave on each side, and strongly so below, where the two sides are drawn down into spine-like prolongations; the lower and inner angle of the dorso lateral plates is similarly prolonged, so that the basal line of these plates forms a sigmoid curve. The lower centro-dorsal plate is about 0.1 inch wide below, very slightly narrower above, and about twice as long. The upper centro-dorsal piece is nearly twice as wide as the lower piece, upon which, and the short sloping upper sides of the dorso-lateral plates it rests. It is twice as wide as high, transversely oblong in outline, rather prominent, and apparently, not anchylosed to the other plates of the body. The ventral arch consists of three plates, a sub-triangular central, and one smaller tumid sub-oval plate on each side. Resting on the central piece is the first of a series that supports the long ventral tube. The first and second pieces of this series are large and strongly convex, but the following ones are considerably smaller.

Dorsal arm strong, sub-cylindrical, apparently simple, and composed of pieces that are about as long as wide, and of which six occur in 0.5 inch. The first piece tapers upward and is of the same height as the succeeding ones. Lateral arms two, one on each side, not as strong as the dorsal ray. The first radial rests upon the upper sloping side of the dorso-lateral plate, and is twice as wide as high. The second is slightly higher, pentagonal, and supports two equal divisions of the ray. Beyond this the arms do not bifurcate, but each second piece throws off



a long slender armlet. These occur alternately on each side of the arm, and give it a slightly zigzag appearance. The arm-pieces are rounded, about as high as wide, and provided with a deep ambulacral furrow within. Entire length of arms at least two inches.

Surface of all the plates covered with rather large and deep punctae, just visible to the unaided eye.

The punctate surface will distinguish this species from the other forms referred to this genus. The centro-dorsal pieces, (especially the lower,) are also large, and the body shorter than in those species. I have seen specimens of a species with similarly punctate plates, from the Trenton limestone at Dixon, Ill. In that species, however, the dorsal arm is much smaller than the lateral ones, while the form of the body and its plates is quite different from those of *C. punctatus*.

The fine specimen from which the above description is drawn, was discovered by Mr. Frank C. Shenahon, and very generously presented by him to the author, in whose cabinet it now is.

*Formation and locality:* Trenton shales, at Finn's Glen, near Minneapolis, Minn.

#### **DELTACRINUS, n gen.**

Basal piece triangular, composed of several anchylosed pieces. Dorsal side of body above the base composed of four more or less firmly united plates. The lower central plate is triangular and entirely separated from the upper triangular piece by the large lateral plates which unite along the central line. Plates of ventral side not determined. Dorsal arm strong, simple or divided. The first piece is the largest and rests upon the upper centro-dorsal plate. The lateral arms are two on each side. The outer one is the strongest, and divides into two equal rays on the second piece. The first plate of the smaller inner arm is cuneate below and rests upon the inner lateral sloping face of the first radial of the outer arm.

Column round, attached to the lower and inner portion of the basal piece.

Type: *Cheirocrinus clarus*, Hall, Hamilton gr.

**HALYSIOCRINUS**, n. gen.

In the formation of the dorsal side of the calyx, this genus is precisely *Deltacrinus*. The only difference of importance so far detected is found in the number of arms. In *Cremacrinus* we have three primary radials, and in *Deltacrinus* five, while the species for which the above generic term is proposed have eleven,\* one large central arm on the dorsal side, and ten smaller ones, the first pieces of which project abruptly outward, and extend in a curved series, transversely around the ventral side. Their inner ends articulate with the ventral arch. All the arms may bifurcate one or more times.

Column round, attached to the slightly truncated lower extremity of the sub-triangular basal piece.

Type: *Cheirocrinus dactylus*, Hall, Burlington limestone.

Aside from *Calceocrinus*, the first notice of American species of this family of crinoids is found in the 13th Regents Report already referred to, in which Hall defines the preoccupied name *Cheirocrinus*, with the following species: *C. chrysalis*, Niagara gr., *C. ventricosus* and *C. dactylus*, Burlington gr., *C. tunicatus* and *C. nodosus* from the Keokuk gr. He also proposed *C. lamellosus*, but until the species for which it is proposed is better described, I am not inclined to recognize the name.† He gives figures of *C. chrysalis*, *C. dactylus* and *C. tunicatus*. In the 15th Regents Report, N. Y., for 1862, he defines and illustrates *C. clarus* from the Hamilton gr., and in 1863, in the Trans. Alb. Inst., vol. iv, *C. stigmatus* is described from the Niagara gr. at Waldron, Ind. Shumard describes *C. perplexus* in 1866, in the Trans. St. Louis Acad. Sci., from strata, supposed to be equivalent to the Keokuk limestone. In 1869, Meek and Worthen describe *C. wachsmuthi* and *C. bradleyi* in the Proc. Acad. Nat. Sci., Phil., the former from the Burlington limestone, the latter from the Keokuk group. Both these species are redescribed and illustrated in vol. v, Geol. Sur., Ill. In 1875, (Geol. Sur., Ill., vol. vi) Worthen describes and figures the body of a Devonian

\*So far as the means at hand will admit the determination of this point, all the species referred to the genus, appear to have had eleven arms. The number of lateral and ventral arms might, however, be found to vary in different species.

†Hall's description reads as follows: "Body unknown. Arms with strong lamellose extensions at the joints. Burlington limestone."

species under the name of *Calceocrinus? barrisi*. In 1882, Ringueberg describes and illustrates, (Jour. Cin. Soc. Nat. Hist., vol. v,) *Calceocrinus radículus* from the Niagara gr. In the 35th Reg. Rep., N. Y., Walcott illustrates and describes *Calceocrinus barrandei* from the Trenton gr. So far as known to me there are only two other species described from American rocks belonging to the *Cremacrinidae*. These are the *Heterocrinus inaequalis* and *H. articulatus* of Billings from the Trenton rocks of Canada, and described and figured by that author in 1859, in the Can. Org. Rem., Decade iv. Of the sixteen species above enumerated, *C. ventricosus*, Hall, *C. perplexus*, Shumard, *C. barrisi*, Worthen and *H. articulatus*, Billings, are too little known to make their reference to any of the three groups proposed certain, and I leave them in the dubious genus *Calceocrinus*, where they have been placed by Mr. S. A. Miller.\* The last is most probably founded upon one of the lateral arms of a *Cremacrinus*, while the others may belong either to *Deltacrinus* or *Halysiocrinus*. The twelve species remaining divide up as follows:

*C. chrysalis*, Hall, *C. inaequalis*, Billings, *C. barrandei*, Walcott, and *C. radículus*, Ringueberg, agree with *Cremacrinus punctatus*, Ulrich, in having three primary radials, and the dorso-lateral plates entirely separated by the central pieces. In *C. barrandei* and *C. radículus* the lower centro-dorsal plate is narrow-wedged shaped, and almost pointed above where it articulates with the upper central piece. This plate is wider in *C. punctatus* than it is in any of the other species here referred to *Cremacrinus*, but the separation of the large dorso-lateral plates is nevertheless complete in all. This character and the limited number of primary radials are the distinguishing features of the genus. All the species are Silurian.

The proposed genus *Deltacrinus* will include *C. clarus*, Hall, the type species, *C. stigmatus*, Hall, *C. bradleyi*, M. & W., and very likely *C. tunicatus*, Hall. These species all agree in having the dorso-lateral plates join along the central line of the body. The lower centro-dorsal plate is wide and depressed triangular, the form being quite different from that of the equivalent piece

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\*Amer. Pal. Foss., p. 72 and 73.

in *Cremacrinus*. The form of the upper central plate resembles the lower in every particular, excepting that the lateral angles are usually obtuse. The arms are known of *C. clarus* and *C. bradleyi* only, but Hall's figures of *Calceocrinus stigmatus* in the 28th Reg. Rep. N. Y., show the articulating scars for the first arm pieces very distinctly and leave little room to doubt that the arms of that species are like those of *C. clarus*. In this species the arms are primarily five, consisting of the large centro-dorsal one, which may be divided once or remain simple throughout, one somewhat smaller lateral arm on each side, and between each of these and the dorsal arm, one still smaller, and differing from the lateral arms, whose second piece is axillary and supports two equal divisions of the ray, in remaining simple throughout, or, at any rate, for a longer distance. These medio-lateral arms are further peculiar because their first piece rests mainly upon the side of the first radial of the lateral arms. Aside from them the arms of *Deltacrinus* do not differ from those of *Cremacrinus*. They furnish, therefore, one of the principal differences between the two genera.

There are at least three American species that have the characters ascribed to *Halysiocrinus*. These are the *C. dactylus* and *C. nodosus*, Hall, and the *C. wachsmuthi*, M. & W., the first and last from the Burlington limestone, and the second from the Keokuk gr. Beside these the *Cheirocrinus gothlandicus* of Angelin, is an unquestionable member of the genus, and Prof. A. H. Worthen will illustrate in the forthcoming vol. viii, of the Ill. Geol. Sur., two specimens from the Keokuk, which resemble the *C. nodosus*, but may prove specifically distinct. In the construction of the body, and in the possession of a strong dorsal arm, these species do not differ from *Deltacrinus*. The lateral arms, however, differ conspicuously from all the species of both *Cremacrinus* and *Deltacrinus*, in being much more numerous, sub-equal and in extending completely around the ventral side. The primary piece of the first of these lateral arms, and a portion of the first piece of the second, rest upon the upper side of the dorso-lateral plate, while the primary pieces of the remaining six ventral arms project abruptly outward, and their inner surfaces or ends articulate with the anchylosed ventral arch. The ventral arms give to these crinoids a very

different appearance from that presented by the more simple species of *Cremaerinus* and *Deltacrinus*. In my opinion they constitute an important deviation from the types of those genera, and fully warrant generic separation. The range of the genus is from the upper Silurian, (*H. gothlandicus*, Ang. sp.,) to the Keokuk group. The Devonian formation is, however, not represented, the other species of the genus known being all from sub-carboniferous deposits.

According to the classification here proposed, the species discussed will be arranged as follows:

**CREMACRINIDAE**, n. fam.

**CREMACRINUS**, n. gen.

- C. punctatus*, Ulrich. Trenton group. (type of genus.)
- C. inaequalis*, Billings. " "
- C. barrandei*, Walcott. " "
- C. radculus*, Ringueberg Niagara, gr.
- C. chrysalis*, Hall.

**DELTACRINUS**, n. gen.

- D. clarus*, Hall. Hamilton gr. (Type of genus.)
- D. stigmatus*, Hall. Niagara gr.
- D. bradleyi*, Meek and Worthen, Keokuk gr.
- D. ? tunicatus*, Hall.

**HALYSIOCRINUS**, n. gen.

- H. dactylus*, Hall, Burlington gr. (Type of genus.)
- H. wachsmuthi*, M. & W. Burlington gr.
- H. nodosus*, Hall, Keokuk gr.
- H. gothlandicus*, Angelin, Upper Silurian.

**CALCEOOCRINUS?** Hall.

- C. articulatus*, Billings, Trenton gr.
- C. barrisi*, Worthen, Hamilton gr.
- C. ventricosus*, Hall, Burlington limestone.
- C. perplexus*, Shumard, Keokuk gr.

#### IV.

### CONCHOLOGICAL NOTES.

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BY U. S. GRANT.

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A number of shells from various parts of the state have been collected by the geological and natural history survey at different times, but no attempt has been made to obtain a series of specimens illustrating the molluscan fauna of the state. The shells thus obtained were unpacked and classified during the last summer. They are mostly bivalves and are all "dead," thus furnishing only a few good museum specimens, but giving a number of localities. Last summer one week was spent by the writer in collecting in the vicinity of Minneapolis; a few species were added to the collection already obtained, but no thorough search was made; if more time could have been used a much larger number of species probably would have been found. Hennepin county does not seem to be a good locality for land forms and very few were obtained. There are now some eighty species in the University Museum.

The writer wishes to obtain for the survey as many specimens as possible representing different localities. Any shells, even the most common, will be gladly received, and there are quite a number of duplicates to exchange with those who desire. Any of our lakes will furnish several species, and on the muddy banks and sand-bars of the rivers can be found large numbers of fresh-water clams. At low water the sand-bars will in some places be almost covered with dead shells; the live ones will be found in muddy more commonly than in sandy bottoms. As an example of the abundance of fresh-water mollusks in this state, it can be said that thirty species were found in the Minnesota river at Ft. Snelling, and very likely more could have been procured by farther search. It is probable that other rivers of the state can furnish as large a number of species as the Minnesota.

In the following an attempt has been made to give the species so far collected, and the localities, especially those most widely separated. All species and localities can be referred to specimens in the University collection or in that of the writer. It is hoped that more interest may be taken in the shells of the state and that the survey may be aided in acquiring a complete series of the mollusks of Minnesota.

The survey is indebted to the kindness of professor R. Ellsworth Call for the classification of most of the Unionidæ. Descriptions of all of this family could not be easily obtained, and even if the necessary books were handy, the aid of a specialist would be needed in the classification of this family. Prof. Call has also kindly helped in the verification of some of the gasteropoda.

## LAMELLIBRANCHIATA.

### Family UNIONIDÆ.

*Anodonta corpulenta*, Cooper.—Five or six specimens were obtained in the Minnesota river at Ft. Snelling; only one of them was adult; this approaches *A. grandis* in size, but is much higher in proportion to its length than is *A. grandis*; this specimen is 4 inches high and  $5\frac{3}{4}$  in length. 1496. (These numbers refer to the Zoological Register of the museum.)

*Anodonta edentula*, Say.—Red river, Wilkin county, and Minnesota river at Granite Falls. This shell is heavier in proportion to its size than any of our other species of this genus. 1441, 1548.

*Anodonta ferussaciana*, Lea.—Only one specimen has been collected and this was found in the Rum river at Anoka; it measures  $1\frac{1}{2}$  inches in length and  $\frac{1}{3}$  in height. 1511.

*Anodonta grandis*, Say.—Rollingstone creek, Minnesota City, and Zumbro river, Wabasha county. This is the largest species of the genus found in Minnesota; it will probably be found quite commonly in some localities. 1589, 1590.

*Anodonta imbecilis*, Say.—Very abundant in the Minnesota river at Ft. Snelling; a very pretty fragile shell with bright green epidermis, sometimes having faint darker green radiations; the largest specimens found are nearly  $2\frac{3}{4}$  inches long. 1497.

*Margaritana complanata*, Barnes.—One young shell was found

in the Minnesota river at Ft. Snelling. This species grows to be very large, sometimes measuring over 17 inches in circumference, and not more than 2 inches in width. 1498.

*Margaritana confragosa*, Say.—This peculiar species has been found only in the Minnesota river at Ft. Snelling; two young specimens were procured and one very fine adult, which is  $4\frac{1}{2}$  inches long and  $3\frac{1}{2}$  inches high. This locality is believed to be the most northern from which the shell has been reported, and the first time from Minnesota. 1493.

*Margaritana marginata*, Say.—Found in the Minnesota river at Granite Falls, and the Mississippi at Ft. Snelling; no full grown specimens are yet in the museum. 1540.

*Margaritana rugosa*, Barnes—Only one specimen is in the museum; this is about one third grown and was found in the Minnesota river at Granite Falls. The posterior end of this species has a number of peculiar folds that are more distinct near the top of the shell; the nacre is usually of a delicate cream-color. 1541.

*Unio æsopus*, Green.—Common in the Mississippi river, Dresbach, Winona county. This shell is characterized by a single row of elongated tubercles on each valve extending from the umbone to the lower margin; these tubercles are more in number and not so conspicuous as those on *U. cornutus*. 1480.

*Unio alatus*, Say.—Red river, Wilkin county; Mississippi river, Winona county; lake Pepin; common in the Minnesota river at Granite Falls and at Ft. Snelling. Three alate species of this genus have been found in the state, *alatus*, *levissimus*, and *gracilis*; the first two have a red nacre and are of nearly the same size, but the first is a much heavier shell and has stronger teeth; *U. gracilis* is smaller than the others, the epidermis is much lighter in color and is rayed with green, and the red nacre is generally confined to the dorsal portion of the shell. These three species occur quite commonly in the Minnesota river at Ft. Snelling, but more specimens of the last were procured than of the others. 1436, 1472, 1495, 1542.

*Unio anodontoides*, Lea.—Very abundant in the Minnesota river at Ft. Snelling. A pretty, long, salmon-colored shell; the epidermis has a number of dark rays, but sometimes the rays are nearly obsolete. 1505.



*Unio cornutus*, Barnes.—Lake Pepin; Mississippi river, Winona county; Minnesota river, Ft. Snelling. This species has not been found very abundantly, but is quite common in Lake Pepin; it is easily recognized by a row of large tubercles on each valve; they extend from the umbone to the lower margin and the largest are raised about a quarter of an inch from the surface of the shell. (See *U. æsopus*.) 1430, 1481, 1506.

*Unio ebenus*, Lea.—Very abundant in the Mississippi river at Dresbach, Winona county, but has not been found elsewhere. 1484.

*Unio elegans*, Lea.—Only one specimen is in the museum, and this came from the Minnesota river at Ft. Snelling. A very pretty shell with numerous radiations. 1500.

*Unio ellipsis*, Lea.—Common in the Mississippi river at Dresbach, Winona county. 1482.

*Unio gibbosus*, Barnes.—Minnesota river at Ft. Snelling; not common. This species is similar in shape to *U. rectus*, but can be distinguished from it by the coarser undulations on the umbones and by the heavier lateral teeth. The nacre is usually red. 1504.

*Unio gracilis*, Barnes.—Abundant in the Minnesota river at Ft. Snelling. This shell is oblong and quite fragile and has a light-olive epidermis. The largest specimens obtained are  $4\frac{1}{2}$  inches long. (See *U. alatus*.) 1499.

*Unio graniferous*, Lea.—One dead shell was found in the Mississippi river at Ft. Snelling. 1533.

*Unio Lacrymosus*, Lea.—Two specimens are in the museum; one from the Red river, Wilkin county, and the other from the Minnesota river, Ft. Snelling. The latter is  $2\frac{3}{8}$  by  $2\frac{1}{4}$  in. 1435, 1518.

*Unio levissimus*, Lea.—Common in the Minnesota river at Ft. Snelling. The shell is very thin and has a shining epidermis. (See *U. alatus*.) 1494.

*Unio ligamentinus*, Lamarck. Lake Pepin; Mississippi river, Winona county; common in the Minnesota river at Granite Falls. The specimens from Winona county are very heavy: the largest is 5 inches long. 1477, 1545.

*Unio luteolus*, Lamarck.—Mississippi river, Brainerd; lake Minnewaska, Pope county; White Bear lake; Minnehaha creek,

Hennepin county; Red river, Wilkin county; Mississippi river, Winona county; Rollingstone creek, Minnesota city; lake Minnetonka; Minnesota river, Ft. Snelling; Mississippi river, Anoka county; Rum river, Anoka. This is our most common species and is usually found very abundantly. It is extremely variable. Those found in the lakes in the vicinity of Minneapolis are quite small, fragile, and much eroded, and the radiations are nearly obsolete. The heaviest and largest yet found are from Ft. Snelling; some of these are 5 inches long. The young shells are very beautifully rayed with green. 1423, 1425, 1434, 1443, 1454, 1474, 1485, 1491, 1502, 1509, 1512, 1569.

*Unio metaneros*, Rafinesque.—Mississippi river, Dresbach, Winona county; Minnesota and Mississippi rivers, Ft. Snelling; rather common in Lake Pepin. This shell has a large ridge extending from the umbones to the basal posterior margin. 1476.

*Unio occidentens*, Lea.—Rather common in the Mississippi river at Dresbach, Winona county. 1478.

*Unio parvus*, Barnes.—About a dozen specimens were found in the Minnesota river at Fort Snelling; the largest is less than an inch long. This is the smallest species of the genus yet found in the state. 1508.

*Unio plicatus*, Le Sueur.—Mississippi river, Dresbach, Winona county; Minnesota river at Ft. Snelling and Granite Falls; Lake Pepin. Rather common in these localities. (See *U. undulatus*.) 1473, 1517, 1546.

*Unio rectus*, Lamarck.—Mississippi river, Brainerd; Red river, Wilkin county; Rum river, Anoka county; Minnesota river, Granite Falls; Mississippi river, Winona county. This species is common and in some places abundant. It is a long straight shell; some of the adults are  $5\frac{1}{2}$  in. long and  $2\frac{1}{2}$  high. (See *U. gibbosus*.) 1422, 1433, 1503, 1546.

*Unio rubiginosus*, Lea.—One specimen from the Red river, Wilkin county, is in the museum. 1437.

*Unio securis*, Lea.—Lake Pepin; Mississippi and Minnesota rivers at Ft. Snelling. Not common, a very pretty straw-colored shell with fine radiations and dark blotches, which are arranged in rows from the umbones to the lower margins. 1516.

*Unio solidus*, Lea.—One specimen was found in the Mississippi river at Ft. Snelling. 1513.

*Unio trigonus*, Lea.—Common in lake Pepin and in the Minnesota river at Ft. Snelling. The largest specimens are  $2\frac{1}{2}$  inches by 2. 1521.

*Unio tuberculatus*, Barnes.—Minnesota river at Granite Falls and at Ft. Snelling; Mississippi river, Dresbach, Winona county. This species has not been found to be very common in the localities named. Almost the entire shell, except the posterior portion, is covered with small tubercles. The largest specimen is 5 inches long and  $2\frac{3}{8}$  high. 1514, 1543, 1588.

*Unio undulatus*, Barnes.—Common in the Red river, Wilkin county. This shell resembles *U. plicatus*, but is much thinner; it will probably be found to be rather common. The posterior half of the shell is covered with undulations that run from the umbones obliquely to the lower and posterior margins; these undulations also exist on *U. plicatus*. 1442.

*Unio ventricosus*, Barnes.—Mississippi river, Brainerd; Red river, Wilkin county; Rum river, Anoka county; Minnesota river at Granite Falls and Ft. Snelling. This is a very common species and widely distributed. The specimens from the Rum river are dark-colored and beautifully rayed with green, while those from the Red river are straw-colored and the radiations are nearly obsolete. 1424, 1439, 1510, 1515, 1544.

*Unio zigzag*, Lea.—Rather common in the Minnesota river at Ft. Snelling; the largest specimen is 1 inch long and  $\frac{1}{16}$  high. This is a very pretty little shell beautifully marked with dark-green. 1501.

#### CORBICULADÆ.

*Sphærium occidentale*, Prime.—This species has been found only at Minneapolis, and is not at all common. This family contains quite small bivalves; those found in Minnesota are usually less than half an inch long. 146.

*Sphærium partumeium*, Say.—Found only at Minneapolis. 1566.

*Sphærium rhomboideum*, Say.—Only one specimen in the museum; this came from lake Bertram, Wright county. 1565.

*Sphærium striatinum*, Lamarck.—This species is so far found to be the most common of the genus in this state; it is very common in Minnehaha creek; Minnesota river at Ft. Snelling; and Mississippi and Rum rivers, Anoka county; two specimens

were obtained in lake Bertram, Wright county. This species varies considerably in size, color and thickness; one of the specimens from Wright county is much the largest in the museum; it measures  $\frac{5}{8}$  inch in length. 1537, 1538, 1564.

*Sphærium transversum*, Haldeman.—Common in the Minnesota river at Ft. Snelling. This is the smallest bivalve yet found in the state, being only .15 inch long. 1520.

## GASTEROPODA.

### HELICIDÆ.

*Hyalina arborea*, Say—Quite common in the vicinity of Minneapolis; found associated with *Patula striatella*. It is a pretty shining little shell, measuring about  $\frac{3}{16}$  of an inch in diameter. 1459.

*Helicodiscus lineatus*, Say.—Rather common in Hennepin county. This is a small flat shell with one or two small white teeth within the mouth. 1438.

*Patula alternata*, Say.—Common in Hennepin county; under stones on Nicollet island this shell is very abundant. This is our only large Helix that has reddish-brown blotches on the epidermis; adult specimens are  $\frac{3}{4}$  inch in diameter. 1432.

*Patula striatella*, Anthony.—This is the most abundant land shell in Hennepin county. It is found in almost every damp place under chips and logs; some of the larger specimens are .23 inch in diameter. The surface of the shell is covered with ribs. 1534.

*Strobila labyrinthica*, Say.—Rather common in Hennepin county. Most of the specimens collected are "dead" shells. 1455.

*Stenotrema monodon*, Rackett.—Two specimens have been found on the University campus; the largest is .35 inch in diameter. This is a brown shell and quite thick for its size; there is a long narrow white tooth on the inside edge of the mouth. 1461.

*Mesodon multilineata*, Say.—Found near White Bear lake; common in the vicinity of Minneapolis. This shell is readily distinguished from all others of the family in this state by its size and by the numerous revolving reddish-brown lines. Two specimens were found entirely lacking the revolving lines. This

species can be found crawling about on the ground in damp woods. 1449, 1466.

*Vallonia pulchella*, Muller.—Found very abundantly under logs on one corner of the University campus, but has not been found elsewhere. This is a small white shell, almost transparent, and the lip is thick and quite broad. The largest specimens are a little more than  $\frac{1}{10}$  inch in diameter. 1469.

*Cionella subcylindrica*, Linnæus.—About twenty specimens have been found near Minneapolis. This is one of our prettiest land shells; the epidermis is shining light-brown, and there is a reddish line on the lip. The shell is .26 inch long and .03 in diameter. 1470.

*Succinea obliqua*, Say.—Only collected at Minneapolis, where it has so far been found to be rather rare. This species and the next are very pretty delicate shells; sometimes they are found in great numbers on the under sides of the leaves of large weeds. This shell varies from amber-colored to pale, yellowish-green; sometimes the apex has a slight tinge of red, but no specimens in the museum are thus colored. It is the largest shell of this genus found in Minnesota; the largest specimen collected is over three fourths of an inch long. 1467.

*Succinea ovalis*, Gould.—Found as yet only in Hennepin county, not so rare as the preceding, but still not common. It is much more elongated and delicate than *S. obliqua*, and has a more beautiful amber color. This shell is found on the borders of streams and ponds in damp shady places. The largest shell of this species in the museum is  $\frac{5}{16}$  of an inch long. 1468.

#### AURICULIDÆ.

*Carychium exiguum*, Say.—The smallest shell yet found in the state; it measures only .07 in. in length and .03 in diameter. This shell has been mistaken many times for a shell belonging to the genus *Pupa*, but the animal is very different. It is found in damp places under logs, chips, etc. It has been collected only on the University campus, where, after more than three hours patient and diligent search, less than a dozen specimens were found. The shell is white and very thin, and there is a small tooth on the body-wall of the aperture. No other species of this family is found far away from the sea coast. 1568.

## LIMNÆIDÆ.

*Limnæa stagnalis*, Linnæus.—Found at Minneapolis; lake Minnewaska, Pope county; White Bear lake; lake Bertram, Wright county; Minnesota river at Granite Falls and Ft. Snelling; and in the vicinity of Rainy river. This is one of the shells that is found in the northern parts of both Europe and America. It is rather fragile for so large a shell; some individuals found at Minneapolis are two inches long. This shell is a common species and, where it occurs, is generally found in large numbers. The animal is nearly black and can be easily pulled out of the shell. 1427, 1431, 1446, 1450, 1507, 1550.

*Bulinnea megasoma*, Say.—A fine shell and rather heavy, with chestnut-brown within the aperture and sometimes having green stripes on the larger whorls. Two specimens from Knife lake, on the northern state boundary, are in the museum.

*Limnophysa reflexa*, Say.—Found in the lakes about Minneapolis; also at White Bear lake and Lake City. This shell is very long and slim, sometimes measuring  $1\frac{1}{6}$  inches in length and  $\frac{3}{16}$  in diameter. 1444, 1455, 1456.

*Limnophysa caperata*, Say.—Abundant in the vicinity of Minneapolis, but no specimens have been received from other parts of the state. Running around the shell are numerous fine lines which can be seen with the aid of a pocket lens. 1581.

*Lymnophysa palustris*, Muller.—Found in Lake Minnetonka. This is another form that is common to both Europe and America. It is very variable and has a large synonymy. The shells found in lake Minnetonka correspond to *L. elodes*, Say.

*Physa gyrina*, Say.—Minneapolis; Rum river, Anoka; Mississippi river at Anoka and Ft. Snelling. Very common and in some places abundant.—Specimens vary from dark-brown to light-brown. 1452, 1576, 1577, 1578.

*Physa heterostropha*, Say.—Cedar lake, Minneapolis; Minnehaha creek; Mississippi river at Anoka and Ft. Snelling. This is much prettier and more abundant than the preceding species. The specimens collected are rather small. 1457, 1463, 1522, 1539.

*Bulinus hypnorum*, Linnæus.—Common in one pond near Minneapolis, but has not been found elsewhere. This is a fragile, shining, dark-brown shell. The animal is black. This species

is found in Europe and America. The largest specimens are  $\frac{3}{4}$  inch long and  $\frac{5}{16}$  inch in diameter. 1465.

*Planorbella campanulata*, Say.—Lake Minnetonka; White Bear lake; Minneapolis; Wright county. A very common shell, abundant in some places. Some specimens from Wright county are nearly  $\frac{3}{4}$  of an inch in diameter. 1429, 1447, 1462, 1464, 1489, 1552, 1574, 1592.

*Helisoma bicarinatus*, Say.—Minneapolis; lake Minnewaska, Pope county; Wright county. Common but not so much so as the preceding species. One specimen is over  $\frac{3}{4}$  of an inch in diameter; but this shell does not usually grow to be so large. 1428, 1453, 1553, 1591.

*Helisoma trivolvis*, Say.—Minnesota river at Granite Falls and Ft. Snelling; Minneapolis; White Bear lake; along the northern boundary. Very common. The specimens found in one pond near Minneapolis are extremely black; large shells from Ramsey county are over an inch in diameter. This species varies greatly in size. 1448, 1451, 1549, 1554, 1570, 1571, 1572, 1573.

*Gyraulus deflectus*, Say.—Very common in the lakes about Minneapolis; also found in lake Bertram, Wright county. This is a small flat species with the aperture bent down below the centre of the shell—whence the name. The largest specimens are  $\frac{5}{16}$  inch in diameter, and about  $\frac{1}{2}$  inch high. 1575, 1582.

#### VALVATIDÆ.

*Valvata tricarinata*, Say.—Very common in the lakes of Wright and Hennepin counties. This shell is easily distinguished by its three raised revolving lines, one on the upper edge of the whorl, one on the lower, one on the base. The largest specimen in the museum is from Buffalo lake, Wright county, and is nearly a quarter of an inch in diameter. This species and the preceding are found clinging to the plants in the shallow water of our lakes. 1460, 1555, 1593.

#### VIVIPARIDÆ.

*Vivipara intertexta*, Say.—This shell seems to be very common in White Bear lake, but has not been found elsewhere. It is the only species of this genus found as yet in Minnesota. 1445.

*Melantho decisa*, Say.—Binney gives both *M. subsolida*, Auth. and *rufa*, Hald. as synonyms of this species; the latter has been

found common in the Rum river, Anoka county, the former is common in the Minnesota river at Ft. Snelling, and abundant in the Mississippi river at Minneapolis. The largest specimens are about  $1\frac{1}{2}$  inches high and  $\frac{7}{8}$  in diameter.

*Lioplax subcarinata*, Say.—Rather common in the Minnesota river at Ft. Snelling and found associated with the preceding species. No large individuals were found. The specimens vary from sharply carinated ones to those with no appreciable carinæ. 1486.

#### RISSOIDÆ.

*Bythinella obtusa*, Lea.—Common in the Minnesota river at Ft. Snelling, but not found elsewhere. This and the three following species are found in the mud on the banks of rivers; they can be collected by getting a sieve full of the mud and then washing it out with water; sometimes quite a quantity of shells will be left in the sieve. This species is about .14 inch long. 1535.

*Somatogyrus subglobosus*, Say.—Abundant in the Minnesota river at Ft. Snelling. No specimens from any other locality are in the museum. The shell is rather thin and when cleaned is of a light horn-color, sometimes with a reddish tinge on the apex. The largest specimens are .22 inch high and .19 in diameter. 1471.

*Amnicola cincinnatensis*, Anthony.—Common in the Minnesota river at Ft. Snelling and the Rum river, Anoka County. This species is thicker and larger than the following. One specimen from the Rum River is a quarter of an inch long. 1584, 1585.

*Amnicola porata*, Say.—Common in the Minnesota river at Ft. Snelling, and in the lakes near Minneapolis. This shell is quite thin and nearly transparent. 1586, 1587.

#### STREPOMATIDÆ.

*Pleurocera subulare*, Lea.—This is the only species of this family yet found by the survey in Minnesota. It is very common in the Minnesota river at Ft. Snelling, and in the Mississippi and Rum rivers, Anoka county. Specimens from the Minnesota river are smaller than the others and the shell is not so thick; those found in the Rum river are very large, old, and much eroded; several are over  $\frac{7}{8}$  inch long. 1531, 1532, 1583.



V.

REPORT ON THE MUSEUM FOR 1885.

SPECIMENS REGISTERED IN THE GENERAL MUSEUM IN 1885.

Serial Number.	OBTAINED.		NAME.	No. of Specimens.	Locality.	Formation.	Collector and Remarks.
	When.	Whence.					
5773	May, 1885.	Exchange.....	<i>Platystoma peoriense</i> , McCh.....	2	Peoria Co, Ill. ....		From W. H. Adams.
5774	"	"	<i>Spirifera lineata</i> , Morton.....	10	" " " " " " " " " " " "		" " " " " " " " " "
5775	"	"	<i>Spirifera camerata</i> , Morton.....	1	Knox Co., Ill. ....		" " " " " " " " " "
5776	"	"	<i>Spiriferina kentuckiensis</i> , Sh.....	4	Peoria Co. Ill. ....		" " " " " " " " " "
5777	"	"	<i>Rhynchonella illinoiensis</i> , Worth.....	5	" " " " " " " " " " " "		" " " " " " " " " "
5778	"	"	<i>Rhynchonella metallica</i> , White.....	2	" " " " " " " " " " " "		" " " " " " " " " "
5779	"	"	<i>Rhynchonella uta</i> , Marcou.....	6	Peoria and Knox Co's Ill. ....		" " " " " " " " " "
5780	"	"	<i>Chonetes megaloba</i> , N. & P.....	5	" " " " " " " " " " " "		" " " " " " " " " "
5781	"	"	<i>Chonetes parva</i> , Sh.....	15	" " " " " " " " " " " "		" " " " " " " " " "
5782	"	"	<i>Pleurotomaria grayvillensis</i> , N. & P.....	3	" " " " " " " " " " " "		" " " " " " " " " "
5783	"	"	<i>Pleurotomaria subtrabinata</i> , Meek & H.....	1	Peoria Co., Ill.....		" " " " " " " " " "
5784	"	"	<i>Athyris subtilita</i> , Hall.....	2	" " " " " " " " " " " "		" " " " " " " " " "
5785	"	"	<i>Athyris royssii</i> .....	9	" " " " " " " " " " " "		" " " " " " " " " "
5786	"	"	<i>Retzia mormoni</i> , Marcou.....	8	" " " " " " " " " " " "		" " " " " " " " " "
5787	"	"	<i>Lophophyllum proliferum</i> , McCh.....	21	Peoria and Knox Co's Ill. ....		" " " " " " " " " "
5788	"	"	<i>Cyathaxonia distorta</i> , Worth.....	3	Peoria Co., Ill.....		" " " " " " " " " "
5791	"	"	<i>Productus muricatus</i> , N. & P.....	10	Knox Co., Ill.....		" " " " " " " " " "
5792	"	"	<i>Pleurotomaria illinoiensis</i> .....	1	" " " " " " " " " " " "		" " " " " " " " " "
5793	"	"	<i>Productus nebrascensis</i> , Owen.....	1	" " " " " " " " " " " "		" " " " " " " " " "
5794	"	"	<i>Productus prattenianus</i> , Norwood.....	5	" " " " " " " " " " " "		" " " " " " " " " "
5795	"	"	<i>Nucula ventricosa</i> , Hall.....	2	" " " " " " " " " " " "		" " " " " " " " " "
5796	"	"	<i>Bellerophon carbonarius</i> , Cox.....	4	Peoria and Knox Co's Ill. ....		" " " " " " " " " "
5797	"	"	<i>Bellerophon montfortanus</i> , N. & P.....	4	Knox Co., Ill.....		" " " " " " " " " "
5798	"	"	<i>Terebratula hovidens</i> , Morton.....	2	" " " " " " " " " " " "		" " " " " " " " " "
5799	"	"	<i>Petrodus occidentalis</i> , N. & W.....	1	Peoria and Knox Co's Ill. ....		" " " " " " " " " "
5800	"	"	<i>Discina nitida</i> , Phillips.....	1	Knox Co., Ill.....		" " " " " " " " " "
5801	"	"	<i>Nautilus decoratus</i> , Cox.....	1	" " " " " " " " " " " "		" " " " " " " " " "
5802	"	"	<i>Trachydomia nodulosa</i> , Worth.....	7	Peoria Co., Ill.....		" " " " " " " " " "
5803	"	"	<i>Streptorhynchus crassus</i> , M. & H.....	4	Peoria and Knox Co's, Ill. ....		" " " " " " " " " "
5804	"	"	<i>Phillipsia acitula</i> , M. & W.....	1	Peoria Co., Ill.....		" " " " " " " " " "
5805	"	"	<i>Fusulina cylindrica</i> , Fiss.....	9	Peoria and Knox Co's, Ill. ....		" " " " " " " " " "

5806	"	"	..... Macrocheilus primigenius, Cour.....	2	Peoria Co., Ill.....	"	"
5808	"	"	..... Trigonocarpus adamsi, Lesq.....	16	West Jersey, Stark Co, Ill.....	"	"
5809	"	"	..... Carpolithes perpussillus.....	5	" " " " " "	"	"
5810	"	"	..... Trigonocarpus starkianus, Lesq.....	6	" " " " " "	"	"
5811	"	"	..... Rhabdocarpus mammillatus, Lesq.....	6	" " " " " "	"	"
5812	"	"	..... Trigonocarpus noeggerathi, Brgt.....	1	" " " " " "	"	"
5813	"	"	..... Trigonocarpus dawsi, L. & H.....	1	" " " " " "	"	"
5863	"	Geol. Survey....	..... White clay.....	1	Red Wing, Minn.....	"	N. H. Winchell.
5864	March, 1885.	Presented.....	..... Tufaceous deposit.....	1	Yellowstone Nat. Park.....	"	From Prof. H. S. Baker, St. Paul.
5866	June, 1885.	"	..... Oriskany sandstone.....	1	Schoharie, N. Y.....	"	Chas. E. Hall.
5867	"	"	..... Magnetite and Apatite.....	1	Mineville, Essex Co., N.Y.....	"	"21 Bed" Mine.
5868	"	"	..... Specular iron ore.....	1	Rossie, St. L. Co., N. Y.....	"	Caledonia Mine.
5869	"	"	..... Red slate.....	1	Middle Granville, Wash. Co., N. Y.....	"	Primordial slate.
5870	"	"	..... Utica slate (with graptolites).....	2	Holland Patent, N. Y.....	"	"
5872	"	"	..... Oriskany sandstone.....	1	Oriskany Falls, N. Y.....	"	"
5873	"	"	..... Coralline limestone.....	1	Schoharie, N. Y.....	"	"
5874	"	"	..... Variegated slate.....	1	Middle Granville, Wash. Co., N. Y.....	"	Primordial slate.
5875	"	"	..... Plumbago.....	1	Ticonderoga, Essex Co., N. Y.....	"	Old lead mine.
5876	"	"	..... Clinton ferruginous sandstone.....	1	Ilion, N. Y.....	"	"
5877	"	"	..... Magnetite and Mica.....	1	Crown Point, Essex Co., N. Y.....	Lower Lau	"
5878	"	"	..... Birdseye limestone (with fucoid).....	1	Canajoharie, N. Y.....	"	"
5880	"	"	..... Gray sandstone.....	1	Ilion, N. Y.....	"	"
5881	"	"	..... Water lime.....	1	Manlius, N. Y.....	"	"
5882	"	"	..... Chazy limestone.....	2	Isle La Motte, N. Y.....	"	"
5883	"	"	..... Labradorite.....	1	Little Falls, N. Y.....	"	"
5885	"	"	..... Calciferous sandstone.....	2	" " " " " "	"	"
5886	"	"	..... Gneiss.....	1	Rossie, St. Law. Co., N.Y.....	"	Rocks associated with galena.
5887	"	"	..... Labradorite.....	1	Little Falls, N. Y.....	"	"
5889	"	"	..... Tentaculite limestone.....	1	Schoharie, N. Y.....	"	"
5890	"	"	..... Vein rock.....	1	Rossie, St. Law. Co., N.Y.....	"	" "
5891	"	"	..... Sandstone.....	1	Potsdam, N. Y.....	"	"
5892	"	"	..... Schoharie grit.....	1	Schoharie, N. Y.....	"	"
5893	"	"	..... Calciferous sandstone.....	2	Little Falls, N. Y.....	"	Showing bituminous matter, quartz & calcite.
5894	"	"	..... Labradorite.....	1	" " " " " "	"	"
5895	"	"	..... Labradorite.....	1	" " " " " "	"	"
5896	"	"	..... Breccia.....	1	Rossie, St. Law. Co., N.Y.....	"	Caledonia mine.
5897	"	"	..... Primordial limestone.....	1	Swanton Vt.....	"	"
5898	"	"	..... Goniolite limestone.....	1	Schoharie, N. Y.....	"	"
5899	"	"	..... Purple slate.....	1	Middle Granville, N. Y.....	"	"
5900	"	"	..... Gray garnetiferous gneiss.....	1	Saratoga Co., N. Y.....	"	"

Specimens registered in the General Museum in 1885.—Continued.

Serial Number.	OBTAINED.		NAME.	No. of Specimens.	Locality.	Formation.	Collector and Remarks.
	When.	Whence.					
5901	June, 1885	Presented.....	Gneiss .....	1	Crown Point, Essex Co., N. Y. ....		From Chas. E. Hall.
5902	"	"	Magnetite .....	1	Mineville, Essex Co., N. Y. ....		" " New bed mine.
5903	"	"	Califerous sandstone .....	1	Little Falls, N. Y. ....		" " " "
5904	"	"	Labradorite .....	1	" " " "		" " " "
5906	"	"	Cauda Galli grit .....	1	Clarksville, Albany Co., N. Y. ....		" " " "
5907	"	"	Marble.....	1	Gouverneur, N. Y. ....		" " " "
5908	"	"	Magnetite.....	6	Mineville, Essex Co., N. Y. ....		" " " New bed mine.
5909	"	"	Rock associated with ore.....	3	Gilboa, N. Y. ....		" " " "
5911	"	"	Quartz crystals .....	25	Little Falls, N. Y. ....		" " " "
5912	"	"	Sample of building stone.....	1	Potsdam, N. Y. ....	Potsdam.....	" " Cube of sand- stone, 1 ft. sq.
5913	"	Geol. Survey ...	Sample of building stone (1 ft x 1ft.x6 in.)	1	Mankato, Minn.....	St. Law.....	N. H. Winchell from Fowler & Ring.
5914	"	"	" " " "	1	" " " "	" " " "	N. H. Winchell from W. B Craig & Co.
5915	"	"	" " " "	1	" " " "	" " " "	" " " "
5916	"	"	" " " "	1	" " " "	" " " "	" " " "
5917	"	"	Sample of building stone (pink).....	1	Kasota, Minn.....	Shak.....	" " from C. W. Babcock's quarries.
5918	"	"	Sample of building stone (white).....	1	" " " "	" " " "	" " " "
5919	July, 1884	"	Hematite .....	Ind.	Tower City, Vermilion lake, Minn. ....		" " Breitung mine. Stone " "
5920	"	"	Hematite .....	"	" " " "		" " Breitung " "
5921	"	"	Hematite .....	"	" " " "		" " " "
5922	"	"	Repressed brick.....	6	Dresbach, Minn.....		" " from Sherwood & Johnson.
5923	1884	Presented.....	Red quartzite (striated) .....	1	Pipestone City, Minn.....		C. H. Bennett.
5924	1877	Geol. Survey....	Stomatopora inflata, Hall.....	1	Minneapolis, Minn.....	Trenton.....	N. H. Winchell. From 5537.
5925	1885	"	Berenicea minnesotensis, Ulrich.....	1	" " " "	" " " "	E. O. Ulrich.

5926	1876-1879	"	....	Ropalonaria pertenuis, Ulrich.....	1	"	"	Trenton shales.	C. L. Herrick. Attached to Pachydictya foliata, Ul.
5927	1880	"	....	Arthroclema pulchellum, Bill.....	1	St. Paul, Minn.....	Trenton.....	N. H. Winchell.	
5928	1885	"	....	Helopora divaricata, Ulrich.....	1	Minneapolis, Minn.....	Trenton shales.	E. O. Ulrich.	
5929	"	"	....	Ptilodictya subrecta, Ulrich.....	1	"	"	"	
5930	"	"	....	Ptilodictya ramosa, Ulrich.....	1	"	"	"	
5931	"	"	....	Ptilodictya nodosa, Hall.....	1	"	"	"	
5932	"	"	....	Arthropora shaffeni, Meek.....	1	"	"	"	
5933	"	"	....	Arthropora simplex, Ulrich.....	1	"	"	"	
5934	"	"	....	Stictopora fenestrata (?) Hall.....	1	"	"	"	
5935	"	"	....	Stictopora paupera, Ulrich.....	1	"	"	"	
5936	"	"	....	Stictopora fidelis, Ulrich.....	1	"	"	"	
5937	Sept., 1880.	"	....	Stictopora fidelis, Ulrich.....	1	Near Lanesboro, Minn.....	"	N. H. Winchell. From 4030.	
5938	1885	"	....	Stictopora mutabilis, Ulrich.....	1	Minneapolis, Minn.....	"	E. O. Ulrich.	
5939	Aug., 1877.	"	....	Stictopora mutabilis.....	1	St. Paul, Minn.....	"	N. H. Winchell. From 2662.	
5940	1885	"	....	Stictopora mutabilis, var. major.....	1	Minneapolis, Minn.....	"	E. O. Ulrich.	
5941	"	"	....	Stictopora mutabilis, var. minor.....	1	"	"	"	
5942	1876-1879	"	....	Phaenopora multipora.....	1	"	"	C. L. Herrick. From 5125.	
5943	1885	"	....	Stictoporella angularis, Ulrich.....	1	"	"	E. O. Ulrich.	
5944	"	"	....	Stictoporella cribrosa, Ulrich.....	1	"	"	"	
5945	1882	"	....	Stictoporella frondifera, Ulrich.....	1	Sec. 6, Fremont, Winona Co., Minn.....	"	"	
5946	1876-1879	"	....	Stictoporella frondifera.....	1	Minneapolis, Minn.....	"	Presented by W. H. Shelton. From 4671.	
5947	1885	"	....	Stictoporella frondifera.....	1	"	"	C. L. Herrick From 5125.	
5948	"	"	....	Pachydictya foliata, Ulrich.....	1	"	"	E. O. Ulrich.	
5949	1880	"	....	Pachydictya occidentalis, Ulrich.....	1	St. Paul, Minn.....	"	N. H. Winchell. From 5538.	
5950	1885	"	....	Pachydictya fimbriata, Ulrich.....	1	Minneapolis, Minn.....	"	E. O. Ulrich.	
5951	Aug., 1877.	"	....	Pachydictya fimbriata (?).....	1	St. Paul, Minn.....	"	N. H. Winchell.	
5952	Aug., 1883.	Presented.....	....	Pachydictya conciliatrix, Ulrich.....	1	Cannon River Falls, Goodhue Co., Minn.....	Trenton.....	Presented by W. H. Scofield. From 5303.	
5953	1885	Geol. Survey...	....	Phyllodictya frondosa, Ulrich.....	1	Minneapolis, Minn.....	Trenton shales.	E. O. Ulrich.	
5956	1880	"	....	Stictopora mutabilis, Ulrich.....	1	St. Paul, Minn.....	"	N. H. Winchell. From 5338.	
5957	"	"	....	Stictopora mutabilis.....	1	"	"	very old. From 5338.	
5958	1885	"	....	Crepipora impolita, Ulrich.....	1	Minneapolis, Minn.....	"	E. O. Ulrich.	
5959	1873	"	....	Crepipora impolita.....	1	Minneapolis, Minn., (Finn's Glen).....	"	"	
5960	Aug., 1877.	"	....	Crepipora impolita, Ulrich.....	1	Minneapolis, Minn.....	"	N. H. Winchell. From 330.	
5961	Sept., 1880.	"	....	Crepipora impolita.....	1	Near Lanesboro, Minn.....	"	C. L. Herrick. From 797.	
5962	1876-1879	"	....	Crepipora impolita.....	1	Minneapolis, Minn.....	"	N. H. Winchell. From 4036.	
5967	1885	"	....	Monticulipora wetherbyi, Ulrich.....	1	"	Chazy (?).....	E. O. Ulrich.	
5968	"	"	....	Monticulipora incompta, Ulrich.....	1	"	Trenton shales.	"	
5969	"	"	....	Monticulipora grandis, Ulrich.....	1	"	"	"	
5970	"	"	....	Homotrypa minnesotensis, Ulrich.....	1	"	"	"	
5971	1882	"	....	Homotrypa minnesotensis.....	1	"	"	"	
5972	Sept., 1883.	"	....	Homotrypa minnesotensis.....	1	Near Lanesboro, Minn.....	"	N. H. Winchell. From 4937.	
5973	"	"	....	Homotrypa minnesotensis.....	1	Near Fountain, Minn.....	"	" 436.	
		"	....	Homotrypa minnesotensis.....	1	"	"	" 4050.	

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Specimens registered in the General Museum in 1885.—Continued.

Serial Number.	OBTAINED.		NAME.	No. of Specimens	Locality.	Formation.	Collector and Remarks.
	When.	Whence.					
5974	1882	Geol. Survey. . .	Homotrypa minnesotensis. . . . .	1	Minneola, Goodhue Co., Minn. . . . .	Trenton shales.	N. H. Winchell. From 4996.
5975	1876-1879	"	Homotrypa minnesotensis. . . . .	1	Minneapolis, Minn. . . . .	"	C. L. Herrick. " 5123.
5976	1885	"	Homotrypa exilis, Ulrich. . . . .	1	"	"	E. O. Ulrich.
5977	Aug., 1877.	"	Homotrypa insignis, Ulrich. . . . .	1	St. Paul, Minn. . . . .	"	N. H. Winchell. Type. From 2578.
5978	1885	"	Homotrypa insignis (?) . . . . .	1	Minneapolis, Minn. . . . .	"	E. O. Ulrich.
5979	1880	"	Homotrypa insignis (?) . . . . .	1	Near Fountain, Minn. . . . .	"	N. H. Winchell. From 3539.
5980	1882	"	Homotrypa subramosa, Ulrich. . . . .	1	Minneola, Goodhue Co., Minn. . . . .	"	" " 4996.
5981	Oct., 1875.	"	Homotrypella instabilis, Ulrich. . . . .	1	Fillmore, Fillmore Co., Minn. . . . .	"	" " 259.
5982	1876-1879	"	Homotrypella instabilis. . . . .	1	Minneapolis, Minn. . . . .	"	C. L. Herrick. " 5123.
5983	Aug., 1877.	"	Atactoporella occidentalis, Ulrich . . . . .	1	St. Paul, Minn. . . . .	"	N. H. Winchell. " 2562.
5984	"	"	Atactoporella occidentalis . . . . .	1	Minneapolis, Minn. . . . .	"	" " 2578.
5985	"	"	Atactoporella insueta, Ulrich. . . . .	1	"	"	C. L. Herrick. " 754.
5986	1872	"	Prasopora simulatrix, Ulrich. . . . .	1	Pettit's Mill, Mantorville, Minn. . . . .	Trenton (?) . . . .	N. H. Winchell. From 342.
5987	1882	"	Prasopora simulatrix. . . . .	1	Sec. 16, Minneola, Goodhue Co., Minn. . . . .	Trenton shales.	" " 4997.
5988	1877	"	Prasopora simulatrix. . . . .	1	St. Paul, Minn. . . . .	"	" " 4997.
5989	1882	"	Prasopora contigua, Ulrich. . . . .	1	Sec. 16, Minneola, Goodhue Co., Minn. . . . .	"	" " 4064.
5990	Sept., 1880.	"	Prasopora insularis, Ulrich. . . . .	1	Near Fountain, Minn. . . . .	"	" " 4997.
5991	1882	"	Prasopora insularis. . . . .	1	Sec 16, Minneola, Goodhue Co., Minn. . . . .	"	" " 4064.
5992	1872	"	Prasopora insularis. . . . .	1	Pettit's Mill, Mantorville, Minn. . . . .	Trenton (?) . . . .	" " From 342.
5993	Sept., 1880.	"	Diplotrypa infida, Ulrich . . . . .	1	Near Fountain, Minn. . . . .	Trenton shales.	" " 4064.
5994	"	"	Aspidopora parasitica, Ulrich . . . . .	1	Lanesboro, Minn. . . . .	"	" " " "
5995	1885	"	Aspidopora parasitica . . . . .	1	Minneapolis, Minn. . . . .	"	E. O. Ulrich.
5996	"	"	Amplexopora superba, Foord. . . . .	1	"	"	" " " "
5997	1876-1879	"	Amplexopora superba . . . . .	1	"	"	" " " "
5998	Aug., 1877.	"	Amplexopora superba . . . . .	1	St. Paul, Minn. . . . .	"	C. L. Herrick. From 2123.
5999	"	"	Amplexopora winchelli, Ulrich. . . . .	1	"	"	N. H. Winchell. " 2578.
							" " 2578.

6000	1876-1879	"	Amplexopora winchelli	1	Minneapolis, Minn.	"	C. L. Herrick.	"	5123.
6001	1885	"	Amplexopora winchelli (?)	1	"	"	E. O. Ulrich	"	
6002	Oct., 1872.	"	Batostoma ottawaensis, Foord	1	Pettit's Mill, Mantorville, Minn	Trenton	N. H. Winchell	"	357.
6003	1885	"	Batostoma irrasa, Ulrich	1	Minneapolis, Minn	Trenton shales.	E. O. Ulrich.	"	
6004	1882	"	Batostoma irrasa (?)	1	Minneola, Goodhue Co., Minn	"	N. H. Winchell.	"	4996.
6005	"	"	Batostoma irrasa (?)	1	Minneola, Goodhue Co., Minn	"	"	"	4996.
6006	1875	"	Batostoma fertilis, Ulrich	1	Minneapolis, Minn	"	"	"	282.
6007	Nov., 1884.	Presented	Batostoma fertilis	1	Eyota, Minn	"	Presented by Miss Carrie S. Sey- mour. From 5581.	"	
6008	1876-1889	Geol Survey	Batostoma fertilis	1	Minneapolis, Minn	"	C. L. Herrick.	From 5123.	
6009	1879	"	Batostamella ramulosa, Ulrich	1	Oxford Mills, near Can- non Falls, Minn	"	N. H. Winchell.	"	3486.
6010	1880	"	Trematopora primigenia, Ulrich	1	Near Fountain, Minn	"	"	"	5529.
6011	1885	"	Trematopora primigenia	1	Minneapolis, Minn	"	E. O. Ulrich.	"	
6012	1876-1879	"	Bythopora herricki, Ulrich	1	"	"	C. L. Herrick.	"	5121
6013	"	"	Bythopora herricki	1	St. Paul, Minn	"	"	"	
6014	"	Dr. Stoneman	Callopora prematura, Ulrich	1	"	"	Records doubtful.	From 79.	
6015	"	Geol. Survey	Callopora fraudulenta, Ulrich	1	Near Fountain, Minn	"	"	"	
6016	Sept., 1880.	"	Dekayia trentonensis, Ulrich	1	"	"	N. H. Winchell.	From 4050.	
6017	1885	"	Dekayia trentonensis	1	Minneapolis, Minn	"	E. O. Ulrich,	"	
6018	Sept., 1880.	"	Dekayia internexa, Ulrich	1	Near Lanesboro, Minn	"	N. H. Winchell.	"	4030
6019	1876-1879	"	Dekayella contracta, Ulrich	1	Minneapolis, Minn	"	C. L. Herrick.	"	5123.
6020	Sept., 1880.	"	Dekayella contracta	1	Near Lanesboro, Minn	"	N. H. Winchell.	"	4036.
6021	1885	"	Dekayella contracta	1	Minneapolis, Minn	"	E. O. Ulrich.	"	
6022	1873	"	Monotrypella multitalabulata, Ulrich	1	Minneapolis Minn. (Pinns Glen)	"	N. H. Winchell.	"	330.
6023	Oct., 1875.	"	Monotrypella multitalabulata	1	Fillmore, Fill. Co., Minn.	"	"	"	259.
6024	1885	"	Leptotrypa indiffens, Ulrich	1	Minneapolis, Minn	"	E. O. Ulrich.	"	
6025	"	Presented	Sporangites huronensis (?)	2	East Cleveland, O.	Bedford shales.	From Rev. O. Hertzger.	"	
6026	Aug., 1885.	Geol. Survey	Ferruginous quartz schist	1	Black River Falls, Wis.	"	N. H. Winchell.	Dubuque mine. No. 2	
6027	"	"	"	1	"	"	N. H. Winchell.	York's opening, Mound No. 2, near the river.	
6028	"	"	"	1	"	"	N. H. Winchell.	From the pit of Big Mound.	
6029	"	"	"	1	"	"	N. H. Winchell.	Average surface specimen of the Big Mound.	
6030	"	"	"	1	"	"	N. H. Winchell.	Summit of the Big Mound.	
6031	"	"	"	1	"	"	N. H. Winchell.	Mound No. 5.	
6032	"	"	"	1	"	"	"	Dubuque mine.	
6033	"	"	Red quartzite	1	"	"	"	"	
6034	"	"	Hematite	1	"	"	"	Drift No. 1.	
6035	"	"	Potsdam shale	1	"	"	"	At the "Blue specular" drift.	

Specimens registered in the General Museum in 1885.—Continued.

Serial Number.	OBTAINED.		NAME.	No. of Specimens.	Locality.	Formation.	Collector and Remarks.
	When.	Whence.					
6036	Aug., 1885.	Geol. Survey...	Magnesian schist.....	1	Black River Falls, Wis..		N. H. Winchell.
6037	"	"	Grand Rapids plaster.....	1	Grand Rapids, Mich.....		"
6038	Aug. 15, 1885	Presented.....	Chloritic red granite.....	Ind.	Sleepy Eye, Minn.....		Presented by C. M. Hunt. From a well 269 feet deep, (8 feet in this rock.
6039	Sept., 1885.	"	Refined rock salt.....	"	Marine City, Mich.....		From Marine City Stone Co.
6040	"	"	Calcareous tufa.....	1	S. Moccasin Mts., Mont..		" Rudolf Von Tadel, Jr.
6041	"	"	Orthis remnicha, Winch.....	1	Red Wing, Minn.....		From Dr. J. H. Sandberg. In the street, 2 feet below the surface, in front of his office. Mostly the same level as No. 6042.
6043	"	"	Feldspar (after leucite).....	2	Magnet Cove, Ark.....		From J. F. Kunz.
6047	"	"	Schist.....	1	Near Falkenstein, Saxony		" C. L. Herrick.
6048	"	"	Slate.....	1	Near Altorf, north of St. Gothard.....		"
6071	"	Geol. Survey...	"Deposited silica".	1	Belvidere, Goodhue Co., Minn	Madison.....	N. H. Winchell.
6072	Aug. 5, 1885	"	Drift sand..... Orig. No. 1.	Indef	Minneapolis, Minn.....		18 feet.
6073	"	"	Lime rock..... Orig. No. 2.	"	"		10 "
6074	"	"	Green shales..... Orig. No. 3.	"	"		10 "
6075	"	"	Whitesandrock..... Orig. No. 4.	"	"		91 "
6076	"	"	Yellow sandrock..... Orig. No. 5.	"	"		30 "
6077	"	"	Yellow sandrock..... Orig. No. 6 and 7.	"	"		5 "
6078	"	"	Whitesandrock..... Orig. No. 8.	"	"		" First flow of water, (Red shale 4 feet.) 10 feet.
6079	"	"	Yellow sandrock..... Orig. No. 9.	"	"		18 feet.
6080	"	"	Gray sandrock..... Orig. No. 10.	"	"		6 "
6081	"	"	Red quartzite..... Orig. No. 11.	"	"		effervesces feebly. 32 feet.
6082	"	"	Siliceous fine limestone..... Orig. No. 12.	"	"		40 feet.
6083	"	"	Red siliceous limestone..... Orig. No. 13.	"	"		10 "

Drillings from the deep well at the West hotel.



6084	"	"	.... Limestone with white sand ..Orig. No. 14.	"	"	"	"	"	Similar to No. 12, but rather yellowish-pink. 15 feet.
6085	"	"	.... Calcareous quartzite.....Orig. No. 15.	"	"	"	"	"	6 feet.
6086	"	"	.... Fine, light pinkish limestone..Orig. No. 16.	"	"	"	"	"	30 "
6087	"	"	.... White sand ..Orig. No. 17.	"	"	"	"	"	Second flow of water. 5 feet.
6088	"	"	.... Fine pinkish sand, very hard.Orig. No. 18.	"	"	"	"	"	1 foot.
6089	"	"	.... Rounded, coarse, white sand..Orig. No. 19.	"	"	"	"	"	Water increased to No. 20. 90 feet.
6090	"	"	.... Calcareous shale.....Orig. No. 20.	"	"	"	"	"	N. H. Winchell. 45 feet.
6091	"	"	.... Green shale.....Orig. No. 21.	"	"	"	"	"	104 "
6092	"	"	.... Hard sub-crystalline shale.....Orig. No. 22.	"	"	"	"	"	12 "
6093	"	"	.... White sandrock.....Orig. No. 23.	"	"	"	"	"	Third flow of water. 30 feet.
6094	Oct., 1883.	By Exchange.	Bryozoa .....	"	Keokuk, Iowa .....	Keokuk .....	From A	S. Tiffany, Davenport, Ia	
6095	"	"	Sperifera strigosus, Meek .....	3	Rockford, Iowa .....	Chemung .....	"	"	
6096	"	"	Sperifera whitneyi, Hall .....	2	"	"	"	"	
6097	"	"	Sperifera hungerfordi, Hall .....	2	"	"	"	"	
6098	"	"	Sperifera .....	1	Buffalo, Iowa .....	Hamilton .....	"	"	
6099	"	"	Orthis cyclus, Hall .....	2	Rock Island Ill. ....	"	"	"	
6100	"	"	Orthis iowensis, Hall .....	3	"	"	"	"	
6101	"	"	Orthis suborbicularis, Hall .....	1	"	"	"	"	
6102	"	"	Orthis .....	2	Rock Island and Scott Co., Ia. ....	"	"	"	
6103	"	"	Athyris spiriferoides, Eaton .....	3	18 mile creek, Erie Co., N. Y. ....	"	"	"	
6104	"	"	Athyris vittata, Hall .....	4	Buffalo, Iowa .....	Hamilton .....	"	"	
6105	"	"	Atrypa reticularis, Linn .....	4	Rockford, Iowa .....	Chemung .....	"	"	
6106	"	"	Monticulipora .....	2	Buffalo, Iowa .....	Hamilton .....	"	"	
6107	"	"	Productus longispinus, Law .....	1	Atkinson, Ill. ....	Coal Meas. ....	"	"	
6108	"	"	Productella dissimilis, Hall .....	6	Rockford, Iowa .....	Chemung .....	"	"	
6109	"	"	Strophonella reversa, Hall .....	5	"	"	"	"	
6110	"	"	Pentamarella urata, Con. ....	2	Buffalo, Iowa .....	Hamilton .....	"	"	
6111	"	"	Strophodonta demissa, Con. ....	2	Davenport, Iowa. ....	"	"	"	
6112	Sept., 1885.	Geol. Survey	Drillings. Rock, about 2 feet thick, black, Indef		Browns Valley .....	"	From J	O. Barrett, at 360 feet.	
6113	"	"	Stratum of green colored .....	"	"	"	"	450 "	
6114	"	"	Quick-sand .....	"	"	"	"	460 "	
6115	"	"	Rock below 75 feet .....	"	Mankato, Minn. ....	"	"	A. F. Beckdolt. Well on Third St. Depth of well 96 feet.	
6116	"	Presented	Gray syenitic rock .....	"	Herman, Minn. ....	"	From Chas. Pullman. At 150 ft.	152 "	
6117	"	"	Gray syenitic rock .....	"	"	"	"	"	
6118	Oct., 1885.	Geol. Survey	Marly Clay .....	"	Albert Lea, Minn. ....	"	"	E. D. Edward. From 12-18 in. below the surface.	
6119	"	"	Drift fragment, "Northern limestone" .....	1	Washington Co., Minn. ....	Drift .....	N. H. Winchell.		
6120	"	"	Ogishkie Muncie conglomerate .....	1	Marine Mills, Minn. ....	"	"		
6121	Nov., 1885.	"	Hematite .....	1	Black River Falls, Minn. ....	"	"		

Drillings from the deep well at the West hotel.

Specimens registered in the General Museum in 1885.—Continued.

Serial Number.	OBTAINED.		NAME.	No. of Specimens.	Locality.	Formation.	Collector and Remarks
	When.	Whence.					
6123	Nov., 1885.	Geol Survey ...	Catlinite .....	2	Barron Co., Wis.....		N. H. Winchell.
6123	Oct., 1885.	Presented.....	Cryptozoon proliferum .....	1	3 miles west of Saratoga Springs, N. Y.....	Calciferous ....	From C E. Hall. With a thin section of the same.
6124	"	" .....	Dioryte .....	2	Near Palisade, Dak.....		From J. E. Todd.
6125	"	Geol. Survey ...	Drillings. Granite below 280 feet .....	Ind.	Milbank, Grant Co., Dak.....		From J. W. Williams. 1st, 75 ft. blue clay; 2d, 200 ft. shale; 3d, 8 ft. gravel & shells; 4th, the granite.
6126	"	Presented.....	<i>Hyalithellus micans</i> , Billings.....	1	Columbia Co., N. Y.....	L. Potsdam....	From S. W. Ford.
6127	"	" .....	and <i>Pordilla troyen-</i> <i>sis</i> , Barr .....	1	Columbia Co., N. Y., near Schodack Landing.....	" .....	" .....
6128	"	" .....	<i>Stenotheca rugosa</i> , Hall.....	1	" .....	" .....	" .....
6129	"	" .....	<i>Microdiscus speciosus</i> , Ford.....	1	Troy, N. Y. ....	" .....	" " Head and pygidia.
6130	"	" .....	and <i>lobatus</i> , Hall.....	1	Columbia Co., N. Y.....	" .....	" " With embryo of <i>Olenellus asaphoides</i> .
6131	"	" .....	<i>Graptolithus sagittarius</i> , <i>pristis</i> and <i>gracilis</i> .....	5	Schodack Landing, N. Y. Rensselaer Co.....	Lorraine shales	From S. W. Ford.
6132	"	" .....	" " <i>bicornis</i> and <i>scalaris</i> .....	3	" " " "	" .....	" .....
6133	"	" .....	" " <i>scalaris</i> and <i>bicornis</i> .....	1	" " " "	" .....	" .....
6134	"	" .....	" " <i>furcatus</i> and <i>pristis</i> .....	2	" " " "	" .....	" .....
6135	"	" .....	" " <i>pristis</i> .....	1	" " " "	" .....	" .....
6136	"	" .....	<i>Archimedes wortheni</i> ? .....	6	Russelville, Ky.....	Carbon.....	From G. R. Lumsden, Greenville, Conn.
6137	"	" .....	<i>Pentremites godonii</i> , DeFrance.....	5	" " " "	" .....	" .....
6138	"	" .....	<i>Pentamerus galeatus</i> .....	5	" " " "	Up. Silurian...	" .....
6139	"	" .....	<i>Petraia corniculum</i> .....	1	" " " "	Low. Silurian...	" .....
6140	"	" .....	<i>Chenopus pes-peleicana</i> , Phill .....	1	Asti in Piedmont .....	Pliocene .....	" .....
6141	"	" .....	<i>Trochus majus</i> , Lamarck.....	1	" " " "	" .....	" .....

6142	..	..	.....	Cancellaria cancellata, Lum.	1	..	..	..	..
6143	..	..	.....	Buccinum prismaticum, (Brug.)	1	Castell arquanto, Parma	Muschelsand	..	..
6144	..	..	.....	Pectanculus polydonta, Bronn.	1	Flonheim, Rheinhessen	Miocene	..	..
6145	..	..	.....	Corbula revoluta, Lam.	2	Bordeaux	..	..	..
6146	..	..	.....	Astarte omali.	3	Antwerpen	..	..	..
6147	..	..	.....	Cyrena subarata, Brown	2	Alzey, Rheinhessen	..	..	..
6148	..	..	.....	Cerythium margaritaceum, Broig	1	..	..	..	..
6149	..	..	.....	"    cinctum, Lam.	2	..	..	..	..
6150	..	..	.....	"    inconstans, B	5	Wien	..	..	..
6151	..	..	.....	Fusus burdifakensis, Lam.	1	Bordeaux	..	..	..
6152	..	..	.....	Cyclostoma bisulcatum, Zeit.	1	Hochheim, Mainz	..	..	..
6153	..	..	.....	Lamna cuspidata, Agassiz	3	Flonheim, Rheinhessen	..	..	..
6154	..	..	.....	Nummulites dufrenoy, d'Arch	10	Adelholzen	..	..	..
6155	..	..	.....	Leda deshajesana, (d'Orb.)	1	Basel, Antwerpen	Eocene	..	..
6156	..	..	.....	Cerithium cristatum, Lam	2	Rheims	..	..	..
6157	..	..	.....	Turritella imbricata, Ley	2	Conizae	..	..	..
6158	..	..	.....	Fusus bulbiformis, Det.	1	Barton Cliff, Hampshire	Eocene	..	..
6159	..	..	.....	Rostellaria	2	Paris	..	..	..
6160	..	..	.....	Inoceramus sulcatus, Lam.	2	Perte du Rhone	..	..	..
6161	..	..	.....	Scyphia fuscata	1	..	..	..	..
6162	..	..	.....	Terebratula sella, Sow	2	Sheppensiedtin, Braunschweig	..	..	..
6163	..	..	.....	Cyrena heysii, D.	1	Obernkirchen, Westphalen	Weald. Clas.	..	..
6164	..	..	.....	Paludina fluviiorum, Mantell.	1	Osterwald	..	..	..
6165	..	..	.....	Pentacrinus pentagonia Gold	3	Streitberg, Bayern	Coral Crag	..	..
6166	..	..	.....	Millericrinus horridus, d'Orb.	1	Launoy, Dept. des Ardennes	..	..	..
6167	..	..	.....	Ammonites hecticus	1	Gammelshausen, Wurt.	Oxford Clay	..	..
6168	..	..	.....	Terebratula perovalis, Sow	1	Aalen, Wurttemberg	..	..	..
6169	..	..	.....	Terebratula numismalis, Sow	1	Rautenberg, Braunschweig	Mid. Lias	..	..
6170	..	..	.....	Ammonites amaltheus, Sehl.	2	Plateau de Larzac, France	Up. Lias	..	..
6171	..	..	.....	Ammonites oxynodus, Am	1	Goepingen, Wurttemberg	L. Lias	..	..
6172	..	..	.....	Cidaris dorsata, Bronn	3	St. Cassian, Tyrol	Triassic	..	..
6173	..	..	.....	Nucula frigillata, Golaf.	1	..	..	..	..
6174	..	..	.....	Naticella cortata	1	..	..	..	..
6175	..	..	.....	Pleurotomaria radiata, Wl.	5	..	..	..	..
6176	..	..	.....	Terebratula vulgaris, (Sehl)	2	Bayreuth	..	..	..
6177	..	..	.....	Avicula socialis, Deshays	1	Erkerode, Braunschweig	Mid. Trias	..	..
6178	..	..	.....	Trigonia vulgaris, (Sehl)	1	Bayreuth	..	..	..
6179	..	..	.....	Avicula spelinaria	1	Altenstein, Thuringen	Mgn. limestone	..	..
6180	..	..	.....	Orthis mickelini, Ver.	1	Vise, Belgien	Mt. limestone	..	..
6181	..	..	.....	Spirifer lineatus, Buch.	3	..	Carb. limestone	..	..
6182	..	..	.....	Cyathophyllum caespitosum, Goldf.	1	Refrath, Bensberg	Dev. limestone	..	..
6183	..	..	.....	Terebratula primpelaris, Buch	1	Gerolstein, Eifel	..	..	..
6184	..	..	.....	Atrypa reticularis, (d'Orb.)	1	Renfrath, Coeln	..	..	..

Specimens registered in the General Museum in 1885.—Concluded.

Serial Number.	OBTAINED.		NAME.	No. of Specimens.	Locality.	Formation.	Collector and Remarks.
	When.	Whence.					
6185	Oct., 1885.	Presented.....	<i>Orthis eipliensis</i> .....	1	Gerolstein, Eifel.....	Dev. limestone.	From G. R. Lumsden, Greenville, Conn.
6186	"	"	<i>Orthis resupinata</i> , F. Roemer.....	1	" " .....	"	" " "
6187	"	"	<i>Murchisonia bilineata</i> (d'Arch).....	2	Paffrath, Coeln.....	"	" " "
6188	"	"	<i>Goniatites retrorsus</i> , Buch.....	2	Budesheim, Eifel... ..	Dev. shales ....	" " "
6189	"	"	<i>Terebratula linguata</i> , Buch.....	2	Carlsbatte, Beraun .....	"	" " "
6190	"	"	<i>Orthis elegantula</i> , (Dalm).....	1	Klinterham, Gottland.....	"	" " "

**ARCHÆOLOGICAL SPECIMENS REGISTERED IN  
THE GENERAL MUSEUM IN 1885.**

131. Stone implement found in digging the foundation of Hanover College, Jefferson county, Ind., on the Ohio river bluff. By purchase at the New Orleans industrial and cotton centennial exposition, from—Powers, 1885.

132. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

133. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

134. Stone implement from southern Indiana, near the Ohio river bluff. By purchase from Powers, 1885.

135. Stone implement from Austin, Scott county, Ind. By purchase from Powers, 1885.

136. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

137. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

138. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

139. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

140. Stone implement from Chickamauga creek, near the battle ground, Tenn. By purchase from Powers, 1885.

141. Stone pestle from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

142. Stone pestle from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

143. Stone pestle from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

144. Stone implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

145. Four stone axes from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
146. Two stone disks dug from a mound in Charleston, Mo. Found with a skeleton. By purchase from Powers, 1885.
147. Chert implement dug from a mound at Charleston, Mo. By purchase from Powers, 1885.
148. Chert spear-head from Charleston, Mo. By purchase from Powers in 1885.
149. Stone disk from top of Lookout mountain, Ala. By purchase from Powers, 1885.
150. Stone disk from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
151. Stone implements (three) from Doty's mill on Big creek, Jennings tp., Scott county, Ind. By purchase from Powers, 1885.
152. Chert spear-head. Near Lexington, Scott county, Ind. By purchase from Powers, 1885.
153. Large chert hoe. Mississippi river, Ballard county, Ky. By purchase from Powers, 1885.
154. Fourteen chert implements out of a nest of 23 pieces, all standing edgewise, plowed up on the farm of Hon. Wm. H. English, Lexington, Scott county, Ind. By purchase from Powers, 1885.
155. Three scrapers from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
156. Three chert scrapers from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
157. Two chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
158. Fifteen chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
159. Fourteen chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
160. Fifteen chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
161. Ten chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
162. Eight chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.

163. Eight rough chert implements from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
164. Twelve chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
165. Two chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
166. One chert knife from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
167. One chert knife from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
168. Five chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
169. Chert implement from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
170. Eight chert chisels from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
171. Eight chert drills from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
172. Fourteen chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
173. Eleven chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
174. Eight chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
175. Four chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
176. Nine chert arrow-heads from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
177. Eleven chert knives from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
178. Two chert implements from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
179. Eight chert implements from southern Indiana, near the Ohio river. By purchase from Powers, 1885.
180. Catlinite goblet. Pipestone City, Minn. By purchase, 1885.
181. Catlinite goblet. Pipestone City, Minn. By purchase, 1885.

182. Catlinite paper-weight. Pipestone City, Minn. By purchase, 1885.

183. Catlinite pipe, with spear-head bowl and wooden stem. Pipestone City, Minn. By purchase, 1885.

184. Catlinite pipe, with "dog's-head bowl" and wooden stem. Pipestone City, Minn. By purchase, 1885.

185. Catlinite pipe, with "horse-head" bowl and wooden stem. Pipestone City, Minn. By purchase, 1885.

186. Catlinite pipe, with tomahawk bowl and stone stem. Pipestone City, Minn. By purchase, 1885.

187. Catlinite pipe, with hand holding the bowl and wooden stem. Pipestone City, Minn. By purchase, 1885.

188. Catlinite pipe, with tomahawk head. Pipestone City, Minn. By purchase, 1885.

189. Catlinite pipe. Pipestone City, Minn. By purchase, 1885.

190. Catlinite pipe, with tomahawk bowl and stone handle, (all one piece.) Pipestone City, Minn. By purchase, 1885.

191. Old pipe, plowed up at St. Paul, Minn.

192. Fragments (three) of Indian pottery. From mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

193. Fragments (seven) of skulls from mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

194. Implements of bone from mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside; Goodhue county, Minn. Collected by N. H. Winchell.

195. Implements of bone from mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

196. One knife, highly finished, of granular quartzite, 9 inches long by  $2\frac{1}{2}$ , from mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

197. Stone implement from mounds at the mouth of Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

198. Unfinished stone pipe from mounds at the mouth of



Cannon river, on land of C. Spates, sec. 22, Burnside, Goodhue county, Minn. Collected by N. H. Winchell.

Besides the foregoing, the collections of Dr. H. E. Twitchell have been deposited in the museum, to remain at least four years. These will finally be presented to the museum by Dr. Twitchell, according to his present design. They comprise several hundred specimens, characteristic of the mound-builders of Indiana and Ohio.

## ZOOLOGICAL

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
918	...	Geomys bursarius, (Shaw) Rich.....	...	Hennepin Co., Minn. ..	M't'd ....
919	...	Sula bassania, (Linn.) Bris.....	...	Florida .....	" .....
920	...	Nest and egg of Hummer.....	...	California .....	" .....
921	...	Nest of Hummer.....	...	" .....	" .....
922	...	Nest of Flycatcher.....	...	" .....	" .....
923	...	Nest of Titmouse.....	...	" .....	" .....
924	...	Loligo pealii, LeS. (Dissection).....	...	Salem, Mass.....	Alcohol..
926	...	Salmo namaycush, Block.....	...	Grand Marais.....	" .....
927	...	Stizostelium vitreum.....	...	" .....	" .....
928	...	Vertebra of a whale.....	...	Salem Harbor, Mass.....	Dry.....
929	...	Acipenser rubicundus LeS.....	F.	Minneapolis.....	M't'd .....
931	...	Ovis montana, Cuv.....	Head. M.	Near Ft. Benton, Mon.....	Dry.....
932	...	Rangifer caribou, Aud. & Bach.....	Head.	Near Grand Marais.....	" .....
933	...	Process of vertebra of whale.....	...	Bakers Isl'd, Salem, Mass.....	" .....
934	...	Lingula anatina.....	...	Higo, Japan.....	Alcohol..
935	...	Pityophis melanoleucus, Holb.....	...	Ramsey Co., Minn.....	" .....
936	...	Sceloporus undulatus, Harlan.....	...	Sherwood, Tennessee.....	" .....
937	...	Eutania.....	F.	Minneapolis.....	" .....
938	...	Amblystoma punctatum (L.) Baird.....	...	" .....	" .....
939	...	" .....	...	" .....	" .....
940	...	Ostrea borealis, 1 day old.....	...	Rowes Oyster Farm, L. I. S.....	Dried ....
941	...	" " 2 weeks old.....	...	" .....	" .....
942	...	" " 2 years old.....	...	Ludington's beds, New Haven, Conn. ....	" .....
943	...	" " 2 years, 4 months old.....	...	H. C. Rowes Farm, L. I. S.....	" .....
944	...	" " 3 years old.....	...	" .....	" .....
945	...	" " 4 " ".....	...	" .....	" .....
946	...	" " 5 " ".....	...	Ludington's beds, New Haven, Conn.....	" .....
947	...	" " 7 " ".....	...	" .....	" .....
948	...	" " 17 " ".....	...	Natural bed Indian Neck, Conn.....	" .....
949	...	" " 25 " ".....	...	" .....	" .....
950	...	Lepas Hillia.....	...	Turks Island.....	Alcohol..
951	...	Pyrula carica (Winkle Shell).....	...	Long Island Sound.....	Dry.....
952	...	Pyrula canaliculata (Spawn of Winkle).....	...	New Haven, Conn.....	" .....
953	...	Crepidula.....	...	" .....	" .....
954	...	Gorgonia.....	...	Hampton, Va., Johns Hopkins, Biol. Lab.....	Alcohol..
955	...	Balanoglossus.....	...	" .....	" .....
956	...	" .....	...	" .....	" .....
957	...	Amphioxus lanceolatus.....	...	" .....	Corr. Sub-limate.
958	...	" .....	...	" .....	Alcohol..
959	...	" .....	...	" .....	Picric
960	...	" .....	...	" .....	Acid. Chronic
961	3	Fiber zibethicus, (L.) Cuv.....	...	Minneapolis.....	Acid....
962	18	Geomys bursarius, (Shaw) Rich.....	M.	" .....	M't'd ....
963	19	" .....	F.	" .....	" .....
964	27	Condylura cristata, (L.) Desm.....	...	Hinckley, Minn.....	" .....
965	28	Patonius ermineus, Cuv.....	...	" .....	" .....
966	36a	Sciuropterus volucella.....	...	Monticello, Minn.....	" .....
967	36b	" .....	...	" .....	" .....
968	9	Tamias striatus, (L.) Baird.....	...	Hinckley, Minn.....	" .....
969	8	Sciurus hudsonius, Pallas.....	...	Pine City, Minn.....	" .....
970	6	" carolinensis, Auct.....	...	Minneapolis.....	" .....
971	33	Tamias striatus, (L.) Baird.....	...	Hinckley, Minn.....	" .....
972	...	Picoides arcticus, (Swains) Gray.....	M.	" .....	" .....
973	...	" .....	M.	" .....	" .....

REGISTER.

Collected by	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
E. Lyman Hood ...	May 28, 1881.	May, 1881.	E. Lyman Hood ...	1	Presented.
		"	Regent Chute ...	1	"
E. L. Huggins .....		March, 1881	E. L. Huggins.....	1	"
" .....		"	" .....	1	"
" .....		"	" .....	1	"
C. W. Hall.....	1880	1880	C. W. Hall.....	1	
" .....	August, 1881.	1881	" .....	2	
" .....		"	" .....	1	
" .....	August, 1880.	"	" .....		
M. Pettingill.....	July, 1880.	"	M. Pettingill.....		Presented.
S. F. Peckham.....	1880	"	C. W. Hall.....	1	Depos'td by C. W. H
Mayhew Bros.....	"	"	Mayhew Bros.....	1	
C. W. Hall.....	"	"	C. W. Hall.....	2	
Prof. E. S. Morse ..	1879	1880	Prof. E. S. Morse..	1	Presented.
Thos. S. Roberts...	1882	1882	Thos. S. Roberts...	1	"
N. H. Winchell....	1881	1881	N. H. Winchell....	1	"
N. M. Baker .....	1882	1882	N. M. Baker .....	1	" Dissected to show viscera.
R. M. Bell .....	"	"	R. M. Bell .....	1	Presented. Dissected to show nervous system.
" .....	"	"	" .....	1	Presented. Dissected to show viscera
H. C. Hovey.....	1883	1883	H. C. Hovey.....	Indef	
" .....	"	"	" .....	"	
" .....	"	"	" .....	3	
" .....	"	"	" .....	7	
" .....	"	"	" .....	5	Presented after the Minneapolis meeting, A. A. A. S.
" .....	"	"	" .....	1	
" .....	"	"	" .....	1	
" .....	"	"	" .....	2	
" .....	"	"	" .....	1	
Geo. W. Mansfield.	1882	1882	Geo. W. Mansfield.	Indef.	Presented.
H. C. Hovey.....	1883	1883	H. C. Hovey.....	2	"
" .....	"	"	" .....	2	"
" .....	"	"	" .....	1	"
H. F. Nachtrieb...	"	"	H. F. Nachtrieb...	1	"
" .....	"	"	" .....	Indef.	"
" .....	"	"	" .....	"	"
" .....	"	"	" .....	"	"
" .....	"	"	" .....	Sev'l	"
" .....	"	"	" .....	"	"
" .....	"	"	" .....	"	"
" .....	"	"	" .....	"	"
C. L. Herrick.....	October, 1883.	Oct., 1883.	Geol. & N. H. Sur.	1	
" .....	Nov., 1883.	Nov., 1883.	" .....		
" .....	"	"	" .....		
" .....	"	"	" .....		
" .....	"	"	" .....		
" .....	Dec., 1883.	Dec., 1883.	" .....		
" .....	"	"	" .....		
" .....	Nov., 1883.	Nov., 1883.	" .....		
" .....	"	"	" .....		
" .....	Oct., 1883.	Oct., 1883.	" .....		
" .....	Nov., 1883.	Nov., 1883.	" .....		
" .....	"	"	" .....	1	
" .....	"	"	" .....	1	

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen
974	....	<i>Picoides arcticus</i> .....	F.	Hinckley, Minn.....	M't'd .....
975	....	" .....	F.	" .....	" .....
976	....	<i>Hesperiphona vespertina</i> , (Cooper) Baird.	M.	Minneapolis .....	" .....
977	....	" .....	F.	" .....	" .....
978	41	<i>Lynx rufus</i> , (Gold ) Raf. ....	M.	" .....	M't'd .....
979	34	" .....	F.	Hinckley, Minn.....	M't'd .....
980	43	" Young.....	"	" .....	" .....
981	....	<i>Lanius ludovicianus excubitorides</i> , (Sw ) Coues.....	F.	" .....	M't'd .....
982	305	<i>Carpodacus purpureus</i> , (Gm.) Bd.....	M.	Minneapolis .....	" .....
983	404	<i>Xanthocephalus icterocephalus</i> , (Bp.) Bd.....	F.	" .....	" .....
984	117	<i>Ceryle alcyon</i> , (L.) Boie.....	F.	Minneapolis .....	" .....
985	232	<i>Ampelis garrulus</i> , Linn.....	F.	Richfield, Minn.....	" .....
986	122	<i>Geothlypis trichas</i> , (L.) Caban.....	M.	Minneapolis.....	" .....
987	261	<i>Harporhynchus rufus</i> , (L.) Caban .....	F.	" .....	" .....
988	434	<i>Cyanocitta cristata</i> , (L.) Strickl.....	"	" .....	" .....
989	326	<i>Centrophean lapponicus</i> .....	F.	Sandy Lake .....	" .....
990	414	<i>Icterus spurius</i> (L.) Bp.....	M.	" .....	" .....
991	76	<i>Picus pubescens</i> , Linn.....	F.	Minneapolis.....	" .....
992	349	<i>Zonotricha albicollis</i> , (Gm.) Bp.....	M.	" .....	" .....
993	158	<i>Sialia sialis</i> , (L.) Haldem.....	M.	" .....	" .....
994	217	<i>Setophaga ruticilla</i> , (L.) Sw.....	M.	Bet. Minneapolis & St. P.....	" .....
995	391	<i>Pipilo erythrothalmus</i> , (L.) Vieill.....	M.	Sandy Lake, Hennepin Co.....	" .....
996	112	<i>Caprimulgus vociferus</i> , Wils.....	M.	Minneapolis.....	" .....
997	213	<i>Myiodiodes pusillus</i> , (Wils.) Bp.....	M.	" .....	" .....
998	319	<i>Loxia leucoptera</i> Gm.....	M.	" .....	" .....
999	302	<i>Eremophila alpestris</i> , (Frost) Boie.....	F.	Sandy Lake, Anoka Co.....	" .....
1000	302	" Young .....	F.	" .....	" .....
1001	302	" .....	M.	" .....	" .....
1002	559	<i>Fulica americana</i> , Gmel.....	"	Medicine Lake, Henn. Co.....	" .....
1003	194	<i>Dendroeca coronata</i> , (L.) Gray.....	M.	Minneapolis.....	" .....
1004	61	<i>Nyctea scandiaca</i> , (L.) Newt.....	M.	Windom, Cottonwood Co.....	" .....
1005	48	<i>Bubo virginianus</i> , (Gm.) Bp.....	M.	Near Osseo, Hennepin Co.....	" .....
1006	233	<i>Ampelis cedrorum</i> (Vieill.) Bd.....	"	Minneapolis.....	" .....
1007	254	<i>Galeoscoptes carolinensis</i> , (L.) Caban.....	M.	" .....	" .....
1008	504	<i>Oxyechus vociferus</i> , (L.) Reich.....	M.	Sandy Lake, Anoka Co.....	" .....
1009	400	<i>Molothrus ater</i> , (Bodd.) Gray.....	M.	" .....	" .....
1010	400	" .....	M.	" .....	" .....
1011	317	<i>Chrysomitris pinus</i> , (Wils.) Bp.....	F.	" .....	" .....
1012	400	<i>Molothrus ater</i> , (Bodd.) Gray.....	"	Minneapolis.....	" .....
1013	39	<i>Aquila chrysaetos canadensis</i> (L.) Ridgw.....	M.	Winnipeg, Manitoba.....	" .....
1014	39	" .....	F.	" .....	" .....
1015	39	" .....	M.	" .....	" .....
1016	39	" .....	M.	" .....	" .....
1017	43	<i>Haliaeetus leucocephalus</i> , (L.) Savig.....	F.	St. Croix River.....	" .....
1018	43	" .....	M.	Howard Lake, Wright Co.....	" .....
1019	43	" Young .....	F.	Monticello.....	" .....
1020	44	<i>Pandion haliaetus carolinensis</i> (Gm.) Ridgw.....	"	Manitoba.....	" .....
1021	14	<i>Astur atricapillus</i> , Linn.....	M.	Near Medicine Lake, Hennepin Co.....	" .....
1022	14	" .....	F.	Medicine Lake, Henn. Co.....	" .....
1023	14	" .....	F.	On Watertown Road.....	" .....
1024	14	" .....	M.	Moore Lake, Anoka Co.....	" .....
1025	38	<i>Circus hudsonius</i> , (L.) Vieill.....	M.	Bet. Minneapolis & St. P.....	" .....
1026	38	" Young.....	M.	Near Medicine Lake, Hennepin Co.....	" .....
1027	38	" .....	F.	St. Paul.....	" .....
1028	....	<i>Aesalon columbarius</i> (L.) Kaup.....	"	" .....	" .....
1029	13	<i>Tinnunculus sparverius</i> , (L.) Vieill.....	F.	Near Sandy, Anoka Co.....	" .....
1030	....	" .....	"	" .....	" .....
1031	23	<i>Buteo borealis</i> , (Gm.) Vieill.....	M.	Minneapolis .....	" .....
1032	....	" .....	"	" .....	" .....
1033	48	<i>Bubo virginianus</i> , (Gm.) Bp.....	M.	Bet. Minneapolis & St. P.....	" .....
1034	48	" .....	F.	Rockford, Wright Co.....	" .....
1035	61	<i>Nyctea scandiaca</i> , (L.) Newt., Young.....	M.	Windom, Cottonwood Co.....	" .....

## Register.—Continued.

Collected by	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
C. L. Herrick.....	Nov., 1883.	Nov., 1883.	Geol. & N. H. Sur.	1	.....
"	"	"	"	1	.....
"	Jan., 1883 (?)	Jan., 1883(?)	"	1	.....
"	Oct., 1883.	Oct., 1883.	"	1	.....
N. H. Winchell....	Nov., 1883.	Nov., 1883.	"	1	.....
C. L. Herrick.....	"	"	"	1	.....
"	Feb., 1883.	Feb., 1883.	"	1	.....
Wm. Howling .....	.....	1884	Wm. Howling .....	1	By purchase.
"	1879	"	"	4	"
"	.....	"	"	1	"
"	July 20, 1880.	"	"	1	"
"	Dec. 12, 1881.	"	"	4	"
"	July 1, 1879.	"	"	1	"
"	1879	"	"	1	"
"	.....	"	"	1	"
"	June, 1879.	"	"	1	"
"	.....	"	"	2	"
"	1880	"	"	1	"
"	June 1, 1882.	"	"	1	"
"	July 27, 1881.	"	"	1	"
"	June 26, 1882.	"	"	1	"
"	1880	"	"	2	"
"	July 17, 1880.	"	"	1	"
"	June 13, 1880.	"	"	1	"
"	1880	"	"	2	"
"	July 21, 1881.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	June 13, 1882.	"	"	1	"
"	May 13, 1881.	"	"	1	"
"	Dec. 20, 1880.	"	"	1	"
"	1884	"	"	1	"
"	.....	"	"	1	"
"	1882	"	"	1	"
"	June 20, 1879.	"	"	1	"
"	July 31, 1883.	"	"	1	"
"	.....	"	"	1	"
"	.....	"	"	1	"
"	April 9, 1883.	"	"	1	"
"	"	"	"	1	"
"	.....	"	"	1	"
"	1875	"	"	1	"
"	June 5, 1882.	"	"	1	"
"	April 21, 1884.	"	"	1	"
"	April 9, 1883.	"	"	1	"
"	.....	"	"	1	"
"	1883	"	"	1	"
"	1881	"	"	1	"
"	1883	"	"	1	"
"	May 30, 1882.	"	"	1	"
"	October, 1883.	"	"	1	"
"	.....	"	"	1	"
"	August, 1882.	"	"	1	"
"	1879	"	"	1	"
Wm. Howling .....	May, 1879.	1884	Wm. Howling .....	1	By purchase.
Wm. Howling .....	June 30, 1875.	1884	Wm. Howling .....	1	By purchase.
Wm. Howling .....	.....	.....	.....	1	.....
Wm. Howling .....	1883	1884	Wm. Howling .....	1	By purchase.
"	1882	"	"	1	"
"	June 31, 1881.	"	"	1	"

Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1036	61	Nyctea scandiaca.....	F.	Moose lake, Anoka Co...	M'd.....
1037	54	Strix debulosa, Forst.....	M.	" " " " " " " "	" " " " " " " "
1038	51	Asio americanus, (Steph.) Sharpe.....	M.	Nr. Silver L., Ramsey Co.	" " " " " " " "
1039	52	Asio accipitrinus, (Pall.) Newt.....	M.	Bet. Minneapolis & St P.	" " " " " " " "
1040	52	" " " " " " " "	F.	Near Sandy L, Anoka Co	" " " " " " " "
1041	52	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1042		Haliaetus leucocephalus, (L.) Savig.....		" " " " " " " "	" " " " " " " "
1043		" " " " " " " "		" " " " " " " "	" " " " " " " "
1044		Buteo borealis, (Gm.) Vieill.....		" " " " " " " "	" " " " " " " "
1045		Astur atricapillus, (Wils.) Bp.....		" " " " " " " "	" " " " " " " "
1046	14	" " " " " " " " young.....	M.	Anoka, Anoka Co.....	" " " " " " " "
1047	27	Buteo pennsylvanicus (Wils.) Bp.....	M.	Wright Co.....	" " " " " " " "
1048	1	Cathartes aura (L.) Illig.....	M.	Lake Minnetonka.....	" " " " " " " "
1049	49	Scops asio, (L.) Bp.....	M.	Coon Creek, Anoka Co.....	" " " " " " " "
1050	49	" " " " " " " "	F.	Nr. L. Calhoun, Anoka Co	" " " " " " " "
1051	47	Aluco flammeus americanus, (And.) Ridgw.....	M.	" " " " " " " "	" " " " " " " "
1052	112	Caprimulgus vociferus, Wils.....	F.	Near Sandy L, Anoka Co.	" " " " " " " "
1053	112	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1054	114	Chordeiles popetue, (Vieill.) Bd.....	M.	Minneapolis.....	" " " " " " " "
1055	114	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1056	94	Melanerpes erythrocephalus, (L.) Sw.....	M.	" " " " " " " "	" " " " " " " "
1057	97	Colaptes auratus, (L.) Sw.....	F.	" " " " " " " "	" " " " " " " "
1058	90	Hylotomus pileatus, (L.) Bd.....	M.	Wright Co.....	" " " " " " " "
1059	90	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1060	90	" " " " " " " "	F.	Maple Grove, Henn. Co..	" " " " " " " "
1061	74	Picus villosus, Linn.....	M.	Minneapolis.....	" " " " " " " "
1062	85	Sphyrapicus varius, (L.) Bd.....	M.	" " " " " " " "	" " " " " " " "
1063	85	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1064	59	Speotyto cunicularia hypogaea, (Bd.) Ridgw.....	M.	Dakota.....	" " " " " " " "
1065	70	Coccygus erythrophthalmus, (Wils.) Bd.....	F.	Near Minneapolis.....	" " " " " " " "
1066	70	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1067	434	Cyanocitta cristata, (L.) Strickl.....	F.	" " " " " " " "	" " " " " " " "
1068	434	" " " " " " " "	M.	Minneapolis.....	" " " " " " " "
1069	117	Ceryle alcyon, (L.) Boie.....	M.	Near Minneapolis.....	" " " " " " " "
1070	117	" " " " " " " "	F.	L. Johannah, Ramsey Co	" " " " " " " "
1071	399	Dolichonyx oryzivorus, (L.) Sw.....	M.	Rice creek, Anoka Co.....	" " " " " " " "
1072	426	Corvus frugivorus, Bartr.....	M.	Medicine L., Henn. Co.....	" " " " " " " "
1073	414	Icterus spurius, (L.) Bp..... young.....	M.	Minneapolis.....	" " " " " " " "
1074	414	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1075	414	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1076	414	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1077	415	" " galbula, (L.) Coues.....	M.	" " " " " " " "	" " " " " " " "
1078	401	Agelaius phoeniceus, (L.) Vieill.....	M.	Near Sandy L, Anoka Co.	" " " " " " " "
1079	404	Xanthocephalus icterocephalus, (Bp.) Bd.....	M.	Sandy lake, Anoka Co...	" " " " " " " "
1080	404	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1081		Quiscalus purpureus aeneus, Ridgw.....	M.	Minneapolis.....	" " " " " " " "
1082	406	Sturnella magna (L.) Sw.....	M.	Near Sandy Lk, Henn Co	" " " " " " " "
1083	406	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1084	417	Scolecophagus ferrugineus, (Gm.) Sw.....	M.	" " " " " " " "	" " " " " " " "
1085	401	Agelaius phoeniceus, (L.) Vieill.....	F.	" " " " " " " "	" " " " " " " "
1086	261	Harporhynchus rufus, (L.) Caban.....	F.	Minneapolis.....	" " " " " " " "
1087	158	Sialia sialis, (L.) Haldem.....	F.	" " " " " " " "	" " " " " " " "
1088	158	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1089	155	Merula migratoria, (L.) Sw. & Rich.....		" " " " " " " "	" " " " " " " "
1090	155	" " " " " " " "		" " " " " " " "	" " " " " " " "
1091	232	Ampelis garrulus, Linn.....	M.	Richfield, Hennepin Co..	" " " " " " " "
1092	232	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1093	233	" " cedrorum, (Vieill.) Bd.....	M.	Minneapolis.....	" " " " " " " "
1094	233	" " " " " " " "	F.	" " " " " " " "	" " " " " " " "
1095	233	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1096	233	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1097	227	Tachycineta bicolor, (Vieill.) Caban.....	F.	L'k Johannah Ramsey Co	" " " " " " " "
1098	227	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "
1099	318	Loxia curvirostra americana, (Wils.) Coues.....	F.	Duluth.....	" " " " " " " "
1100	318	" " " " " " " "	M.	" " " " " " " "	" " " " " " " "

Register.—Continued.

Collected by.	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling	Oct. 23, 1881.	1884	Wm. Howling	1	By purchase.
"	Jan. 8, 1880.	"	"	1	"
"	1878	"	"	1	"
"	1882	"	"	1	"
"	1881	"	"	1	"
"	1879	"	"	1	"
			N. L. Bailey	1	Presented.
			"	1	"
			"	1	Young.
			"	1	"
Wm. Howling	1882	1884	Wm. Howling	1	By purchase.
"	1877	"	"	1	"
"	1882	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	Aug. 3, 1882.	"	"	1	"
"	"	"	"	1	"
"	Sept. 3, 1882.	"	"	1	"
"	July 30, 1888.	"	"	1	"
"	July, 1882.	"	"	1	"
"	July 27, 1881.	"	"	1	"
"	Feb. 20, 1880.	"	"	1	"
"	"	"	"	1	"
"	May 12, 1881.	"	"	1	"
"	1880	"	"	1	"
"	June 1, 1881.	"	"	1	"
"	"	"	"	1	"
"	1876	"	"	1	"
"	July, 1881.	"	"	1	"
"	July, 1879.	"	"	1	"
"	June, 1883.	"	"	1	"
"	"	"	"	1	"
"	July 20, 1880.	"	"	1	"
"	Aug. 1, 1882.	"	"	2	"
"	1862	"	"	1	"
"	August, 1878.	"	"	3	"
"	Summer of '80	"	"	4	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	2	"
"	July, 1881.	"	"	1	"
"	1881	"	"	3	"
"	June, 1881.	"	"	1	"
"	"	"	"	1	"
"	June 1, 1879.	"	"	1	"
"	May 15, 1879.	"	"	1	"
"	"	"	"	1	"
"	1879	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	June 1, 1882.	"	"	1	"
"	June 15, 1882	"	"	1	"
"	"	"	"	1	"
"	Dec. 12, 1881.	"	"	2	"
"	"	"	"	2	"
"	1880	"	"	1	"
"	July, 1880.	"	"	1	"
"	"	"	"	1	"
"	1879	"	"	1	"
"	May 4, 1882.	"	"	2	"
"	"	"	"	1	"
"	1877	"	"	1	"
"	"	"	"	1	"

## Zoological

Catalogue number.	Original number.	NAME.	Sex	Locality.	Nature of specimen.
1101	319	<i>Loxia leucoptera</i> , Gm	M.	Minneapolis	M't'd
1102	319	"	F.	"	"
1103	220	<i>Pyrranga rubra</i> , (L.) Vieill.	M.	"	"
1104	220	"	F.	"	"
1105	220	"	M.	"	"
1106	220	" (L.) Vieill	F.	"	"
1107	380	<i>Zamelodia ludoviciana</i> , (L.) Coues	M.	Sandy lake, Anoka Co.	"
1108	380	"	F.	"	"
1109	303	<i>Hesperiphona vespertina</i> , (Cooper) Bp.	M.	Minneapolis	"
1110	303	"	F.	"	"
1111	303	"	M.	"	"
1112	303	"	F.	"	"
1113	304	<i>Pinicola enuncleator</i> , (L.) Vieill.	F.	"	"
1114	304	"	M.	"	"
1115	304	" young.	F.	"	"
1116	304	"	M.	"	"
1117	391	<i>Pipilo erythrophthalmus</i> , (L.) Vieill.	M.	Sandy lake, Anoka Co	"
1118	391	"	F.	"	"
1119	354	<i>Junco hyemalis</i> , (L.) Sch.	M.	Minneapolis	"
1120	325	<i>Plectrophanes nivalis</i> (L.) Meyer.	M.	Osseo, Hennepin Co.	"
1121	325	"	M.	"	"
1122	305	<i>Carpodacus purpureus</i> , (Gm.) Bd.	M.	Minneapolis	"
1123	305	"	M.	"	"
1124	326	<i>Centrophanes lapponicus</i> , (L.) Caban.	M.	Sandy lake, Hennepin Co	"
1125	320	<i>Aegiothus linaria</i> , (L.) Caban.	M.	Minneapolis	"
1126	313	<i>Astragalinus tristis</i> , (L.) Caban.	M.	"	"
1127	313	"	F.	"	"
1128	349	<i>Zonotrichia albicollis</i> , (Gm.) Bp.	M.	"	"
1129	238	<i>Lanius ludovicianus excubitorides</i> , (Sw.) Coues	M.	Anoka, Anoka Co	"
1130	279	<i>Sitta canadensis</i> , Linn.	M.	Minneapolis	"
1131	277	<i>Sitta carolinensis</i> , Gmel.	M.	"	"
1132	277	"	F.	"	"
1133	374	<i>Passerella iliaca</i> , (Merrem) Sw.	F.	Bet. Minneapolis & St. P.	"
1134	374	"	F.	"	"
1135	259	<i>Parus atricapillus</i> , Linn.	F.	Minneapolis	"
1136	259	"	F.	"	"
1137	130	<i>Myiarchus crinitus</i> , (L.) Caban.	M.	Bet. Minneapolis & St. P.	"
1138	130	"	F.	"	"
1139	130	"	M.	"	"
1140	130	"	F.	"	"
1141	348	<i>Zonotrichia querula</i> , (Nutt.) Gamb.	M.	"	"
1142	345	" <i>leucophrys</i> , (Forst.) Sw.	M.	Minneapolis	"
1143	275	<i>Certhia familiaris rufa</i> , (Bartr.) Ridgw.	M.	"	"
1144	200	<i>Dendroica pennsylvanica</i> , (L.) Bd.	M.	"	"
1145	200	"	M.	"	"
1146	200	"	M.	"	"
1147	194	" <i>coronata</i> , (L.) Gray.	M.	"	"
1148	194	"	F.	"	"
1149	101	<i>Trochilus colubris</i> , Linn.	F.	"	"
1150	196	<i>Dendroica blackburniae</i> , (Gm.) Bd.	M.	"	"
1151	181	<i>Helminthophaga chrysoptera</i> , (L.) Bd.	F.	"	"
1152	181	"	M.	"	"
1153	161	<i>Regulus calendula</i> , (L.) Licht.	M.	"	"
1154	162	<i>Regulus satrapa</i> , Licht.	F.	"	"
1155	162	"	M.	"	"
1156	217	<i>Setophaga ruticilla</i> , (L.) Sw.	F.	Bet. Minneapolis & St. P.	"
1157	217	"	M.	"	"
1158	217	"	F.	"	"
1159	217	"	M.	"	"
1160	"	"	M.	"	"
1161	"	"	M.	"	"
1162	170	<i>Geothlypis trichas</i> , (L.) Caban.	M.	Sandy lake, Anoka Co.	"
1163	206	<i>Perisoglossa tigrina</i> , (Gm.) Bd.	"	"	"
1164	206	"	"	"	"



## Register.—Continued.

Collected by.	When Collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling ....	1880	1884	Wm. Howling ....	1	By purchase.
" .....	" .....	" .....	" .....	1	" .....
" .....	July 14, 1883.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	1880	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	July 4, 1880.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	1880	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	Dec., 1879.	" .....	" .....	1	" .....
" .....	Dec., 1878.	" .....	" .....	3	" .....
" .....	Dec., 1879.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	1880	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	Nov., 1880.	" .....	" .....	1	" .....
" .....	Dec. 25, 1881.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	1879	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	June, 1879.	" .....	" .....	2	" .....
" .....	1879	" .....	" .....	1	" .....
" .....	1881	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	May 28, 1879.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	Aug. 20, 1879.	" .....	" .....	1	" .....
" .....	1880	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	June 17, 1880.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	1880	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	June 16, 1882.	" .....	" .....	1	" .....
" .....	June 30, 1882.	" .....	" .....	1	" .....
" .....	June 16, 1882.	" .....	" .....	1	" .....
" .....	June 30, 1882.	" .....	" .....	1	" .....
.....	.....	.....	.....	1	.....
Wm. Howling ....	1879	1884	Wm. Howling ....	1	By purchase.
" .....	" .....	" .....	" .....	1	" .....
" .....	May 30, 1882	" .....	" .....	1	" .....
" .....	June 2, 1879.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	June, 1882.	" .....	" .....	1	" .....
" .....	May 13, 1881.	" .....	" .....	1	" .....
" .....	June 3, 1882.	" .....	" .....	1	" .....
" .....	June 7, 1882.	" .....	" .....	1	" .....
" .....	June 3, 1882.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....
" .....	May 23, 1880.	" .....	" .....	1	" .....
" .....	June 14, 1884.	" .....	" .....	1	" .....
" .....	June 1, 1880.	" .....	" .....	1	" .....
" .....	May 28, 1879.	" .....	" .....	1	" .....
" .....	June 26, 1882.	" .....	" .....	1	" .....
" .....	May 28, 1879.	" .....	" .....	1	" .....
" .....	June 26, 1882	" .....	" .....	1	" .....
.....	.....	.....	.....	1	.....
.....	.....	.....	.....	1	.....
Wm. Howling ....	June 30, 1882.	1884	Wm. Howling ....	1	" .....
" .....	May 29, 1879.	" .....	" .....	1	" .....
" .....	" .....	" .....	" .....	1	" .....

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen
1165	206	<i>Perissoglossa tigrina</i> .....		Sandy lake Anoka Co.	Mtd ....
1166	206				
1167	204	<i>Dendroca maculosa</i> , (Gm.) Bd .....	M.	Bet. Minneapolis & St. P.	"
1168	168	<i>Parula americana</i> , (L.) Bp. ....	M.	Minneapolis .....	"
1169	168	" .....	M.	" .....	"
1170	168	" .....	F.	" .....	"
1171	202	<i>Dendroca striata</i> , (Forst.) Bd. ....	F.	Bet. Minneapolis & St. P.	"
1172	202	" .....	M.	" .....	"
1173	203	" <i>æstiva</i> , (Gm.) Bd. ....	M.	Rice creek, Anoka Co. ...	"
1174	183	<i>Helminthophaga ruficapilla</i> , (Wils.) Bd. ....			"
1175	183	" .....			"
1176	203	<i>Dendroca æstiva</i> , (Gm.) Bd. ....	F.	Rice creek, Anoka Co., ...	"
1177	213	<i>Myiodytes pusillus</i> , (Wils.) Bp. ....	F.	Minneapolis .....	"
1178	189	<i>Dendroca virens</i> , (Gm.) Bd. ....	F.	" .....	"
1179	189	" .....	F.	" .....	"
1180	208	" <i>palmarum</i> , (Gm.) Bd. ....	M.	Minneapolis .....	"
1181	208	" .....	F.	Sandy lake, Anoka Co.	"
1182	208	" .....	F.	" .....	"
1183	186	<i>Spurus auricapillus</i> , (L.) Sw. ....		Minneapolis .....	"
1184	186	" .....		" .....	"
1185	187	" <i>nævius</i> , (Bodd.) Cones. ....		" .....	"
1186	187	" .....		" .....	"
1187	240	<i>Vireosylva olivacea</i> , (L.) Bp. ....	M.	" .....	"
1188	245	" <i>gilva</i> , (Vieill) Cass. ....	F.	" .....	"
1189	240	" <i>olivacea</i> , (L.) Bp. ....	M.	" .....	"
1190	55	<i>Nyctale tengmalmi richardsoni</i> , (Bp.) Ridgw		Near Minneapolis .....	"
1191	57	<i>Nyctale acadica</i> , (Gmel.) Bp. ....		" .....	"
1192	250	<i>Lanius solitarius</i> , (V.) Bd. ....	M.	Minneapolis .....	"
1193	250	" .....	F.	" .....	"
1194	252	" <i>flavifrons</i> , (V.) Bd. ....	M.	" .....	"
1195	139	<i>Contopus virens</i> , (L.) Caban. ....	F.	" .....	"
1196	148	<i>Hylocichla mustelina</i> , (Gm.) Bd. ....		Minneapolis .....	"
1197	148	" .....		" .....	"
1198	154	" <i>aliciae</i> , Bd. ....		" .....	"
1199	153	" <i>ustulata swainsoni</i> , (Cab.) Ridgw		" .....	"
1200	348	<i>Zonotrichia albicollis</i> , (Gm.) Bp. ....	M.	" .....	"
1201	369	<i>Melospiza palustris</i> , (Wils.) Bd. ....		Near Minneapolis .....	"
1202	357	<i>Spizella montana</i> , (Forst.) Ridgw	M.	Minneapolis .....	"
1203	363	<i>Melospiza fasciata</i> , (Gm.) Scott. ....		" .....	"
1204	363	" .....		" .....	"
1205	135	<i>Sayornis fuscus</i> , (Gm.) Bd. ....		Sandy lake, Anoka Co.	"
1206	135	" .....		" .....	"
1207	583	<i>Spatula clypeata</i> , (L.) Boie .....	M.	Medicine Lake, Henn. Co.	"
1208	583	" .....	M.	" .....	"
1209	577	<i>Anas obscura</i> , Gmel. ....	F.	Sandy lake, Anoka Co.	"
1210	576	<i>Anas boschas</i> , Linn. ....	M.	" .....	"
1211	576	" .....	M.	" .....	"
1212	576	" .....	F.	Sandy lake, Anoka Co.	"
1213	578	<i>Dafila acuta</i> , (L.) Bp. ....	M.	Lk. Johannah, Ramsey Co	"
1214	578	" .....	M.	" .....	"
1215	578	" .....	M.	" .....	"
1216	585	<i>Mareca americana</i> , (Gm.) Steph. ....	M.	Lake Amelia, Henn. Co. .	"
1217	585	" .....	M.	" .....	"
1218	613	<i>Lophodytes cucullatus</i> , (L.) Reich. ....	M.	Medicine lake, Henn. Co.	"
1219	613	" .....	F.	" .....	"
1220	581	<i>Querquedula discors</i> , (L.) Steph. ....	M.	Moore lake, Anoka Co. .	"
1221	581	" .....	F.	" .....	"
1222	579	<i>Nettion carolinensis</i> , (Gm.) Bd. ....	M.	Minneapolis .....	"
1223	579	" .....	M.	" .....	"
1224	579	" .....	M.	" .....	"
1225	595	<i>Ciangula albeola</i> , (L.) Steph. ....	M.	Sandy Lake, Anoka Co.	"
1226	593	" <i>glauca americana</i> , (Bp.) Ridgw.	M.	" .....	"
1227	593	" .....	M.	" .....	"
1228	593	" .....	F.	Lake Minnetonka. ....	"

Register.—Continued.

Collected by.	When Collected.	OBTAINED.		No. of specimens.	Remarks
		When.	Whence.		
Wm. Howling ....	May 29, 1879.	1884	Wm. Howling ....	1	By purchase.
"	"	"	"	1	"
"	June 7, 1879.	"	"	1	"
"	1880	"	"	1	"
"	"	"	"	1	"
"	June 4, 1881.	"	"	1	"
"	"	"	"	1	"
"	July 28, 1882	"	"	1	"
"	"	"	"	1	"
"	July 28, 1882	"	"	1	"
"	May 30, 1878	"	"	1	"
"	"	"	"	1	"
"	June 3, 1879.	"	"	1	"
"	June 14, 1882.	"	"	1	"
"	"	"	"	1	"
"	July 14, 1881.	"	"	1	"
"	"	"	"	1	"
"	June 26, 1882.	"	"	1	"
"	"	"	"	1	"
"	1881	"	"	1	"
"	"	"	"	1	"
"	1879	"	"	1	"
"	"	"	"	2	"
"	"	"	"	1	"
"	Spring 1882.	"	"	1	"
"	"	"	"	1	"
"	June, 1882.	"	"	1	"
"	"	"	"	1	"
"	1880	"	"	1	"
"	"	"	"	1	"
"	June 1, 1881.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	July 28, 1882.	"	"	1	"
"	June 20, 1880.	"	"	1	"
"	"	"	"	1	"
"	June 15, 1883.	"	"	1	"
"	"	"	"	1	"
"	Spring 1882.	"	"	1	"
"	"	"	"	1	"
"	Sept., 1880.	"	"	1	"
"	"	"	"	1	"
"	1879	"	"	1	"
"	Fall, 1881.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	Spring, 1878.	"	"	1	"
"	"	"	"	1	"
"	Fall, 1880.	"	"	1	"
"	"	"	"	1	"
"	Spring, 1877.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	May 26, 1880.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	Fall, 1879.	"	"	1	"

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1229	611	Mergus merganser americanus, (Cass.) Ridgw .....	M.	Long lake, Henn. Co....	M't'd ....
1230	611	" " " " " " " "	M.	Moore lake, Anoka Co...	" " " "
1231	611	" " " " " " " "	F.	Lake Amelia, Henn. Co...	" " " "
1232	611	" " " " " " " "	F.	L. Johannah, Ramsey Co	" " " "
1233	563	Chen hyperboreus, (Pall) Boie .....	M.	Windom, Cottonwood Co	" " " "
1234	563	" " " " " " " "	F.	Minneapolis .....	" " " "
1235	623	Phalacrocorax dilophus, (Sw. & Rich.) Nutt	M.	Rice lake, Hennepin Co	" " " "
1236	698	Colymbus torquatus, Brunn .....	M.	Lake Minnetonka .....	" " " "
1237	698	" " " " " " " "	F.	Long lake, Henn. Co....	" " " "
1238	698	" " " " " " young.	M.	Sandy lake, Anoka Co....	" " " "
1239	615	Pelecanus erythrorhynchus, Gm .....	M.	New Ulm .....	" " " "
1240	615	" " " " " " " "	F.	Fisher's Landing, D. T.	" " " "
1241	590	Fulix collaris, (Donov.) Bd .....	M.	" " " " " " " "	" " " "
1242	580	Fulix marila, (L.) Bd .....	M.	Sandy lake, Henn. Co....	" " " "
1243	591	Aethya americana (Eyt.) Bp .....	M.	Lake Amelia, Henn. Co...	" " " "
1244	592	Aethya vallisneria (Wils.) Boie .....	M.	Duluth .....	" " " "
1245	559	Fulica americana, Gm .....	M.	Medicine lake, Henn. Co.	" " " "
1246	706	Dytes auritus, (L.) Ridgw .....	M.	" " " " " " " "	" " " "
1247	706	" " " " " " " "	M.	" " " " " " " "	" " " "
1248	706	" " " " " " " "	M.	Minneapolis .....	" " " "
1249	695	Hydrochelidon lariformis surinamensis (Gm.) Ridgw .....	M.	Long lake, Henn. Co....	" " " "
1250	695	" " " " " " " "	F.	" " " " " " " "	" " " "
1251	870	Larus philadelphia, (Ord.) Gray .....	M.	Richfield, Henn. Co....	" " " "
1252	870	" " " " " " " "	M.	" " " " " " " "	" " " "
1253	670	" " " " " " young.	M.	" " " " " " " "	" " " "
1254	670	" " " " " " young.	M.	" " " " " " " "	" " " "
1255	670	" " " " " " " "	F.	" " " " " " " "	" " " "
1256	.....	" " " " " " " "	F.	Lake Minnetonka .....	" " " "
1257	478	Grus americana, (L.) Temm .....	M.	Cedar Mills .....	" " " "
1258	487	Ardea herodias, Linn .....	M.	Lake Minnetonka .....	" " " "
1259	487	" " " " " " " "	M.	" " " " " " " "	" " " "
1260	495	Nyctiardea grisea naevia, (Bodd.) Allen...	M.	Lake Amelia .....	" " " "
1261	495	" " " " " " " "	F.	Windom, Cottonwood Co	" " " "
1262	493	Butorides virescens, (L.) Bp .....	M.	" " " " " " " "	" " " "
1263	493	" " " " " " " "	M.	" " " " " " " "	" " " "
1264	493	" " " " " " " "	F.	Minneapolis .....	" " " "
1265	492	Botaurus lentiginosus (Montag.) Steph...	M.	Long lake, Henn. Co....	" " " "
1266	492	" " " " " " " "	F.	" " " " " " " "	" " " "
1267	464	Cupidonia cupido, (L.) Bd .....	M.	" " " " " " " "	" " " "
1268	464	" " " " " " " "	M.	" " " " " " " "	" " " "
1269	464	" " " " " " " "	M.	" " " " " " " "	" " " "
1270	464	" " " " " " " "	F.	" " " " " " " "	" " " "
1271	464	" " " " " " " "	F.	" " " " " " " "	" " " "
1272	464	" " " " " " young.	M.	Moore lake, Anoka Co...	" " " "
1273	463	Pediceetes phasianellus columbianus, (Ord.) Cones .....	M.	Dakota .....	" " " "
1274	465	Bonasa umbrellus, (L.) Steph .....	M.	Bet. Minneapolis & St. P.	" " " "
1275	465	" " " " " " " "	F.	Minneapolis .....	" " " "
1276	.....	" " " " " " " "	M.	" " " " " " " "	" " " "
1277	471	Ortyx virginiana, (L.) Bp .....	M.	Moore Lake, Anoka Co...	" " " "
1278	471	" " " " " " " "	F.	" " " " " " " "	" " " "
1279	471	" " " " " " " "	F.	" " " " " " " "	" " " "
1280	471	" " " " " " " "	F.	" " " " " " " "	" " " "
1281	448	Ectopistes migratoria, (L.) Sw .....	M.	Rice Creek, Anoka Co...	" " " "
1282	448	" " " " " " " "	F.	" " " " " " " "	" " " "
1283	451	Zenaidura carolinensis, (L.) Bp .....	M.	Sandy Lake, Anoka Co...	" " " "
1284	451	" " " " " " " "	F.	" " " " " " " "	" " " "
1285	519	Steganopus wilsoni, (Sab.) Cones .....	M.	" " " " " " " "	" " " "
1286	519	" " " " " " " "	M.	" " " " " " " "	" " " "
1287	519	" " " " " " " "	M.	" " " " " " " "	" " " "
1288	519	" " " " " " " "	M.	" " " " " " " "	" " " "
1289	519	" " " " " " " "	F.	" " " " " " " "	" " " "
1290	520	Lobipes hyperboreus, (L) Cuv. (Young)..	M.	Moore Lake, Anoka Co...	" " " "

Register.—Continued.

Collected by	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling ....	1877	1884	Wm. Howling ....	1	By purchase.
"	April 10, 1882.	"	"	1	"
"	Nov. 5, 1882.	"	"	1	"
"	Nov. 1, 1879.	"	"	1	"
"	Oct. 15, 1880	"	"	1	"
"	Fall, 1874.	"	"	1	"
"	April 27, 1881.	"	"	1	"
"	Oct. 2, 1880.	"	"	1	"
"	Aug. 28, 1881.	"	"	1	"
"	June 30, 1879.	"	"	1	"
"	April 27, 1880.	"	"	1	"
"	June 3, 1875.	"	"	1	"
"	"	"	"	1	"
"	Sept. 17, 1880.	"	"	1	"
"	Spring, 1878.	"	"	1	"
"	Fall, 1879.	"	"	1	"
"	June 13, 1882.	"	"	1	"
"	"	"	"	1	"
"	July 14, 1878.	"	"	1	"
"	"	"	"	1	"
"	June 13, 1879.	"	"	1	"
"	"	"	"	1	"
"	1880	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
J. H. C. Hutchinson	May 15, 1885	1885	J. H. C. Hutchinson.	1	Presented.
Wm. Howling ....	Sept. 17, 1878.	1884	Wm. Howling ....	1	By purchase.
"	June 15, 1877.	"	"	1	"
"	"	"	"	1	"
"	July 21, 1878	"	"	1	"
"	April 23, 1881	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	May 20, 1881.	"	"	1	"
"	June 14, 1880.	"	"	1	"
"	June 20, 1881.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	June, 1882.	"	"	1	"
"	"	"	"	1	"
"	Nov. 20, 1880.	"	"	1	"
"	1880	"	"	1	"
"	1878	"	"	1	"
"	July, 1876.	"	"	1	"
Wm. Howling ....	August, 1880.	1884	Wm. Howling ....	1	By purchase.
"	"	"	"	1	"
"	"	"	"	1	"
"	July 27, 1881.	"	"	1	"
"	"	"	"	2	"
"	August, 1880.	"	"	1	"
"	"	"	"	1	"
"	July, 1880.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	August, 1882.	"	"	1	"

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1291	504	Oxyechus vociferus, (L.) Reich.....	M.	Sandy lake, Hennepin Co	M't'd ....
1292	504	"	F.	"	"
1293	507	Aegialites semipalmatus, Bp.....	"	"	"
1294	560	Gallinula galeata, (Licht.) Bp.....	M.	L Johannah, Ramsey Co.	"
1295	554	Rallus virginianus, Linn.....	M.	Minneapolis.....	"
1296	555	Porzana carolina, (L.) Bd.....	M.	Near Minneapolis.....	"
1297	555	"	F.	"	"
1298	"	" young	F.	Fond du Lac.....	"
1299	542	Rallus elegans, Aud.....	M.	Rice creek, Anoka Co...	"
1300	503	Charadrius dominicus, Mull.....	M.	Sandy lake, Anoka Co....	"
1301	503	"	F.	"	"
1302	503	"	M.	"	"
1303	503	"	"	"	"
1304	503	"	"	"	"
1305	522	Philohela minor (Gm.) Gray.....	M.	Rice creek, Anoka Co...	"
1306	523	Gallinula media wilsoni, (Temm.) Ridg..	M.	"	"
1307	523	"	M.	"	"
1308	523	"	F.	Medicine lake, Henn. Co.	"
1309	517	Recurvirostra americana, Gm.....	M.	Northern Pacific Road...	"
1310	547	Limosa fedea, (L.) Ord.....	M.	Sandy lake, Anoka Co....	"
1311	547	"	F.	"	"
1312	537	Symphemia semipalmata, (Gm.) Hartl....	M.	Moore lake, Anoka Co...	"
1313	537	"	F.	Lk Johannah, Ramsey Co	"
1314	539	Totanus melanoleucus, (Gm.) V.....	M.	Moore lake, Anoka Co...	"
1315	539	Totanus melanoleucus (Gm.) V.....	M.	"	"
1316	539	"	F.	"	"
1317	539	"	F.	"	"
1318	546	Tryngites rufescens, (V.) Cab.....	M.	"	"
1319	530	Pelidna alpina americana, Cass.....	M.	Sandy lake, Anoka Co...	"
1320	530	"	F.	"	"
1321	541	Rhyacophilus solitarius, (Wils.) Cass....	M.	Minneapolis.....	"
1322	541	"	F.	"	"
1323	543	Tringoides muscularius, (L.) Gray.....	M.	"	"
1324	543	"	F.	"	"
1325	541	Ereunetes pusillus, (L.) Cass.....	F.	Sandy lake, Hennepin Co	"
1326	"	" (young)	"	"	"
1327	"	" (young)	"	"	"
1328	390	Cardinalis virginianus, (Briess.) Bp.....	M.	Virginia.....	"
1329	390	"	F.	"	"
1330	160	Sialia arctica, Sw.....	"	California.....	"
1331	156	Hesperocichla naevia, (Gm.) Bd.....	M.	"	"
1332	126	Tyrannus verticalis, Say.....	M.	"	"
1333	232	Ampelis garrulus, Linn.....	M.	Minneapolis.....	Skin.....
1334	232	"	F.	"	"
1335	232	"	"	"	"
1336	303	Hesperiphona vespertina, (Cooper) Bd....	M.	"	"
1337	3-3	"	F.	"	"
1338	348	Zonotrichia querula, (Nutt) Gamb.....	M.	"	"
1339	325	Plectrophanes nivalis, (L.) Meyer.....	M.	"	"
1340	325	"	F.	"	"
1341	233	Ampelis cedrorum, (V.) Bd.....	F.	"	"
1342	70	Coccyzus erythrophthalmus, (Wils.) Bd....	F.	"	"
1343	380	Zamelodia ludoviciana, (L.) Coues.....	M.	"	"
1344	130	Myiarchus crinitus (L.) Cab.....	M.	"	"
1345	276	Certhia familiaris rufa, (Bartr.) Ridgw..	M.	"	"
1346	114	Chordeiles popetue, (V.) Bd.....	M.	"	"
1347	414	Icterus spurius, (L.) Bp.....	M.	"	"
1348	414	" (young)	M.	"	"
1349	137	Contopus borealis, (Sw.) Bd.....	M.	"	"
1350	387	Passerina cyanea, (L.) Gray.....	M.	Medicine lake, Henn. Co.	M't'd ....
1351	227	Tachycineta bicolor (V.) Cab.....	"	Lk Johannah, Ramsey Co	"
1352	70	Coccyzus erythrophthalmus, (Wils.) Bd....	M.	Minneapolis.....	"
1353	69	Coccyzus americanus, (L.) Bp.....	M.	California.....	"
1354	325	Plectrophanes nivalis, (L.) Meyer.....	M.	"	"
1355	325	"	F.	"	"

*Register.—Continued.*

Collected by.	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling	July 1, 1880.	1884	Wm. Howling	1	By purchase.
"	June 20, 1879.	"	"	1	"
"	"	"	"	1	"
"	1882	"	"	1	"
"	1879	"	"	1	"
"	1877	"	"	1	"
"	"	"	"	1	"
C. W. Hall.	Sept. 1, 1880.	"	C. W. Hall.	1	Presented.
Wm. Howling	May 12, 1880.	1884	Wm. Howling	1	By purchase.
"	July 1, 1880.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	July, 1880.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	1880	"	"	1	"
"	August, 1878.	"	"	1	"
"	1876	"	"	1	"
"	"	"	"	1	"
"	June 30, 1882.	"	"	1	"
"	May 4, 1882.	"	"	1	"
"	Aug 27, 1881.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	Sept. 27, 1882.	"	"	1	"
"	Summer, 1881.	"	"	1	"
"	"	"	"	1	"
"	1880	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	1879	"	"	1	"
"	"	"	"	1	"
"	1880	1884	Wm. Howling	2	By purchase.
"	"	"	"	2	"
"	"	"	"	2	"
"	1876	"	"	1	"
"	1878	"	"	1	"
Wm. Howling	"	"	"	3	"
"	"	"	"	4	"
"	"	"	"	3	"
"	"	"	"	6	"
"	"	"	"	6	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	June, 1879	"	"	2	"
"	May 4, 1882.	"	"	2	"
"	July, 1882.	"	"	2	"
"	1876	"	"	1	"
Wm. Howling	"	"	"	2	"
"	"	"	"	3	"

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1356	325	Plectrophanes nivalis.....	..	.....	M't'd....
1357	303	Hesperiphona vespertina, (Cooper) Bd.....	M.	Minneapolis.....	..
1358	303	.....	F.	.....	..
1359	124	Tyrannus carolinensis, (L) Temm.....	M.	.....	..
1360	124	.....	F.	.....	..
1361	473	Oreortyx picta, (Dougl.) Bd.....	M.	California.....	..
1362	474	Lophortyx californica, (Shaw) Bp.....	M.	.....	..
1363	474	.....	F.	.....	..
1364	712	Lunda cirrhata, Pall.....	M.	Kamschatka.....	..
1365	96	Melanerpes torquatus, (Wils.) Bp.....	M.	California.....	..
1366	96	.....	F.	.....	..
1367	95	formicivorus bairdi, Ridgw.....	M.	.....	..
1368	85	Sphyrapicus varius, (L) Bd.....	M.	Bet. Minneapolis & St. P.	..
1369	240	Pyrranga rubra, (L.) V.....	F.	Minneapolis.....	..
1370	277	Sitta carolinensis, Gm.....	M.	.....	..
1371	.....	Quiscalus purpureus aeneus, Ridgw.....	F.	.....	..
1372	401	Agelaius phoeniceus, (L.) V.....	M.	.....	..
1373	194	Dendroca coronata, (L) Gray.....	M.	.....	..
1374	213	Myiodiodes pusillus, (Wils) Bp.....	M.	.....	..
1375	403	Agelaius tricolor, (Nutt) Bp.....	M.	California.....	..
1376	413	Icterus cucullatus, Sw.....	M.	.....	..
1377	416	Icterus bullocki, (Sw.) Bp.....	M.	.....	..
1378	437	Aphelocoma californica, (Vig.) Cab.....	M.	.....	..
1279	381	Zamelodia melanocephala, (Sw.) Coues.....	M.	.....	..
1280	386	Passerina amena, (Say) Gray.....	M.	California.....	..
1381	704	Aechmophorus occidentalis, (Laur) Coues.....	M.	.....	..
1382	256	Harporhynchus redivivus, (Gamb.) Cab.....	M.	.....	..
1383	232	Larus delawarensis, Ord.....	..	Otter Tail Co., Minn.....	Skin.....
1384	256	.....	..	Lake Mille Lac, Minn.....	..
1385	236	Erismatura rubida, (Wils) Bp.....	..	Otter Tail Co., Minn.....	..
1386	246	Corvus corax, L.....	..	.....	..
1387	257	Buteo borealis, (Gm.) V.....	..	Borden lake, C. Wing Col	..
1388	196	Otus vulgaris var. wilsonianus.....	..	Thief river, Minn.....	..
1389	254	Larus argentatus, Brunn..... (juv.)	F.	Lake Mille Lac, Minn.....	..
1390	235	Chaulelasmus streperus, (L) Gray.....	F.	Otter Tail Co., Minn.....	..
1391	249	Dafla acuta, (L.) Bp.....	M.	.....	..
1392	233	.....	M.	.....	..
1393	237	Fuligula affinis.....	F.	.....	..
1394	238	.....	..	.....	..
1395	184	Steganopus wilsoni, (Cab.) Coues.....	M.	Norman Co., Minn.....	..
1396	183	Steganopus wilsoni, (Sab.) Coues..... (juv.)	M.	.....	..
1397	181	Actiturus bartramius, (Wils.) Bd.....	M.	.....	..
1398	180	Podilymbus podiceps, (L) Laur.....	..	Ada, Minn.....	..
1399	182	Xanthocephalus icterocephalus, (Bp.) Bd.....	..	Crookston, Minn.....	..
1400	245	Larus philadelphiae, (Ord) Gray.....	..	Otter Tail Co., Minn.....	..
1401	239	Hylotomus pileatus, (L.) Bd.....	..	.....	..
1402	224	Helminthophaga peregrina, (Wils.) Bd.....	F.	St. Vincent, Minn.....	..
1403	188	Turdus fuscescens.....	..	Ada, Minn.....	..
1404	250	Hesperiphona vespertina, (Cooper.) Bd.....	..	Pelican Rapids, Minn.....	..
1405	252	Picus villosus, L.....	F.	Lake Mille Lac, Minn.....	..
1406	163	Sturnella magna, (L) Sw.....	..	Ada, Minn.....	..
1407	219	.....	..	.....	..
1408	217	..... (juv.)	..	Norman Co., Minn.....	..
1409	244	Scolecophagus ferrugineus, (Gm.) Sw.....	M.	Otter Tail Co., Minn.....	..
1410	228	Zonotrichia albicollis, (Gm.) Bp.....	..	.....	..
1411	234	Spizella monticola, (Gm.) Bd.....	..	.....	..
1412	226	Vireo gilvus.....	M.	Georgetown, Clay Co. Minn	..
1413	209	Passerculus savanna, (Wils.) Bp.....	F.	Crookston, Minn.....	..
1414	214	.....	..	Ada, Minn.....	..
1415	210	..... (juv.)	M.	Crookston, Minn.....	..
1416	211	..... (juv.)	..	Georgetown, Minn.....	..
1417	203	.....	..	Ada, Minn.....	..
1418	212	Ammodramus candactus, (Gm.) Sw.....	..	St. Vincent, Minn.....	..
1419	213	Troglodytes aedon, Vieill.....	..	.....	..
1420	.....	Spizella pallida, (Sw.) Bp.....	..	.....	..



## Register.—Continued.

Collected by.	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling	March 25, 1884	1884	Wm. Howling	1	By purchase.
"	"	"	"	2	"
"	"	"	"	1	"
"	June 1, 1881.	"	"	1	"
"	May 26, 1879.	"	"	1	"
"	1881	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	1880	"	"	1	"
"	1882	"	"	1	"
"	"	"	"	2	"
"	1882	"	"	1	"
Wm. Howling	1883	"	"	1	"
"	1879	"	"	1	"
"	1878	"	"	1	"
"	June 1, 1879.	"	"	1	"
"	1879	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	1882	"	"	1	"
"	1880	"	"	1	"
"	1881	"	"	2	"
"	1876	"	"	1	"
"	"	"	"	1	"
"	1882	"	"	1	"
"	1876	"	"	1	"
"	1877	"	"	1	"
F. L. Washburn	Oct. 11, 1885.	1885	Geol. & N. H. Sur.	1	"
"	Nov. 5, 1885.	"	"	1	"
"	Oct. 11, 1885.	"	"	1	"
"	Oct. 10, 1885.	"	"	1	"
"	Nov. 5, 1885.	"	"	1	"
"	Sept. 4, 1885.	"	"	1	"
"	Nov. 1, 1885.	"	"	1	"
"	Oct. 11, 1885.	"	"	1	"
"	Oct. 23, 1885.	"	"	1	"
"	Oct. 11, 1885.	"	"	1	"
"	"	"	"	1	"
"	Aug. 4, 1885.	"	"	1	"
"	"	"	"	1	"
"	"	"	"	1	"
"	Aug. 10, 1885.	"	"	1	"
"	Aug. 20, 1885.	"	"	1	"
"	Oct. 20, 1885.	"	"	1	"
"	Oct. 11, 1885.	"	"	1	"
"	Aug. 25, 1885.	"	"	1	"
"	Aug. 10, 1885.	"	"	1	"
"	Oct. 27, 1885.	"	"	1	"
"	Nov. 2, 1885.	"	"	1	"
"	Aug. 6, 1885.	"	"	1	"
"	"	"	"	1	"
"	Aug. 4, 1885.	"	"	1	"
"	Oct. 11, 1885.	"	"	1	"
"	Oct. 12, 1885.	"	"	1	"
"	Oct. 13, 1885.	"	"	1	"
"	August, 1885.	"	"	1	"
"	Aug. 18, 1885.	"	"	1	"
"	Aug. 6, 1885.	"	"	1	"
"	Aug. 18, 1885.	"	"	1	"
"	August, 1885.	"	"	1	"
"	Aug. 6, 1885.	"	"	1	"
"	Aug. 26, 1885.	"	"	1	"
"	Aug. 25, 1885.	"	"	1	"
"	Aug. 1885	"	"	1	"

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1421	192	<i>Sitta canadensis</i> , L.	..	St. Vincent, Minn.	Skin
1422	1	<i>Unio rectus</i> , Lam.	..	Mississippi R., Brainerd	..
1423	2	<i>Unio luteolus</i> , Lam.	..	" "	..
1424	3	<i>Unio ventricosus</i> , Bar.	..	" "	..
1425	4	<i>Unio luteolus</i> , Lam.	..	Lk. Minnewaska, Pope Co.	..
1426	5	..	..	..	..
1427	6	<i>Limnæa stagnalis</i> , Linn.	..	Lk. Minnewaska, Pope Co.	..
1428	7	<i>Helisoma bicarinatus</i> , Say.	..	" "	..
1429	8	<i>Planorbella campanulata</i> , Say.	..	" "	..
1430	9	<i>Unio cornutus</i> , Bar.	..	Lake Pepin, Lake City.	..
1431	10	<i>Limnæa stagnalis</i> , Linn.	..	Minneapolis	..
1432	11	<i>Patula alternata</i> , Say.	..	..	..
1433	12	<i>Unio rectus</i> , Lam.	..	Red river, Wilkin Co.	..
1434	13	<i>Unio luteolus</i> , Lam.	..	" "	..
1435	14	<i>Unio lacrymosus</i> , Lea.	..	" "	..
1436	15	<i>Unio alatus</i> , Say.	..	" "	..
1437	16	<i>Unio rubiginosus</i> , Lea.	..	" "	..
1438	17	<i>Helicodiscus lineatus</i> , Say.	..	Minneapolis	..
1439	18	<i>Unio ventricosus</i> , Bar.	..	Red river, Wilkin Co.	..
1440	19	..	..	..	..
1441	20	<i>Anodonta edentula</i> , Say.	..	Red River, Wilkin Co.	..
1442	21	<i>Unio undulatus</i> , Bar.	..	" "	..
1443	22	<i>Unio luteolus</i> , Lam.	..	White Bear lake	..
1444	23	<i>Limnophya reflexa</i> , Say.	..	" " "	..
1445	24	<i>Vivipara intertexta</i> , Say.	..	" " "	..
1446	25	<i>Limnæa stagnalis</i> , Linn.	..	" " "	..
1447	26	<i>Planorbella campanulata</i> , Say.	..	" " "	..
1448	27	<i>Helisoma trivolvis</i> , Say.	..	" " "	..
1449	28	<i>Mesodon multilineata</i> , Say.	..	" " "	..
1450	29	<i>Limnæa stagnalis</i> , Linn.	..	Northern Boundary, east of Vermillion river	..
1451	30	<i>Helisoma trivolvis</i> , Say.	..	Minneapolis	..
1452	31	<i>Physa gyrina</i> , Say.	..	..	..
1453	32	<i>Helisoma bicarinatus</i> , Say.	..	Minnehaha creek, Henn. Co.	..
1454	33	<i>Unio luteolus</i> , Lam.	..	" "	..
1455	34	<i>Limnophya reflexa</i> , Say.	..	Cedar lake, Minneapolis.	..
1456	35	..	..	Lake City	..
1457	36	<i>Physa heterostropha</i> , Say.	..	Cedar lake, Minneapolis.	..
1458	37	<i>Strobila labyrinthica</i> , Say.	..	Minneapolis	..
1459	38	<i>Hyalina arborea</i> , Say.	..	" "	..
1460	39	<i>Valvata tricannata</i> , Say.	..	Cedar lake, Minneapolis.	..
1461	40	<i>Stenotrema monodon</i> , Rackett.	..	Minneapolis	..
1462	41	<i>Planorbella campanulata</i> , Say.	..	Kegan's Lk, Minneapolis.	..
1463	42	<i>Physa heterostropha</i> , Say.	..	Minnehaha creek, Henn. Co.	..
1464	43	<i>Planorbella campanulata</i> , Say.	..	" "	..
1465	44	<i>Bulinus hypnorum</i> , Linn.	..	Minneapolis	..
1466	45	<i>Mesodon multilineata</i> , Say.	..	" "	..
1467	46	<i>Succinea obliqua</i> , Say.	..	" "	..
1468	47	<i>Succinea ovalis</i> , Gould.	..	" "	..
1469	48	<i>Valona pulchella</i> , Mull.	..	" "	..
1470	49	<i>Cionella subcylindrica</i> , Linn.	..	" "	..
1471	50	<i>Somatogyrus subglobosus</i> , Say.	..	Miss. R., Ft. Snelling	..
1472	51	<i>Unio alatus</i> , Say.	..	Mississippi R., Dresbach, Winona Co.	..
1473	52	<i>Unio plicatus</i> , Le Sueur.	..	" " "	..
1474	53	<i>Unio luteolus</i> , Lam.	..	" " "	..
1475	54	<i>Unio rectus</i> , Bar.	..	" " "	..
1476	55	<i>Unio metanervus</i> , Raf.	..	" " "	..
1477	56	<i>Unio ligamentinus</i> , Lam.	..	" " "	..

## Register.—Continued.

Collected by.	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
F. L. Washburn...	Aug. 26, 1885.	1885	Geol. & N. H. Sur.	1	
N. H. Winchell....	Sept., 1877.	Sept., 1877.	Geol. & N. H. Sur.	14	
"	"	"	"	1½	
"	"	"	"	20	
"	"	"	"	4	
N. H. Winchell....	"	"	Geol. & N. H. Sur.	1	
"	"	"	"	1	
"	"	"	"	6	
Frank Patton.....	1884	June, 1885.	Uly. S. Grant.....	2	Presented.
Uly. S. Grant.....	Sept., 1884.	"	"	20	"
"	"	"	"	25	"
N. H. Winchell....	"	"	Geol. & N. H. Sur.	3	20 miles north of Breckenridge.
"	"	"	"	6	"
"	"	"	"	1	"
"	"	"	"	2	"
"	"	"	"	1	"
Uly. S. Grant.....	July, 1885.	July, 1885.	"		
N. H. Winchell....	"	"	"	8	20 miles north of Breckenridge.
N. H. Winchell....	"	"	Geol. & N. H. Sur.	2½	20 miles north of Breckenridge.
"	"	"	"	4	"
"	Aug., 1877.	Aug., 1877.	"	1	"
"	"	"	"	1	"
"	"	"	"	75	"
"	"	"	"	5	"
"	"	"	"	2	"
"	"	"	"	16	"
"	"	"	"	1	"
Uly. S. Grant.....	Oct., 1878.	Oct., 1878.	"	5	
"	Sept., 1884	June, 1885.	Uly. S. Grant.....	15	Presented.
"	"	"	"	20	"
O. W. Oestlund ..	June 21, 1885.	June 21, '85.	Geol. & N. H. Sur.		
Uly. S. Grant .....	July 31, 1885	July 31, '85.	"		
Uly. S. Grant .....	June 23, 1885.	June 23, '85.	"		
Frank Patton.....	1884	June, 1885.	Uly. S. Grant.....	12	Presented.
Uly. S. Grant.....	June 23, 1885.	June 23, '85.	Geol. & N. H. Sur.		
"	July, 1885.	July, 1885.	"		
"	"	"	"		
"	"	"	"		
"	June 22, 1885.	June 22, '85.	"		
"	June 21, 1885.	June 21, '85.	"		
"	July, 1885.	July, 1885.	"		
"	"	"	"		
"	"	"	"		
"	"	"	"		
"	"	"	"		
"	Aug., 1885.	Aug., 1885.	"		
"	"	"	"	2	
"	"	"	"	3	
"	"	"	"	1	Very old, abnormal and distorted.
"	"	"	"	1	
"	"	"	"	1	
"	"	"	"	2	

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1478	57	<i>Unio occidens</i> , Lea.....	.....	Mississippi R., Dresbach, Winona Co.....	.....
1480	59	<i>Unio æsopus</i> , Green.....	.....	" " " ".....	.....
1481	60	<i>Unio cornutus</i> , Linn.....	.....	" " " ".....	.....
1482	61	<i>Unio ellipsis</i> , Lea.....	.....	" " " ".....	.....
1483	62	.....	.....	.....	.....
1484	63	<i>Unio ebenus</i> , Lea.....	.....	Mississippi R., Dresbach, Winona Co.....	.....
1485	64	<i>Unio luteolus</i> , Lam.....	.....	Min'sota City, Winona Co.....	.....
1486	65	<i>Lioplax subcarinata</i> , Say.....	.....	Minnesota R., Ft. Snelling.....	.....
1487	66	<i>Mesodon multilineata</i> , Say.....	.....	Minneapolis.....	.....
1488	67	" ".....	.....	" ".....	.....
1489	68	<i>Planorbella campanulata</i> , Say.....	.....	Cedar lake, Minneapolis.....	.....
1490	69	<i>Limnæa stagnalis</i> , Linn.....	.....	Lake Bertram, Wright Co.....	.....
1491	70	<i>Unio luteolus</i> , Lam.....	.....	Lake Minnetonka.....	.....
1493	72	<i>Margaritana confragosa</i> , Say.....	.....	Minnesota R., Ft. Snelling.....	.....
1494	73	<i>Unio lævissimus</i> , Lea.....	.....	" ".....	.....
1495	74	<i>Unio alatus</i> , Say.....	.....	" ".....	.....
1496	75	<i>Anodonta corpulenta</i> , Cooper.....	.....	" ".....	.....
1497	75	<i>Anodonta imbecillis</i> , Say.....	.....	" ".....	.....
1498	77	<i>Margaritana complanata</i> , Bar.....	.....	" ".....	.....
1499	78	<i>Unio gracilis</i> , Bar.....	.....	" ".....	.....
1500	79	<i>Unio elegans</i> , Lea.....	.....	" ".....	.....
1501	80	<i>Unio zigzag</i> , Lea.....	.....	" ".....	.....
1502	81	<i>Unio luteolus</i> , Lam.....	.....	" ".....	.....
1503	82	<i>Unio rectus</i> , Lam.....	.....	Rum R., Anoka, Anoka Co.....	.....
1504	83	<i>Unio gibbosus</i> , Bar.....	.....	Minnesota R., Ft. Snelling.....	.....
1505	84	<i>Unio anodontoides</i> , Lea.....	.....	" ".....	.....
1506	85	<i>Unio cornutus</i> , Bar.....	.....	" ".....	.....
1507	86	<i>Limnæa stagnalis</i> , Linn.....	.....	" ".....	.....
1508	87	<i>Unio parvus</i> , Barnes.....	.....	" ".....	.....
1509	88	<i>Unio luteolis</i> , Lam.....	.....	Miss. R., Anoka, Anoka Co.....	.....
1510	89	<i>Unio ventricosus</i> , Bar.....	.....	Rum " ".....	.....
1511	90	<i>Anodonta ferussaciana</i> , Lea.....	.....	" ".....	.....
1512	91	<i>Unio luteolus</i> , Lam.....	.....	" ".....	.....
1513	92	<i>Unio solidus</i> , Lea.....	.....	Mississippi R. Ft. Snelling.....	.....
1514	93	<i>Unio tuberculatus</i> , Bar.....	.....	Minnesota R., Ft. Snelling.....	.....
1515	94	<i>Unio ventricosus</i> , Bar.....	.....	" ".....	.....
1516	95	<i>Unio securis</i> , Lea.....	.....	" ".....	.....
1517	96	<i>Unio plicatus</i> , LeS.....	.....	" ".....	.....
1518	97	<i>Unio lacrymosus</i> , Lea.....	.....	" ".....	.....
1519	98	<i>Pisidium abditum</i> , Hald.....	.....	" ".....	.....
1520	99	<i>Sphærium transversum</i> , Say.....	.....	" ".....	.....
1521	100	<i>Unio trigonus</i> , Lea.....	.....	" ".....	.....
1522	101	<i>Physa heterostropha</i> , Say.....	.....	Mississippi R., ".....	.....
1523	102	<i>Unio metanervus</i> , Raf.....	.....	Cumber'nd R. Nash, Tenn.....	.....
1524	103	<i>Unio trigonus</i> , Lea.....	.....	Mississippi R., Moline, Ill.....	.....
1525	104	<i>Unio crassidens</i> , Lam.....	.....	Duck river, Tenn.....	.....
1526	105	<i>Unio pernix</i> , Lea.....	.....	" ".....	.....
1527	106	<i>Lithæa geniculata</i> , Hald.....	.....	Cumber'nd R. Nash, Tenn.....	.....
1528	107	<i>Angitrema armigera</i> , Say.....	.....	" ".....	.....
1530	109	<i>Io spinosa</i> , Lea.....	.....	Holston R., Knoxville, T.....	.....
1531	110	<i>Pleurocera stubulare</i> , Lea.....	.....	Miss. R., Anoka, Anoka Co.....	.....
1532	111	" ".....	.....	Minnesota R., Ft. Snelling.....	.....
1533	112	<i>Unio graniferus</i> , Lea.....	.....	Miss. R., Ft. Snelling.....	.....
1534	113	<i>Patula striatella</i> , Auth.....	.....	Minneapolis.....	.....
1535	114	<i>Bythinella obtusa</i> , Lea.....	.....	Minnesota R. Ft. Snelling.....	.....
1536	115	<i>Limnæa megasoma</i> , Say.....	.....	Knife lake, Lake Co.....	.....
1537	116	<i>Sphærium striatinum</i> , Lam.....	.....	Minnesota R. Ft. Snelling.....	.....
1538	117	" ".....	.....	Miss. R., Anoka, Anoka Co.....	.....
1539	118	<i>Physa heterostropha</i> , Say.....	.....	" ".....	.....
1540	119	<i>Margaritana marginata</i> , Say.....	.....	Minnesota R., Granite F.....	.....
1541	120	" " rugosa, Bar.....	.....	" ".....	.....
1542	121	<i>Unio alatus</i> , Say.....	.....	" ".....	.....



## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1543	122	Unio tuberculatus, Bar.		Minnesota R., Granite F.	
1544	123	Unio ventricosus, Bar.		" " "	
1545	124	Unio ligamentinus, Lam.		" " "	
1546	125	Unio plicatus, LeS.		" " "	
1547	126	Unio rectus, Lam.		" " "	
1548	127	Anodonta edentula, Say.		" " "	
1549	128	Helisoma trivolvis, Say.		" " "	
1550	129	Limnæa stagnalis, Linn.		" " "	
1552	131	Planorbella campanulata, Say.		Lake Bertram, Wright Co.	
1553	132	Helisoma bicarinatus, Say.		" " "	
1554	133	" trivolvis, Say.		" " "	
1555	134	Valvata tricarinata, Say.		" " "	
1556	135	Unio undulatus, Bar.		Des Moines, Iowa.	
1557	136	Unio ligamentinus, Lam.		" " "	
1558	137	Unio rectus, Lam.		" " "	
1559	138	Unio gibbosus, Bar.		" " "	
1560	139	Unio luteolus, Lam.		" " "	
1561	140	Unio ventricosus, Bar.		" " "	
1562	141	Margaritana complanata, Bar.		" " "	
1563	142	Mesodon albolabris, Say.		" " "	
1564	143	Sphærium striatulum, Lam.		Lake Bertram, Wright Co.	
1565	144	" rhomboideum, Say.		" " "	
1566	145	" partumeum, Say.		Minneapolis.	
1567	146	" occidentale, Prime.		" " "	
1568	147	Carychium exiguum, Say.		" " "	
1569	148	Unio luteolus, Lam.		Minnehaha Crk, Henn. Co.	
1570	149	Helisoma trivolvis, Say.		Minneapolis.	
1571	150	" " "		St. Anthony Park, Ramsey Co.	
1572	151	" " "		Minnesota R., Ft. Snelling	
1573	152	" " "		International Boundary, east of Vermillion R.	
1574	153	Planorbella campanulata, Say.		Minneapolis.	
1575	154	Gyraulus defectus, Say.		" " "	
1576	155	Physa gyrina, Say.		" " "	
1577	156	" " "		Mississippi R., Ft. Snelling	
1578	157	" " "		Mississippi R., Anoka.	
1579	158	Sphærium striatulum, Lam.		Rum River, Anoka.	
1580	159	" " "		Minnehaha Crk, Henn. Co.	
1581	160	Limnophysa caperata, Say.		Minneapolis.	
1582	161	Gyraulus defectus, Say.		Lake Bertram, Wright Co.	
1583	162	Pleurocera subulare, Lea.		Rum River, Anoka.	
1584	163	Ammicola cincinnatiensis, Auth.		" " "	
1585	164	Ammicola cincinnatiensis, Auth.		Minnesota R., Ft. Snelling	
1586	165	" porata, Say.		" " "	
1587	166	" " "		" " "	
1588	167	Unio tuberculatus, Bar.		Cedar lake, Minneapolis.	
1589	168	Anodonta grandis, Say.		Mississippi R., Dresbach, Winona Co.	
1590	169	" " "		Minnesota City.	
1591	170	Helisoma bicarinatus, Say.		Zumbro River, Wab. Co.	
1592	171	Planorbella campanulata, Say.		Buffalo lake, Wright Co.	
1593	172	Valvata tricarinata, Say.		" " "	
1594	173	Ursus americanus, Pallas.		" " "	
1595	174	Bos americanus, Gm. (albino.)		" " "	M't'd
1596	175	Ovis montana, Cuv.	M.	Maiden, M. T.	"
1597	176	Antilocapra americana, Ord.	M.	Bismark, D. T.	"
1598	177	" " "	M.	" " "	"
1599	178	" " (young)	M.	" " "	"
1600	179	" " "	M.	Montana.	"
1601	180	Cariacus virginianus, (Bodd.) Gray.	M.	Minnesota.	"
1602	181	" " "	M.	" " "	"
1603	182	" " (young).	M.	Near Minneapolis.	"

## Register.—Continued.

Collected by.	When Collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
C. W. Hall.....		Dec., 1885.	C. W. Hall.....	1	Presented.
".....			".....	4	"
".....			".....	5	"
".....			".....	1	"
".....			".....	3	"
".....			".....	1	"
".....			".....	2	"
".....			".....	3	"
H. V. Winchell....	June 29, 1885.	July 1, '85.	H. V. Winchell....	4	"
".....	"	"	".....	7	"
".....	"	"	".....	5	"
".....	"	"	".....	1	"
Uly. S. Grant.....	1883	Dec. 29, '85.	Uly. S. Grant.....	3	"
".....	1884	"	".....	3	"
".....	"	"	".....	3	"
".....	"	"	".....	4	"
".....	"	"	".....	8	"
".....	"	"	".....	6	"
".....	"	"	".....	4	"
H. V. Winchell....	June 29, 1885.	July 1, '85.	H. V. Winchell....	2	"
".....	"	"	".....	1	"
O. W. Oestlund....	July, 1885.	July, 1885.	Geol. & N. H. Sur.		
Uly. S. Grant.....	"	"	".....		
".....	"	"	".....		
O. W. Oestlund....	"	"	".....		Very abnormal.
Uly. S. Grant.....	"	"	".....		
".....	Aug., 1885.	Aug., 1885.	".....		
N. H. Winchell....	Oct., 1878.	Oct., 1878.	".....		
Uly. S. Grant.....	June, 1885.	June, 1885.	".....		
".....	"	"	".....		
".....	Aug., 1885.	Aug., 1885.	".....		
".....	"	"	".....		
O. W. Oestlund....	July 31, 1885.	July 31, '85.	".....		
Uly. S. Grant.....	June, 1885.	June, 1885.	".....		
H. V. Winchell....	June 29, 1885.	July 1, '85.	H. V. Winchell....	2	Presented.
Uly. S. Grant.....	Aug., 1885.	Aug., 1885.	Geol. & N. H. Sur.		
".....	"	"	".....		
".....	"	"	".....		
".....	"	"	".....		
N. H. Winchell....			".....	1	
".....			".....	2	
Warren Upham....	Oct. 13, 1875.	Oct. 13, '75.	".....	1	
".....			".....	8	
".....			".....	15	
".....			".....	30	
C. L. Herrick.....	Jan. 5, 1885.	1885	John S. Pillsbury..	1	Presented.
".....	Dec., 1882.	1884	Wm. Howling.....	1	By purchase.
".....	Feb., 1883.	"	".....	1	"
".....	"	"	".....	2	"
".....	"	"	".....	1	"
".....	1878	"	".....	1	"
Wm. Howling....	1882	"	".....	5	"
".....	1875	"	".....	1	"
".....	1876	"	".....	1	Double growth of horn. By purchase.

## Zoological

Catalogue number.	Original number.	NAME.	Sex.	Locality.	Nature of specimen.
1604	.....	Cariacus virginianus.....	M.	Minnesota.....	“
1605	.....	“ “ (young).....	“	Hinckley, Minn.....	“
1606	.....	Cervus macrotis, Say.....	M.	Montana.....	“
1607	.....	Rangifer caribou, And. and Bach.....	F.	Canada.....	“
1608	.....	Canis lupus, L.....	“	Dakota.....	“
1609	.....	Castor fiber, L.....	M.	Minnesota.....	“
1610	.....	Procyon lotor, (L.) Storr.....	M.	Near Minneapolis.....	“
1611	.....	“ “.....	F.	Rice lake, Anoka Co.....	“
1612	.....	Taxidea americana, (Bodd.) Baird.....	M.	Nicollet Island, M'p'ls.....	“
1613	.....	Fiber zibethicus, (L.) Cuv.....	M.	Lake Calhoun, M'p'ls.....	“
1614	.....	Mephitis mephitica, Baird.....	F.	Minneapolis.....	“
1615	.....	“ “ (6 mo. old).....	M.	Moore Lake, Anoka Co.....	“
1616	.....	“ “ (young).....	“	“ “.....	“
1617	.....	“ “.....	“	“ “.....	“
1619	.....	Arctomys monax, (L.) Gm.....	M.	Minneapolis.....	“
1620	.....	“ “.....	F.	“ “.....	“
1621	.....	Putorius vison, Rich.....	M.	Coon creek, Anoka Co.....	“
1622	.....	“ “.....	F.	“ “.....	“
1623	.....	“ ermineus, Cuv. (Summer).....	M.	Minneapolis.....	“
1624	.....	“ “ (Autumn).....	M.	“ “.....	“
1625	.....	“ “.....	F.	“ “.....	“
1626	.....	“ “ (Winter).....	M.	“ “.....	“
1627	.....	Sciurus ludovicianus, Custis.....	“	“ “.....	“
1628	.....	“ hudsonius, Pallas.....	“	“ “.....	“
1629	.....	“ carolinensis, Gm.....	“	“ “.....	“
1630	.....	Sciuropterus volans, (L.) Coues.....	“	“ “.....	“
1631	.....	Mus decumanus, Pallas.....	F.	Minneapolis.....	“
1632	.....	Spermophilus franklini, Cuv.....	M.	“ “.....	“
1633	.....	Ursus americanus, Pallas, (young).....	F.	“ “.....	“



Register.—Concluded.

Collected by.	When collected.	OBTAINED.		No. of specimens.	Remarks.
		When.	Whence.		
Wm. Howling ....	1875	1884	Wm. Howling.....	1	By purchase. Curious shaped horn.
.....	1884	1884	Wm. Howling .....	1	By purchase.
.....	1876	"	" .....	1	"
.....	"	"	" .....	2	"
Wm. Howling ....	Jan. 14, 1882.	"	Wm. Howling .....	1	"
" .....	1876	"	" .....	1	"
" .....	1877	"	" .....	1	"
" .....	July, 1875.	"	" .....	1	"
" .....	1880	"	" .....	2	"
" .....	"	"	" .....	1	"
" .....	1881	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	1879	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	1882	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	1881	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	"	"	" .....	1	"
" .....	"	"	" .....	3	"
" .....	1876	"	" .....	1	"
" .....	1877	"	" .....	2	"
" .....	"	"	" .....	2	"
" .....	1875	"	" .....	2	"
" .....	June 13, 1873.	"	" .....	1	" 5 legs.
" .....	1877	"	" .....	1	"
" .....	1874	"	" .....	1	"



GEOLOGICAL AND NATURAL HISTORY SURVEY OF MINNESOTA.

N. H. WINCHELL, STATE GEOLOGIST.

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THE BIBLIOGRAPHY  
OF THE  
FORAMINIFERA

RECENT AND FOSSIL,  
INCLUDING EOZON AND RECEPTACULITES.

1565—JAN. 1, 1886.

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**By ANTHONY WOODWARD.**

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*Part VI of the annual report of progress for the year  
1885.*

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ST. PAUL:  
J. W. CUNNINGHAM & CO., STATE PRINTERS,  
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1886.



NOTE.—This paper is introductory to a contemplated work on the foraminifera and other microscopic organisms of the Cretaceous of Minnesota. According to present plans this work will be done by Messrs. Woodward and Thomas, jointly, and it will be published in one of the volumes of the final report of the survey.

N. H. W.



# PREFACE.

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This bibliography, which is the result of five years of research, is based largely on facilities afforded by the libraries of the American Museum of Natural History and of the New York Academy of Sciences,—facilities which are not enjoyed by many scientific students. At the beginning I had no idea of presenting this work to the scientific world. When I began the study of the foraminifera I had no knowledge whatever of that which had been done in this branch of science. After I commenced looking up the subject the references accumulated so rapidly that I thought it might be well to collect and put them in shape so that they might be useful to others as well as to myself.

After three years' labor I applied to Mr. H. B. Brady, F. R. S., for information pertaining to the subject. He at once informed me that he had in press a bibliography of the same character, and kindly offered to give me any assistance he could.

When the British Association for the Advancement of Science met at Montreal, in 1884, I met in New York Mr. James Thomson, F. G. S., a member from Scotland, to whom I spoke of my work, asking his advice about proceeding with it. He urged me to continue, and to finish it, as it would become accessible to a great number of workers who could not possess the valuable monograph of Mr. H. B. Brady.

I do not presume that this list is complete; since titles are liable to be found in obscure publications that have not fallen

under my notice. Some of those that are here listed may at first appear not to pertain to the subject, but many of the discussions, criticisms, notes, etc., to which reference has been made, although some of them are in general works on microscopy, are of much interest and value to the student, and will be found useful to those who have not access to large libraries.

The list is divided under the following heads:

(1)—Eozoon. (2)—North and South America, Bermuda, Leeward and Windward Islands. (3)—England, Ireland, Scotland and Wales. (4)—France and Italy. (5)—Austro-Hungary, Belgium, Denmark, Finland, Germany, Holland, Netherlands, Norway, Sweden, Switzerland. (6)—Russia and Turkey. (7)—Africa and Asia. The authors names are then arranged alphabetically and their works according to the date of publication.

I must ask those who may notice omissions or detect errors, to kindly inform me of the same so that I may be able to make corrections in a completed supplement.

I am under great obligations, and return my sincere thanks to the following gentlemen who have rendered me invaluable assistance in sending manuscript lists of their papers.

Rev. P. B. Brodie, M. A., F. G. S., R. V., Warwick, England; Dr. R. Haensler, Sussex, England; Prof. W. C. Williamson, Manchester, England; H. J. Carter, F. R. S., Budleigh, Salterton Devon, England; Joseph Wright, F. G. S., Belfast, Ireland; Sir J. W. Dawson, Montreal, Canada; R. J. Lachmere Guppy, F. L. S., F. G. S., Trinidad; M. O. Terquem, Paris, France; Dr. A. Schneider, Breslau; Prof. Dr. H. B. Geinitz, Dresden, Germany; Prof. Dr. Leopold Auerbach, Breslau, Germany; Prof. Hertwig, Bonn, Germany; Prof. Dr. Carl W. Gumbel, Munich, Germany; Prof. Dr. Haeckel, Jena, Germany; Prof. Dr. Valerian Møeller, St. Petersburg, Russia.

It is hoped that this bibliography will be of some service to the student. The writer will then feel that his years of tedious and constant labor have been well repaid.

ANTHONY WOODWARD.

New York, March 1, 1886.



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- VI. Russia and Turkey.
- VII. Africa and Asia.



PART I.



EOZON.



# EOZOON.

- ANON. Anorganischer Ursprung des Eozoon. <Verhandl. d. geol. k. k. Reichsanst., p. 58. 1872.
- ANON. Eozoon canadense. <Journ. Roy. Micr. Soc. Lond., vol. ii. pp. 275, 276, 744, 745, 902. 1879.
- ANON. Eozoon canadense. <Journ. Roy. Micr. Soc. Lond., vol. iii., pp. 471, 472. 1880.
- BARKER, A. E. Latest observations on Eozoon canadense by Prof. Max Schultze. <Ann., and Mag. Nat. Hist. ser. 4, vol. xiii, pp 379-380. 1874.  
Publishing a letter from Prof. Max. Schultze, in which he expresses the opinion that "proper wall" of *Eozoon* is of inorganic origin (Nicholson in White and Nicholson's Bib. p. 75.)
- BIGSBY, J. J. On the Laurentian Formation: its mineral constitution, its geographical distribution, and its residuary elements of life. <Geol. Mag. Dec. 1, vol. i, pp. 154-158, 200-206. 1864.  
Contains remarks on the distribution of phosphate of lime and carbon in the Laurentian Rocks, and on the occurrence of Eozoon. (Nicholson in White and Nicholson's Bib. p. 77.)
- BURBANK, L. S. On Eozoon canadense in the crystalline Limestones of Massachusetts. <Amer. Nat., vol. v, pp. 535-539. 1871.
- BURBANK, L. S. On Eozoon canadense in the crystalline Limestones of Massachusetts. <Proc. Am. Assoc. Adv. Sci., 1871, vol xx, pp. 262-266. 1872.
- BURBANK, L. S. Views on the *Eozoonal* limestones of Eastern Massachusetts. <Proc. Bost. Soc. Nat. Hist., vol. xiv, pp. 194-198. 1872.
- CARPENTER, W. B. On the Structure and Affinities of *Eozoon canadense*. <Proc. Roy. Soc., vol. xiii, pp. 545-549. 1860.
- CARPENTER, W. B. Additional Note on the Structure and Affinities of Eozoon canadense. <Quart. Journ. Geol. Soc. Lond., vol. xxi, pp. 59-66, 2 plates and wood cuts. 1865.
- CARPENTER, W. B. On the Structure, Affinities, and Geological Position of Eozoon canadense. <Intellectual Observer, No. xl, p. 278, 2 plates. 1865.
- CARPENTER, W. B. Eozoon canadense. <Intellectual Observer, No. xl, p. 300. 1865.
- CARPENTER, W. B. Supplemental Notes on the Structure and Affinities of Eozoon canadense. <Quart. Journ. Geol. Soc. Lond., vol. xxii, pp. 219-228. 1866.
- CARPENTER, W. B. Notes on the Structure and Affinities of Eozoon canadense. <Canad. Nat., new ser., vol. ii, pp. 111-119, wood cut. 1865. A reprint from *Quart. Journ. Geol. Soc. Lond.*, 1865. (Nicholson in White and Nicholson's Bib. p. 87.)

CARPENTER, W. B. Further Observations on the Structure and Affinities of *Eozoon canadense*. In a letter to the president. <*Proc. Roy. Soc. Lond.*, vol. xxv, pp. 503-508. 1867.

A resume of the state of the *Eozoon* controversy at the time—1867. (Nicholson in White and Nicholson's Bib. p. 87.)

CARPENTER, W. B. On the *Eozoon canadense*. <*Nature*, vol. iii, pp. 185, 186, 386. 1871.

CARPENTER, W. B. New Observation on *Eozoon canadense*. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiii, pp. 456-470, 1 plate. 1874.

The author treats more especially of the nummuline layer and the canal-system of the "intermediate skeleton," and concludes by summarizing the general evidence in favor of the organic origin of *Eozoon*. (Nicholson in White and Nicholson's Bib. p. 87.)

CARPENTER, W. B. Final Note on *Eozoon canadense*. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiv, pp. 371-372. 1874.

CARPENTER, W. B. Remarks on Mr. H. J. Carter's Letter to Prof. King on the Structure of the so-called *Eozoon canadense*. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiii, pp. 277-284 with 2 engravings. 1874.

A recapitulation of the principal facts in support of the belief that *Eozoon canadense* is a *Foraminifer*. (White's Bib. p. 87.)

CARPENTER, W. B. Remarks on *Eozoon canadense*. <*Nature*, vol. ix, p. 491. 1874. (Abstract.)

His reply to Mr. Carter's letter to Prof. King on the structure of the so-called *Eozoon canadense*.

CARPENTER, W. B. Further Researches on *Eozoon canadense*. <*Nature*, vol. x, p. 390. 1874.

CARPENTER, W. B. On the Replacement of Organic Matter by Siliceous Deposits in the process of Fossilization. <*Nature*, vol. x, p. 452. 1874. (Abstract.)

CARPENTER, W. B. Further Researches on *Eozoon canadense*. <*Rep. Brit. Assoc. for 1874*, Section, pp. 136, 137. 1875.

CARPENTER, W. B. New Laurentian Fossil. <*Nature*, vol. xiv, pp. 8, 9. 1876.

CARPENTER, W. B. Supposed New Laurentian Fossil. <*Nature*, vol. xiv, p. 68. 1876.

CARPENTER, W. B. Note on Otto Hahn's Microgeological Investigation of *Eozoon canadense*. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xvii, pp. 417-422. 1876.

CARPENTER, W. B. The *Eozoon canadense*. <*Nature*, vol. xx, pp. 328-330. 1879.

CARPENTER, W. B. *Eozoon canadense*. <*The Microscope and its Revelations*, Sixth Edition, pp. 587-592. 1881.

CARPENTER, W. B., and J. W. Dawson. The *Eozoon canadense*. <*Nature*, vol. xx, p. 328. 1879.

CARTER, H. J. On the structure called *Eozoon canadense*, in the Laurentian Rocks of Canada. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiii, pp. 189-193. 1874.

Gives reasons for believing that *Eozoon* is not of organic origin. (Nicholson in White and Nicholson's Bib. p. 88.)

CARTER, H. J. On the structure called *Eozoon canadense* in the Laurentian Limestones of Canada. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiii, pp. 376-378, with 1 engraving. 1874.

CARTER, H. J. Relation of the Canal-system to the Tubulation in the Foraminifera, with reference to Dr. Dawson's "Dawn of Life." <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xvi, pp. 420-424. 1874.

Discusses the minute structure of the test of recent *Foraminifera*, as bearing on the nature of *Eozoon canadense*. (Nicholson in White and Nicholson's Bib. p. 88)

CARTER, H. J. *Eozoon canadense* not a Foraminifer or calcareous Rhizopod secretion. <*Amer. Journ. Sci.*, vol. vii, 3d ser., pp. 437, 438. 1874.

CREDNER, H. Die Gliederung der eozoischen (vorsilurischen) Formationsgruppe Nord-Amerikas. <*Zeit. Gesam. Naturwissenschaften*, 32, pp. 353-405. 1868.

DANA, J. D. On the History of *Eozoon canadense*. <*Am. Journ. Sci.*, vol. xi, 2d ser., pp. 344-362, wood cuts and 1 plate. 1865.

This article appears in the Journal without a name; *i. e.* editorially. This history embraces a full discussion of the subject, and includes a complete description and illustration of the structure of the fossil, and the chemical composition of specimens. (White in White and Nicholson's Bib. p. 22.)

DANA, J. D. Manual of Geology. Second edition, pp. 158, 159. 1875.

D'ARCHIAC. Note sur l'existence des restes organiques dans les Roches Laurentiennes du Canada. <*Comptes Rendus*, vol. liii, pp. 192-194. 1865.

A note presented by M. D'Archiac on the part of Dr. W. B. Carpenter as to the discovery of *Eozoon canadense*. (Nicholson in White and Nicholson's Bib. p. 90)

DAWSON, J. W. On the Structure of certain Organic Remains in the Laurentian Limestones of Canada. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxi, pp. 51-59, pls. vi, vii. 1865.

The author gives a detailed description of the structure of the bodies described by Sir. William Logan as being organic and as occurring in the Lower Laurentian Limestones. (*Quart. Journ. Geol. Soc.*, vol. xxi, p. 45.) The generic name of *Eozoon* is proposed for these, and the single form described is discussed under the name of *Eozoon canadense*. The author further concludes that *Eozoon* is probably to be regarded as an ancient type of the *Foraminifera*. (Nicholson in White and Nicholson's Bib. p. 93.)

DAWSON, J. W., and W. B. CARPENTER. Notes on Fossils recently obtained from the Laurentian Rocks of Canada, and on objections to the Organic nature of *Eozoon*. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxiii, pp. 257-265, 2 plates. 1865.

DAWSON, J. W. Notes on fossils recently obtained from the Laurentian Rocks of Canada, and objections to the Organic nature of *Eozoon*. <*Amer. Journ. Sci.*, vol. xlv, 2d ser., pp. 367-376. 1867.

The article also contains notes by W. B. Carpenter; and "Summary" and "conclusion" of King and Rowney, on the same subject; the latter gentlemen opposing, and the former advocating, the organic origin of *Eozoon*. (White in White and Nicholson's Bib. p. 22.)

DAWSON, J. W. On certain Organic remains in the Laurentian Limestone of Canada. <*Canad. Nat.*, new ser., vol. 11, pp. 99-111, 127, 128. 3 wood cuts. 1865.

A reprint from the *Quart. Journ. Geol. Soc. Lond.*, 1865, with some additional notes. A short appendix to the paper follows at pp. 127, 128. (Nicholson in White and Nicholson's Bib. p. 93.)

DAWSON, J. W. Notes on fossils recently obtained from the Laurentian Rocks of Canada, and on objections to the Organic nature of Eozoon, with notes by W. B. Carpenter, M. D., F. R. S. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxiii, pp. 257-265, pls. xi, xii. 1867.

In the first part of this memoir, Dr. Dawson gives an account of the general appearance and microscopic structure of a specimen of *Eozoon canadense*, found in the Laurentian rocks at Tudor, in which the chambers of the skeleton are filled with a dark colored coarse limestone. The author next deals with certain specimens from Long Lake and Wentworth, and also from Madoc, and concludes by reviewing the objections brought forward by Professors King and Rowney to the organic nature of Eozoon. Dr. W. B. Carpenter adds a note on the appearances presented by thin slices of specimens of Eozoon in which the canal-system has been infiltrated with transparent carbonate of lime. (Nicholson in White and Nicholson's Bib. p. 93.)

DAWSON, S. W., and W. B. CARPENTER. Notes on Fossils recently obtained from the Laurentian Rocks of Canada, and objections to the organic nature of Eozoon. <*Amer. Journ. Sci.*, vol. xlv, 2d ser., pp. 367-376. 1867.

DAWSON, J. W., and W. B. CARPENTER. On new specimens of Eozoon canadense, with a reply to the objections of Professors King and Rowney. <*Amer. Journ. Sci.*, vol. xlv, 2d ser., pp. 245-255, 2 plates. 1868.

DAWSON, J. W. On new specimens of Eozoon canadense, with a reply to Professors King and Rowney; with notes by W. B. Carpenter. <*Amer. Journ. Sci.*, vol. xlv, 2d ser., pp. 245-257, 2 plates. 1868.

The authors advocate the organic origin of Eozoon. (Nicholson in White and Nicholson's Bib. p. 22.)

DAWSON, J. W. Remarks on Eozoon canadense. <*Nature*, vol. x, p. 103. 1 wood cut. 1874.

DAWSON, J. W. Notes on the occurrence of Eozoon canadense, at Cote St. Pierre. <*Nature*, vol. xii, p. 79. 1875. (Abstract.)

DAWSON, J. W. On the Eozoon canadense. <*Nature*, vol. iii, p. 287. 1871.

DAWSON, J. W. The Story of the Earth and Man.

(Remarks on Eozoon chapter ii, iii, pp. 17-38) pp. 408, 800. London, 1873.

DAWSON, J. W. The Dawn of Life: being the history of the oldest known fossil remains, and their relations to geological time and to the development of the animal kingdom, pp. 239, with 8 plates and 49 wood cuts. London, 1875.

This work deals principally with the history of the discovery of *Eozoon canadense*, and with all the known facts bearing on its structure and nature. The author first gives a descriptive sketch of the Laurentian formation, accompanied by sections, and a colored map showing the distribution of the Laurentian Limestones in the counties of Ottawa and Argenteuil. Next, a history is given of the various steps which led to the discovery of *Eozoon*, and a record of its interpretation by Carpenter and the author



Thirdly, a chapter is devoted to a consideration of the minute structure exhibited by *Eozoon*; and this is compared with the structure of recent *Foraminifera*. The fifth chapter is concerned with the manner in which *Eozoon* has been preserved, and with a consideration of the processes of fossilization by infiltration in general. In the sixth chapter, the author deals with the successors and contemporaries of *Eozoon*, with special reference to *Archæosphærina*, *Stromatopora*, *Caunopora*, and *Receptaculites*. Another chapter is devoted to a consideration of the various objections which have been urged against the organic nature of *Eozoon*; and a final chapter treats of certain speculative considerations which may be drawn from the study of this fossil. (Nicholson in White and Nicholson's Bib. p. 95.)

DAWSON, J. W. On Mr. Carter's objections to *Eozoon*. <Ann., and Mag. Nat. Hist., ser. 4, vol. xvii, pp. 118, 119. 1876.

DAWSON, J. W. Notes on the Phosphates of the Laurentian and Cambrian Rocks of Canada. <Quart. Journ. Geol. Soc. Lond., vol. xxxii, pp. 285-291. 1876.

Concludes that the phosphatic material found in these rocks in Canada is of organic origin, and has been produced by the agency of marine invertebrates. (Nicholson in White and Nicholson's Bib. p. 95.)

DAWSON, J. W. Notes on the Occurrence of *Eozoon canadense* at Cote St. Pierre. <Quart. Journ. Geol. Soc. Lond., vol. xxxii, pp. 66-74, plate x, with 4 wood cuts. 1876.

The author gives an account of the nature and arrangement of the strata at Cote St. Pierre, with special reference to the appearance presented by *Eozoon* as occurring *in situ*. Numerous chrysotile veins pass through the limestone, but the author concludes that they are altogether subsequent to the fossil in origin. The close resemblance of weathered specimens to *Stromatopora* is insisted upon; and two new forms of *Eozoon canadense* are described as var. *minor* and var. *acervulina*. The limestone sometimes contains numerous little globose casts of chamberlets, single or attached in groups, each of which possesses the structure of the "proper wall" of *Eozoon*. For these the author proposes the name of *Archæosphærinæ*. (Nicholson in White and Nicholson's Bib. pp. 95, 96.)

DAWSON, J. W. On some new specimens of Fossil Protozoa from Canada. <Proc. Am. Assoc. Adv. Sci., vol. xxiv, pp. 100-106, wood cuts. 1876.

The author gives general description and illustration of *Eozoon canadense*, and also *Foraminifera*, from Cretaceous rocks. He advocates the organic origin of *Eozoon*. (White in White and Nicholson's Bib. p. 22.)

DAWSON, J. W. New Facts relating to *Eozoon canadense*. <Proc. Am. Assoc. Adv. Sci., vol. xxv, pp. 231-234. 1876.

The fossil nature of *Eozoon canadense* is advocated. (White in White and Nicholson's Bib. p. 22.)

DAWSON, J. W. *Eozoon canadense* according to Hahn. <Ann. Mag. Nat. Hist., ser. 4, vol. xviii, pp. 29-38. 1877.

A critical notice of a memoir by Hahn (see post.) in which the latter endeavors to show that *Eozoon* is a purely mineral structure. (Nicholson in White and Nicholson's Bib. p. 96.)

DAWSON, J. W. New Facts relating to *Eozoon canadense*. <Canad. Nat. new ser., vol. viii, pp. 282-285. 1878.

DAWSON, J. W. On the Microscopic Structure of *Stromatoporidae*, and on Palæozoic Fossils mineralized with Silicates, in illustration of *Eozoon*. <Quart. Journ. Geol. Soc. Lond. vol. xxxv, pp. 48-66. 3 plates. 1879.

- DAWSON, J. W. Note on recent Controversies respecting Eozoon canadense. < *Can. Nat.*, vol. ix; p. 228. 1879.
- DAWSON, J. W. Mæbius on Eozoon canadense. < *Amer. Jour. Sci.*, vol. xvii, p. 196, wood cuts. 1879.
- DAWSON, J. W. Notes on Eozoon canadense. < *The Can. Rec. of Sci.*, vol. i, pp. 58, 59. 1884.  
 Abstract of a paper read before the British Association at Southport, 1883.
- DAWSON, J. W. On the Geological Relations and Mode of Preservation of Eozoon canadense. < *Report Brit. Assoc.* (Southport, 1883), p. 494. 1884.
- DAWSON, J. W. Canadian and Scottish Geology. An Address delivered before the Edinburgh Geological Society at the close of the Session, 1884. < *Trans. Edin. Geol. Soc.*, vol. v, pp. 113, 114. 1885.  
 Remarks on Eozoon canadense.
- EDWARDS, A. M. Microscopical Examination of Two Minerals.\* < *Proc. Lyceum Nat. Hist.*, pp. 96-98. 1870.  
 [\*Supposed to be Eozoon.]
- FRITSCH, A. Ueber das Vorkommen des Eozoon im nordlichen Bohmen. *Neues Jahrb. fur Min.*, etc., pp. 352-354. 1866.
- FRITSCH, A. Ueber Eozoon bohemicum aus dem Kornigen Kalke von Raspenau in Bohmen. < *Landesdurchforschung von Bohmen*,—*Geol. Sect.*, pp. 245-251, 1 wood cut and 2 plates. 1869.  
 Not seen.
- FRIC, ANTON (Dr.) Ueber Eozoon bohemicum, Fr., aus den Kornigen Kalkstein von Raspenau bei Friedland in Bohmen. < *Geologie von Bohmen* vol. i, pp. 245-256, 1 wood cut, 2 plates. 1869.
- GUMBEL, C. W. Ueber das Vorkommen von Eozoon in dem ostbayerischen Urgebirge. < *Sitzungsber. d. k. b. Akad. Wiss. Munch.* 1866, Bd. i, pp. 25-144, 3 plates.
- GUMBEL, C. W. Eozoon im ostbayer. Urgebirge. < *N. Jahrb. fur Min. etc.*, 1866. I. S. 1 und *N. Jahrb. fur Min.*, etc. 1866. S. 210.
- GUMBEL, C. W. Eozoon im Urkalke von Sachsen. < *N. Jahrb. fur Min.*, etc. 1866. S. 579.
- GUMBEL. On the Occurrence of Eozoon in the Primary Rocks of Eastern Bavaria. < *Quart. Journ. Geol. Soc. Lond.*, vol. xxii, pp. 23, 24. 1866.  
 A review by H. M. J.
- GUMBEL, C. W. On the Laurentian Rocks of Bavaria. < *Can. Nat.* new series, vol. iii, pp. 81-101, 1 plate. 1868 Translated from the proceedings of the Royal Bavarian Academy for 1886, by Prof. Markgraf.  
 [\*EDITOR'S NOTE.—In revising and preparing this for the press, the original paper has been considerably abridged by the omission of portions, whose place is indicated in the text. Some explanatory notes have also been added.—T. S. H.]
- GUMBEL, C. W. Eozoon im Kornigen Kalke Schwedens. < *Leonhard und Geinitz neues Jahrbuch.* 1869. pp. 551-559. 1869.
- GUMBEL, C. W. Ueber die Natur von Eozoon. 8 p. Ratisbonne. 1876.  
 Not seen; title taken from a catalogue.

HAHN, DR. O. Gibt es ein Eozoon canadense? Eine mikrogeologische Untersuchung. < *Wurtembergische naturwiss. Jahreshfte*, 32 Jahr, pp. 132-155. (Translated by W. S. Dallas, *Ann. and Mag. Nat Hist*, ser. 4, vol. xvii, pp. 265, 282 ) 1876.

After an examination of serpentinous limestones from Canada and Europe, the author concludes that *Eozoon canadense* is of organic origin. (Nicholson in White and Nicholson's Bib. p. 103.)

HAHN, DR. O. Gibt es ein Eozoon canadense? Eine mikrogeologische Untersuchung. < *Wurtl. naturwiss. Jahreshften*, 1876, 24 pp. Stuttgart, 1876.

Printed as a separate pamphlet.

HAHN, (DR.) O. Gibt es ein Eozoon canadense? Erwide rungauf Dr. C. W. Gumbel's und Dr. Carpenter's Entgegnung. < *Wurtl. naturwiss. Jahreshften*. Jahrgang. 1878. 21 pp. 1 plate. Stuttgart. 1878.

HAHN, O., in Reutlingen sprach uber das Eophyllum canadense aus dem Serpentin-kalk des Laurentiangneisses von Canadas. < *Wurttemb. naturwiss. Jahreshften*. Jahrgang, 1880. pp. 71-74.

HAHN, O. Die Meteorite (chondrite) und ihre Organismen, 56 pp. 32 plates. 1880.

Plate xxx., fig. 5, Eozoon canadense, reputed canal system of Eozoon; fig. 6 the same. Both stones from which the slides were taken were collected by me in Little Nation. Let one compare the canal system of the nummulite fig. 3 with this reputed canal system! Figs. 3 and 5 should be the same thing.

HALL, J. Note upon the Geological position of the Serpentine Limestone of Northern New York, and an inquiry regarding the relations of this Limestone to Eozoon Limestones of Canada. < *Amer. Journ. Sci.*, vol. xii, 3d ser., pp. 298-300, 1876.

Abstract of the paper read before the Amer. Association at Buffalo.

HAUER, M. Das Eozoon canadense. Eine micro-geologische Studis, mit 18 photographic plates. Leipzig. 1885.

HITCHCOCK, C. H. The Earlier Forms of Life (Eozoon). 16 pp. 10 figs. N. P. N. D.

HOCHSTETTER, —. Eozoon in Austria. < *Quart. Journ. Geol. Soc. Lond.*, vol. xxii, p. 16. 1866.

HOCHSTETTER, R. F. Ueber das Vorkommen von Eozoon in Krystallinischen Kalke von Krumman in sudlichen Bohmen. < *Sitz. d. k. Akad. d. Wiss.*, vol liii, pp. 14-25. 1866.

HOCHSTETTER, (Prof V.) DR. W. B. CARPENTER IN LONDON. *Neuer Fund von Eozoon canadense*. < *K. K. geol. Reich. Ver.* 1868, pp. 69, 70. 1868.

HOFFMANN, R. On the Mineralogy of Eozoon canadense. < *Amer. Journ. Sci.*, vol. i, 3d ser., pp. 378, 379. 1871.

HUNT, T. S. Laurentian Rhizopods of Canada. (Extract of a letter from T. Sterry Hunt, F. R. S., to J. D. Dana, April 2, 1864.) < *Amer. Journ. Sci.*, vol., xxxvii, 2d ser., p. 431. 1864.

HUNT, T. S. On the Mineralogy of Eozoon canadense. < *Canad. Nat.*, n. s., vol. ii, pp. 120-127, 1 plate. 1865.

- HUNT, T. S. On the Mineralogy of certain Organic Remains from the Laurentian Rocks of Canada. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxi, pp. 67-71. 1865.  
Gives a detailed account accompanied with analysis, of the mineral nature and structure of *Eozoon Canadense*. (Nicholson in White and Nicholson's Bib. p. 107.)
- HUNT, T. S. Geology and mineralogy of the Laurentian Limestones. <*Geological Survey of Canada*. Report of progress from 1863 to 1866, pp. 181-233. Ottawa, 1866.  
Though essentially mineralogical, this report contains many interesting observations bearing on the nature and mode of preservation of *Eozoon canadense*. (Nicholson in White and Nicholson's Bib. p. 107.)
- HUNT, T. S. The Geological History of Serpentes, including Notes on pre-Cambrian Rocks. <*Trans. Roy. Soc. Canada*, vol. i, pp. 165-215. 1883.
- JONES, T. R. *Eozoon canadense* in this country. <*Nat. Hist. Rev. Lond.*, vol. v., pp. 297, 298. 1865.  
In this communication to the editor he states that *Eozoon canadense* is abundant in the British Isles. Mr. W. A. Sanford has hunted it up in the Green Connemara marble, and he also finds it there in masses indicated by him. The best way of getting a sight of the structure due to the presence of Foraminifera is to dissolve small flakes of the "Irish Green" in very weak dilute acid, and then the shelly part being removed, the green silicates remain representing the sarcode that filled the chambers, pseudopodiam tubules and stolon passages.
- JONES, T. R. On the Oldest Known Fossil, *Eozoon canadense*. <*Popular Sci. Rev.*, vol. iv., pp. 343, pl. xv. 1865.  
Discusses the geological and zoological relations of *Eozoon*.
- JONES, T. R. On the Oldest Known Fossil, *Eozoon canadense* of the Laurentian Rocks of Canada; its place, structure and significance. <*Popular Sci. Review*, 1867, pp. 343-352, plates xv and 2 wood cuts.  
A semi-popular account of *Eozoon canadense*. (Nicholson in White and Nicholson's Bib. p. 109.)
- JULIEN, A. A. A study of "*Eozoon Canadense*" Field observations. <*Proc. Amer. Asso. Adv. Sci.*, vol. xxxiii, 1884, pp. 415, 416. (Abstract.) 1885.
- KING, W. Note on *Eozoon canadense*. <*Nature*, vol. iv, p. 85. 1871.
- KING, W., and T. H. Rowney. On the so called "*Eozoonal Rock*." <*Quart. Journ. Geol. Soc. Lond.*, vol. xxii, pp. 185-218, 2 plates. 1866.  
The authors describe in this memoir the results of a careful chemical and microscopical examination of the Grenville "*Eozoonal*" Ophite, from which they arrive at the conclusion that *Eozoon canadense* is of truly inorganic origin. (Nicholson in White and Nicholson's Bib. p. 110.)
- KING W., and T. H. ROWNEY. On the so-called "*Eozoonal*" Rock. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxv, pp. 116, 117. (Abstract.) 1869.  
The authors adduce further evidence that their views as to the mineral nature of *Eozoon* are correct (Nicholson in White and Nicholson's Bib. p. 110.)
- KING, W., and T. H. ROWNEY. On *Eozoon canadense*. <*Proc. Roy. Irish Acad.*, vol. x, p. 506, 2 plates xli-xliv. 1870.

KING, W., and T. H. ROWNEY. On the Mineral Origin of the so-called "Eozoon canadense." <Proc. Roy. Irish Acad., ser. 2, vol. 1, pp. 140-153. 1871.

A reply to papers by Drs. J. W. Dawson and T. Sterry Hunt on the zoological and chemical aspects of the question respectively. The paper concludes with a recapitulation of the various points detailed in the formerly published papers of the authors. (Nicholson in White and Nicholson's Bib. p. 110.)

KING, W., and T. H. ROWNEY. Eozoon, examined principally from a Foraminiferal standpoint. <Ann., and Mag. Nat. Hist., ser. 4, vol. xiv, pp. 274-289, plate xix. 1874.

A controversial paper, in which evidence is brought forward to show that *Eozoon canadense* is inorganic in its nature. (Nicholson in White and Nicholson's Bib. p. 111.)

KING, W., and T. H. ROWNEY. Remarks on the subject of Eozoon. <Ann., and Mag. Nat. Hist., ser. 4, vol. xiii, pp. 390-396. 1874.

A summary of the chief points in favor of the mineral nature of *Eozoon canadense*. (Nicholson in White and Nicholson's Bib. p. 111.)

KING, W., and T. H. ROWNEY. Remarks on the "Dawn of Life" by Dr. Dawson; to which is added a supplementary note. <Ann., and Mag. Nat. Hist., ser. 4, vol. xvii, pp. 360-377. 1876.

A critical memoir, stating the objections held by the authors as to the supposed organic origin of Eozoon. (Nicholson in White and Nicholson's Bib. p. 111.)

LAUBE, G. Notizer von einer Reise in Scandinavien. <Lotos, xxiv, Jahrg. (Eozoon p. 21.) Prague. 1874.

LEA, I. Contributions to Geology. Philadelphia, 1833.

LEIDY, J. Remarks on Eozoon. <Proc. Acad. Nat. Sci., 1877, p. 20. 1877.

LOGAN, W. E. Supposed Fossils in the Laurentian Limestone. <Geology of Canada pp. 48, 49, 2 wood cuts. 1863.

LOGAN, W. E. On Organic Remains in the Laurentian Rocks of Canada; (from a letter to the editors of this Journal from Sir W. E. Logan, F. R. S., dated Montreal, Feb. 17th, 1864.) <Amer. Journ. Sci., vol. xxxvii, 2d ser., pp. 272, 273. 1864.

LOGAN, W. E. On the Occurrence of Organic Remains in the Laurentian Rocks of Canada. <Quart. Journ. Geol. Soc. Lond., vol. xxi, pp. 45-50. 1865.

This memoir is a geological one, occupied with a general description of the Laurentian Rocks of Canada, illustrated by sections. The author, however, gives an account of the discovery of *Eozoon* in the Lower Laurentian Limestone, and describes the general mode of occurrence of, and the appearance presented by, the specimens. (Nicholson in White and Nicholson's Bib. p. 112.)

LOGAN, W. E. On the Occurrence of Organic Remains in the Laurentian Rocks of Canada. <Canad. Nat., new ser., vol. ii, pp. 92-99. 1865.

A reprint from the Quart. Journ. Geol. Soc. Lond., 1865, with some additional notes. (Nicholson in White and Nicholson's Bib. p. 112.)

LOGAN, W. E. On New specimens of Eozoon. <Quart. Journ. Geol. Soc. Lond., vol. xxiii, pp. 253-257. 1867.

This is a geological memoir, it is of interest to the palaeontologist as giving a detailed account of the precise geological position of the bed from which was obtained the least altered example of *Eozoon canadense* (the "Tudor specimen") as yet known to science. (Nicholson in White and Nicholson's Bib. p. 113.)

- LOGAN, W. E., J. W. Dawson, and T. S. Hunt. On the Occurrence of Organic Remains in the Laurentian Rocks of Canada. <Report Brit. Assoc. (Bath Meeting), Trans. Sections, p. 225. 1864.
- MOEBIUS, K. Der Bau des Eozoon canadense nach eigenen Untersuchungen verglichen mit dem Bau der Foraminiferen. <Palaeontographica, vol. xxv, pp. 175-192, plates 23-40. 1878.
- MOEBIUS, DR. K. Ist das Eozoon ein versteinertes Wurzelfussler oder ein Mineralgemenge? <Die Natur. Jahrg. 1879, Nos. 7, 8, 10-21, wood cuts. 1879.
- MOEBIUS, DR. K. Principal, J. W. Dawson's Criticism of my Memoir "On the Structure of Eozoon canadense compared with that of Foraminifera." <Amer. Journ. Sci., vol. xviii, 3d ser., p. 177. 1879.
- NICHOLSON, H. A., and DR. J. MURIE. On the Minute Structure of *Stromatopora* and its Allies. <Journ. Linn. Soc., vol. xiv, pp. 187-246, 5 wood cuts and 5 plates. 1878.
- PARKER, JONES, and BRADY. On the Priority in the Discovery of the Canal System in Foraminifera. <Ann., and Mag. Nat. Hist., ser. 4, vol. xiv, p. 64, 305. 1874.
- PERRY, J. B. Eozoon Limestone of Eastern Massachusetts. <Amer. Nat., vol. v, pp. 539, 541. 1871.
- PERRY, J. B. Notes on Eozoon canadense. <Nature, vol. iv, p. 28. 1871.
- PERRY, J. B. On "the Eozoon" Limestone of Eastern Massachusetts. <Proc. Am. Assoc. Adv. Sci., vol. xx, 270-276. 1872.
- Mr. Perry corroborates the statement of Mr. Burbank as to the existence of *Eozoon* in the crystalline limestones of Eastern Massachusetts. (Nicholson in White and Nicholson's Bib. p. 57.)
- PERRY, J. B. Few remarks on the "Eozoon" Limestone of Eastern Massachusetts. <Proc. Bost. Soc. Nat. Hist., vol. xiv, pp. 199-204. 1872.
- PUSYREWSKI, (PROF.) P. Eozoon canadense im Kalkstein von Hopinwara in Finnland. <Bull. d. l'Acad. Imp. d. Sci. a. St. Peter, tome x, pp. 151, 152. 1866.
- READE, T. M. On the Eozoon canadense. <Nature, vol. iii, pp. 146, 147. 1870.
- READE, T. M. On the Eozoon canadense. <Nature, vol. iii, pp. 267, 367, 368. 1871.
- ROWNEY, T. H. On the so-called "Eozoonal" Rock. <Quart. Journ. Geol. Soc. Lond., vol. xxv, pp. 115-118. 1869.
- SCHULTZE, M. S. Eozoon canadense. <Kolner Zeitung, aug. 14, Cologne. 1873.
- Not seen.
- SCHULTZE, M. S. Eozoon canadense. <Ann., and Mag. Nat. Hist., ser. 4, vol. xiii, pp. 324-326. 1874.
- SANFORD, (MR.) Announces Eozoon in Connemara Marble of the Binabola Mountains, Ireland. <Geological Maga. Reannounced in "Reader," Feb. 25th, 1865.
- Not seen.

- THOMSON, W. Palæozoic crinoids. <*Nature*, vol. iv, p. 72. 1871.  
Remark on Eozoon.
- VILANOVA Y PEIRA, JUAN. Estructura de las rocas serpentinosas y el Eozoon canadense. <*Soc. Espan. Hist. Nat.*, vol. iii, parts 2 and 3. 1874.  
Concludes that Eozoon canadense is not the remains of an organism. (Nicholson in White and Nicholson's Bib. p. 130.)
- WHITNEY, J. D., and M. E. Wadsworth. Remarks on the Eozoon from the Azoic System and its subdivisions. <*Bull. Mus. Comparative Zool.*, vol. vii, pp. 528-538. 1884.
- WINCHELL, N. H. The curiferous series in Minnesota. <*Am. Assoc. Adv. Sci.* 1880, p. 425. Reprinted in the ninth annual report of the Minnesota survey.  
A remark on the probable Silurian or Cambrian age of the Eozoon-bearing rocks of Canada, based on the age of the Norian rocks of Minnesota.
- WINCHELL, N. H. Geology of Minnesota, vol. i, of the final report, p. 283. 1884.  
Note on Eozoon.





PART II.

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NORTH AND SOUTH AMERICA, INCLUDING BERMUDA,  
LEEWARD AND WINDWARD ISLANDS.

## NORTH AND SOUTH AMERICA.

- ANON. The Nummulites of North America. <*Amer. M. Micro. Journ.*, vol. iv, pp. 1-2. 1883.
- ARNOLD, J. W. S. Microscopical Examination of Specimens of Deep Sea Soundings, taken during a cruise of the "Nautical School-ship Mercury," 1871-2. <*Rept. Comm. of Pub. Charities and Corrections*, pp. 13-16. 1872.
- AGASSIZ, L. Report upon deep-sea dredgings in the Gulf Stream during the Third Cruise of the United States Steamer Bibb, addressed to Prof. Benjamin Pierce, Superintendent United States Coast Survey. <*U. S. Coast Survey Report*, 1869, pp. 208-219. 1872.
- AGASSIZ, A. On the Explorations in the Vicinity of the Tortugas, during March and April, 1881. (Pelagic Fauna of the Gulf Stream). <*Bull. Mus. Comp. Zool.*, vol. ix, pp. 145-149, 1881; also *Nature*, vol. xxiv, p. 592. 1881.
- BAILEY, J. W. Fossil Foraminifera in the Green Sand of New Jersey. <*Amer. Journ. Sci.*, vol. xli, pp. 213, 214. 1841.
- BAILEY, J. W. American Polythamia from the Upper Mississippi; and also from the cretaceous formation on the Upper Missouri. <*Amer. Journ. Sci.*, vol. xli, pp. 400, 401; 4 wood cuts. 1841.
- BAILEY, J. W. On fossil *Foraminifera* in the calcareous marl from the cretaceous formation on the Upper Missouri, and on silicified wood found near Fredericksburg, Va. <*Proc. Acad. Nat. Sci., Phila.*, vol. i, p. 75. 1843.
- BAILEY, J. W. On some New Localities for Infusoria, Fossil and Recent. <*Amer. Journ. Sci.*, vol. xlviii, pp. 321-343. 1845.
- BAILEY, J. W. On a Process for Detecting the Remains of Infusoria, etc., in Sedimentary Deposits. <*Proc. Amer. Assoc. Adv. Sci.*, 1849, p. 409. 1850.
- BAILEY, J. W. Microscopical examination of Soundings made by the U. S. Coast Survey off the Atlantic Coast of the U. S. <*Smith Contrib. to Knowl.*, vol. ii, p. 15; 1 plate. 1851.
- BAILEY, J. W. Observations on a newly discovered animalcule (*Pamphagus*). <*Amer. Journ. Sci.*, vol. xv, 2d ser., pp. 341-347, 1853; and *Quart. Journ. Micro. Sci.*, vol. i, pp. 295-299. 1853.
- BAILEY, J. W. Examination of some Deep Soundings from the Atlantic Ocean. <*Amer. Journ. Sci.*, vol. xvii, 2d ser., pp. 176-178. 1854.
- BAILEY, J. B. On the Origin of Green Sand, and its formation in the Oceans of the present Epoch. <*Proc. Bos. Soc. Nat. Hist.*, vol. v, pp. 364-368, 1856; also in *Amer. Journ. Sci.*, vol. xxii, pp. 280-284. 1856.
- BAILEY, J. W. On the Origin of Green Sand and its formation in the Oceans of the present Epoch. <*Quart. Journ. Micro. Sci.*, vol. v, p. 83. 1857.

BAILEY, L. W. Notes on New Species of Microscopical Organisms, chiefly from the Para River, South America. <*Jour. Bos. Sci. Nat. Hist.*, vol. vii, pp. 327-351. 1863.

BARNARD, W. S. Protozoan Studies. <*Proc. Amer. Assoc. Adv. Sci.*, 1871, vol. xxiv, pp. 240-242. (Abstract.) 1872.  
Echinopyxis, Englypha.

BILLINGS, E. Notes on some of the more remarkable genera of Silurian and Devonian fossils. <*Canad. Nat.*, new ser., vol. ii, pp. 184-189, with 14 wood cuts; and pp. 405-409, with 3 wood cuts. 1857.

Discusses the structure and affinities of Receptaculites, Pascedias, and Beatricea. (Nicholson in White and Nicholson's Bib. p. 79.)

BILLINGS, E. Palæozoic Fossils, vol. i, 1861-1865. <*Geol. Survey of Canada*. "New Species of Lower Silurian Fossils."

BLAKE, W. P. Notice of Remarkable Strata containing the remains of Infusoria and Polythalamia in the Tertiary Formation of Monterey, California. <*Proc. Acad. Nat. Sci. Phila.*, vol. viii, pp. 328-351. 1856.

BORNEMANN, J. G., in Erman's—Ueber einige bisher nicht beachtete Tertiär-Gesteine aus der Umgegend von Rio de Janeiro. <*Erman's Archiv. v. wissensch. Kunde v. Russland*, vol. xiv, pp. 143-161, pl. iv. 1854.

BRADY, H. B. A monograph of Carboniferous and Permian Foraminifera (the genus Fusulina excepted). <*Paleontographical Society*, 1876, pp. 1-166, plates i-xii.

This work is necessarily principally concerned with British forms, but not exclusively so. At page 47 is a summary of geological localities in North America which have yielded Carboniferous or Permian Foraminifera. The following forms are described from the Carboniferous Rocks of North America: *Valulina paleotrochus*, Eheb., *V. decurrens*, *V. plicatæ*, Brady. *V. bulloides*, n. sp., *V. rudis*, n. sp., *Nodosinella priscilla*, Dawson. *Calcarina ambigua*, n. sp., and *Endothyra bowmani*, Phill. The last is shown to be the subsequently described *Rotelia baileyi*, Hall, from the Spergen Hill Limestone of Indiana. (Nicholson in White and Nicholson's Bib. p. 86.

BROADHEAD, G. C., in Raphael Pumpelly's Preliminary Report on the Iron Ores and Coal Fields. <*Geol. Survey of Missouri*. 1873.

Fusulina and Receptaculites.

BROADHEAD, G. C. Carboniferous Rocks of Kansas. <*Trans. Acad. Sci., St. Louis*, vol. iv, pp. 481-492. 1884.

Fusulina cylindrica.

CONRAD, T. A. Descriptions of new species of Organic Remains from the Upper Eocene Limestone of Tampa Bay. <*Amer. Journ. Sci.*, vol. ii, 2d ser., pp. 399, 400) 9 wood cuts. 1846.

Describes *N. floridanus*, *Cristellaria rotella*.

CONRAD, T. A. Observations on the Eocene formation, and descriptions of one hundred and five new fossils of that period, from the vicinity of Vicksburg, Mississippi; with an appendix. <*Proc. Acad. Nat. Sci., Phila.*, vol. iii, pp. 280-299. 1848.

Remarks, among the characteristic fossils, *Nummulites Mantelli* *N. Floridana*. *Cristellaria rotella*.

- CONRAD, T. A. Report of the United States and Mexican Boundary Survey, vol. i, pt. ii. Descriptions of Cretaceous Fossils. 1857.
- CONRAD, T. A. Catalogue of the Eocene Annulata, Foraminifera, Echinodermata and Cirripedia of the United States. <Proc. Acad. Nat. Sci., Phila., vol. xvii, pp. 73-75. 1865.
- COUPER, J. H. A letter read by Dr. A. A. Gould, dated at Bainbridge, on the Chatahoochee River, Georgia, March 15, 1845. <Proc. Bos. Soc. Nat. Hist., vol. ii, pp. 123-124. 1848.  
*Nummulites*, probably *N. Mantelii*.
- CRAVEN, AND MAFFIT. Recent Discovery of a Deep-sea Bank on the Eastern Side of the Gulf Stream of the Coast of South Carolina, Georgia and Florida. <Proc. Amer. Assoc. Adv. Sci., vol. vii, pp. 167-171. 1856.
- CRISP, F. On Mr. W. B. Thomas' slides of sand obtained by washing clay from the boulder-drift of Meeker county, Minn., U. S. A. <Journ. R. Micro. Soc., ser. ii, vol. iv, p. 504. 1884.
- CREDNER, H. Die Kreide von New Jersey. <Zeitschr. d. deutsch. geol. Gesell., bd. xxii, pp. 191-252. 1870.
- CROSBY, W. O. On a Possible Origin of Petrosiliceous Rocks. <Proc. Bos. Soc. Nat. Hist., vol. xx, pp. 160-169. 1879.
- CUNNINGHAM, K. M. Cleaning Foraminifera. <Amer. M. Micro. Journ. vol. i, p. 88. 1880.
- CUNNINGHAM, R. O. Notes on the Natural History of the Strait of Magellan; pp. 28-32. 1871.
- DANA, J. D. Descriptions of fossils. <Appendix to vol. x, Wilkes's U. S. Expl. Exped., (Foraminifera from Oregon,) p. 729, pl. 21 of atlas. 1849.
- DANA, J. D. Origin of Coral Reefs and Islands. <Amer. Journ. Sci., 3d ser., vol. xxx, pp. 89-105, 169-191. 1885.
- DAWSON, G. M. On Foraminifera from Gulf and River St. Lawrence. <Canad. Nat., N. S., vol. v, pp. 172- wood cuts. 1870.
- DAWSON, G. M. Note on the occurrence of Foraminifera, Coccoliths, etc., in the Cretaceous Rocks of Manitoba. <Canad. Nat., new ser., vol. vii, pp. 252-357. 1874.
- The author examined the Cretaceous Rocks of Pembina, some of which resembled the "chalk" of Nebraska in appearance and texture. The earthy base of this deposit consisted principally of *Foraminifera*, coccoliths, and allied organisms. The author describes and figures *Textularia globulosa*, *T. pygmæa*, *Discorbina globularis*, *Planorbulina ariminensis*, and forms of coccoliths and Rhabdoliths. (Nicholson in White and Nicholson's Bib. p. 91.)
- DAWSON, G. M. Report on the geology and resources of the region in the vicinity of the Forty-ninth Parallel, from the Lake of the Woods to the Rocky Mountains; with lists of plants and animals collected, and notes on the fossils. Pages 379, with 18 plates and 3 maps. 1875.
- There are notes on the fossils collected (mostly plants and vertebrates), and amongst these may be mentioned the microscopic organisms (*Foraminifera*, etc.,) detected by the author in the Cretaceous Rocks of the Pembina escarpment and other localities. (Nicholson in White and Nicholson's Bib. p. 91.)

- DAWSON, G. M. On a new Species of *Loftusia* from British Columbia. *Quart. Journ. Geol. Soc., Lond.*, xxxv, p. 69, pl. vi. 1879.
- DAWSON, G. M. Boulder Clays; their Microscopic Structure and the Various Organisms Found in Them. *<The Times, Chicago, June 13, 1885.*
- DAWSON, G. M. Boulder-clays. On the Microscopic Structure of Boulder-clays and the Organisms contained in them. *<Bull. Chicago Acad. Sci., vol. i, pp. 59-69; 3 wood cuts. 1885. Also in the Thirteenth Ann. Rept. Geol. and Nat. Hist., Sur. Minn., 1884, pp. 150-163; 3 wood cuts. 1885.*
- DAWSON, J. W. Additional Notes on the Post-Pliocene Deposits of the St. Lawrence Valley. *<Canad. Nat., vol. iv, pp. 23-39; wood cuts. 1859.*  
The author describes and figures 8 species of the Foraminifera.
- DAWSON, J. W. Notice of Tertiary Fossils from Labrador, Maine, etc., and Remarks on the Climate of Canada in Newer Pliocene or Pleistocene Period. *<Canad. Nat., vol. v, pp. 188-200; wood cuts. 1860. Foraminifera.*  
The only new species mentioned is *Nonionina labradorica*.
- DAWSON, J. W. Notes on Post-pliocene Deposits at Riviere Du Loupe and Tadaissac. *<Canad. Nat., N. S., vol. ii, pp. 81-87. 1865.*
- DAWSON, J. W. On Foraminifera from the Gulf and River St. Lawrence. *<Amer. Journ. Sci., vol. i, ser. 3, pp. 204-210; 10 wood cuts. 1871.*
- DAWSON, J. W. On Foraminifera from the Gulf and River St. Lawrence. *<Ann. and Mag. Nat. Hist., ser. 4, vol. vii, pp. 83-89. 1871.*
- DAWSON, J. W. On Some New Specimens of Fossil Protozoa from Canada. *<Proc. Amer. Assoc. Adv. Sci., 1875, vol. xxiv, pp. 100-105; wood cuts. 1872.*
- DAWSON, J. W. Notes on the Post-pliocene Geology of Canada. *<Canad. Nat., N. S., vol. vi, pp. 19, 166, 241, 369, pl. iii. 1872.*
- DAWSON, J. W. On some New Specimens of Fossil Protozoa from Canada. *<Proc. Amer. Assoc. Adv. Sci., vol. xxiv, pp. 100-106. 1876.*
- DAWSON, J. W. Palæontological Notes.—II. Saccamina? (*Calcisphæra*) Eriana. *<Canad. Nat., vol. x, No. 1. 1881.*
- D'ORBIGNY, A. Voyage dans l'Amerique Meridionale pendant les Annees, 1826-1833. Paris, 1834-'43, vol. v, partie 5. *Foraminiferas, fol. 9 pl's. 1839.*
- D'ORBIGNY, A. D. Die Foraminiferen Amerikas und der Canarischen Inseln. (Muller Archiv.) 80 Berlin. 1840.
- EHRENBERG, C. G. Verbreitung und Einfluss der Mikroskopischen Lebens in Sud und Nord Nord Amerika. *<Abhan. Kongl. Akad. Wiss. Berlin, (1841), pp. 291, 438; 4 plates. 1841.*
- EHRENBERG, C. G. Verbreitung des Mikroskopischen Lebens als Felsmassen im Centralen Nord-Amerika und im Westlichen Asien. *<Berichte d. k. preuss. Ak. Wiss., 1842, pp. 187, 188. 1842.*
- EHRENBERG, C. G. Ueber das mikroskopische Leben in Texas. *<Berichte d. Kongl. preuss. Akad. Wiss., (1849), pp. 87-91. 1849.*

- EHRENBERG, C. G. Verbreitung und Einfluss des mikroskopischen Lebens in Sud und Nord Amerika. <*Abhand. d. Akad. d. Wiss. zu Berlin* (1841), pp. 291-445; 4 plates. 1843.
- EHRENBERG, C. G. Report on the species of Infusoria contained in specimens of the sediment of the Mississippi river. <*Astronom. Obser. Nat. Obser. Wash.*, vol. III, appendix B. Observations on the Mississippi River at Memphis, Tenn., pp. 26-32. 1853.
- EHRENBERG, C. G. Die weitere Entwicklung Kenntniss des Grundsandes als grüne Polythalamien-Steinkerne, ueber braunrothe und corall-rothe Steinkerne der Polythalamien-Krede in Nord-Amerika, und ueber den Meeresgrund aus 12,900. Fuss Tiefe. [The further development of the discovery that the green sand is composed of green casts of polythalamia, also on the brownish-red or bright-red casts of polythalamia in chalk of North America, and on the sea bottom at depths of 12,900.] <*Monatsbericht d. k. k. Akad. d. Wiss. Berlin*, 1855, pp. 172-178.
- The chief point in this paper is that the brownish or reddish "chalk" of Alabama owes its color to numerous shells of *Foraminifera* filled with a similarly colored silicate of iron. Nicholson in White and Nicholson's Bib. p. 98.)
- EHRENBERG, C. G. Erlauterungen ueber den Grunsand im Zeuglodon-Kalke Alabam's in Nord-Amerika. [Investigations into the green sand of the Zeuglodon limestone of North America.] *Monatsbericht d. k. k. Akad. d. Wiss. Berlin*, 1855, pp. 86-89.
- The author shows that the grains of green sand interspersed in the Zeuglodon-limestone of Alabama are really of the nature of casts of the shells of Polythalamons *Foraminifera*. At least thirty different forms were recognized by the author. (Nicholson in White and Nicholson's Bib. p. 98.)
- EHRENBERG, C. G. Beitrag zur Uebersicht der Elemente des tiefen Meeresgrundes im Mexicanischen Golfstrome bei Florida. <*Monatsber d. k. pr. Akad. d. Wiss. Berlin* (1861), pp. 222-240; table. 1862.
- FABRICIUS, O. Fauna Groenlandiæ, systematice sistens animalia Groenlandiæ occidentalis hactenus indagata, etc. Hafniæ et Lipsiæ. 1780.
- GABB, W. M. Descriptions of new species of American Tertiary and Cretaceous Fossils. <*Journ Acad. Sci., Phila.* n. s., vol. iv, pp. 375-406, pl. lxix; 1860.
- GABB, W. M. Catalogue of the Invertebrate Fossils of the Cretaceous formation of the United States, with references. <*Proc. Acad. Nat. Sci., Phila.*, 1859, 20 pages. 1860.
- GABB, W. M. Description of a Collection of Fossils made by Dr. Antonio Raimondi in Peru. <*Journ. Acad. Nat. Sci., Phila.*, vol. viii, pp. 263-336. 1877.
- GALEOTTI, H. G. Sur le calcaire Cretace des environs de Jalapa au Mexique. <*Bull. de la Societe Geol. de France*, vol. x. 8 vo. Paris. 1839.
- GEINITZ, H. B. Carbonformation und Dyas in Nebraska. <*Acta Academia Leop. Carol.*, vol. xxxiii, pp. 1-91; 5 plates. 1866.
- Fusulina depressa*, Fischer. *F. cylindrica*, Fischer.

- HALL, J. Description of new species of Fossils from the Carboniferous Limestones of Indiana and Illinois. <*Trans. Albany Inst.*, iv, pp. 2-36. 1856.  
Rotalia Baileyi, p. 34.
- HALL, J. Observations upon the Cretaceous Strata of the United States with reference to the Relative Position of Fossils Collected by the Boundary Commission. <*Amer. Journ. Sci.*, vol. xxiv, 2d ser., pp. 72-86. 1857.
- HALL, J. Notice of some New Species of Fossils from a Locality of the Niagara Group, in Indiana, with a list of Identified species from the same place. <*Trans. Albany Inst.*, iv, pp. 195-228. 1862.  
Receptaculites subtrubrinatus (Hall) p. 224.
- HAMLIN, F. M. The Preparation and Mounting of Foraminifera, with Description of a New Slide for Opaque Objects. <*Proc. Amer. Soc. Mic.*, sixth meeting, 1883, pp. 65-68. 1883.
- HARPER, L. Preliminary Report on the Geology and Agriculture of the State of Mississippi, pp. 348; tables I-VII. 1857.
- HARVEY, W. H., and J. W. BAILEY. New Species of Diatomaceæ, collected by the United States Exploring Expedition, under the command of Captain Wilkes, U. S. N. Appendix. (Lagena Williamsoni.) <*Proc. Acad. Nat. Sci., Phila.*, vol. vi, p. 430. 1853.
- HAYDEN, (DR.) F. V. Geological Report of the Yellowstone and Missouri River's Foraminifera, p. 123. 1860.
- HAYDEN, (DR.) F. V. Final Report of the United States Geological Survey of Nebraska and Portions of the Adjacent Territories, p. 140, pl. ii, v. 1872.
- HEILPRIN, A. Notes on the Tertiary Geology of the Southern United States. <*Proc. Acad. Nat. Sci., Phila.*, 1881, pp. 151-159. 1881.
- HEILPRIN, A. On the Occurrence of Nummulitic Deposits in Florida, and the Association of Nummulites with Fresh-water Fauna. <*Proc. Acad. Nat. Sci., Phila.*, pp. 189-194. 1882.
- HEILPRIN, A. Notes on some New Foraminifera from the Nummulitic Formation of Florida. <*Proc. Acad. Nat. Sci., Phila.*, 1884, pp. 321-322. 1884.
- HEILPRIN, A. The Tertiary Geology of the Eastern and Southern United States. <*Journ. Acad. Nat. Sci., Phila.*, 2d ser., vol. iv, pp. 115-154. 1884.
- HILGARD, E. W. Remarks on the new division of the Eocene, or Shell Bluff Group, proposed by Mr. Conrad. <*Amer. Journ. Sci.*, vol. xlii, 2d ser., pp. 68-70. 1866.
- HILGARD, E. W. On the Tertiary Formations of Mississippi and Alabama. <*Amer. Journ. Sci.*, vol. xliii, 2d ser., pp. 29-41. 1867.
- HILGARD, E. W. On the Geology of the Delta, and the Mud-lumps of the Passes of the Mississippi. <*Am. Journ. Sci.*, vol. i, 3d ser., pp. 425-437. 1871.
- HITCHCOCK, C. H. Notes on the Geology of Maine. <*Proc. Portland Soc. Nat. Hist.*, vol. i, pp. 72-86. 1862.

- HITCHCOCK, R. Synopsis of the Fresh-water Rhizopods, 8 vo. 2881;
- HITCHCOCK, R. The Cause of Variation. <Ann. and Mag. Nat. Hist., ser 5, vol. xiv, pp. 93-97. 1884.
- HOPKINS, F. V. Report on the Microscopic examination of the specimens. <Reclamation of the Alluvial Basin of the Mississippi River. Appendix No. 2. 1878.
- HOPKINS, F. V. List of Microscopic Organisms, with two plates. <Reclamation of the Alluvial Basin of the Mississippi. Appendix No. 4. 1878.
- HONEYMAN D. Chebucto Nullipores, with Attaches. <Proc. Trans. Nova Scotia Inst. Nat. Sci., vol. vi, 1882-83., pp. 8-12. 1883.
- JAMES, F. L. Separation of the Sand from Diatoms and Foraminifera. <The Micro. Bull. Sci. News, vol. ii, p. 43. 1885.
- See also *National Druggist*, p. 60, vol. v.
- JAMES, J. F. Remarks on the Genera Lepidoites, Anomaloides, Ischadites and Receptaculites, from the Cincinnati Group. <Journ. Cin. Soc. Nat. Hist., vol. viii, pp. 163-166. 1885.
- JAMES, T. R., and W. R. PARKER. On the Foraminifera of the Family Rotalinæ (Carpenter) found in the Cretaceous Formations; with Notes on their Tertiary and Recent Representatives. <Quart. Journ. Geol. Soc. Lond., vol. xxviii, pp. 103-131. 1872.
- The American forms treated of in this communication are the Cretaceous Rotalinæ described by Ehrenberg, from the Missouri and Mississippi (*Mikrogeologie*), and those described by Reuss from the Green sand of New Jersey. (See Reuss.) (Nicholson in White and Nicholson's Bih. p. 110.)
- JOHNSON, DR. H. A., and B. W. THOMAS. Report of the Committee on the Microscopic Organisms in the Bowlder Clays of Chicago and vicinity. <Bull. Chic Acad. Sci., vol. i, No. 4, pp. 35-40. 1884.
- KARRER, F., L. F. Pourtales. Der Boden des Golfstroms und der Atlantischen Kuste Nord-Amerika's (Petermann's Miththerlungen 16 Bd. 1870, XI.) <K. k. Geol. Reich. Ver. 1870, pp. 329-331. 1870.
- LEA, ISAAC. Contributions to Geology, 227 pp.; 6 plates. 1833. Miliola Maryladica, p. 215, pl. vi.
- LEIDY, J. Remarks on some Marine Rhizopoda. <Proc. Acad. Nat. Sci., Phila., 1875, p. 73. 1875.
- LEIDY, J. Foraminiferous Shells of our Coast. <Proc. Acad. Nat. Sci., Phila., 1878, p. 336. 1878.
- LEIDY, J. Foraminifera of the Coast of New Jersey. <Proc. Acad. Nat. Sci., Phila., 1878, p. 292. 1878.
- LEIDY, J. Fresh-water Rhizopods of North America, 4to 48 plates. 1879.
- LEIDY, J. Foraminifera in the Drift of Minnesota. <Proc. Acad. Nat. Sci., Phila., 1884, pp. 22, 23. 1884.
- LYELL, C. Notes on the Cretaceous Strata of New Jersey and other Parts of the United States bordering the Atlantic. <Quart. Jour. Geol. Soc., vol. i, pp. 55-60, 1845.



- LYELL, C. Notice of the Foraminifera of New Jersey. *Quart. Journ. Geol. Soc., Lond.*, vol. i, p. 64. 1845.
- LYELL, C. On the Newer Deposits of the Southern States of North America. *Quart. Journ. Geol. Soc., Lond.*, vol. ii, pp. 405-410. 1846.  
Nummulites Mantelli.
- LYELL, C. On the relative Age and Position of the so-called Nummulite Limestone of Alabama. *Amer. Journ. Sci.*, vol. iv, 2d ser., pp. 186-191. 1847.
- LYELL, C. On the relative age and position of the so-called Nummulite Limestone of Alabama. *Quart. Journ. Geol. Soc., Lond.*, vol. iv, pp. 10-16. 1848.  
Numerous fossils are alluded to as occurring in the strata in question, and the memoir contains notes from Edward Forbes and Alcide D'Orbigny as to the zoological position of *Orbitoides (Nummulites) mantelli*. Nicholson in White and Nicholson's Bib. p. 114.)
- MAURY, M. F. The Physical Geography of the Sea, pp. 274; 12 plates. 1855.  
Containing much interesting matter, on the sea bottom.
- MEEK, F. B., and Dr. F. V. HAYDEN. Remarks on the Lower Cretaceous Bed of Kansas and Nebraska, together with descriptions of some new species of Carboniferous Fossils from the Valley of Kansas River. *Proc. Acad. Nat. Sci., Phila.*, pp. 256-266. 1858.
- MEEK, F. B., and F. V. HAYDEN. Geological Explorations in Kansas Territory. *Proc. Acad. Nat. Sci., Phila.*, 1859, pp. 8-30. 1860.
- MEEK, F. B. In A. H. Worthen's *Geological Survey of Illinois*, vol. v. Palæontology, p. 560; pl. xxiv. 1873.
- MEEK, F. B. and A. H. WORTHEN. Descriptions of new Species and Genera of Fossils from the Palæozoic rocks of the Western States. *Proc. Acad. Nat. Sci., Phila.*, 1870, pp. 22-56. 1870.  
Receptaculites pp. 22, 23.
- MEYER, O. The Genealogy and the Age of the species in the Southern Old-tertiary. *Amer. Journ. Sci.*, 3rd ser., vol. xxiv, pt. I, pp. 457-468. II, vol. xxx, pp. 60-72. III, vol. xxx, pp. 1-16. 1885.
- MORTON, S. G. Supplement to the "Synopsis of the Organic Remains of the Ferruginous Sand Formation of the United States." *Amer. Journ. Sci.*, vol. xxii, pp. 288-294; 2 plates. 1833.  
Figure and description of *Nummulites Mantelli*.
- MORTON, S. G. Synopsis of the Organic Remains of the Cretaceous Group. 8 vo. Philadelphia, 1834.
- MORTON, S. G. Description of some new Species of Organic Remains of the Cretaceous group of the United States, with a tabular view of the Fossils hitherto discovered in this formation. *Jour. Acad. Nat. Sci.*, vol. viii, pp. 207-227. 1842.  
*Planularia cuneata*.
- MURRAY, J. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, in the Gulf of Mexico (1877-'78), in the Carribean

- 1878-'79), and along the Atlantic Coast of the United States, during the Summer of 1880, by the U. S. Coast Survey Steamer "Blake" Lieutenant-Commander C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., Commanding. XXVII. Report on the Specimens of Bottom Deposits. <*Bull. Mus. Comp. Zool.*, vol. xii, No. 2, pp. 1-61. 1885.
- OWEN, D. D. Geological Survey of Wisconsin, Iowa, and Minnesota; pp. 586, 587, pl. ii B. 1852.
- (Foraminifera.) Selenoides. (N. G.?)
- PACKARD, A. S., (Jun.) A list of Animals dredged near Caribou Island, South Labrador, during July and August, 1860, with a list of the Invertebrata collected at Anticosti and Mingan Islands by A. E. Verrill, etc. <*Canad. Nat.*, vol. viii, pp. 400-429. 1863.
- PACKARD, JR., A. S. Life History of the Protozoa. <*Amer. Nat.*, vol. viii, pp. 728-748. 10 wood cuts. 1874.
- POURTALES, L. F., DE. On the order of Succession of Parts in Foraminifera, Communicated by Prof. Agassiz. *Proc. Amer. Assoc. Adv. Sci.*, vol. iii, p. 89. 1850.
- POURTALES, L. F., DE. On the Distribution of the Foraminifera on the Coast of New Jersey, as shown by the off-shore soundings of the Coast Survey, Communicated by Prof. A. D. Bache. <*Proc. Amer. Assoc. Adv. Sci.*, 1850, pp. 84-88. 1850.
- POURTALES, L. F., DE. Notes on the Specimens of the Bottom of the Ocean brought up in recent Explorations of the Gulf Stream, in Connection with the Coast Survey. <*Proc. Amer. Assoc. Adv. Sci.*, 1853, vol. vii, pp. 181-184. 1856.
- POURTALES, L. F. On the genera Orbulina and Globigerina of D'Orbigny. <*Amer. Journ. Sci.*, vol. xxvi, 2d ser., p. 96. 1858.
- POURTALES, L. F., DE. Contributions to the Fauna of the Gulf Stream at great depths. <*Bull. Mus. Comp. Zool.*, No. 6, 1867, p. 103. 1863-69.
- POURTALES, L. F. Der Boden des Gulfstromes und der atlantischen Kuste Nord—America's. <*Petermann's Geogr. Mittheil.*, vol. xvi, pp. 393-398. 1870.
- POURTALES, L. F. The Gulf Stream,—Characteristics of the Atlantic Seabottom off the coast of the United States. <*U. S. Coast Survey Report*, 1869, pp. 220-225, 1872.
- REUSS, A. E. Die Foraminifera des Senonischen Grunsandes von New Jersey. Palaeontologische Beitrage. <*Sitzungst. Math-Naturh. cl. Kais. Akad. Wiss. Wien*, vol. xlv, pp. 334-340, pl. vii, fig. 6, and pl. vii, fig. 1. 1861.
- Describes and figures *Rotalia mortoni* and *Truncatulina Dekayi*. (Nicholson in White and Nicholson's Bib. p. 124.)
- ROEMER, F. Die Kreidebildungen von Texas. 4to, 11 plates. Washington, 1852.

- RYDER, J. A. The Protozoa and Protophytes Considered as the Primary or Indirect Source of the Food of Fishes. <*Bull. U. S. Fish. Comm.*, vol. i, pp. 236-251. 1881.
- SALTER, J. W. Fossils from the base of the Trenton Limestone. <*Figures and Descriptions of Canadian Organic Remains*. Decade I, Montreal, 1859, pp. 47, pls. i-x.
- The author deals with the affinities and structure of the genus *Receptaculites*, referring the fossils of this group to the *Foraminifera*, and placing them in the neighborhood of *orbitalites*. Two new species are described, one, *R. occidentalis*, from the Trenton Limestone, and the other, *R. australis*, introduced for comparison for the Silurian rocks of New South Wales. (Nicholson in White and Nicholson's Bib. p. 127.)
- SCHLUMBERGER, C. Remarks upon a species of *Cristellaria*. <*Journ. Oinn. Soc. Nat. Hist.*, vol. v, p. 119, plate 5, figs. 2, 2a. 1882.
- SHUMARD, B. F. Notice of New Fossils from the Permian Strata of New Mexico and Texas, collected by Dr. George G. Shumard, Geologist of the United States Government Expedition for obtaining water by means of Artesian Wells along the 32d parallel, under the direction of Capt. John Pope, U. S. Corps, Top. Eng. <*Trans. Acad. Sci. St. Louis*, vol. i, p. 297. 1858.
- SMITH, E. A. On the Geology of Florida. <*Amer. Journ. Sci.*, 3d ser., vol. xxi, pp. 292-309. 1881.
- SMITH, E. A. Remarks on a paper of Dr Otto Meyer on "Species in the Southern Old-Tertiary." <*Amer. Journ. Sci.*, 3d ser., vol. xxx, pp. 270-275. 1885.
- SPENCER, J. W. Stromatoporidæ of the Upper Silurian System. <*Bull. Mus. Univ. S. Missouri*. Part II, vol. i, No. i, pp. 43-53, pl. vi. 1884. Also *St. L. Acad. Sci.*, vol. iv, No. 4.
- VERNEUIL, E. de. On the *Fusulina* in the coal formation of Ohio. <*Amer. Journ. Sci.*, vol. ii, 2d series, p. 293. 1846.
- VERNEUIL, (de) P. E. Note sur le parallelisme des roches des depots paleozoiques de l'Amerique Septentrionale avec ceux de l'Europe. <*Bull. Soc. Geol. de France*, ser. 2, vol. iv, p. 682. 1847.
- VERRILL, A. E. Materials of Sea Bottoms. Their nature and origin in the region of the Gulf Stream. <*N. Y. Sunday Times*. Feby. 1883.
- VORCE, C. M. Cleaning Foraminifera. *Amer. Month. Micr. Journ.*, vol. i, p. 24. 1880.
- WALLICH, —. Critical observations on Prof. Leidy's "Freshwater Rhizopods of North America," and classification of the Rhizopods in general. <*Ann., and Mag. Nat. Hist.*, 5 ser., vol. xvi, pp. 317-334, 453-473. 1885.
- WHITE, C. A. Note on *Endothyra ornata*. <*Proc. U. S. National Mus.* 1879, p. 291. 1879.
- WHITE, C. A., and ST. JOHN, O. H. Description of New Sub-carboniferous and Coal-Measure Fossils, collected upon the Geological Survey of Iowa. <*Trans. Chicago Acad. Sci.*, vol. i, pp. 115-127. 1867.

- WHITEAVES, J. F. On some Results obtained by Dredging in Gaspe and off Murry Bay. <*Canad. Nat.*, n. s. vol. iv, p. 270. 1869.
- WHITEAVES, J. F. Notes on a Deep-sea Dredging-Expedition round the Island of Anticosti, in the Gulf of St. Lawrence. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. x, pp. 341-354. 1872.
- WHITEAVES, J. F. Report on a Deep sea Dredging Expedition to the Gulf of St. Lawrence. <*Appendix K. Fourth Ann. Rept. Dept. Marine and Fisheries*, pp. 90-101. 1872.
- WHITEAVES, J. F. Notes of a Deep-sea Dredging Expedition round the Island of Anticosti, in the Gulf of St. Lawrence. <*Brit. Assoc. Advan. Sci.* 1872. Pp. 143-145. 1873.
- WHITEAVES, J. F. Report on Deep Sea Dredging Operations in the Gulf of St. Lawrence, with notes on the present conditions of the Marine Fisheries and Oyster beds of part of that Region. <*Appendix U. Ann. Rept. Dept. Marine and Fisheries*, pp. 178-204. 1874.
- WHITEAVES, J. F. On recent Deep-Sea Dredging Operations in the Gulf of St. Lawrence. <*Amer. Journ. Sci.*, vol. vii, 3d ser., pp. 210-219. 1874.
- WHITFIELD, R. P. On the Fauna of the Lower Carboniferous limestones of Spergen Hill, Ind., with a revision of the descriptions of its Fossils hitherto published, and illustrations of the species from the original type series. <*Bull. Amer. Mus. Nat. Hist.*, vol. i, No. 3, pp. 39-97, pls. vi-ix, 1882.
- Endothyra Baleyi, Hall's sp. (?) Figs. 34-36, p. 42.
- WOODWARD, A., and B. W. THOMAS. On the Foraminifera of the Boulder-Clay, taken from a well-shaft 22 feet deep, Meeker County, Central Minnesota. <*Thirteenth Ann. Rept. Geol., and Nat. Hist. Surv. Minn.*, 1884. pp. 164-177; pls. iii, iv. 1885.

---

## BERMUDA.

- WOODWARD, A. Foraminifera of Bermuda. *Journ. N. Y. Micro. Soc.*, vol. i, pp. 147-151. 1885.

---

## LEEWARD AND WINDWARD ISLANDS.

- BURY, MRS. Polycystius; figures of remarkable forms, etc., in the Barbadoes Chalk Deposit. 2nd edition. Edited by M. C. Cooke. 4 to. London. 1862.
- BURY, P. S. Polycystius; Remarkable Forms, etc., from the Barbadoes deposit, second edition, edited by M. C. Cooke. 4 to. 1867.
- Only fifty copies produced of this very curious microscopic work.

- D'ORBIGNY, A., In M. Ramon de la Sagra Histoire de l'Île de Cuba. Foraminifères, 224 pp., and atlas. 8 vo., folio. Paris, 1839.
- D'ORBIGNY, A. Foraminifères. In Ramon de la Sagra's Histoire physique, politique et naturelle de l'Île de Cuba. French edition, 8 vo., 1839; Spanish edition, 1840, fol., 12 plates.
- DUNCAN, P. M. A notice of the Geology of Jamaica, especially with reference to the District of Clarendon; with Descriptions of the Cretaceous, Eocene, and Miocene Corals of the Islands. <Quart. Journ. Geol. Soc. Lond., vol. xxi, pp. 1-15, 2 plates. 1865.
- EHRENBERG, C. G. Ueber die mikroskopischen kieselschaligen Polycystinen als mächtige Gebirgsmasse von Barbados; <Monatsberichte der Königl. Akad. der Wissenschaften zu Berlin. 1847.
- EHRENBERG, C. G. Fortsetzung der mikrogeologischen Studien als Gesamt-Uebersicht der mikroskopischen Palaontologie gleichartig analysirter Gebirgsarten der Erde, mit specieller Rücksicht auf den Polycystinen Mergel bei Barbados. <Abhand. d. Akad. d. Wiss. Berlin, 1875, pp. 1-168, 30 plates. 1875.
- GUPPY, R. J. L. On the occurrence of Foraminifera in the Tertiary beds of San Fernando, Trinidad. <Trans. Sci. Assoc. Trinidad, 1863, p. 11, also Geologist, 1864, p. 159.
- GUPPY, R. J. L. On the Tertiary Mollusca of Jamaica. <Quart. Journ. Geol. Soc. Lond., vol. xxii, pp. 281-295, 2 plates. 1866.
- GUPPY, R. J. L. On Tertiary Brachiopoda from Trinidad. <Quart. Journ. Geol. Soc. Lond., vol. xxii, pp. 295, 296. 1866.
- GUPPY, R. J. L. On the Relations of the Tertiary Formations of West Indies, with a note on a new species of Rannia by Henry Woodward and on the Orbitoides and Nummulina by T. Rupert Jones. <Quart. Journ. Geol. Soc. Lond., vol. xxii, p. 570. 1866.
- GUPPY, R. J. L. On the discovery of Organic Remains in the Caribbean Series of Trinidad. <Quart. Journ. Geol. Soc. Lond., vol. xxvi, pp. 413-415. 1870.
- GUPPY, R. J. L. On the Foraminifera from the Tertiaries of San Fernando, Trinidad. <Proc. Sci. Assoc. Trinidad., pp. 13-16, 1872; also Geol. Mag., dec. I, vol. x, pp. 362-363. 1873.
- GUPPY, R. J. L. On the West Indian Tertiary Fossils. <Geol. Mag., 1874., p. 445.
- A list of the Foraminifera of the Tertiary Deposits of the West Indies.
- HENEKEN, T. S. On some Tertiary Deposits in San Domingo. <Quart. Journ. Geol. Soc. Lond., vol. ix, pp. 115-129. 1853.
- JONES, T. R. Note on some Nummulinæ and Orbitoides from Jamaica. <Quart. Journ. Geol. Soc. Lond., vol. xix, pp. 514, 515. 1863.
- JONES, T. R. The Relationship of certain West-Indian and Maltese strata, as shown by some Orbitoides and other Foraminifera. <Geol. Mag., dec. I, vol. i, pp. 102-106. 1864.

- JONES, T. R. In Guppy's Relations of the Tertiary formations of the West Indies. On the Orbitoides and Nummulinae. <Quart. Journ. Geol. Soc. Lond., vol xxii, pp. 570-593, pl. xxvi. 1866.
- JONES, T. R. Note on the Orbitoides and Nummulinæ of the Tertiary Asphaltic Bed, Trinidad. *Quart. Journ. Geol. Soc. Lond.*, vol. xxii, pp. 572, 573. 1866.
- JONES, T. R., and W. K. PARKER. Notes on some Fossil and Recent Foraminifera collected in Jamaica by the late Lucas Barrett, F. G. S. <Report. Brit. Assoc. (Newcastle-on-the-Tyne Meeting) Trans. Sections, p. 80. 1863.
- JONES, T. R., and W. K. PARKER. Note on some Foraminifera dredged by the late Mr. Lucas Barrett at Jamaica. <Report Brit. Assoc. (Newcastle on-Tyne Meeting.) Trans. Section. p. 105. 1863.
- JONES, T. R. and PARKER, W. K. Notice sur les Foraminiferes vivants et Fossiles de la Jamaïque. Bruxelles, 1876.
- MOORE, J. C. On some Tertiary Beds in the Island of San Domingo; from Notes by J. S. Heniker. <Quart. Journ. Geol. Soc. Lond., vol. vi, pp. 39-53, 2 plates. 1850.
- MOORE, J. C. Notes on the Fossil Mollusca and Fish from San Domingo. <Quart. Journ. Geol. Soc. Lond., vol. ix, pp. 129-132. 1853.
- MOORE, J. C. On some Tertiary Shells from Jamaica. <Quart. Journ. Geol. Soc. Lond., vol. xix, pp. 510-513. 1863.
- SCHOMBURGH, (Sir) R. H. The Microscopical siliceous Polycystina of Barbadoes, and their relation to existing animals as described in a lecture by Prof. Ehrenberg of Berlin, delivered before the Royal Acad. of Sci. 1847. <Ann., and Mag. Nat. Hist., ser. I, vol. xx, pp. 115-127. 1847.
- SCHOMBURGH, R. H. The History of Barbadoes, 772, pp. 8vo. London, 1848.
- VAN BROECK, E. Etude sur les Foraminiferes de la Barbade (Antilles) recueillis par L. Agassiz precedee de quelques considerations sur la classification et la nomenclature des Foraminiferes. <Ann. de la Soc. Belg. de Micro., vol. ii, pp. 68-152, 2 plates. 1876.

PART III.

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ENGLAND, IRELAND, SCOTLAND  
AND WALES.

## ENGLAND, IRELAND, SCOTLAND AND WALES.

- ADAMS, G. *Micrographia Illustrata; or the knowledge of the Microscope explained.* 4to. London, 1747. Fourth edition, with 72 plates, 8 vo. in 1771.
- ADAMS, G. (filius). *Essays on the Microscope, containing a description of the most improved microscopes, a general history of insects, and a description of 379 animalculæ, etc.* 4to. London, 1787. A second edition in 1798, edited by Frederick Kanmacher. 4to., with folio plates.
- ADAMS, J. *Descriptions of some minute British Shells.* <*Trans. Linnaean Soc., Lond.,* vol. v, pp. 1-6; pl. i. 1800.
- ALCOCK, T. *On Natural History Specimens recently received from Connamara.* <*Proc. Lit., and Phil. Soc., Manches.,* vol. iv, p. 193; wood cuts. 1865.
- ALCOCK, T. *Foraminifera of Dogs Bay.* *Proc. Lit. Philos. Soc., Manchester,* vol. v, pp. 99, 100. 1866.
- ALCOCK, T. *On Foraminifera from a Shell of Halia Priamus.* <*Proc. Lit. Philos. Soc., Manchester,* vol. v, p. 123. 1866.
- ALCOCK, T. *On Polymorphina tubulos.* <*Proc. Lit. and Phil. Soc., Manchester,* vol. vi, p. 85. 1867.
- ALCOCK, T. *Questions regarding the Life-History of the Foraminifera, suggested by Examinations of their Dead Shells.* <*Mem. Lit. Philos. Soc., Manchester,* ser. iii, vol. iii, pp. 175-181; 1 plate. 1868.
- ALLMAN, G. J. *Note on Polytrema miniaceum.* *Ann. and Mag. Nat. Hist.,* ser. 4, vol. v, pp. 372, 373. 1870.
- ALLMAN, P. *Recent Researches among some of the more simple Sarcode Organisms.* <*Journ. Lin. Soc., Lond.,* vol. viii, pp. 261-305; 19 wood cuts, pp. 385-439, 17 wood cuts. 1878.
- ANON. *On the natural Position and Limits of the group Protozoa.* <*Nat. Hist. Review,* 1861, pp. 34-43.  
A review.
- ANON. *Localities for Marine Foraminifera.* <*Journ. R. Micr. Soc., Lond.,* vol. iii, p. 497. 1880.
- ANON. *Importance of Foraminifera for the Doctrine of Descent.* <*Journ. R. Micr. Soc., Lond.,* vol. iii, p. 975. 1880.
- ANON. *Orbulina universa.* <*Journ. Micr. Soc.,* ser. ii, vol. iv, pp. 579, 580. 1884.



- ANSTED, D. T. On the Geology of the Southern Part of Andalusia, between Gibraltar and Almeria. <*Quart. Journ. Geol. Soc., Lond.*, vol. xiv, pp. 130-133. 1858.
- ARMSTRONG, J., J. YOUNG, and D. ROBERTSON. Catalogue of the Western-Scottish Fossils. 8 vo. Glasgow. 1876.
- BALKWILL, F. P., and JOSEPH WRIGHT. Recent Foraminifera of Dublin and Wicklow. <*Proc. Royal Irish Acad.* 1882.  
A Preliminary Report; not seen.
- BALKWILL, F. P., and F. W. MILLET. The Foraminifera of Galway, Pt. I. <*Journ. of Microscopy and Nat. Sci.*, vol. iii, pp. 19-28, pls. i-iv. 1884.
- BALKWILL, F. P., and J. WRIGHT. Recent Foraminifera of Dublin and Wicklow. <*Proc. R. Irish Acad.*, ser. 2, vol. iii, pp. 545-550. 1882.
- BAUERMAN, H. On the Occurrence of Celestine in the Nummulitic Limestone of Egypt. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxv, pp. 40-44. 1869.
- BENNIE, J. Note on the Range of *Saccamina carteri* (Brady) in the Carboniferous Series. <*Geol. Mag.*, n. s. dec. II, vol. iii, p. 47. 1876.
- BIGSBY, J. J. Thesaurus Siluricus, 4to, London. 1868.
- BIGSBY, J. J. Thesaurus Devonico-Carboniferous, 4to, London. 1878.
- BLAKE, J. F. On the Infrafas in Yorkshire. With an appendix on some Bivalve Entomostraca, by Prof T. Rupert Jones, F. G. S. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxviii, pp. 132-147. 1872.
- BLAKE, J. F. On the Kimmeridge Clay of England. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxi, pp. 196-233. 1875.
- BLAKE, J. F. Lower-Silurian Foraminifera. <*Geol. Mag.*, n. s., dec. II, vol. iii, p. 134. 1876.
- BLAKE, J. F. On *Renulina Sorbyana*. <*Monthly Micr. Journ.*, vol. xv, p. 262, wood cut. 1876.
- BOWDICH, T. E. Elements of Conchology, including the Fossil Genera and the Animals, p. 75. Paris, 1822.
- BOWERBANK, J. S. On the Anatomy and Physiology of the Spongiadae. <*Philos. Trans.* p. 279. 1858.
- BRADY, H. B. Report on the Dredging of the Northumberland and Coast and Dogger Bank, drawn up by Henry T. Mennell. <*Brit. Assoc. Advan. Sci.* (Foraminifera), 1862, p. 122. 1863.
- BRADY, H. B. Notes on Foraminifera new to the British Fauna. <*Report Brit. Assoc.* (Newcastle-on-Tyne Meeting), Trans. Section, p. 100. 1863.
- BRADY, H. B. Contributions to Knowledge of the Foraminifera. On the Rhizopodal Fauna of the Shetlands. <*Trans. Linn. Soc. Lond.*, vol. xxiv, p. 463, pl. xlvi. 1863.

- BRADY, H. B. Foraminifera;—in report of Deep-sea Dredging on the Coasts of Northumberland and Durham in 1862-1864. <*Nat. Hist. Trans. Northd., and Durham*, vol. i, p. 51. 1863.
- BRADY, H. B. On *Involutina liassica* (*Nummulites liassicus*, Rupert Jones). <*Geol. Mag.*, vol. i, p. 193, pl. ix. 1863.
- BRADY, H. B. On the Foraminifera of the Middle and Upper Lias of Somersetshire. <*Brit. Assoc. Advan. Sci.* (Bath Meeting), Trans. Section, 1863, p. 50.
- BRADY, H. B. A catalogue of the Recent Foraminifera of Northumberland and Durham. <*Nat. Hist. Trans. Northd., and Durham*, vol. i, p. 83, pl. xii. 1865.
- BRADY, H. B. Notes on Foraminifera from the Valley-deposits of the Nar., Norfolk. <*Geol. Mag.*, vol. ii, pp. 306, 307. 1865.
- BRADY, H. B. On the Rhizopodal Fauna of the Hebrides. <*Brit. Assoc. Advan. Sci.* (Nottingham meeting), 1866, pp. 69, 70. 1866.
- BRADY, H. B., in C. W. PEACH'S—Further Observations on, and additions to, the list of Fossils found in the Boulder Clay of Caithness. N. B. <*Report Brit. Assoc.* (Nottingham meeting), p. 64. 1866. See Peach.
- BRADY, H. B. Synopsis of the Foraminifera of the Upper and Middle Lias of Somersetshire.—In Charles Moore's paper—On the Middle and Upper Lias of the South-west of England. <*Proc. Somerset Arch., and Nat. Hist. Soc.*, vol. xiii, p. 104, pls. i-iii. 1867.
- BRADY, H. B. On *Ellipsoidina*, a New Genus of Foraminifera, by Guiseppo Seguenza; with further notes on its structure and affinities. <*Ann., Mag. Nat. Hist.*, ser. 4, vol. i, p. 333, pl. xiii. 1868.
- BRADY, H. B. Notes on the Foraminifera of Mineral Veins and the Adjacent Strata. <*Report Brit. Assoc.* (Exeter Meeting), pp. 381-382. Also further notes in Charles Moore's paper. 1869.  
See under *Moore*.
- BRADY, H. B., in Brady, Robertson, and Brady's paper. The Ostracoda and Foraminifera of Tidal Rivers. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. vi, p. 273, pls. xi, xii. 1870.
- BRADY, H. B. Catalogue of British Foraminifera in Edinburgh Museum of Science and Art. Edinburgh, 1870.
- BRADY, H. B. On *Saccamina carteri*, a new Foraminifer from the Carboniferous Limestone of Northumberland. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. vii, pp. 177-184. 1871. Also *Nat. Hist. Trans. Northd. and Durham*, vol. vii, p. 177, pl. xii.
- BRADY, H. B. Memoirs of the Geological Survey of Scotland. Explanation of Sheet 23—Lanarkshire. Central Districts, 8 vo. 1873.

- BRADY, H. B. On *Archæodiscus Karreri*, a new type of Carboniferous Foraminifera. < *Brit. Assoc. Advan. Sci.* (Bradford Meeting) 1873, p. 76.  
Abstract.
- BRADY, H. B. On *Archæodiscus Karreri*, a new type of Carboniferous Foraminifera. < *Ann., and Mag. Nat. Hist.*, ser 4, vol. xii, pp. 286-290, pl. vl. 1873. (Abstract Report Brit. Assoc. (Bradford Meeting).)
- BRADY, H. B. On a True Carboniferous Nummulite. < *Ann., and Mag. Nat. Hist.*, ser. 4, vol. xiii, p. 222, pl. xii. 1874.
- BRADY, H. B. A monograph of Carboniferous and Permian Foraminifera, (The Genus *Fusulina* excepted.) < *Palæon Soc.*, vol. xxx, pp. 1-166, plates i-xii. 1876.
- BRADY, H. B. On some Foraminifera from Loo Choo Islands. < *Proc. R. Irish Acad.*, ser 2, vol. ii, p. 589. Also *Quart. Journ. Micr. Sci.*, vol. xvi. new series, p. 405. 1876.
- BRADY, H. B. Notes on a Group of Russian Fusulinæ. < *Ann., and Mag. Nat. Hist.*, ser. 4, vol. xvii, p. 414, pl. xviii. 1876.
- BRADY, H. B. Zittel's Handbook of Palæontology. < *Nature*, vol. xiv, pp. 445-447. 1876.
- BRADY, H. B. Supplementary Note on the Foraminifera of the Chalk (?) of the New Britain Group < *Geol. Mag.*, dec. II, vol. iv, p. 534. 1876.
- BRADY, H. B. In Prof. E. P. Wright's Notes on Foraminifera. (Seychelle Islands and Cagliari.) < *Ann., and Mag. Nat. Hist.*, ser. 4, vol. xix, p. 103. 1877.
- BRADY, H. B. Rhizopoda reticularia, in Sir. G. S. Nares' Narrative of a Voyage to the Polar Sea during 1875-6 in H. M. Ships "Alert" and "Discovery," vol. ii, app. xiii, p. 295. 8 vo. London, 1878.
- BRADY, H. B. On the Reticularian and Radiolarian Rhizopoda. (Foraminifera and Polycystina) of the North Polar Expedition of 1875, 1876. < *Ann., and Mag. Nat. Hist.*, ser. 5, vol. i, p. 425, pls. xx, xxi. 1878.
- BRADY, H. B. Notes on some of the Reticularian Rhizopoda of the Challenger Expedition. < *Quart. Journ. Micros. Sci.*, vol. xix-xxi, new series.  
I. On new or little known Arenaceous types, vol. xix, p. 20, pls. iii.-v.  
II. Additions to the knowledge of Porcellaneous and Hyaline types, and notes on Pelagic Foraminifera, vol. xix, p. 261, pl. viii.  
III. Classification, Further Notes on New Species, and Note on *Biloculina Mud*, vol. xxi, p. 31. 1879-81.
- BRADY, H. B. Notes on Rhizopoda obtained from Capt. Markham's Soundings on the Shores of Novaya Zemlya. In Markham's *A Polar Reconnaissance*, p. 346. 8 vo. London, 1881.
- BRADY, H. B. Notes on some of the Reticularian Rhizopoda of the "Challenger" Expedition, by H. B. Brady, F. R. S. (*Microsc. Journal*, vol. xix, new ser.) < *Bull., de la Soc. Belg., de Micros.*, vol. vi, pp. xvii-xxv. 1882.

- BRADY, H. B. Note on the Keramosphæra, a new Type of Porcellanous Foraminifera. <Ann., and Mag. Nat. Hist., ser. 5, vol. x, pp. 242-245. 1882.
- BRADY, H. B. Pliocene Foraminifera, in Clement Reid's Geology of the Country around Cromer. <Mem. Geol. Survey—England and Wales. (Explanation of Sheet 68 E), p. 65. 1882.
- BRADY, H. B. In the Exploration of the Faroe Channel, during the Summer of 1880, in H. M.'s hired ship "Knight Errant." By Staff Commander Tizard, R. N., and John Murray. <Proc. Roy. Soc., vol. xi, pp. 638-720. 1882.
- See under Tizard and Murray.
- BRADY, H. B. Note on Syringamina, a new type of Arenaceous Foraminifera. <Proc. Roy. Soc., vol. xxxv, pp. 155-161, pl. ii, iii. 1883.
- BRADY, H. B. Report on the Foraminifera dredged by H. M. S. Challenger, during the years 1873-1876. <Report of the Scientific Results of the Voyage of H. M. S. Challenger during the years 1873-1876. Zoology—vol. ix, text and plates, 2 parts. Folio. London, 1884.
- BRADY, H. B., W. K. PARKER, and R. T. JONES. Monograph of the Genus Polymorphina. <Trans. Linn. Soc. Lond., vol. xxvii, p. 197, 4 pls. 1870.
- BROWN, J. Notes on the Artesian Well at Colchester, and remarks on some of the Microscopic Fossils from the Colchester Chalk. <Ann., and Mag. Nat. Hist. Lond., ser. 2, vol. xii, p. 240, vii, ix. 1853.
- BROWN, (Capt.) T. Conchologist's Text-Book, embracing the arrangements of Lamarck and Linnæus with a glossary of technical terms. Glasgow, 1833.
- BROWN, (Capt.) T. Illustrations of the Conchology of Great Britain and Ireland. Edinburgh, 1827. Second edition, London, 1839.
- BROCKLESBY, J. Views of the Microscopic World, pp. 54-58. 1851.
- BRODIE, REV. P. B. Remarks on the Lias at Fretherne near Newnham, and Purton near Sharpness, with an account of some new Foraminifera discovered there. <Ann., and Mag. Nat. Hist. London, ser. 2, vol. xii, p. 272. 1853.
- BROOKES, S. An introduction to the study of Conchology. Chap. xxii, pp. 91-96. (Nautilus. genus, xix.) 1815.
- BRUCE, J. On the Order of Succession in the Drift-beds of the Island of Arran. <Quart. Journ. Geol. Soc. Lond., vol. xxi, pp. 204-213. 1865.
- BUCKLAND, (REV.) DR. W. Notice of the Discovery of Fossil Foraminifera in the Mountain-Limestone of England in 1839 by Messrs. Tennant and Darker. <Abstracts of the Proceedings of the Ashmolean Society, vol. i, (Reprinted, Edin. New Phil. Journ., vol. xxx, p. 441. 1841.

- CARPENTER, W. B. On the Microscopic Structure of *Nummulina Orbitolites*, and *Orbitoides*. <*Quart. Journ. Geol. Soc. Lond.*, vol. vi, p. 21-38. 1849.
- CARPENTER, W. B. Researches on the Foraminifera; Part I, General Introduction and Monograph of the Genus *Orbitolites*. <*Ann. Mag. Nat. Hist.*, vol. xvi, p. 207. *Amer. Journ. Sci.*, vol. xxi, 2d ser., pp. 429-432. 1856.
- CARPENTER, W. B. The Microscope and its Revelations; with an appendix by Francis Gurney Smith, L. I.  
 Chap. x. Foraminifera, Polycystina, and Sponges, pp. 436-456. Composition of Marine deposits pp. 631-634. Structure of *Nummulite* pp. 634-636. *Orbitoides* 637-639, Philadelphia, 1856.
- CARPENTER, W. B. "Researches on the Foraminifera;" Part II. <*Proc. Roy. Soc.*, vol. viii, pp. 205-208. 1857. (Abstract.)
- CARPENTER, W. B. Researches on the Foraminifera.—Part III. On the Genera *Peneroplis*, *Operculina*, and *Amphistegina*. <*Proc. Roy. Soc.*, vol. ix, pp. 334-337. 1859. (Abstract.)
- CARPENTER, W. B. Researches on the Foraminifera <*Phil. Trans.* 1856-1860.  
 1st Series.—Introduction; Genus *Orbitolites*, 1856, p. 181, pls. iv, ix.  
 2d Series.—Genera *Orbiculina*, *Alveolina*, *Cyclocypens*, and *Heterostegina*, 1856, p. 547, pls. xxviii.—xxxii.  
 3d Series.—Genera *Peneroplis*, *Operculina*, and *Amphistegina* 1858, p. 1, pls. i.—vi.  
 4th Series.—Genera *Polystomella*, *Calcarina*, *Tinoporus*, and *Carpenteria*. Concluding Summary, 1860, p. 535, pls. xvii.—xxii.
- CARPENTER, W. B. General Results of the Study of Typical Forms of *Foraminifera*, in their Relation to the Systematic Arrangement of that Group, and to the Fundamental Principles of Natural History Classification. <*Nat. Hist. Rev.*, vol. i, pp. 185-201. 1861.
- CARPENTER, W. B. On the Systematic Arrangement of the Rhizopoda. <*Nat. Hist. Rev.*, vol. i, pp. 456-472. 1861.
- CARPENTER, W. B. Preliminary Report, of Dredging Operations in the Seas to the North of the British Islands, carried on in Her Majesty's steam vessel "Lightning," by Dr. Carpenter and Dr. Wyville Thomson. *Proc. Roy. Soc.*, vol. xvii, pp. 168-200. 1868.
- CARPENTER, W. B. On the Shell Structure of *Fusulina*. *Monthly Micr. Journ.*, 1869, p. 180. pls. xiv. 1869.
- CARPENTER, W. B. The Geological Bearings of Recent Deep-sea Explorations. <*Nature*, vol. ii, pp. 513-515. 1870.
- CARPENTER, W. B. On the Rhizopodal Fauna of the Deep-sea. <*Proc. Roy. Soc.*, vol. xviii, pp. 59-62. 1870.

- CARPENTER, W. B. Descriptive Catalogue of Objects from Deep-sea Dredgings, exhibited at the Soiree of the Royal Microscopical Society, King's College, April 20, 1870. 12mo. London.
- CARPENTER, W. B. Remarks on Professor Wyville Thomson's Preliminary Notes on the Nature of the Sea-bottom procured by the soundings of H. M. S. Challenger. <*Nature*, vol. xi, pp. 297-298. 1875. (Abstract.)
- CARPENTER, W. B. Remarks on Professor Wyville Thomson's Preliminary Notes on the Nature of the Sea-bottom procured by the Soundings of H. M. S. "Challenger." <*Proc. Roy. Soc.*, vol. xxiii, pp. 234-245. 1875.
- CARPENTER, W. B. The Microscope and its Revelations. 5th ed. 12mo. London, 1875.
- CARPENTER, W. B. On the conditions which determine the Presence or Absence of Animal Life on the Deep-sea Bottom. *Geol. Mag.*, new series, vol. ii, pp. 88-90. 1875.
- CARPENTER, W. B. On the Origin of the Red Clay found by the "Challenger" at great Depths of the Ocean. <*Report Brit. Assoc.* (Bristol meeting). Trans. Sections, p. 64. 1875.
- CARPENTER, W. B. Remarks on Mr. Carter's paper On the Polders. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. xvii, pp. 380-387. 1876.
- CARPENTER, W. B. Art.—Foraminifera. <*Encyclopædia Britannica*, 9th ed., vol. ix, p. 371. 1871.
- CARPENTER, W. B. On the Genus *Astrorhiza* of Sandahl, lately described as *Hæckelina* by Dr. Bessels. <*Quart. Journ. Micr. Soc.*, new series, vol. xvi, p. 221, pl. xix. 1876.
- CARPENTER, W. B. The Microscope and its revelations.  
*Foraminifera and Radiolaria* chapter xii, pp. 543-609. (Sixth edition.) 1881.
- CARPENTER, W. B. Researches on the Foraminifera—Supplemental Memoir. On an Abyssal type of the genus *Orbitolites*; a Study in the Theory of Descent. *Phil. Trans.*, vol. clxxiv, pp. 551-573; pls. xxxvii, xxxviii 1883.
- CARPENTER, W. B. Report on the specimens of the Genus *Orbitolites*, collected by H. M. S. Challenger, during the years 1873-76. <*Zool. Jhall Exp.*, vol. vii, pp. 47. 8 plates. 1883.
- CARPENTER, W. B., and H. B. BRADY. Description of *Parkeria* and *Loftusia*, two gigantic types of Arenaceous Foraminifera. <*Phil. Trans.* 1869, p. 721; pl. lxxii-lxxx. 1869.
- CARPENTER, W. B., and JEFFREYS, Dr. J. GWYN. Report on Deep-sea Researches, carried on during the months of July, August and September 1870, in H. M. Surveying Ship "Porcupine." <*Proc. Roy. Soc.*, vol. xii p. 146, 1870.

- CARPENTER, W. B., W. K. PARKER, and T. R. JONES. Introduction to the Study. 319 pages. Fol., 22 plates. *Roy. Society*. 1862.
- CARRUTHERS, W. On Traquairia, a Radiolarian Rhizopod from the Coal-measures. <*Report Brit. Assoc.*, (Brighton meeting), Trans. Sec., p. 126. 1872.
- CARTER, H. J. On the Structure of the larger Foraminifera. <*Ann. and Mag. Nat.*, vol. viii, p. 246. 1861.
- CARTER, H. J. On two New Species of the Foraminiferous Genus Squamulina; and on a New Species of Diffugia. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. v, pp. 309-326; pls. iv, v. 1870.
- CARTER, H. J. Notes on the Branched Variety of Squamulina scopula. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. vi, p. 346. 1870.
- CARTER, H. J. On Haliphysema ramulosa (Bowerbank) and the Sponge-spicules of Polytrema. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. v, p. 389. 1870.
- CARTER, H. J. On Melobesia unicellularis, better known as the *Coccolith*. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. vii, pp. 184-189. 1871.
- CARTER, H. J. Absence of microscopic calcareous Organic Remains in Marine Strata charged with siliceous ones. <*Nature*, vol. xi, p. 186. 1875.
- CARTER, H. J. On the Locality of Carpenteria balaniformis, with Description of a new Species, and other Foraminifera found in and about Tubipora musica. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xix, p. 209, pl. xiii. 1877.
- CARTER, H. J. On the branched form of the Apertural Prolongation from the summit of Carpenteria monticularis. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xx, p. 68, wood cut. 1877.
- CARTER, H. J. On a Melobesian form of Foraminifera (*Gypsina melobesioides*, mihl); and further observations on Carpenteria monticularis. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xx, p. 172. 1877.
- CARTER, H. J. Description of a new Species of Foraminifera (*Rotalia spiculotesta*). <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xx, p. 470, pl. xvi. 1877.
- CARTER, H. J. On Stromatopora. *Ann., and Mag. Nat. Hist.*, ser. 5, vol. ii, p. 85. 1878.
- CARTER, H. J. Position of the Sponge spicule in the Spongidae; and Post-script on the identity of Squamulina scopula with the Sponges. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. i, pp. 170-174. 1878.
- CARTER, H. J. On a New Genus of Foraminifera (*Aphrosina informis*) and Spiculation of an unknown Sponge. <*Jour. R. Micr. Soc. Lond.*, vol. ii, pp. 500-502, 1 pl. 1879.
- CARTER, H. J. Notes on Foraminifera. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. iii, p. 407. 1879.

- CARTER, H. J. Report on specimens dredged up from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren. <Ann., and Mag. Nat. Hist., ser. 5, vol. v, p. 437, pls. xviii, xix. 1880.
- CARTER, H. J. Supplementary Report on Foraminifera and Sponges, Dredged up from the Gulf of Manaar, together with others from the Sea in the vicinity of the Basse Rocks and from Bass's Straits, presented to the Liverpool Free Museum by Captain W. H. Cawne Warren. <Proc. Lit. and Philo. Soc. Liv., vol. xxxv, pp. 271-275. 1881. Same reprinted in the Ann., and Mag. Nat. Hist., ser. 5, vol. vii, pp. 361-385, pl. xviii, 1881.
- CARTER, H. J. Note on the assumed Relationship of Parkeria to Stromatopora, and on a Microscopic Section of Stromatopora mamillata, Fr. Schmidt. <Ann., and Mag. Nat. Hist., ser. 5, vol. xiii, pp. 353-356. 1884.
- CARTER, H. J. Remarks on Prof. Haeckel's Observations on Wyvillethomsonia Wallichii and Squamulina scopula. <Ann., and Mag. Nat. Hist., ser. 4, vol. xx, pp. 337-339. 1877.
- CARTER, H. J. Points of Distinction between the Spongiadae and the Foraminifera. <Ann., and Mag. Nat. Hist., ser. 4, vol. xi, pp. 351-356. 1873.
- CARTER, H. J. On the Striae of Foraminiferous Tests, with a reply to Criticism. <Ann., and Mag. Nat. Hist., ser. 4, vol. xiv, p. 138. 1874.
- CARTER, H. J. On the Polythematata (Foraminifera) especially with reference to their Mythical Hybrid Nature. <Ann., and Mag. Nat. Hist., ser. 4, vol. xvii, p. 185, pl. xiii. 1876.
- CARTER, H. J. Parkeria inferred to have been a species of Hydractinia. <Ann., and Mag. Nat. Hist., ser. 4, vol. xviii, p. 187. 1876.
- CARTER, H. J. On the close Relationship of Hydractinia, Parkeria, and Stromatopora, with Descriptions of new Species of the former, both Recent and Fossil. <Ann., and Mag. Nat. Hist., ser. 4, vol. xix, p. 44, pl. viii. 1877.
- CARTER, H. J. Description of Bdelloidina aggregata, a new genus and species of Arenaceous Foraminifera, in which their so-called "Imperforation" is questioned. Ann., and Mag. Nat. Hist., ser. 4, vol. xix, p. 201, pl. xiii. 1877.
- CHIMMO, WM. Bed of the Atlantic Ocean, in latitude 47° N., longitude 23° W., are taken upwards of 100 (Microscopic Drawings of) Minute Organisms, 40 n. p. 1870.  
Not seen.
- CLARK, WM. Observations on the recent Foraminifera. <Ann. and Mag. Nat. Hist., ser. 2, vol. v, p. 380. 1849.



- CLARK, WM. On the recent Foraminifera. <*Ann. and Mag. Nat. Hist.*, ser. 2, vol. v, p. 161. 1850.
- COCKS, W. P. Contributions to the Fauna of Falmouth. Foraminifera. <*Seventeenth Ann. Report Roy. Cornwall, Pol. Soc.*, p. 87. 1849.
- COSTA, E. da., Mendes, *Historia Naturalis Testaceorum Britannicæ*. London, 1778.
- CROSSKEY, H. W., and D. ROBERTSON. The Post-tertiary Fossiliferous Beds of Scotland, parts I-XX. <*Trans. Geol. Soc. Glasgow*, vol. ii, p. 267;—vol. iii, pp. 113, 321;—vol. iv, pp. 32, 128 and 241;—vol. v, p. 29. 1867-1876.
- CROUCH, E. A. An Illustrated Introduction to Lamarck's Conchology; contained in his *Histoire Naturelle des Animaux sans Vertebres*: being a literal translation of the descriptions of the Recent and Fossil Genera, p. 47, pl. 22. London, 1827.
- DAWSON, J. W. *Acadian Geology*, 2d ed., 8vo. London, 1868.
- DEANE, H. On the occurrence of Fossil Xanthidia and Polythalmia in Chalk. <*Trans. Micr. Soc. Lond.*, vol. ii, pp. 77-79. 1845.
- DIXON, F. *The Geology and Fossils of the Tertiary and Cretaceous Formations of Sussex*. London, 1850.
- DUNCAN, P. M. Note on the Scindian Fossil Corals. <*Quart. Geol. Soc. Lond.*, vol. xx, pp. 66-72. 1864.
- DUNCAN, P. M. On the Syringosphæridæ, an Order of Extinct Rhizopoda. <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. ii, pp. 297-299. 1878.
- DUNCAN, P. M. On the genus *Stoliczkaria*, Dunc., and its distinctness from *Parkeria*, Carp. <*Quart. Jour. Geol. Soc. Lond.*, vol. xxxviii, pp. 69-74, pl. ii. 1882.
- ELCOCK, C. Foraminifera at Southport. <*Journ. Postal Micr. Soc.*, vol. ii, p. 120. 1882.
- ELCOCK, C. Preparing Fossil Foraminifera, Spicula, etc. <*Journ. Micr. Soc., Lond.*, n. s., vol. ii, pp. 886, 887. 1882.
- ELCOCK, C. List of Foraminifera from Silt. <*Journ. Postal Micr. Soc.*, vol. ii, pp. 119, 120. 1883.
- ELCOCK, C. Notes on the Occurrence of some rare Foraminifera in Irish Sea. <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. xiv, pp. 366, 367. 1884.
- ELEY, (Rev.) H. *Geology in the Garden; or the Fossils in the Flint Pebbles*. 8 vo. London, 1859.
- ETHERIDGE, R. (Jun.) On the Occurrence of Foraminifera (*Saccamina Carteri*, Brady), in the Carboniferous Limestone Series of the East of Scotland. *Trans. Edin. Geol. Soc.*, vol. ii, pp. 225, 236. 1873.
- ETHERIDGE, R. (Jun.) Note on the Fossils from the Glacial Deposits of the North-west Coast of the Island of Lewis, Outer Hebrides. *Geol. Mag.*, n. s., dec. II, vol. iii, p. 552. 1876.

- FLEMING, J. *Philosophy of Zoology; or, a General view of the Structure, Functions, and Classification of Animals.* 8 vo. Edinburgh. 1822.
- FLEMING, J. *Observations on some Species of the Genus Vermiculum of Montague.* <*Mem. Wern. Soc.*, vol 4, part ii, pp. 564-567; pl. xv. 1823.
- FLEMING, J. *A History of British animals, exhibiting the descriptive characters and systematic arrangement of the genera and species of Quadrupeds, Birds, Reptiles, Fishes, Mollusca, and Radiata of the United Kingdom.* 8 vo. Edinburgh, 1828.
- FOLIN, M. de. *On a new State of Reticularian Rhizopods.* <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. xvi, pp. 232, 233. 1882.
- GEDDES, P. *On the Nature and Functions of the "Yellow Cells" of Radiolarians and Coelenterates.* <*Proc. Roy. Soc. Edin.*, vol. xi, pp. 377-396. 1882.
- GOSSE, P. H. *Rhizopoda (Foraminifera), Marine Zoology.* Part I, pp. 8-14. 1855.
- GOSSE, P. H. *On the Presence of Motile Organs, and the Power of Locomotion, in Foraminifera.* <*Ann. Mag. Nat. Hist.*, ser 2, vol. xx, pp. 365-367. 1857.
- GRAY, J. E. *On Carpenteria and Dujardinia, two genera of a new form of Protozoa, with attached multilocular Shells filled with Sponge apparently intermediate between Rhizopoda and Porifera.* <*Proc. Zool. Soc. Lond.*, vol. xxvi, p. 226, wood cuts. 1858.
- GREEN, J. *Foraminiferous Silt Banks of the Isle of Ely.* <*Journ. Roy. Mic. Soc. Lond.*, n. s., vol. i, p. 473. 1881.
- GUMBEL, C. W. *On Deep-Sea Mud.* <*Nature*, vol. iii, pp. 16, 17. 1870.
- GUPPY, R. L. J. *The Origin of Coral Reefs. Shortlands Islands, Solomon Group.* *Nature*, vol. xix, pp. 214, 215. 1884.
- HARDMAN, E. T. *The Deep-Sea Manganiferous Muds.* <*Nature*, vol. xv, pp. 57, 58. 1877.
- HOEVEN, J. VAN DER. *Systematic arrangement of Infusories.* <*Hand-Book of Zoology*, vol. i, pp. 45-59. 1856.
- HOOKE, R. *Micrographia; or some Physiological Descriptions of Minute bodies made by Magnifying Glasses, with Observations and Inquiries thereupon.* Thirty-eight plates, folio. London, 1665.
- HOOKE, R. *Micrographia, or some Physiological Descriptions of Minute Bodies, made by Magnifying Glasses, with Observations and Inquiries thereupon.* Fol. 38 plates. London, 1667.
- HOUSE, R., and J. W. KIRKLY. *Synopsis of the Geology of Durham and part of Northumberland.* 8 vo. Newcastle-on-Tyne. 1863.
- HULL, E. *Nature of the Oceanic Bed at great Depths.* <*Jour. Roy. Geol. Soc. Ireland*, vol. iv, pp. 55-59. 1879.

- HUXLEY, T. H. Upon *Thalassicolla*, a new Zoophyte. <*Ann. Mag. Nat. Hist.*, ser. 2, vol. viii, pp. 433-442. 1851.
- HUXLEY, T. H. Report on the Examination of Specimens of Bottom. In Report on Deep-Sea Soundings in the North-Atlantic Ocean between Ireland and Newfoundland, made in H. M. S. "Cyclops," Lieut. Comm. Joseph Dayman, in June and July 1857, p. 62, pl. iv. 1858.
- HYNDMAN, G. L. Report of the Proceedings of the Belfast Dredging Committee. *Brit. Assoc. Advan. Sci.*, 1857, pp. 220-237. 1858.  
List of Foraminifera p. 237.
- JAMESON, R. Notes on the geology of the countries discovered during Captain Parry's second expedition, A. D. 1821-22-23. In Journal of a Third Voyage for the Discovery of a North West Passage from the Atlantic to the Pacific; performed in the years 1824-25, in His Majesty's ship Hecla and Fury, under the orders of Captain William Edward Parry." Appendix, pp. 132-151. London, 1826.  
Contains various notes on the fossils observed during the expedition. Mr. Stokes communicates a note on a fossil from limestone of the island of Igloodik, which is clearly a species of *Receptaculites*.
- JAMIESON, T. F. On the Pleistocene Deposits of Aberdeenshire. <*Quart. Journ. Geol. Soc. Lond.*, vol. xiv, pp. 509-532. 1858.
- JAMIESON, —. Balanus, and some Foraminifera found in the Post-Tertiary shell-beds in Nairnshire. <*Trans. Edin. Geol. Soc.*, vol. iv, pp. 141, 142. 1882.
- JEFFREYS, J. G. Notes on British Foraminifera. *Proc. Roy. Soc.*, vol. vii, No. 14. 1855.
- JEFFREYS, J. G. Notes on British Foraminifera. <*Ann. and Mag. Nat. Hist.*, vol. xvi, p. 207. *Amer. Journ. Sci.*, vol. xxi, 2d ser., pp. 432-434. 1856.
- JEFFREYS, J. G. Deep-Sea Exploration. <*Nature*, vol. xxiii, pp. 300-302, 324-326. 1881.
- JONES, T. R., in Prof. W. King's — Monograph of the Permian Fossils of England. <*Palaeontographical Society's Monographs*. 1850.
- J., T. R. On Recent Notices of the Nummulite Formation. By C. Giebel. *Quart. Journ. Geol. Soc. Lond.*, vol. vii, pp. 116-118. 1851.
- JONES, T. R., in Prestwich's paper—On the Structure of the Strata between the London Clay and the Chalk, in the London and Hampshire Tertiary Systems. Part iii. The Thanet sands. <*Quart. Journ. Geol. Soc. Lond.*, vol. viii, p. 235; pls. xv-xvi. 1852.
- JONES, T. R., in the Rev. P. B. Brodie's—Remarks on the Lias at Fretherne, near Newnham, and Purton near Sharpness, with an account of some new Foraminifera discovered there. <*Ann. and Mag. Nat. Hist.*, ser. 2, vol. xii, p. 272. 1853.
- JONES, T. R. Chalk Foraminifera, in S. J. Mackie's—Thoughts on Dover Cliffs. <*Geologist*, vol. vi; p. 293, and p. 432. 1863.

- JONES, T. R. In Prof. Prestwick's Anniversary Address. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxvii, p. 51. 1871.
- JONES, T. R. On the Range of the Foraminifera in Time. <*Proc. Geologists' Assoc.*, vol. ii, p. 187. 1872.
- JONES, T. R. On some Foraminifera in the chalk of the North of Ireland. <*Journ. Roy. Geol. Soc.*, n. s., vol. iii, pp. 88-91. 1873.
- JONES, T. R. On Quartz and other Forms of Silica. <*Nature*, vol. xiii, pp. 159-160. 1875.  
(Foraminifera.)
- JONES, T. R. In Griffith and Henfrey's Micrographic Dictionary, 3d ed., 8vo. London, 1875.
- JONES, T. R. Oolitic Foraminifera of England. <In Phillips's *Geology of the Yorkshire Coast*, 3d ed., p. 278. 1875.
- JONES, T. R. Remarks on the Foraminifera, with special reference to their Variability of Form, illustrated by the Cristellarians. <*Monthly Micr. Journ.*, vol. xv, p. 61, pls. cxxviii, cxxix.  
Note on Prof. Rupert Jones's Memoir on the variability of Foraminifera. *Ibid.* p. 200. 1876.
- JONES, T. R. The Late Prof. Ch. G. Ehrenberg's Researches on the Recent Foraminifera. <*Monthly Micr. Journ.*, vol. xvii, p. 300;—vol. xviii, p. 49. 1877-78.
- JONES, T. R. In Dixon's *Geology of Sussex*, new ed., pt. ii, p. 168, etc. 1878.
- JONES, T. R. Note on the Foraminifera and other Organisms in the Chalk of the Hebrides. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxiv, pp. 739, 740. 1878.
- JONES, T. R. On some Foraminifera in the Chalk of the North of Ireland. <*Journ. R. Geol. Soc. Ireland*, vol. iii, p. 88. 1879.
- JONES, T. R. Catalogue of the Fossil Foraminifera in the British Museum. 8vo. London, 1882.
- JONES, T. R. The importance of Minute things of Life in Past and Present times. <*Trans. Hert. Nat. Hist. Soc. and Field Club*, vol. ii, pt. 4, pp. 164-172, 1883.
- JONES, T. R. Notes on the Foraminifera and Ostracoda from the Deep Boring at Richmond. <*Quart. Journ. Geol. Soc. Lond.*, vol. pp. 765-777, plate xxxiv. 1884.
- JONES, T. R. The Origin and Composition of Chalk and Flint, with special reference to their Foraminifera and other Minute Organisms. <*Trans. Hert. Nat. Hist. Soc. F. Club.*, vol. iii, pp. 143-156. 1885.
- JONES, T. R., W. K. PARKER and H. B. BRADY. A Monograph of the Foraminifera of the Crag. <*Palaeon. Soc.*, vol. xix, pp. 1-72, 3 tables, 4 plates. 1865.

- JONES T. R. and W. K. PARKER. On the Rhizopodial Fauna of the Mediterranean, compared with that of the Italian and some other Tertiary Deposits. <*Quart. Journ. Geol. Soc. Lond.*, vol. xvi, pp. 292-307. 1860.
- JONES T. R. and W. K. PARKER. On some Fossil Foraminifera from Chellaston near Derby. <*Quart. Journ. Geol. Soc. Lond.*, vol. xvi, pp. 452-458, 2 plates. 1860.
- JONES T. R. and W. K. PARKER. On the Foraminifera of the Crag. <*Ann., and Mag. Nat. Hist.*, ser. 3, vol. xiii, p. 64. 1864. See also *Mem. Geol. Survey of Gt. Britain*, Geology. Middlesex, etc., p. 59.
- JONES T. R. and W. K. PARKER. On the chalk of Gravesend and Mendon, figured by Prof. Dr. Chr. G. Ehrenberg (in 1854). <*Geol. Mag.*, new series, vol. viii, p. 506. 1871.
- JONES T. R. and W. K. PARKER. On the Foraminifera of the Family Rotalinae (Carpenter), found in the Cretaceous Formation, with Notes on their Tertiary and Recent Representatives. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxvii, pp. 103-131. 1872.
- JONES T. R. and W. K. PARKER. Notes on Eley's Foraminifera from the English Chalk. <*Geol. Mag.*, vol. ix, p. 123. 1872.
- JONES T. R. and W. K. PARKER. Lists of some English Jurassic Foraminifera. <*Geol. Mag.*, dec. II, vol. ii, pp. 308-311. 1875.
- JONES T. R. and W. K. PARKER. On some Recent and Fossil Foraminifera dredged up in the English Channel. <*Ann., and Mag. Nat. Hist.*, ser. 4, xvii, p. 283, wood cuts. 1876.
- JUDD J. W. and C. HOMERSHAM. Supplementary Notes on the Deep Boring at Richmond, Surrey. *Quart. Journ. Geol. Soc.*, vol. xli, pp. 523-528. 1885.
- KANMACHER, F. Adams's Essays on the Microscope; the second edition, with considerable additions and improvements. 4to, with folio plates. London, 1798.
- KINAHAN, G. H. On the Cretaceous Period. <*Nature*, vol. iii, p. 286. 1871.
- KEEPING, W. On some Remains of Plants, Foraminifera and Annelida in the Silurian Rocks of Central Wales. <*Geol. Mag.*, dec. II, vol. ix, pp. 485-491, pl. xi. 1882.
- KENT, W. S. The Foraminiferal Nature of *Haliphysema Tumanowiczie*, Bow. (*Squamulina scopula*, Carter) demonstrated. <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. ii, p. 68, pls. iv, v. 1878.
- KENT, W. S. Observations of Professor Ernst Haeckel's Group of the *Physemaria*, and on the Affinity of the Sponges. <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. i, p. 1-17. 1878.
- KING, W. A. Catalogue of the Organic Remains of the Permian Rocks of Northumberland and Durham. 8 vo. Newcastle-on-Tyne, 1848.

- KING, WM. A Monograph of the Permian Fossils of England. London, 1850.
- KING, W. On the Occurrence of Permian Magnesian Limestone at Tullyconnel, near Artree, in the County of Tyrone. <*Journ. Geol. Soc.*, Dublin, vol. vii, part 2. 1850.
- KING, W. Oceanic Sediments and their Relation to Geological Formations. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. xv, pp. 198-204. 1875.
- KING, W., and T. H. ROWNEY. An old chapter of the Geological Record. 8 vo. London, 1881.
- KIRKLY, J. W. Brachiopoda, Polyzoa, and Foraminifera from the Permian Rocks of South Yorkshire. <*Quart. Journ. Geol. Soc., Lond.*, vol. xvii, pp. 306-309. 1861.
- LAMPLUGH, G. W. On the Bridlington and Dimlington Glacial Shell-beds. <*Geol. Mag.*, dec. II, vol. viii, p. 535. 1881.
- LANKESTER, E. R. The Structure of Haliphysema Tumanowiczii. <*Quart. Journ. Micr. Soc.*, vol. xix, new ser., p. 475, pl. xxii. 1879.
- LATHAM, A. G. On Foraminifera from Dogs Bay, Roundstone, and from Berwick Bay. <*Proc. Lit. Philos. Soc., Manchester*, vol. vi, pp. 85, 191, 1867.
- LEBOUR, G. A. On the "Great" and "Four-fathom" Limestone and their associated beds in South Northumberland. <*Trans. N. of Eng. Inst. Min. Engineers*, vol. xxiv. 1875.
- LEBOUR, G. A. Range of Saccummina Carteri (Brady). <*Geol. Mag.*, n. s., dec. II, vol. iii, p. 135. 1876.
- LEGG, M. S. Observations on the Examination of Sponge Sand, with remarks on collecting, mounting, and viewing Foraminifera as microscopic objects. <*Quart. Journ. Micro. Sci.*, vol. i, 1853. Also, *Trans. Micro. Soc., Lond.*, ser. 2, vol. ii, pl. xix.
- LINTON, J. On a Sample of Sand from Dogs Bay, Connemara, skimmed from the Surface of the Sea. <*Proc. Lit. Philos. Soc., Manchester*, vol. vi, pp. 184-186. 1867.
- LISTER, M. *Historiæ animalium Angliæ tres tractatus; Unus de Araneis Alter de Cochleis tum terrestribus tum fluviatilibus, Tertius de Cochleis marinis, etc., cum Tab. æn. ix.* Londini. 1678.
- LIVERSIDGE, A. On the Occurrence of Chalk in the New Britain Group. <*Geol. Mag.*, n. s., dec. II, vol. iv, p. 539. 1877.
- MAC COY, F. Contributions to British Palæontology, 1854.
- MACDONALD, J. D. Further Observations on deep soundings obtained by H. M. S. "Herald," Capt. Denham, employed on the Surveying Service in South-western Pacific. <*Ann. and Mag. Nat. Hist.*, ser. 2, vol. xxi 1857.

- MACGILLIVRAY, W. A History of the Molluscous Animals of the counties of Aberdeen, Kincardine, and Banff, &c. 12mo. London, 1843.
- MACKIE, S. J. Microscopic Geology. <*Recreative Science.*, vol. i, pp. 145-150. 1860.
- MANTELL, G. A. Thoughts on Animalcules. 12mo. 1846.
- MANTELL, G. A. The soft bodies of Polythalmia found in fossil state. <*Trans. of the Roy. Soc. of Lond.* and in *Amer. Jour. Sci.*, vol. ii. 1846.
- MANTELL, G. A. On the Fossil Remains of the soft parts of Foraminifera, in the Chalk and Flint of the Southeast of England. <*Amer. Journ. Sci.*, vol. v. 2d ser., pp. 70-74. 3 wood cuts. 1848.
- MANTELL, G. A. "On the Fossil Remains of the soft parts of Foraminifera discovered in the Chalk Flint of Southeast of England." <*Proc. Roy. Soc.*, vol. v, pp. 627, 628. 1851.
- MANTELL, G. A. Pictorial Atlas of Fossil Remains. Plates 61, 62. 1850.
- MANTON, W. G., and RACKETT, REV. T. A Descriptive Catalogue of the British Testacea. <*Trans. Linnæan Soc.*, vol. viii. 1807.
- MCANDREW, R. List of the British Marine Invertebrate Fauna. Pp. 234, 235, (Foraminifera). <*Brit. Assoc. Advan. Sci.*, 1860-1861.  
This list of British Foraminifera is taken from Prof. Williamson's "Recent Foraminifera of Great Britain," published by the Ray Society.
- M'COY, F. On some new Genera and Species of Palæozoic Corals and Foraminifera. <*Ann. and Mag. Nat. Hist.*, ser. 2, vol. iii, p. 131. 1849.
- MEASURES, J. W. Foraminifera from Silt. <*Journ. Micr. Soc.*, vol. xiv, pp. 118, 119. 1883.
- MIVART, (SR.) G. Notes touching Recent Researches on the Radiolaria. <*Journ. Linn. Soc.*, vol. xiv, pp. 136-186, 16 wood cuts. 1878.
- MOORE, C. On the Abnormal Conditions of Secondary Deposits when connected with the Somersetshire and South Wales Coal-Basin, and on the age of the Sutton and Southerndoun Series. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxiii, pp. 449-568, 2 plates. 1867.
- MOORE, C. Report on Mineral Veins in Carboniferous Limestone and their Organic Contents. <*Report Brit. Assoc. (Exeter Meeting)* pp. 360-388. 1869.
- MOORE, C. On the Palæontology and Physical Conditions of the Meux-Well. <*Quart. Journ. Geol. Soc.*, vol. xxxiv, p. 914. 1878.
- MORRIS, J. Catalogue of British Fossils. London, 1843. (2d Edit. 1852.)
- MORRIS, J., and J. QUEKETT. Catalogue of the Hunterian Museum of the Royal College of Surgeons of England, p. 87. 4to. London, 1860.
- MOSELEY, H. N. Pelagic Life. <*Nature*, vol. xvi, pp. 559-564. 1882.

- MONTAGU, G. *Testacea Britannica, or Natural History of British Shells, Marine, Land, and Fresh-water, etc.* 3 vols. 4o. London, 1803.
- MONTAGU, G. *A supplement to the Testacea Britanica.* London, 1808.
- MOSELEY, H. N. Notes by a Naturalist on the "Challenger," being an account of various observations made during the voyage of H. M. S. "Challenger" round the world, in the years 1872-1876. London, 1879.
- MUNIER-CHALMAS, and C. SCHLUMBERGER. New Observations on the Dimorphism of the Foraminifera. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. xl, pp. 336-340. 1883.
- MURRAY, J. Preliminary Reports to Professor Wyville Thompson F. R. S., Director of the Civilian Scientific Staff, on Work done on board the "Challenger." <*Proc. Roy. Soc.*, vol. xxiv, pp. 471-544, 4 plates. 1876.
- MURRAY, J. Deep-Sea Muds. <*Nature*, vol. xv, pp. 319, 340. 1877.
- MURRAY, J. On the Structure and Origin of Coral Reefs and Islands (Abstract). <*Proc. Roy. Soc. Edinb.*, vol. x. pp. 505-518. 1880.
- NEEDHAM, T. V. An Account of some new Microscopical Discoveries, plate 6. London, 1745.
- NEVILL, T. H. Foraminifera from a deposit at Montreal. <*Proc. Lit., and Phil. Soc.*, Manchester, vol. iii, p. 100. *Quart. Journ. Micr. Sci.*, vol. iii, n. s., p. 211. 1863.
- NICHOLSON, H. A, and R. ETHERIDGE, Jun. A Monograph of the Silurian Fossils of the Glrvan District in Ayrshire, with especial referencé to those contained in the "Gray Collection," fasc. i. 1878.
- NORMAN, A. M. In Jeffreys and Norman's Submarine Cable Fauna. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xv, p. 169, pl. xii. 1875.
- NORMAN, A. M. In Dr. Jeffrey's Preliminary Report of the Biological Results of a Cruise in H. M. S. "Valorous" to Davis Strait in 1875. *Proc. Roy. Soc.*, vol. xxv, p. 202. Also Dr. W. B. Carpenter. *Ibid.*, p. 223. 1876.
- NORMAN, A. M. Notes on the French Exploration of Le "Travailleur" in the Bay of Biscay (Abstract). <*Report Brit. Assoc. (Swansea Meeting)* p. 387. 1880.
- NORMAN, A. M. On the Genus Haliphysema, with a description of several forms apparently allied to it. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. i, p. 265, pl. xvi. 1878.
- NORMAN, A. M. On the Architectural Achievements of little Masons, Annelidan and Rhizopodan, in the Abyss of the Atlantic. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. i, p. 284. 1878.
- NORMAN, A. M. Presidential Address. Part. II. The Abysses of the Ocean. <*Nat. Hist. Trans. Northd. and Durham*; vol viii, p. 25. 1883.



- NORTHAMPTON (Marquis of). On Spirolinites in Chalk and Chalk-flints. < *Lond. and Edin. Phil. Mag.*, also *Proc. Geol. Soc. Lond.*, vol. ii, p. 685. 1838.
- OWEN, S. R. J. On the Surface fauna of Mid-Ocean. < *Journ. Linn. Soc. Lond.*, (Zoology) vol. ix., p. 147, pl. v. 1867.
- PARFITT, E. On the Protozoa of Devonshire. < *Trans. Devon. Assoc. Sci. Lit. and Art.*, vol. iii. 1869.
- PARFITT, E. On a Species of Arenaceous Foraminifer? from the Carboniferous Limestone of Devonshire. < *Ann., and Mag. Nat. Hist.*, ser. 4, vol. vii, pp. 158-161. 1871.
- PARFITT, E. On a new Species of Cellepora. < *Ann., and Mag. Nat. Hist.*, ser. 4, vol. xii, pp. 68, 69, pl. iii. B., 1873.
- PARFITT, E. On the Structure of Haliphysema Tumanowiczii. < *Ann., and Mag. Nat. Hist.*, ser. 6, vol. ii, p. 88. 1878.
- PARKER, W. K. and T. R. JONES, in Ansted's paper on Malaga,—Foraminifera of the Blue Clay of Tejares, Malaga. < *Quart. Journ. Geol. Soc., Lond.*, xv, p. 600. 1859.
- PARKER, W. K., and T. R. JONES. On some Foraminifera from the North Atlantic and Arctic Oceans, including Davis Strait and Baffin Bay. < *Proc. Roy. Soc.*, vol. xix, pp. 239, 240. 1864.
- PARKER, W. K., and T. R. JONES. On some Foraminifera from the North Atlantic and Arctic Oceans, including Davis Straits and Baffin's Bay. < *Phil. Trans. Roy. Soc. Lond.*, vol. clv, pp. 325-441; 7 plates. 1865.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera, Part I, Linnæus and Gmelin. < *Ann. and Mag. Nat. Hist.*, ser. 3, vol. iii, p. 474. 1859.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera; Part II, Walker and Montagu. < *Ann. and Mag. Nat. Hist.*, ser. 3, vol. iv, p. 333. 1859.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part III, Fichtel and Moll. < *Ann. and Mag. Nat. Hist.*, ser. 3, pp. 98, 174. 1860.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part IV, Lamarck. < *Ann. and Mag. Nat. Hist.*, ser. 3, vol. v, pp. 285, 466; vol. vi, p. 29. 1860.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part V, De Montfort. < *Ann. and Mag. Nat. Hist.*, ser. 3, vol. vi, p. 337. 1860.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part VI, Aveolina. < *Ann. and Mag. Nat. Hist.*, ser. 3, vol. viii, p. 161. 1863.

- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part VII, Operculina and Nummulina. <Ann. and Mag. Nat. Hist., ser. 3, vol. viii, p. 229. 1861.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part VIII.—Textularia. <Ann. and Mag. Nat. Hist., ser. 3, vol. xi, pp. 91-98. 1863.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part IX. *The species enumerated by De Blainville and DeFrance.* <Ann. and Mag. Nat. Hist., ser. 3, vol. xii, pp. 200-219. 1863.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. *The species enumerated by D'Orbigny in the "Annales des Sciences Naturelles,"* vol. vii, 1826. <Ann. and Mag. Nat. Hist., ser. 3, vol. xii, pp. 429-440. 1863.
- PARKER, W. K., T. R. JONES, and H. B. BRADY. On the Nomenclature of the Foraminifera. Part XI.—*The species enumerated by Batsch in 1791.* <Ann. and Mag. Nat. Hist., ser. 3, vol. xv, pp. 225-232. 1865.
- PARKER, W. K., T. R. JONES, and H. B. BRADY. On the Nomenclature of the Foraminifera. Part XII.—*The species enumerated by D'Orbigny in the Annales des Sciences Naturelles, vol. vii, 1826.* (3) The species illustrated by Models. <Ann. and Mag. Nat. Hist., ser. 3, vol. xvi, p. 15, pls. i-iii. 1865.
- JONES, T. R., W. K. PARKER, and J. W. KIRKBY. On the Foraminifera. Part XIII.—*The Permian Trochammina pusilla and its Allies.* <Ann. and Mag. Nat. Hist., ser. 4, vol. iv, pp. 386-392. 1869.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part XIV.—*The species enumerated by D'Orbigny in the "Annales des Sciences Naturelles," 1826, vol. vii.* IV.—*The Species founded upon the Figures in Soldani's "Testaceographia ac Zoophytographia."* <Ann. and Mag. Nat. Hist., ser. 4, vol. viii, pp. 145-179, 238-266. 1871.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part XV.—*The Species figured by Ehrenberg.* <Ann. and Mag. Nat. Hist., ser. 4, vol. x, pp. 184-200, 253-271, 453-457. 1872.
- PARKER, W. K., and T. R. JONES. On the Nomenclature of the Foraminifera. Part XV.—*The Species figured by Ehrenberg.* <Ann. and Mag. Nat. Hist., ser. 4, vol. ix, pp. 211-230, 280-303. 1872.
- PARKER, JONES and BRADY. On Priority in the Discovery of the Canal-system in Foraminifera. <Ann. and Mag. Nat. Hist., ser. 4, vol. pp. 64 and 305. 1874.
- PARKER, W. K., and T. R. JONES. On *Ovulites margaritula.* <Ann. and Mag. Nat. Hist., ser. 4, vol. xx, p. 79. 1877.
- PARKINSON, J. *The Organic Remains of a former World.* 3 vols. 4to. London, 1804-11.

- PEACH, C. W. Additional List of Fossils from the Boulder-Clay of Caithness. <Report Brit. Assoc. (Bath Meeting) Trans. Soc., p. 61. 1864.
- PEACH, C. W. Further Observations on, and additions to, the List of Fossils found in the Boulder-Clay of Caithness, N. B. <Brit. Assoc. Advan. Sci., 1866, pp. 64, 65.  
See Brady.
- PENNANT, T. The British Zoology. 8 vo. London, 1776-77.
- PENNANT, T. British Zoology. London, 1812. "A new edition."
- PERRY, G. Conchology or the Natural History of Shells. (*Dentalia viridis*, and *bandata*, pl. 52.) London, 1811.
- PERRY, J. On collecting Foraminifera on the West Coast of Ireland. <Proc. Lit. Philos. Soc. Manches., vol. v, p. 42. 1866.
- PHILLIPS, J. On the Remains of Microscopic Animals in the Rocks of Yorkshire. <Proc. Geol., and Polytech. Soc. W. R. Yorks., vol. ii, p. 277, pl. vii. Leeds. 1845.
- PRESTWICH, J. On the Structure of the Strata between the London Clay and the Chalk in the London and Hampshire Tertiary Systems. Part III.—The Thanet Sands. <Quart. Journ. Geol. Soc. (Proc.), vol. viii, pp. 235-268, plates xv, xvi. 1852.
- PRESTWICH, J. On the Thickness of the London Clay; on the Relative Position of the Fossiliferous Beds of Sheppy, Highgate, Harwich, Newnham, Bognor, etc. <Quart. Journ. Geol. Soc. Lond., vol. x, pp. 401-419. 1854.
- PRESTWICH, J. On the Correlation of the Middle Eocene Tertiaries of England, France and Belgium. <Quart. Journ. Geol. Soc. Lond., vol. xii, pp. 390-392, 599-604. 1856.
- PRESTWICH, J. On the Correlation of the Eocene Tertiaries of England, France and Belgium. <Quart. Journ. Geol. Soc. Lond., vol. xiii, pp. 89-134. 1857.
- PRESTWICH, J. Notes on the Phenomena of the Quaternary Period in the Isle of Portland and around Weymouth. <Quart. Journ. Geol. Soc. Lond., vol. xxxi, pp. 29-52. 1875.
- PRICE, F. G. H. A Monograph of the Gault, being the substance of a Lecture delivered in the Woodwardian Museum, Cambridge, 1878, and before the Geological Association, 1879, p. 81. 1880.
- PRITCHARD, A. A history of Infusoria, including the Desmidiaceæ and Diatomaceæ, British and Foreign, 4th edition, enlarged and revised by J. T. Arlidge, W. Archer, J. Ralfs, W. C. Williamson, and the Author. London, 1861.
- PULTENEY, R. Catalogues of the Birds, Shells, and some of the most rare Plants of Dorsetshire, from the new and enlarged edition of Mr. Hutchin's History of that County. Fol. London, 1799.

- READE, J. B. Observations on some new organic remains in the flint of chalk. London, 1838.
- READE, J. B. On the Animals of the Chalk still found in the living state in the Stomachs of Oysters. <*Trans. Micr. Soc. Lond.*, vol. ii, pp. 20-24. 1844.
- REUSS, A. E., H. BRADY. Synopsis of the Foraminifera of the Middle and Upper Lias, Somersetshire. <*Verhandl. K. K. Geol. Reich.* 1868, pp. 151, 152. 1868.
- ROBERTSON, D. On Foraminifera from the South Coast of Devon and Cornwall. <*Report Brit. Assoc.*, (Exeter Meeting) p. 91. 1869.
- ROBERTSON, D. Notes on the Recent Foraminifera and Ostracoda of the Firth of Clyde, with some Remarks on the Distribution of the Mollusca. <*Trans. Geol. Soc. Glasgow*, vol. v, p. 112. 1874.
- ROBERTSON, D. Notes on a Raised Beach at Cumbrae. <*Trans. Geol. Soc. Glasgow*, vol. v, p. 192. 1875.
- ROBERTSON, D. In G. S. Brady and Robertson's Report on Dredging off the Coast of Durham and North Yorkshire in 1874. <*Report Brit. Assoc.* (Bristol Meeting) p. 185. 1875.
- ROBERTSON, D. Notes on a Post tertiary Deposit of Shell-bearing clay on the west side of the Railway Tunnel at Arkleston near Paisley. <*Trans. Geol. Soc. Glasgow*, vol. v, p. 281. 1876.
- ROBERTSON, D. Garnock-water Post-tertiary Deposit. <*Trans. Geol. Soc. Glasgow*, vol. v, p. 297. 1876.
- ROBERTSON, D. Foraminifera in—A Contribution towards a Complete List of the Fauna and Flora of Clydesdale and the West of Scotland, p. 51, 8 vo. Glasgow, 1876.
- ROBERTSON, D. Notes on the Post-tertiary Deposit of Misk Pit, near Killingwinning. <*Trans. Geol. Soc. Glasgow*, vol. v, p. 297. 1877.
- ROBERTSON, D. On the Post-tertiary Beds of gravel, Greenock. *Trans. Geol. Soc. Glasgow*, vol. vii, 1-37, pl. i. 1883.
- ROBERTSON, D. Foraminifera, in D. J. Gwyn Jeffrey's paper,—Mediterranean Mollusca (No. 3.) and other Invertebrata. <*Ann. and Mag. Nat. Hist.*, ser 5, vol. xi, p. 401. 1883.
- ROBERTSON, D. Report on the Sand and Gravels and Boulder-clays and the Silt, at the Dock F of the Atlantic Docks, Liverpool. (Appendix to T. Mellard Reade's paper,—The Drift beds of the North-west of England and North Wales.) <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxix, pp. 129-132. 1883.
- ROGERS, H. D. On the probable depth of the Ocean of the European Chalk Deposits. <*Proc. Bost. Soc. Nat. Hist.*, vol. iv, p. 297. 1853. *Amer. Journ. Sci.*, 2 ser., vol. xvii, p. 131. 1854.

- SALTER, J. W. Arctic Carboniferous Fossils, collected by the Expedition under Sir E. Belcher, C. B., 1852-54, in the "last of Arctic Voyages," by Sir Edward Belcher. 2 vols., 8 vo. London, 1855; pp. 377, 391, pl. xxxvi.
- SCHLUMBERGER, M. C. On *Orbulina universa*. <*Ann. Mag. Nat. Hist.*, ser. 5, vol. xiv, pp. 69-71. 1884.
- SCHULTZE, M. S. Beobachtungen uber, die Fortpflanzung der Polythalamien. <*Muller's Archiv.*, 1856, p. 165. *Quart. Journ. Micr.*, vol. v, p. 220. 1856.
- SEGUENZA, G. On *Ellipsoidina*, a new Genus of *Foraminifera*, with further Notes on its Structure and Affinities, by Henry B. Brady, F. L. S., F. G. S. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. i, pp. 333-343. 1868.
- SHONE, W. On the Discovery of *Foraminifera*, etc. in the Boulder-clays of Cheshire. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxx, pp. 181-185. 1874.
- SHONE, W. On the Glacial Deposits of West Cheshire, together with Lists of the Fauna found in the Drift of Cheshire and the adjoining counties. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxiv, p. 383; table. 1878.
- SIDDALL, J. D. On the *Foraminifera* of the River Dee. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. xvii, p. 37. 1876.
- SIDDALL, J. D. On *Foraminifera* and other Microzoa. <*Nature*, vol. xv, p. 461. 1878. (Abstract.)
- SIDDALL, J. D. On the *Foraminifera* of the River Dee. <*Proc. Chester Soc. Nat. Sci.*, pt. ii. p. 42; wood cuts. 1878.
- SIDDALL, J. D. Catalogue of British Recent *Foraminifera*, for use of Collectors. 8 vo. Chester. 1879.
- SIDDALL, J. D. On *Shepherdella*, an Underscribed Type of Marine Rhizopoda, with a few Observations on *Lieberkuehnia*. <*Quart. Journ. Micr. Sci.*, vol. xx, n. s., p. 130, pls. xv, xvi. 1880.
- SMITH, J. T. The *Ventriculidæ* of the Chalk, 8vo. London, 1848.
- SOLLAS, W. J. An Aberrant *Foraminifer*. <*Nature*, vol. v, p. 83. Woodcut. 1871. *Peneroplis pertusus*.
- SOLLAS, W. J. On the *Foraminifera* and Sponges of the Upper Greensand of Cambridge. <*Geol. Mag.*, vol. x, pp. 268-274. 1873.
- SOLLAS, W. J. On the Glauconite Granules of Cambridge Greensand. <*Geol. Mag.*, dec. II, vol. iii, p. 539, pl. xxi, 1876.
- SOLLAS, W. J. On the Perforate Character of the Genus *Webbina*, with a notice of two new species, *W. laevis* and *W. tuberculata*, from the Greensand. <*Geol. Mag.*, dec. II, vol. iv, p. 102, pl. vi. 1877.
- SOLLAS, W. J. The Estuaries of the Severn and its Tributaries; an inquiry into the nature and origin of their tidal sediment and alluvial flats. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxix, pp. 611-626. 1883.

- SOLLAS, W. J. On the Origin of Freshwater Faunas. A Study in Evolution. <*Sci. Trans. Roy. Dub. Soc.*, vol. iii, ser. II, pp. 87-118. 1884.
- SORBY, H. C. On the Microscopical Structure of the Calcareous Grit of the Yorkshire Coast. <*Quart. Journ. Geol. Soc. Lond.*, vol. vii, pp. 1-6. 1851.
- SORBY, H. C. Address delivered at the Anniversary Meeting of the Geological Society. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxv. with a privately published appendix of 18 plates. 1879.
- SOWERBY, G. B. Foraminifera from the Colne Tidal River, Essex, 1 plate, (privately printed) 8vo. London, 1856.
- SOWERBY, J. Mineral Conchology of Great Britain, 12 vols., 8vo. London, 1818-1829.
- STEWART, S. A. A list of the Fossils of the Estuarine Clays of the Counties of Down and Antrim. <*Eighth Ann. Rept. Bel. Nat. F. C.*, appendix ii, pp. 27-40. 1871.
- STEWARTSON, G., H. B. BRADY, and D. ROBERTSON. The Ostracoda and Foraminifera of Tidal Rivers, with an Analysis and Descriptions of the Foraminifera, by Henry B. Brady. <*Ann. and Mag. Nat. Hist.*, ser. 4, vol. vi, pp. 1-34, 273-309. 1870.
- STRICKLAND, H. E. On two Species of Microscopic Shells found in the Lias. <*Quart. Journ. Geol. Soc. Lond.*, vol. ii, pp. 30, 31, wood cuts. 1846.
- TATE, R. On the Correlation of the Cretaceous Formations of the north east of Ireland. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxi, pp. 15-44, 3 plates. 1865.
- TATE, R. and J. F. BLAKE. The Yorkshire Lias. 8vo., 19 plates and map. London, 1876.
- THOMSON, C. W. The Depths of the Sea. 8vo. London, 1873.
- THOMSON, C. W. The Depths of the Sea. Second edition, 8vo. London. 1874.
- THOMSON, C. W. On Dredgings and Deep-Sea Soundings in the South Atlantic. <*Proc. Roy. Soc.*, vol. xxii, pp. 423-428. 1874.
- THOMSON, W. On Deep Sea climates. <*Nature*, vol. ii, pp. 257-261. 1870.
- THOMSON, W. The continuity of the chalk. <*Nature*, vol. iii, pp. 225-257-286. 1871.
- THOMPSON, W. On the Fauna of Ireland. <*Mag. Nat. Hist.*, vol. v. 1840.
- THOMPSON, W. Report on the Fauna of Ireland: Div. Invertebrata. <*Report Brit. Assoc.*, (Cork Meeting), p. 274. 1843.
- THOMPSON, W. Additions to the Fauna of Ireland. <*Mag. Nat. Hist.*, vol. xiii. 1844.
- THOMPSON, W. Report on the Fauna of Ireland. (Foraminifera) <*Brit. Assoc. Advan. Sci.* 1843, xiii, pp. 274, 275. 1844.

- THOMPSON, W. "Preliminary Notes on the Nature of the Sea-bottom procured by the Soundings of H. M. S. 'Challenger' during her Cruise in the 'Southern Sea' in the early part of the year 1874." <*Proc. Roy. Soc.*, vol. xxiii, pp. 32-48. 1875.
- THOMPSON, W. "Preliminary Report to the Hydrographer of the Admiralty on some of the Results of the Cruise of H. M. S. 'Challenger' between Hawaii and Valparaiso." <*Proc. Roy. Soc.*, vol. xxiv, pp. 463-470, 5 plates. 1876.
- THORPE, C. *British Marine Conchology; being a Descriptive Catalogue, arranged to the Lamarckian System, of the Salt-water Shells in Great Britain.* 12mo. London, 1844.
- TIZARD, Staff-Commander, and J. MURRAY. *Exploration of the Farøe Channel during the summer of 1880, in Her Majesty's hired ship "Knight-Errent."* <*Proc. Roy. Soc. Edinb.*, vol. xi, pp. 638-720, pl. vi,—Report on the Foraminifera by H. B. Brady, pp. 708-717. 1882.
- TURTON, W. *Linnaeus. General system of Nature; translated from Gmelin's last edition, amended and enlarged.* 8vo. Swansea, 1800-06.
- TURTON, W. *A Conchological Dictionary of the British Islands.* 12mo. London, 1819.
- TUTE, J. S. *Organisms in Carboniferous Flint or Chert.* <*Science Gossip*, August 1874, p. 188. 1875.
- VINE, G. R. *Foraminifera from Shetland.* <*Science Gossip*, vol. xiv, p. 51. 1879.
- VINE, G. R. *Notes on the Carboniferous Entomostraca and Foraminifera of the North Yorkshire Shales.* <*Proc. Yorkshire Geol. and Pol. Soc.*, n. s., vol. viii, pp. 226-239. 1884.
- WALFORD, E. A. *On some Upper and Middle Lias Beds in the Neighbourhood of Banbury.* <*Proc. Warwicksh. Field-Club* for 1878; Supplement. 1878.
- WALKER, G. *Testacea Minuta Rariora; a collection of the minute and rare shells lately discovered in the sand of the sea-shore near Sandwich, by William Boys, Esq.* London, 1784.
- WALLER, E. *Report on the Foraminifera obtained in the Shetland Seas.* <*Brit. Assoc. Advan. Sci.*, 1867, pp. 441-446. 1868.
- WALLER, E. *Report on the Shetland Foraminifera for 1868.* <*Brit. Assoc. Advan. Sci.*, 1868, pp. 340, 341. 1869.
- WALLICH, G. C. *Notes on the Presence of Animal Life at Vast Depths in the Ocean.* London, 1860. Privately printed, 8vo.
- WALLICH, G. C. *Remarks on some Novel Phases of Organic Life, and on the Boring Powers of Minute Annelids, at Great Depths in the Sea.* <*Ann. and Mag. Nat. Hist.*, ser. 3, vol. viii, pp. 52-58. 1861.

- WALLICH, G. C. The North Atlantic Sea-bed; comprising a Diary of the Voyage on Board H. M. S. "Bulldog," in 1860, and Observations on the Presence of Animal Life, and the Formation and Nature of Organic Deposits, at Great Depths in the Ocean, published with the Sanction of the Lords Commissioners of the Admiralty, part 1, with map and 6 pls. 4to. 1862.
- WALLICH, G. C. On the mineral secretions of Rhizopods and Sponges. <Ann. and Mag. Nat. Hist., ser. 3, vol. xiii, p. 72.—Amer. Journ. Sci., vol. xxxviii, ser. 2, p. 131. 1864. A review.
- WALLICH, G. C. On the process of Mineral Deposit in the Rhizopoda and Sponges, as affording a Distinctive Character. <Ann. and Mag. Nat. Hist., ser. 3, vol. xiii, pp. 72-82. Wood cuts. 1864
- WALLICH, G. C. On the Deep-Sea Bed of the Atlantic and its inhabitants. <Quart Journ. Sci. Lond., vol. i, pp. 36-44. 1864.
- WALLICH, G. C. On the extent and some of the principal causes of Structural Variation among the Difflugian Rhizopods. <Ann. and Mag. Nat. Hist., ser. 3, vol. xiii, p. 215, pls. xv., xvi. 1864.
- WALLICH, G. C. On the Structure and Affinities of the Polycystina. <Trans. Micros. Soc. Lond., vol. xiii, p. 75-84. 1865.
- WALLICH, G. C. On the Radiolaria as an Order of Protozoa. <Pop. Sci. Review, new series, vol. ii, pp. 267-368, pl. vi. 1868.
- WALLICH, G. C. On some undescribed Testaceous Rhizopods from the North Atlantic Deposits. <Monthly Micr. Journ., vol. i, p. 104, pl. iii. 1869.
- WALLICH, G. C. On the Vital Functions of Deep Sea Protozoa. <Month Micro. Journ., vol. i, p. 32. 1869.
- WALLICH, G. C. On the Rhizopoda as embodying the Primordial Type Animal Life. <Monthly Micr. Journ., vol. i, p. 228. 1869.
- WALLICH, G. C. On the true Nature of the so-called "Bathybius." <Ann. and Mag. Nat. Hist., ser. 4, vol. xvi, pp. 322-339. 1875.
- WALLICH, G. C. Deep-Sea Researches on the Biology of Globigerina, 2 pls. 8vo. London, 1876.
- WALLICH, G. C. On the Fundamental Error of constituting Gromia the Type of Foraminiferal Structure. <Ann. and Mag. Nat. Hist., ser. 4, vol. xix, p. 158. 1877.
- WALLICH, G. C. Observations on the Coccosphere. <Ann. and Mag. Nat. Hist., ser. 4, vol. xix, p. 342, pl. xvii. 1877.
- WALLICH, G. C. On Rupertia stabilis, a new sessile Foraminifer from the North Atlantic. <Ann. and Mag. Nat. Hist., ser. 4, vol. xix, p. 501, pl. xx. 1877.



- WALLICH, G. C. Deep Sea Researches on the Biology of the *Globigerina*. 1877.  
Not seen.
- WALLICH, G. C. On the Radiolaria as an order of the Protozoa. <*Pop. Sci. Rev.*, new series, vol. vi, pp. 267-382, pl. vi. 1878.
- WALLICH, G. C. A Contribution to the Physical History of the Cretaceous Flints. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxvi, pp. 68-92. 1880.
- WALLICH, —. Note on the Detection of *Polycystina* with the hermetically closed Cavities of certain Nodular Flints. <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. xii, pp. 52-53. 1883.
- WALLICH, —. Critical Notes on Dr. Augustus Gruber's "Contributions to the Knowledge of the Amœbæ." <*Ann. and Mag. Nat. Hist.*, ser. 5, vol. xvi, pp. 215-227. 1885.
- WEAVER, T. On the Composition of Chalk Rocks and Chalk Marl, from the Observations of Dr. Ehrenberg. <*Ann. and Mag. Nat. Hist.*, vol. vii, p. 398. 1841.
- WETHERELL, N. T. Observations on a Well dug on the South side of Hampstead Heath. <*Trans. Geol. Soc. Lond.*, 2nd. ser., vol. v, p. 131, pl. ix. 1834.
- WETHERELL, N. T. Notice of a species of *Rotalia* found attached to specimens of *Vermetus Bognoriensis*. <*Mag. of Nat. Hist.*, vol. iii, pp. 162, 163. 1839.
- WHITAKER, W. On the "Lower London Tertiaries" of Kent. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxii, pp. 404-435. 1866.
- WHITAKER, W. The Geology of the London Basin. <*Mem. Geol. Sur. Gt. Brit.*, vol. iv, pp. 575, 578, 581, 596, 600. 1872.  
Lists of Foraminifera found in Thanet, Woolwich and Reading, Oldhaven, London Clay, Bracklesham, and Upper Bagshot Beds.
- WILSON, E. On the Occurrence of Foraminifera in the Carboniferous Limestone of Derbyshire. <*Midland Naturalist*, vol. iii, p. 220. 1880.
- WILLIAMSON, W. C. On some of the Microscopical Objects found in the Mud of the Levant, and other Deposits, with remarks on the Formation of Calcareous and Infusorial Siliceous Rocks. <*Mem. Lit. and Philos. Soc. of Manchester*, ser. 2, vol. viii, p. 1. 1848.
- WILLIAMSON, W. C. On the recent British species of the genus *Lagena*. <*Ann., and Mag. Nat. Hist.*, ser. 2, vol. i, p. 1. 1848.
- WILLIAMSON, W. C. On the Structure of the Shell and Soft Animal of *Polytomella crispa*, with some remarks on the Zoological position of the Foraminifera. <*Trans. Micros. Soc. Lond.*, vol. ii, p. 159, pl. xxviii. 1848.
- WILLIAMSON, W. C. On the minute structure of the Calcareous Shells of some recent species of *Foraminifera*. <*Trans. Micros. Soc. Lond.*, ser. 2, vol. iii, p. 105. 1851.

- WILLIAMSON, W. C. On the minute structure of a species of *Faujasina*.  
 < *Trans. Micros. Soc. Lond.*, ser. 2, vol. i, p. 87. 1851.
- WILLIAMSON, W. C. On the Recent Foraminifera of Great Britain. Printed  
 for the Ray. Society, London, 1858.
- WILLIAMSON, W. C. On the Anatomy and Physiology of the Foraminifera.  
 < *Popular Science Review*, vol. iv, p. 171, pl. viii. 1865.
- WILLIAMSON, W. C. Deep-sea Researches. < *Nature*, vol. xi, p. 148. 1875.
- WILLIAMSON, W. C. On the Supposed Radiolarians and Diatoms of the  
 Carboniferous Rocks. < *Report Brit. Assoc. (Dublin Meeting)*, Trans.  
 Sections, p. 534. 1878.
- WILLIAMSON, W. C. The Origin of a Limestone Rock. < *Nature*, vol.  
 xvii, p. 265. 1878.
- WOOD, J. G. Common Objects of the Microscope, pp. 121, 122, n. d. 16mo.
- WOOD, W. Index Testaceologicus; or a Catalogue of Shells, British and  
 Foreign, arranged according to the Linnean System. 8vo. London,  
 1825.
- WRIGHT, E. P. Fossil Calcareous Algæ. < *Nature*, xix, pp. 485, 486. 1879.
- WRIGHT, J. A list of the Irish Liassic Foraminifera. < *Eighth Ann. Rept*  
*Bel. Nat. F. C.* 1870-71. Appendix ii, pp. 22-26. 1871.
- WRIGHT, J. A list of the Cretaceous Microzoa of the North of Ireland.  
 < *Proc. Bel. Nat. F. C.*, ser. ii, vol. i, appendix 1873-74, pp. 73-99. 1875.
- WRIGHT, J. On the Discovery of Microzoa in the Chalk-flints of the North  
 of Ireland. < *Rep. Brit. Assoc. Advan. Sci.*, 1874, pp. 95, 96. 1875.
- WRIGHT, J. Foraminifera, Recent and Fossil, with especial reference to  
 those found in Ireland. < *Proc. Belfast Nat. Hist. and Phil. Soc.* Dec.  
 4, 1877.
- WRIGHT, J. Recent Foraminifera of Down and Antrim. < *Proc. Belfast*  
*Nat. Field. Club*, 1876-7, appendix. 1877.
- WRIGHT, J. Recent Foraminifera of Down and Antrim. < *Annual Rept.*  
*Bel. Nat. F. C.*, appendix iv, pp. 101-105, 1 plate, 2 folding lists. 1878.
- WRIGHT, J. A list of the Post-Tertiary Foraminifera of the North-East of  
 Ireland. < *Proc. Bel. Nat. F. C.*, appendix v, pp. 152-163. 1881.
- WRIGHT, J. Notes on the Foraminifera, Genus *Lagena*. < *Proc. Bel. Nat.*  
*F. C.*, ses. 1880-81, pp. 108-109. 1882.
- WRIGHT, J. A list of Recent Foraminifera found during the Belfast Nat-  
 uralists' Field Club's Excursion to South Donegal, 1880. < *Proc. Bel.*  
*Nat. F. C.*, ser. ii, vol. ii, appendix vi, pp. 179-187, 1880-81, 1 plate.  
 1882.
- WRIGHT, T. S. Description of New Protozoa. < *Edinb. New Philos. Journ.*,  
 new series, vol. vii, pp. 276-281, 1858; vol. x, pp. 97-104. 1859.

- WRIGHT, T. S. On the Reproductive Elements of the *Rhizopoda*. <*Ann. and Mag. Nat. Hist.*, ser. 3, vol. vii, p. 360. 1861.
- WRIGHT, T. S. Observations on British Protozoa and Zoophytes. <*Ann. and Mag. Nat. Hist.*, ser. 3, vol. viii, p. 120, pls. iii-v. 1861.
- WYATT, J., and T. R. JONES. On the *Orbitulinae* of the Chalk, and "Fossil Beds" of the Drift. Geol., p. 233. 1862.  
Not seen.
- YOUNG, J., and J. ARMSTRONG. On the Carboniferous Fossils of the West of Scotland. <*Trans. Geol. Soc. Glasgow*, vol. iii, supplement. 1871.
- YOUNG, J., and J. ARMSTRONG. The Fossils of the Carboniferous Strata of the West of Scotland. <*Trans. Geol. Soc. Glasgow*, vol. iv, pp. 267. 1873.
- ALCOCK, T. On the Structure of the Shell of several common species of Polymorphina. <*Proc. Man. Lit., and Philo. Soc.*, vol. xxii, pp. 67, 68. 1883.
- BRADY, H. B., in M'Intosh's Marine Invertebrates and Fishes of St. Andrews. (A list of Foraminifera,) pp. 11, 12. 1875.
- CROSSKEY, H. W. Note on the *Ostracoda* and *Foraminifera* of the Shelly Patches at Bridlington Quay. <*Quart. Journ. Geol. Soc.*, vol. xl, pp. 325-327. 1884.
- GARDNER, J. S. Chalk, and the Origin and Distribution of Deep-Sea Deposits. <*Nature*, vol. xxx, pp. 192, 193, 264, 265. 1884.



PART IV.



FRANCE AND ITALY.

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- ACHIARDI, A. d. Corrali Fossili del Terreno *Nummulitico* dell' Alpi Venete. 4to. Pisa, 1867.
- ANON. Foraminifères et Infusoires. Je donne ici l' énumération des espèces en deux listes séparées ainsi qu' elles ont été successivement publiées. < *Actes. Soc. Linn.*, ser. 3, vol. iv, pp. 643-651. 1861.
- Aoust, VIRLET D'. Réponse aux différentes objections de M. Viguier, relatives à sa communication sur les *Marbres de l' Aude*. < *Bull. de la Soc. Geol. de France*, ser. 3, vol. xi, pp. 315, 318. 1883.
- BACHMANN, I. Quelques remarques sur une note de M. Renevier intitulée: "Quelques observations géologiques sur les Alpes de la Suisse centrale. (Schwaytz, Uri, Unterwalden et Berne) comparées aux Alpes vaudoise." < *Mittheil. der Naturforsch. Gesellsch. in Berne, Jahr*, 1869, pp. 161-174. 1870.
- BARROIS, C. Recherches sur les terrains anciens des Asturies et de la Galicie. < *Mem. Soc. Geol. du Nord.*, vol. ii, pp. 1-630, pls. i-xx. (Also separately published, 1 vol., 4to, 20 plates), Lille. 1882.
- BEAUMONT, É. de. Sur l' âge du terrain nummulitique des Pyrénées. < *Bull. de la Soc. Geol. de France*, sér. 2, tome v, p. 413. 1848. (Leonhard's *Jahr neuse buch für Geonose*, p. 272. 1848.
- BECCARIUS, J. B. De Bononiensi arena quadam (*Commentarii de Bonon. Scient. et Art. Inst.*) Vol. i. 1731.
- BELLARDI, L. Liste des fossiles de la formation nummulitique du comté de Nice. < *Bull. de la Soc. geol. de France*, sér. 2, vol. vii, pp. 678-683. 1850.
- BELLARDI, L. Catalogue raisonné des Fossiles nummulitiques du comté de Nice. < *Mem. Geol. Soc. de France*, sér. 2, vol. iv, pp. 206-300, plates 12-22. 1852.
- BELLARDI, L. Catalogo ragionato dei Fossili *Nummulitici* d' Equitto della raccolta del R. Museo Mineralogico di Torino. 4to. 1854.
- BERTHELIN, G. Liste des Foraminifères receuillis dans la Baie de Bourgneuf et à Pornichet. 8vo. Nantes, 1878.
- BERTHELIN, G. Foraminifères du Lias Moyen de la Vendée. < *Revue et Mag. de Zool.*, 1879, p. 18, 1 pl. 1879.
- BERTHELIN, G. Coup d' œil sur la Faune Rhizopodique du Calcaire Grossier inférieur de la Marne. < *Bull. de l' Assoc. France, pour l' Avance. des Sci.*, 1880, pp. 553-559. 1880.
- BERTHELIN, G. Mémoire sur les Foraminifères fossiles de l' étage Albien de Monteley (Doubs). < *Mem. Soc. Geol. de France*, sér. 3, vol. i, No. 5, pls. xxiv-xxvii. 1880.
- BERTHELIN, G. Les Foraminifères fossiles de l' étage Albien de Monteley, 4 pls. Paris, 1882.

- BERTHELIN, G. Sur l'ouverture de la *Placentula Partschiana*, d'Orb., sp. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xi, Nov. 6th, pp. 66, 17. 1882.
- BERTHELIN, G. Réponse à la *Note de M. Terquem*, au sujet de l'ouverture de la *Placentula Partschiana*. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xi, pp. 304-308. 1882.
- BERTHELIN, G. Liste des Foraminifères recueillis dans la baie de Bourgneuf et à Pornichet. Nantes, 55 pp., 8vo. 1884.  
Not seen.
- BEUDANT, F. S. Cours Élémentaire d' Histoire Naturelle. La Minéralogie et la Géologie, pp. 116-118, 5th edition. Paris, 1851.
- BEUDANT, F. S. Cours Élémentaire d' Histoire Naturelle. La Minéralogie et la Géologie. Calcaires à *Nummulites*, pp. 239-240, 5 edit. Paris, 1851.
- BLAINVILLE, H. M. Ducrotay de, *Traité de Malacologie*. Paris, 1825.
- BLAINVILLE, H. M. *Ducrotay de*, Manuel de Malacologie et de Conchyliologie, &c. Paris, 1825-27.
- BLAINVILLE, H. D. de. Faune Française, Malacozoaires ou Animaux Mollusques. Paris, 1820-30.
- BLAINVILLE, H. D. de. Manuel de l' Actinologie ou de Zoophytologie. 8vo. Paris, 1834.
- BLAINVILLE, H. D. de. Dictionnaire des Sciences Naturelles. Paris, 1814-30.
- BOEHM, G. Contribuzione allo studio dei calcari grigi del Veneto. <*Boll. d. R. Com. Geol. d' Italia*, ser. ii, vol. vi, pp. 156-165. 1885. (G. B. C.)
- BONISSENT,— Essai Géologique sur le Département de la Manche, 9e Époque. —Sol Secondaire. Terrani Crétacé. <*Mem. Soc. Sci. Nat. Cher.*, vol. xi, pp. 217-228. 1865.
- BONISSENT, — Essai Géologique sur le Département de la Manche, 10e Époque.—Sol Tertiaire. <*Mem. Soc. Sci. Nat. Cher.*, vol. xiii, pp. 5-34. 1867.
- BORNEMANN, L. G. Sopra una Specie mediterranea del genere *Lingullnopsis*. <*Atti della Soc. Tosc. Sci. Nat.*, vol. vi, fasc. 1, and plate. 1883.
- BOSC, L. A. G. Histoire Naturelle des Coquilles. Paris, 1802.
- BOUE, A. Observations sur le travail de M. Adolphe de Morlot relatif à la position du calcaire à *Nummulites* relativement, au grès à *Fucoides* de Vienne et de Trieste et au calcaire crétacé à *Rudistes*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, p. 68. 1847.
- BOUBÉE, N. Observations sur la note de M. d' Archiac relative aux fossiles du terrain à *nummulites* de Bayonne et de Dax. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. iv, pp. 10, 11. 1847.
- BRUGUIERE, J. G. Encyclopédie Méthodique. <*Hist. Nat. desiere*, vol. i. Paris, 1789.

- BUVIGNIER, A. Statistique Géologique, minéralogique, métallurgique et paléontologique du département de la Meuse. 8vo and 32 plates 4to. Paris, 1852.
- CAILLAUX, A. Sur le terrain nummulitique en Toscane. < *Bull. de la Soc. Geol. de France.*, sér 2, vol. viii, pp. 131-136. 1851.
- CAILLAUD, F. Voyage à Méroé, au Fleuve blanc, etc. 4 vols. Paris, 1827.
- CAPELLINI, G. Calcare a Amphistegina, strati a Congeria e calcare di Leitha dei Monti Livornesi, nuove. < *Boll. R. Comit. Geol. D' Italia*, vol. vi, pp. 241-244. 1875.
- CATTANEO, G. Prime ricerche sui Protozoi, 12 pp. Pavia, 1878.
- CATULLO, A. Sur l'inadmissibilité de la Faune fossile annoncée par M. Ewald comme caractéristique de la grande formation nummulitique du terrain tertiaire, 12 pp. Padoue, 1848.
- CLAPAREDE, EDOUARD, et LACHMANN. Etudes sur les *Infusoires* et les *Rhizopodes*. Genève, 1858-61.
- COPPI, F. Frammenti di Paleontologia Modense. < *Boll. del. R. Com. Geol. Anno.*, 1876, No. 5-6. 1876.
- COPPI, F. Sul calcare Zancleano? Estratto dagli. < *Atti. Soc. dei. Nat. di Modena.*, ser. iii, vol. i. 1883.
- COPPI, F. II. Miocene medio nei colli modenese; appendice alla Paleontologia Modenese. < *Boll. R. Comit. Geol. D' Italia.*, vol. xiv, pp. 171-201. 1884.
- CORNUEL, M. J. Description des nouveaux fossils microscopiques du terrain crétacé inférieur du département de la Haute-Marne. < *Mem. Geol. Soc. de France*, sér. 2, vol. iii, pp. 241-263, 2 plates. 1848.
- CORNUEL, J. Catalogue des coquilles de mollusques entomostracés et foraminifères du terrain crétacé inférieur de la Haute-Marne, avec diverses observations relatives à ce terrain. < *Bull. de la Soc. Geol. de France*, sér. 2, vol. viii, pp. 430-448. 1851.
- COSTA, O. G. Fauna del Regno di Napoli. Naples, 1838.
- COSTA, O. G. Foraminiferi Fossili della Marna Blu del Vaticano. < *Mem. Accad. Sc. Napoli*, vol. ii, p. 113, pl. i. 1855.
- COSTA, O. G. Foraminiferi Fossili delle Marne Terziarie di Messina. < *Mem. Accad. Sci. Napoli*, vol. ii, p. 127, pls. i, ii,—continuazione, *ibid*, p. 367, pl. iii. 1855.
- COSTA, O. G. Paleontologia del Regno di Napoli, parte 2. < *Atti. dell' Accademia Pontaniana*, vol. vii, p. 105, pls. ix-xxvii. 1856.
- COSTA, O. G. Microdoride Mediterranea, o Descrizione de' poco ben conosciuti od affatto ignoti viventi minuti e microscopici del Mediterraneo, vol. i. Naples, 1861.



- COSTA, O. G. Sopra i foraminiferi di Messina e della Calabria estrema. <*Rendic. dell' Accad. d. sci. fis. e matem. di Napoli*, vol. v, pp. 366-372. 1866.
- CUVIER, GEO. L. C. F. Le Règne Animal distribué d'après son Organisation. Paris, 1817.
- CUVIER, GEO. Le Règne Animal, distribué d'après son Organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée. 2<sup>nde</sup>, édit. Paris, 1828-30.
- D'ARCHIAC, LE VICOMTE. Mémoire sur la formation crétacée du Sud-Ouest de la France. <*Mem. Soc. Geol. de France*, vol. ii, pp. 157-192. 1835.
- D'ARCHIAC. Mémoire sur la formation crétacée du sudouest de la France. <*Mem. Soc. Geol. de France*. 1837.
- D'ARCHIAC, L. V. Essais sur la coordination des terrains tertiaires du nord de la France et de l'Angleterre. <*Bull. Soc. Geol. de France*, vol. x, p. 168. 1839.
- D'ARCHIAC, L. V. Sur les caractères tirés de la différence de stratification et le classement des terrains à nummulites. <*Bull. de la Soc. Geol. de France*, sér. 1, vol. iv, pp. 532-536. 1843.
- D'ARCHIAC, L. V. Observations sur divers terrains à nummulites et sur leur classement. <*Bull. de la Soc. Geol. de France*, sér. 1, vol. iv, pp. 485-491. 1843.
- D'ARCHIAC, L. V. Description des fossiles recueillis par M. Thorent aux environs de Bayonne (extrait). <*Bull. de la Soc. de Geol. France*, sér. 2, vol. iii, pp. 475-477. 1846.
- D'ARCHIAC, L. V. Description des fossiles recueillis par M. Thorent dans les couches à Nummulines des environs de Bayonne. <*Mem. Geol. Soc. de France*, sér. 2, vol. ii, pp. 189-217, plate 7. 1846.  
*Calcarina? stellata*, Nov. sp.
- D'ARCHIAC. Sur les fossiles à Nummulites des environs de Bayonne et de Dax. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. iv, pp. 1006-1013. 1847.
- D'ARCHIAC, A. Description des Fossiles du groupe Nummulitique recueillis par M. S.—P. Pratt et M. J. Delbos aux environs de Bayonne et de Dax. <*Mem. de la Soc. Geol. de France*, sér. 2, vol. iii, pp. 397-456, pls. viii-xiii. 1848.
- D'ARCHIAC. Histoire des progrès de la Géologie de 1834-59, 8 vols., vol. iii. Paris, 1850.
- D'ARCHIAC, A. Description des fossiles du groupe nummulitique, recueillis par M. M. S.—P. Pratt et J. Delbos aux environs de Bayonne et de Dax. <*Mem. Geol. Soc. de France*, ser. 2, vol. iii, pp. 397-502, plates, 8, 9. 1850.

- D'ARCHIAC, LE. V., in Bellardi's Catalogue raisonné des Fossiles Nummulitiques du Comté de Nice. <Mem. Soc. Geol. France, sér. 2, vol. iv, p. 204, pls. xiv-xxii. 1852.
- D'ARCHIAC, LE. V. Description de quelques fossiles nouveaux ou imparfaitement connus des environs des Bains de Rennes. <Bull. Soc. Geol. de France, sér. 2, vol. xi, p. 205, pl. ii. 1854.
- D'ARCHIAC, L. V. Observations critiques sur la distribution stratigraphie et synonymie de quelques rhizopodes. <Bull. Soc. Geol. de France, sér. 2, vol. xviii, pp. 460-468. 1861.
- D'ARCHIAC, M. Etudes Géologiques d'une partie des départements de l'Aude et des Pyrénées—Orientales. <Mem. Geol. Soc. de France, 2 sér., vol. vi, (Groupe Nummulitique) pp. 288-311. 1859.
- D'ARCHAIC ET JULES HÂIME. Description des animaux fossiles du groupe nummulitique de l'Inde (extrait). <Bull. de la Soc. Geol. de France, sér. 2, vol. x, pp. 378-384. 1853.
- D'ALLARD, DE SARRAN. Recherches sur les Dépôts fluvis-lacustres antérieurs et postérieurs aux assises marines de la craie supérieure du département du Gard. <Bull. Soc. Geol. de France, sér. 3, vol. xii, pp. 553-634. 1884.
- DE CRISTOFORI, J. Conchyliia Fossileo exformatione telluris tertiaria in collecti nostra extrantia. 1832.  
Not seen.
- DE FAVANNE. La Conchyliologie, ou histoire naturelle des Coquilles de mer, d'eau douce, terrestres et fossiles, etc.; DEZALLIER D'ARGENVILLE, augmentée par De Favanne de Mentcervelle, père et fils. Paris. 1786.
- DE FOLIN, Le Marquis. Exploration du Travilleur, 1880—Golfe du Gascogne, Rhizopodes Réticulaires, liste des genres et espèces. <Bull. Soc. d'Hist. Nat. de Toulouse, pp. 12. 1881.
- DEFRANCE, J. L. M. Art.—Nummulites, etc. <Dictionnaire des Sciences Naturelles, vol. xxxv. 1825.
- DE GRATELEUP, J. P. S. Catalogue Zoologique renfermant les débris fossiles des Animaux. etc., dubassin de la Gironde. 8vo, Bordeaux, 1838.
- DE LA HARPE, P. Note sur les Nummulites des Environs de Nice et de Menton. Lettre à M. le Prof. Renevier, par M. Phil. de la Harpe. <Bull. Soc. Geol. de France, sér. 3, vol. v, p. 817. 1877.
- DE LA HARPE, P. Note sur les Nummulites des Alpes occidentales. <Actes de la Soc. Helvet Sci. Nat. S. 60; pp. 225-233. 1878.
- DE LA HARPE, P. Les Nummulites du Comté de Nice, leur espèces et leur distribution stratigraphique, et Échelle des Nummulites. <Bull. Soc. Vaud. Sci. Nat., vol. xvi, pp. 201-243; 1 plate. 1879.
- DE LA HARPE, P. Nummulites des Alpes Françaises. <Bull. Soc. Vaud. Sci. Nat., vol. xvi, pp. 409-434. 1879.

- DE LA HARPE, P. Description des Nummulites appartenant à la Zone supérieure des Falaises de Biarritz. <*Bull. Soc. de Borda. a Dax*, IV année. 1879.
- DE LA HARPE, P. Description des Nummulites des falaises de Biarritz; additions et conclusions. <*Bull. Soc. de Borda. a Dax*, vol. vi. 1881.
- DE LA HARPE, P. Note sur la distribution par couples des Nummulites • Éocènes. <*Bull. Soc. Vaud. Sci. Nat.*, vol. xvii, pp. 429-444. 1881.
- DE LA HARPE, P. Sur l'importance de la loge centrale chez les Nummulites — lettre de M. de la Harpe. <*Bull. Soc. Geol. France*, vol. ix, pp. 171-176. Tournouer, M. Observations, *ibid.*, pp. 176-178. 1881.
- DE LA HARPE, P. Etud des Nummulities de la Suisse et révision des espèces éocènes des genres Nummulities et Assilina, pt. I. <*Mem. Soc. Paleont. Suisse*, vol. vii, pp. 1-104, pl. i, ii. Pt. II, *ibid.*, pp. 105-140. 1881.
- DELBOS, J. Remarques sur les la note de M. d'Archiac, relative aux fossiles du terrain à nummulites de Bayonne et de Dax. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. iv, pp. 1013. 1847.
- DELBOS, J. Notice sur les fahluns du Sud-Ouest de la France. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, pp. 417-423. 1848.
- DELUC, G. A. Observations sur la Bélemnite. <*Journ. de Physique de Chimie. et d'Hist. Nat.*, vol. lii, pp. 362-366. 1801.
- DELUC, G. A. La Lenticulaire Numismale et la Bélemnite. <*Journ. de Physique de Chimie et, d'Hist. Nat.*, vol. liv, pp. 173-180, 1 plate. 1801.
- DELUC, G. A. Nouvelles observations sur la Lenticulaire de la Perte du Rhone et la Lenticulaire Numismale. <*Journ. de Physique de Chimie. d'Hist. Nat.*, vol. lvi, pp. 325-346, 1 plate. 1803.
- DESHAYES, G. P. Description des Coquilles fossiles des environs de Paris. 1824.
- DESHAYES, G. P. Mémoire sur les *Alveolines*, etc. <*Annales des Sciences Naturelles*, vol. xiv, p. 225. 1828.
- DESHAYES, G. P. Encyclopédie Methodique; Histoire naturelle des Vers, des Mollusques, des Coquellages, Zoophytes; Hist. Nat. des Vers, par Bruguière et de Lamarck, continuée by G. P. Deshayes. Paris. 1830-32.
- DESHAYES, G. P. Description des Coquilles caracteristiques des Terrains. Strasbourg. 1831.
- DESHAYES, G. P. Observations sur les Fossiles de la Crimée. <*Mém. Géol. sur la Crimée par M. de Verneuil.* <*Mem. Soc. Geol. de France*, vol. iii, p. 1, pls. i-vi. 1837.
- DESHAYES, G. P., and MILNE EDWARDS, in Lamarck's Animaux sans Vertèbres. 2de ed., vol. xi. 1846.
- DESLONGCHAMPS, E. Zoophytes (Encyclopédie Méthodique). 4to. Paris. 1824.

- DE STEFANI, C. Quadro comprensivo dei Terreni che costituiscono l'Apennino settentrionale. <*Atti della Soc. Tosc. Sci. Nat.*, vol. v, pp. 206-253. 1881.
- DILLWYH, L. W. A Descriptive Catalogue of recent Shells, arranged according to the Linnean method, with particular attention to synonymy. London. 1817. Discussion sur les terrains nummulitiques du midi de la France. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. iv, pp. 537-542, 560. 1847.
- DODERLEIN, P. Cenni geologici intorno alla giacitura dei terreni miocenici superiori dell'Italia centrale. <*Atti dei Scienziati Italiani*, vol. x, pp. — Sienna, 1862.
- D'ORBIGNY, ALCIDE Dessalines. Modèles de Céphalopodes Microscopiques vivans et fossiles, représentant un individu de chacun des genres et des sous-genres de ces Coquilles, etc. Paris, 1826; 2nd edit., Paris, 1843.
- D'ORBIGNY, M. D. Tableau méthodique de la classe des Céphalopodes. Ordre.—Foraminifères. <*Ann. d. Sci. Nat.*, vol. vii, pp. 245-314, plates x-xvii. 1826.
- D'ORBIGNY, A. Sur les Foraminifères de la Craie Blanche de Paris. <*Mem. de la Soc. Geol. de France*, vol. iv, p. 1, pls. iv. 1839.
- D'ORBIGNY, M. A. Mémoire sur les Foraminifères de la Craie Blanche du Bassin de Paris. <*Mem. Soc. Geol. de France*, 1 sér., vol. iv, pp. 1-51, plates 1-4. 1840.
- D'ORBIGNY, A. Dictionnaire Universelle d'Histoire Naturelle, vol. v, p. 662-671. Art. Foraminifères. Paris, 1844.
- D'ORBIGNY, A. Prodrôme de Paléontologie stratigraphique universelle des Animaux Mollusques et Rayonnés, 3 vols., 80, with 4to Atlas. Paris, 1849-52.
- D'ORBIGNY, A. D. Cours élémentaire de Paléontologie et de Géologie stratigraphiques, vol. ii, fasc. 1,800, and Atlas 4to. 1852.
- DUJARDIN, F. Observations nouvelles sur les prétendus Céphalopodes microscopiques. <*Ann. de la Société des Sciences nat. de France*, sér. 2, vol. iii, pp. 108, 312. 1835.
- DUJARDIN, F. Recherches sur les organismes inférieurs. <*Annales des Sciences naturelles*, sér. 2, vol. iv, p. 343. 1835.
- DUJARDIN, F. Observations sur les Rhizopodes et les Infusoires. <*Comptes Rendus*, 1835, p. 338. L'Institut. 1835, No. 11, p. 202. 1835.
- DUJARDIN, F. Histoire Naturelle des Zoophytes, Infusoires, comprenant la physiologie et la classification de ces animaux et la manière de les étudier à l'aide du microscope. 22 plates. 1841.
- DUJARDIN. Notice sur les Infusoires. 1845.

- DUJARDIN, F. Art.-Infusoires. <*Dictionnaire universel d'Histoire naturelle*, vol. vii, pp. 43-52, 1848. Art.-Rhizopodes, *Ibid.*, vol. xi, pp. 115, 116. 1846.
- DUJARDIN. Articles: Orthocère; in 8, 4 colonnes, Orécule: in-8, 1 colonne. Opis, Pachymia, Pentacrinites, Pentremites, Operculina, Orbitolite, Ovulite; in-8, 1 colonne. <*Dictionnaire universel d'histoire nat.* rédigé par M. C. d'Orbigny. 1847.
- DUTHIERS, H. LACAZE. Mémoire sur les Antipathaires. (*Genre Gerardia*, L. D.) <*Ann. des Sci. Nat.*, sér. v, vol. ii, pp. 169-239. 1864.
- EWALD, J. Remarques sur les Nummulites. Padoue, 1847.
- EWALD, J. Quelques remarques sur les nummulites, 7 pp. Padoue, 1848.
- FAUVERGE, H. G. Sur le dépôt à Nummulites du département de l'Aude. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. vii, pp. 633-636. 1850.
- FERRY, H. DE. Mémoire sur le groupe oolithique des inférieurs des environs de Mâcon (Sâône-et-Loire). 1 re partie. Jura mâconnais, étage bajouzien. 4o laen.
- FERUSSAC, LE BARON and E. I. D'AUDEBARD d. Tableaux Systématiques des Animaux Mollusques, etc. Paris and London, 1822.
- FERUSSAC, M. De. Bulletin universel des Sciences et de l'industrie. Paris, 1827.
- FERUSAC, —. Aperçu historique sur les Céphalopodes. 1835.
- FISCHER, P. Bryozoaires, Echinodermes, et Foraminifères marins du Département de la Gironde et des Côtes du Sud-Ouest de la France. <*Actes de la Soc. Linn. de Bordeaux*, vol. xxvii, (Foraminifera), p. 377. 1870.
- FISCHER, P. Examen d'une série de sondages exécutés dans l'atlantique sous la direction du commandant Vignes. <*Journ. de Zool.*, vol. iv, pp. 298-302. 1875.
- FISCHER, P. Note sur un type particulier de Rhizopodes. (Astrorhiza). <*Journ. de Zool.*, vol. iv, pp. 503-510, 1 plate. 1875
- FONTANNES, F. Première Note sur les Foraminifères des Terrains tertiaires supérieurs du Bassin du Rhône. <*Ann. Soc. d'Agric. Hist. Nat., et ar's utiles de Lyon*, ser. 5, vol. ii, pp. 199-203. 1880.
- FORBES, E. Note on the Fossils found by Lieut. Spratt in the several beds of the Tertiary Formation of Malta and Gozo. <*The Geology of Malta and Goz.*, pp. 21-24. 1852.
- FORNASINI, C. Nota preliminare sui Foraminiferi della marna pliocenica del Ponticello di Savena nel Bolognese. <*Boll. Soc. Geol. Ital.*, vol. ii, (16 pages, 1 plate). 1883.
- FORNASINI, C. I foraminiferi della Tabella Oryctographica esistente nel R. Museo Geologico di Bologna. <*Boll. d. R. Com. Geol. d' Italia*, ser. ii, vol. vi, pp. 53, 54. 1885. (M. C.)

- FORTIS, C. A. Quelques nouvelles espèces de Discolithes. (Camerines, Lenticulaires, Helicites, Numismales, etc., (A letter to C. Hermann). <*Journ. de Physique de Chimie et d'Hist. Nat.*, vol. lli, pp. 106-115, 1 plate. 1801.
- FORTIS, J. B. Mémoires pour Servir à l'Histoire naturelle, et principalement à l'oryctographic del'Italie, 2 vols. Paris, 1802.
- FUCHS, TH, and A. MANZONI. Sulla Relazione un viaggio Geologico in Italia. <*Boll. del. R. Com. Geol. d'Italia*, 1875, No. 7 e 8. Nota di G. Seguenza. *Ibid.*, No. 9 e 10. 1874.
- GAUDIN, C. T., and M. MOGGRIDGE. Mémoires. Menton. I. Terrains secondaires Crétacé. II. Eocène, Pliocène. <*Bull. Soc. Vaud. d. Sci. Nat.*, vol. viii, pp. 187-197. 1865.
- GEMMELLARO, G. G. Sopra taluni organici Fossili del Turoniano e Nummulitico di Judica. <*Atti. dell. Accad. Gioenia di Sci. Nat.*, ser. 2, vol. xv, p. 269. 1860.
- GERVAIS, P. Sur un Point de la Physiologie des Foraminifères. <*Comptes Rendus*, p. 469, 1847, and in *L'Institut*, p. 316. 1847.
- GINANNI, G. CONTE. Opere postume nelle quale si contengono 114 Piante che Vegetano nel mare Adriatico da lui osservante, e descritte. Fol. Venezia, 1755-57.
- Gregorio, A. de. Sulla Fauna delle argille Scagliose di Sicilia (olgiocene-eocene) e sul Miocene di Nicosia. Palermo, 1881. Tav. III, Fig. 3 a. b. *Alveolina Sphaericea* (Fert).
- Gregorio, A. de. Fossili dei Dintorni di Pachino, 22 pp., 6 plates. Palermo, 1882.
- GUALTIERI, N. Index Testarum Conchyliorum quæ adservantur in museo Nic. Gualtieri, et methodice distributæ; exhibentur; tabulis æn. cx, Fol. maj. Florentinæ. 1741.
- GUETTARD, J. E. Nouvelle Collection de Mémoires sur différentes parties interessantes des Sciences et des Arts 3 vols. 4to. Paris, 1786.
- GUMBEL, C. W. Beitrage zur Foraminiferenfauna der Nordalpinen Eocengebilde. <*Abh. d. II. cl. d. k. Ak. d. Wiss.*, Bd. x, II, abth. pp. 581-730. 1868.
- GUMBEL, C. W. Geognostische Mittheilungen aus den Alpen. <*Sitzung. d. Math. phys. classe d. k. b. Akad. Munchen*, Bd. iii, pp. 37-40. 1873.
- GUMBEL, C. W. Kurze Anleitung zu geologischen Beobachtungen in den Alpen. <*Anleit. zu Wissen. Beobacht. auf alpenreisen*, pt. i, p. 25; wood cuts. 12mo. Munich, 1878.
- GUMBEL, C. W. Geognostische Mittheilungen aus den Alpen. <*Sitzungsber. d. Math.-phys. classe d. k. b. Akad. Wiss. Munchen*, 1880; pp. 164-240. 1880.
- HAMILTON, W. J. Sulla Costituzione Geologica dei Monti Pisani. Memoria

- del Prof. Cav. Paolo Savi, Pisa, P'resso rocco Vannucchi, 1846. <*Quart Journ. Geol. Soc. Lond.*, vol. iii, part ii, pp. 1-10. 1847.
- HERBERT, E. Note sur le terrain nummulitique de l'Italie septentrionale et des Alpes, et sur éiologocène d'Allemagne. <*Bull. d. la Soc. Geol. de France*, sér. 2, vol. xxiii, pp. 126-144. 1865.
- HERBERT, E. Sur le Groupe nummulitique du Midi de la France. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. x, pp. 364-392. 1882.
- HERBERT, E. Aperçu général sur la Geologie des environs de Foix. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 523-531. 1882.
- HERBERT, E. Disposition du terrain tertiaire à Lavelanet. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 565-569. 1882.
- HERBERT, E. Sur la structure géologique du vallon de Paradières. *Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 548-551. 1882.
- HERBERT, E. Compte rendu de l'excursion de St.-Girons à Ste Croix. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 615-622. 2 wood-cuts. 1882.
- HERBERT, E. Compte rendu de l'excursion de de Sainte Croix à Audinac. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 623-631. 1882.
- HERBERT, E. Allocution finale et résumé des observations faites par la Société pendant la session de Foix. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 644-659. 1882.
- HERBERT, E. Sur la faune de l'étage danien dans les Pyrénées. <*Bull. Soc. Geol. de France*, sér. 3, vol. x, pp. 664-666. 1882.
- HERBERT, E. et RENEVIER. Description des fossiles du terrain nummulitique de Gass, des Diablerets, etc. Extrait du Bulletin de la Soc de Statistique du Dép. de l'Isere, Grenoble. 1854.  
Title not seen; taken from foot note.
- ISSEL, A. Esame sommario di alcuni saggi di fondo raccolti nel Golfo di Genova. <*Boll. d. R. Com. Geol. d. Itali.*, sér. ii, vol. vi, pp. 129-148. 1885.
- JOLY, N. and LEYMERIE. Principaux résultats de leur recherches sur les Nummulites. <*Comptes Rendus*, vol. xxv, p. 591. 1847.
- JOLY, N. et A. LEYMERIE. Mémoire sur les Nummulites considérées Zoologiquement et géologiquement. <*Mem. de l'Acad. des. Sci. de Toulouse*, vol. iv, p. 149, pl. i. 1848.
- JONES, T. R. On the Fossil Foraminifera of Malta and Gozo. <*Geologist*, vol. vii, pp. 133-135. 1864.
- JONES, T. R., and W. K. PARKER. Appendix to Ansted Geology of Malaga. <*Quart. Journ. Geol. Soc. Lond.*, vol. xv, pp. 585-604. 1859.
- LAMARCK, J. B. P. de. Mémoire sur les fossiles environs de Paris, comprenant la détermination des espèces qui appartiennent aux animaux marins sans vertèbres. 4to. Paris, 1802-06.

- LAMARCK, J. B. de. Suite des Mémoires sur les Coquilles fossiles des environs de Paris. <Ann. du Mus., vol. v, 1804; vol. vii, 1806; vol. ix, 1807.
- LAMARCK, J. B. P. Ant. DE MONNET. Extrait du cours de Zoologie du Muséum d'Histoire naturelle sur les animaux invertébrés. Paris. 1812.
- LAMARCK, J. B. de. Tableau Encyclopédique et Méthodique des Trois Régnes de la Nature; vingt-troisième partie; mollusques et Polypes divers. Paris. 1816.
- LAMARCK, DE LA. Recueil de Planches des Coquilles Fossiles des Environs de Paris. 38 plates. 4to. Paris. 1823.
- LAMARCK, J. B. P. Ant. DE MONNET. Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres des ces animaux. Paris 1801.
- LAMARCK, J. B. P. Ant. DE MONNET. Mémoire sur les fossiles des environs de Paris, comprenant la détermination des espèces qui appartiennent aux animaux marins sans vertèbres. Paris. 1804.
- LAMARCK, J. B. P. A. de. Histoire naturelle des Animaux sans vertèbres, vol. ii, 1816; vol. vii, 1822, 2nd edit. 1835-45.
- LAMARCK, J. B. de. Histoire naturelle des Animaux sans vertèbres; 1 ère édit., Paris, 1815-1822; 2 ième édit., augmentée de notes par M.M. Deshayes et Milne-Edwards, Paris, 1835-1842.
- LATRIELLE, PIERRE ANDRE. Familles naturelles du règne Animal, etc. Second edition. Paris. 1825.
- LEYMERIE et JOLY, N. Mémoire sur les nummulites considérées zoologiquement et géologiquement. Voyez Joly et Leymerie.
- LEYMERIE, A. Note sur le terrain nummulitique de la Scie et considérations général à ce sujet. <Bull. de la Soc. Geol. de France, ser. 2, vol. ii, pp. 27. 1844.
- LEYMERIE, A. Litle résumé d'un Mémoire sur le terrain à Nummulites (épicrétacé) des Corbières et de la Montagne Noire (Aude). <Bull. de la Soc. Geol. de France, sér 2, vol. ii, pp. 11-27. 1844.
- LEYMERIE, A. Lettre sur le terrain à Nummulites des Corbières. <Bull. de la Soc. Geol. de France, sér 2, vol ii, pp. 270-273. 1844.
- LYMERIE, M. A. Mémoire sur le terrain à nummulites (épicrétacé) des Corbières et de la Montagne Noire. <Mem. Soc. Geol. de France, sér. 2, vol. i, pp. 327-373, and plate 13. 1845.
- Nummulites Atacicus, Leym. N. globulus, Leym. Operculina ammona, Leym. O. granulosa, Leym. Alveolina sub-Pyrenaica, Leym. A. var. globosa, Leym.
- LEYMERIE, A. Mémoire sur le terrain à Nummulites (épicrétacé) des Corbières de la Montagne noire. <Mem. Soc. Geol. de France, ser. 2, vol. i, p. 337, pls. xii-xvii. 1846.



- LEYMERIE, A. Observations critique (1) sur une note de M. Raulin, intitulée. Quelques mots encore sur le terrain à Nummulites. < *Bull. de la Soc. Geol. de France*, sér. 2, vol. vii, pp. 90-98. 1850.
- LEYMERIE. Mémoire sur un nouveau type pyrénéen. < *Mem. Société Geol. de France*, vol. iv. 1851.
- LEYMERIE, A. Observations sur quelques terrains de la Provence. < *Bull. de la Soc. Geol. de France*, ser 2, vol. viii, pp. 202-207. 1851.
- LEYMERIE, A. Note sur quelques localités de l'Aude, et particulièrement sur certains gîtes épicrotaccés. < *Bull. de la Soc. Geol. de France*, ser 2, vol. x, pp. 511-519. 1853.
- LEYMERIE, A. Note sur le massif d'Ausseing et du Saboth Haute-Garonne. < *Bull. de la Soc. Geol. de France*, sér. 2, vol. x, pp. 519-523. 1853.
- LOCARD, A. Description de la Mollasse mærine et d'eau douce du Lyonnais et du Dauphiné. < *Arch. du Mus. de Lyon*, vol. ii. (Foraminifères, pp. 198, 199.) 1878.
- LORY, C. Note sur les terrains du Dévolny (Hautes-Alpes). < *Bull. de la Soc. Geol. de France*, sér. 2, vol. x, pp. 20-33. 1853.
- LOVISATO, D. Riassunto sui terreni e posterziari del Circondario di Catawzaro. < *Boll. d. R. Com. Geol. d'Italia*, ser. 2, vol. vi, pp. 87-120 1885.
- LYELL, C. Quelques considerations sur la communication précédente. < *Bull. de la Soc. Geol. de France*, sér. 2, tome ix, pp. 351-354. 1852.
- MANZONI, A. Tortoniano e i suoi fossili nella Provincia di Bologna. < *Bollet. del. Com. Geol. d'Italia*, vol. xi, pp. 510-520. 1880.
- MENKE, C. T. Synopsis Methodica Molluscorum generum omnium et specierum quæ in Museo Menkeano adservantur. Ed. 2 auct. et emend. Pyramonti, 1830.
- MASSOLONGO. Schizzo geogn. sulla valle del Progno. Verono, 1850.
- MICHELOTTI, G. Saggio storico intorno dei Rizopodi caratteristici dei Terreni sopraretacei. < *Mem. Soc. Ital. d. Sc.*, xxii, p. 302, pls. i-iii. 1841.
- MICHELOTTI, G. Description of the Fossils of the Miocene Strata of Northern Italy. < *Naturkundige Verhandlingen van de Hollandsche Maatschappij der wetenschappen te Haarlem*, II. Verzam., 3 Deel. Haarlem, 1847.
- MURCHISON, R. I. On the Geological Structure of the Alps, Apennines and Carpathians, more especially to prove a transition from Secondary to Tertiary rocks, and the development of Eocene deposits in Southern Europe. < *Quart. Journ. Geol. Soc. Lond.*, vol. v, pp. 157-312, 1 plate. 1849.
- MILNE-EWARDS, A. Compte rendu sommaire d'une exploration zoologique, faite dans la Méditerranée à bord du navire de l'état "le Travailleur." < *Comptes Rendus*, 28 nov. and 5 Dec. 1881, pp. 876-882 and 931-936. 1881.

- MONFORT, DENYS. De quelques argonautes qui restent toujours petits, des corps pétrifiés qu'on peut rapporter en général au genre des argonautes, et des argonautes microscopiques. <*Hist. Nat. des Moll.*, vol. iv, pp. 1-46, 1 pl.
- MONFORT, DENYS DE. Histoire Naturelle générale et particulière des Mollusques (faisant partie du *Buffon de Sonnini*). Paris, 1802-5.
- MONFORT, DENYS DE. Conchyliologie systématique et classification méthodique de Coquilles, etc. Paris, 1808-10.
- MONFORT, DENYS, and DE ROISSY, F. Histoire Naturelle générale et particulière des Mollusques, animaux sans vertèbres et à sang blanc (faisant partie du *Buffon de Sonnini*) Denys de Monfort, continuée par F. de Roissy. Paris, 1802-05.
- MORTILLET, G, DE. Note sur le crétacé et le nummulitique des environs de Pistojà. <*Mil. Att.* iii, p. 459.
- MUNIER-CHALMAS. Observations sur les Algues calcaires appartenant au groupe des Siphonées verticillées (*Dasycladées*, HARV.), et confondues avec les Foraminifères. <*Comptes Rendus*, vol. lxxxv, p. 814. 1877.
- MUNIER-CHALMAS. Observations sur les Algues calcaires confondues avec les Foraminifères et appartenant au groupe des Siphonées dichotomes. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. vii, p. 661, wood cuts. 1879.
- MUNIER-CHALMAS. Études sur les Nummulites lævigata, planulata, variolaria, irregularis, et sur les Assilina granulata et spira, etc. <*Bull. de la Soc. Geol. France*, sér. 3, vol. viii, p. 300. 1880.
- MUNIER-CHALMAS. Sur les Nummulites. <*Bull. de la Soc. Geol. France*, sér. 3, vol. vii, pp. 300, 301. 1881.
- MUNIER-CHALMAS. Caractères der Miliolidæ. <*Bull. de la Soc. Geol. France*, sér. 3, vol. x, pp. 424, 425. 1882.
- MUNIER-CHALMAS and C. SCHLUMBERGER. Nouvelles observations sur le dimorphisme des Foraminifères. <*Comptes Rendus*, vol. xcvi, pp. 862-866, wood cuts 1-4, pp. 1598-1601, wood cuts 5-8. 1883.
- MUNIER-CHALMAS, M. M., et SCHLUMBERGER. Note sur les Miliolidées<sup>s</sup> trématophorées. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xiii, pp. 273-323, plates xiii, xiv. 40 wood cuts. 1885.
- NICOLIS, E. Oligocene e Miocene nel Sistema del Monte Baldo. Verona, 1884.
- PARETO, L. Note sur le terrain nummulitique du pied des Apennins. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. xii, pp. 370-395. 1855.
- PHILIPPI, R. A. Enumeratio Molluscorum Siciliæ, cum viventium tum ni tellure tertiaria fossilium, quæ ni itinere suæ observavit, 4 maj., vol. i, Berolina, 1836; vol. ii, Halis Saxorum. 1844.

- PICTET, F. J. *Traité de Paléontologie, Foraminifères*, vol. iv, pp. 476-526, plate cix. 1857.
- PLANCHUS, J. *Ariminensis, De Conchis minus notis liber, Venetiis*. 1739.  
An edition at Rome in 1760.
- PLANCUS, J. *Appendix ad Phytobasanum (Fabio Colonna)*. Florence, 1744.
- POTIEZ, VALÉRY LOUIS VICTOR, et Michaud, André Louis GASP. *Galérie des Mollusques, ou Catalogue méthodique, descriptif et raisonné des Mollusques et Coquilles du Muséum de Douai*. Paris, 1838-45.
- PRATT, S. P. *Sur la Géologie des Environs de Bayonne*. <*Mem. Soc. Geol. de France*, ser. 2, vol. ii, p. 185, p's. v-viii. 1846.
- RAULIN, V. *Faits et considérations pour servir au classement du terrain à Nummulites*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, pp. 114-128. 1848.
- RAULIN, V. *Note sur la position géologique du calcaire d'eau douce à Physes de Montolieu (Aude)*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, pp. 429-429. 1848.
- RAULIN, V. *Rectifications à la notice sur le classement du terrain à Nummulites*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, pp. 433-437. 1848.
- RAULIN, V. *Quelques mots encore sur le terrain à Nummulites des Pyrénées*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. vi, pp. 531-538. 1849.
- RAULIN, V. *Réponse aux observations critiques de M. Leymerie sur une note intitulée. Quelques mots encore sur le terrain à Nummulites*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. vii, pp. 644-650. 1850.
- RAULIN, V. *Note relative aux terrains tertiaires de l'Aquitaine*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. ix, pp. 406-422. 1851.
- READE, Rev. J. B. *On the Animals of the chalk still found in the living state in the stomachs of Oysters*. <*Trans. Micr. Soc. Lond.*, vol. ii, pp. 20-24. 1844.
- RENEVIER, E. *Notices géologiques et Paléontologiques sur les Alpes Vaudoises. II Massif de L'Oldenhorn*. <*Bull. Soc. Vaud. d. Sci. Nat.*, vol. viii, pp. 273-290. 1865. *III Environs de Cheville*, vol. ix, pp. 108-109. 1866.
- RISSE, J. A. *Histoire naturelle des principales productions de l'Europe Méridionale et principalement de celles des environs de Nice et des Alpes maritimes*. Paris et Strasbourg. 1826-27.
- ROUAULT, A. *Description des fossiles du terrain éocène des environs de Pau*. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. v, pp. 204-210. 1848.
- ROUAULT, A. *Description des fossiles du terrain éocène des environs de Pau*. <*Mem. Soc. Geol. de France*, sér. 2, vol. iii, pp. 457-502. 1850.

- RUTIMEYER, L. Recherches géol. et paléontol, sur les terrains nummulitiques des Alpes Vernoises. < *Verhand. der Schweiz; Naturforsch-Gesell, bei ihrer Versammlung zu Solothurn*; Bibliothèque univers de Genève, vol. ix, pp. 177-192. 1848.
- SANDBERGER, F. Foraminiferen der alpinen Trias. < *Verhand. K. K. Geol. Reich.* 1868, pp. 219. 1868.
- SANDER-RANG, A. Manuel de l'histoire naturelle des Mollusques et de leurs Coquilles. Paris. 1829.
- SAGE, F. G. Observations propres à faire connaitre dans quelle classe on doit ranger les nummismales. (*Journ. de Physique*, vol. xl ) 1805.
- SAUSSURE DE, H. B. De Voyage dans les Alpes, 2d ed. Neuchatel, 1779.
- SAVI, P. ET MENEHINI, G. Considerazioni sulla géologia della Toscana, &c. Firenze, 1851.
- SCHARDT, A. Étuds géologiques sur le Pays-d'enhaut Vaudois. < *Bull. de la Soc. Vaud. Sci. Nat.*, vol. xx, p. 1-182. 1884. (Faune de Foraminiferes du crétacé supérieur, p. 71.)
- SCHLUMBERGER, C. Structure intime des Foraminifères. < *Assoc. franc. pour l'avancem. des Sci. (Lyon)*, vol. ii, pp. 562, 563. 1873.
- SCHLUMBERGER, C. Sur un nouveau Pentellina. < *Assoc. franc. pour l'avancem. des Sci. (Rochelle)*, pp. 230-232, wood cuts 63, 64. 1882.
- SCHLUMBERGER, C. Note sur les Foraminifères. < *Feuille des Jeunes Naturalistes*, p. 30, pls. i-iii. 1882.
- SCHLUMBERGER, C. Note sur quelques Foraminifères nouveaux ou peu connus du Golfe de Gascogne. < *Feuille des Jeunes Naturalistes*, xiii, année, pp. 21-28, pls ii, iii. 1883.
- SCHLUMBERGER, C. Note sur le genre *Cuneolina*. < *Bull. de la Soc. Geol. de France*, sér. 3, vol. xi, pp. 272-273. 1883.
- SCHLUMBERGER, C. Reproduction des Foraminifères. < *Assoc. franc. pour l'avancem. des Sci. (Nantes)*, vol. iv, pp. 800, 101. 1885.
- SCHNEIDER, A. Ueber zwei neue *Thalassicollen* von Messina. < *Muller's Archiv.*, p. 38. 1858.
- SCHWAGER, C. Saggio di una Classificazione dei Foraminiferi avuto riguardo alle loro No. 1, 2. Famiglie Naturali. < *Bollet. del R. Comitato Geologico*, ann. 1876, No. 11, 12. 1877.
- SCHWAGER, C. Nota su alcuni Foraminiferi nuovi del tufo di Stretto presso Girgenti < *Boll. R. Comit. Geol. D. Italia*, vol. ix, pp. 519-529, 1 plate. 1878.
- SCORTEGAGNA, F. O. Nota Sopra le Nummoliti. < *Ann. Sci. Lomb. Veneto*, vol. xii, pp. 118-120; *Atti Scienz. Ital.* 1842, pp. 235, 236.
- SCORTEGAGNA, F. O. Sur les Nummulites; lettre à M. D'Orbigny. Padua. (Revue Zoolog.) Paris. 1846.

- SCORTEGAGNA, F. O. Sur les Nummulites; lettre à M. le Professeur Alcide D'Orbigny, par M. le Docteur, F. O. Scortegagna, de Lonigo, Padua. 8vo. 1846. <*Biblioth. Univ. Geneve*, Mar. 1851. Sc. Phys. p. 254. 1851.
- SEGUENZA, G. Intorno ad un Nuovo Genere di Foraminiferi Fossili del Terreno Miocenico di Messina. <*Eco Peloritano*, anno, v, ser. 2, fasc. 9, 1 plate. 1859.
- SEGUENZA, G. Prime Ricerche intorno ai Rizopodi fossili delle Argille Pleistoceniche dei dintorni di Catania. <*Atti dell' Accad. Gioenia Sci. Nat.*, ser. 2, vol. xviii, p. 85, pls. i, iii. 1862.
- SEGUENZA, G. Notizie succinte intorno alla Costituzione Geologica dei Terreni Terziarii del Distretto di Messina. Parte prima. Table. Messina. 1862.
- SEGUENZA, G. Descrizione dei Foraminiferi Monotalamici delle Marne Mioceniche del Distretto di Messina. Parte seconda, pls. i, ii. Messina. 1862.
- SEGUENZA, G. Brevissimi Cenni intorno alla Serie Terziaria della Provincia di Messina. Lettera al Sig. Ing. L. Molino Foti. <*Bollet. del R. Com. Geol. d'Italia*. 1873.
- SEGUENZA, G. Le Formazioni Terziarie nella Provincia di Reggio (Calabria). <*Atti R. Accad. dei Lincei*, ser. 3, vol. vi, pp. 1-446, pls. i-xvii. 1880.
- SEGUENZA, G. Studi geologici e paleontologici sul Cretaceo medio dell'Italia meridionale. <*Atti R. Accad. dei Lincei*, Anno cclxxix, ser. 3, vol. xii, pp. 1-150, pls. i-xxi. 1882.
- SEGUENZA, G. Della *Lingulinopsis carlofortensis*, Bornemann, jun. <*Il Naturalista Siciliano*, ann. iii, No. 5, p. 135. 1884.
- SILVESTRI, O. Le Nodosarie fossili nel Terreno subappennino Italiano e viventi nei Mari d'Italia, 11 plates. Catania, 1872.
- SISMONDA, E. Synopsis Methodica Animalium invertebratorum Pedemontii fossilium quæ in collectione comitis St. Martino della Motta pro max. parte extant. Turin, 1842.
- SISMONDA. Place le terrain nummulitique de Savoie dans le craie supérieure. <*Bull. de la Soc. Geol. de France*, sér. 1, vol. v, pp. 626-630. 1844.
- SISMONDA, A. Note sur les dépôts à Nummulites. <*Bull. de la Soc. Geol. de France*, ser. 2, vol. x, pp. 47-52. 1853.
- SISMONDA, A. Lettre à M. Elie de Beaumont sur le terrain Nummulitique. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. xii, pp. 807-808. 1855.
- SISMONDA, A. Sur les deux formations Nummulitiques du Piémont (extrait d'une lettre à M. Elie de Beaumont). <*Bull. de la Soc. Geol. de France*, sér. 2, vol. xii, pp. 508-510. 1855.
- SIX. ACH. Le challenger et les abîmes de la mer, *Analyse de la note d. M. M. Murray et Renard sur les dépôts des mers profondes*. <*Ann. Soc. Geol. du Nord.*, vol. xi, pp. 313-335. 1884.

- SOLDANI, A. Saggio oritografico ovuero osservazioni sopra le terre nauti-  
litiche ed ammonitiche della Toscana. Sienna, 1780.
- SOLDANI, A. Testaceographiæ et Zoophyographiæ-parvæ et microscopiçæ, 2  
vols, fol. Sienna, 1789-98.
- STACHE, G. TERQUEM, M. O. Premier Mémoire sur les Foraminifères du  
Système oolithique etude du Fullers-Eartto de la Moselle. Metz.  
Lorette editeur-Libraire, sul du Petit-Paris, 1867. <Ver. K. K. Geol.  
Reich., 1868, pp. 42, 43. 1868.
- STOHR, E. Il terreno pliocenico dei dintorni di Girgenti. <Bollet. del. Com.  
Geol. d'Italia, vol. vj, pp. 451-474, table. 1876.
- STOHR, E. Bericht über die Tripoli-Schichten auf Sicilien. <Zeitschr. d.  
deutsch Geol. Gesell., vol. xxix, pp. 638-643. 1877.
- STOHR, E. Sulla posizione geologica del tufo e del tripoli nella zona solfi-  
fera di Sicilia. <Bollet. del. Com. Geol. d'Italia, vol. ix, pp. 498-518.  
1878.
- STUDER, TH. Ueber Foraminiferen aus den Alpenen Kreide. <Bernar Mit-  
theil. Naturf. Gesell., 1867, pp. 177-179.
- SUËSS, E. On the Occurrence of Fusulinæ in the Alps. <Quart. Journ.  
Geol. Soc. Lond., vol. xxvi, p. 3. 1870.
- TALLAVIGNES. Sur les terrains à Nummulites du département de l'Aude et  
des Pyrénées. <Bull. de la Soc. Geol. de France, sér. 2, vol. iv, pp. 1127-  
1144, 1162. 1847.
- TALLAVIGNES. Résumé d'un mémoire sur les terrains à Nummulites du dé-  
partement de l'Aude et des Pyrénées. <Comptes rendus de l'Acad. des  
Sciences Naturelles, Paris, vol. xxv, p. 716. 1847.
- TALLAVIGNES. Observations sur le mémoire de M. Raulin, intitulé; "Faits  
et considérations pour servir au classement du terrain à Nummulites."  
<Bull. de la Soc. Geol. de France, sér. 2, vol. v, pp. 130-135. 1848.
- TALLAVIGNES. Sur l'âge du terrain nummulites des Pyrénées. <Bull. de la  
Soc. Geol. de France, sér. 2, vol. v, pp. 412-415. 1848.
- TALLAVIGNES. Resumé d'un mémoire sur les terrains à Nummulites du dé-  
partement de l'Aude et des Pyrénées. <Archives des Sciences Naturelles  
de Geneve, vol. vi, p. 334, 1847; vol. ix, p. 322, 1848.
- TALLAVIGNES. Resumé d'un mémoire sur les terrains à Nummulites du dé-  
partement de l'Aude et des Pyrénées. <Leinhard's neues Jahrbuch fur  
Geognosie, p. 366. 1848.
- TCHIHATCHEFF, P. DE. Mémoire sur les terrains jurassique, crétacé et num-  
mulitique de la Bithymè, de la Galatie et de la Paphlagonie. <Bull. de  
la Soc. Geol. de France, sér. 2, vol. viii, pp. 280-297. 1851.
- TCHIHATCHEFF, P. DE. Dépôts nummulitiques et diluviens de la presqu'île  
de Thrace. <Bull. de la Soc. Geol. de France, sér. 2, vol. viii, pp. 297-  
316. 1851.

- TERQUEM, O. Recherches sur les Foraminifères du Lias. Parts 1-3, in the *Mem. de l'Acad. imp. de Metz*, 2me ser, vol. xxxix-xliv, the remainder published separately.
- I. Foraminifères du Lias du Département de la Moselle, vol. xxxix, p. 563, pls. i-iv. 1858.
  - II. Foraminifères de l'étage moyen et de l'étage inférieur du Lias, vol. xliii, p. 415, pls. v., vi. 1852.
  - III. Foraminifères du Lias des Départements de la Moselle, Côte d'Or, du Rhône, de la Vienne et du Calvados, vol. xlv, p. 151, pls. vii-x. 1863.
  - IV. Les Polymorphines des Départements de la Moselle, de la Côte-d'Or et de l'Indre, pls. xi.-xiv. 1864.
  - V. Foraminifères du Lias des Départements de la Moselle, de la Côte-d'Or et de l'Indre, pls. xv.-xviii. 1863.
  - VI. Foraminifères du Lias des Départements de l'Indre et de la Moselle, pls. xix.-xxii. 1866.
- TERQUEM, O. Mémoires sur les Foraminifères du Système Oolithique. Part 1, in the *Bulletin de la Soc. d'Histoire Nat. du Dep. de la Moselle*, 1868; the remainder published by the author. 8vo.
- I. Etude du Fuller's-earth de la Moselle, pp. 1-138, pls. i.-viii. Metz, 1867.
  - II. Zone à Ammonites Parkinsoni de la Moselle, pp. 139-194, pls. ix-xxi. Metz, 1869.
  - III. Les Genres Frondicularia, Flabellina, Nodosaria, Dentalina, etc., de la Zone à Ammonites Parkinsoni de Fontoy (Moselle), pp. 195-278. pls. xxii, xxix, Metz. 1870.
  - IV. Les Genres Polymorphina, Guttulina, Spiroloculina, Triloculina et Quinqueloculina de la Zone à Ammonites Parkinsoni de Fontoy (Moselle) pp. 279-338, pls. xxx-xxxvii, Paris. 1874.
- TERQUEM, O., and G. BERTHELIN. Étude microscopique des Marnes du Lias Moyen d'Essey-lès Nancy. Zone inférieure de l'assise à Ammonites margaritatus. <*Mem. Soc. Geol. France*, ser. 2, vol. x, mén. 3, pls. xi-xx. 1875.
- TERQUEM, O. Essai sur le classement des Animaux qui vivent sur la Plage et dans les Environs de Dunkerque, 1re fasc., 1875, pp. 1-54, pls. i-vi; 2me fasc., 1876, pp. 55-100, pls. vii-xii; 3me fasc., 1880, pp. 101-152, pls. xiii-xvii. 1875, 80.
- TERQUEM, O. Recherches sur les Foraminifères du Bajocien de la Moselle. <*Bull. Soc. Geol. de France*, sér. 3, vol. iv, p. 447, pls. xv-xvii. 1876.
- TERQUEM, O. Observations sur l'Etude des Foraminifères. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. iv, p. 506, pl. xiii. 1876.
- TERQUEM, O. Note sur les genres Dactylopora, Polytrypa, etc. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. vi, p. 83. 1877.
- TERQUEM, O. Observations sur les Classifications proposées pour les Foraminifères. <*Bull. de la Soc. Geol. de France*, vol. vi, p. 211. 1878.
- TERQUEM, O. Les Foraminifères et les Entomostracés-Ostracodes du Pliocène supérieur de l'Ile de Rhodes. <*Mem. Soc. Geol. de France*, sér. 3, vol. i, pp. 1-8, pls. i-xiv. 1878.

- TERQUEM, O. Observations sur les Foraminifères du terrain tertiaire parisien. <*Bull. de la Soc. Geol. de France*, vol. vii, pp. 249-251. 1879.
- TERQUEM, O. Observations sur quelques Fossiles des Époques Primaires. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. viii, p. 414, pl. i. 1880.
- TERQUEM, O. Note sur la communication de M. Berthelin. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xi, pp. 39-43. 1882.  
Placentula partschiana.
- TERQUEM, O. Les Foraminifères de l'Éocene des Environs de Paris, 20 pls. 40. 1882.
- TERQUEM, O. Observation sur une communication de M. Munier-Chalmas (sur quelques genres de foraminifères.) <*Bull. de la Soc. Geol. de France*, ser. 3, vol. xi, pp. 13, 14. 1883.
- TREQUEM, O. Cinquième mémoire sur les Foraminifères du Système Oolithique, pp. 339-406, pls. xxxviii-xlv. 1883.
- TREQUEM, O. Sur un nouveau genre de *Foraminifères* du Fuller's-earth de la Moselle. (*Genre Epistomina*.) <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xi, pp. 37-39, 1 plate. 1883.
- TERQUEM, O. Note relative à son 5e mémoire sur les *Foraminifères* du système oolithique de la zone à Am. Parkensoni de Fontoy (Moselle.) <*Bull. de la Soc. de France*, ser. 3, vol xi, pp. 448, 449. 1883.
- TERQUEM, M. O., and M. E. La Rade de Smyrne. <*Bull. Soc. Zool. de France*, vol. x, pp. 547-550. 3 wood cuts. 1885.
- TERRIGI, G. I Rhizopodi fossili o Foraminiferi dei terreni Terziarii di Roma Studiati nelle sabbie gialle Plioceniche. <*Bullet. d Soc. Geog. Ital.*, fase. x-xii. 1876.
- TERRIGI, G. Fauna Vaticana a Foraminiferi delle Sabbie Gialle nel Pliocene Subapennino superiore, 4 pls. <*Atti. dell'Accad. Pontif. de Nuovi Lincei.*, ann. xxxiii, pp. 127-129; pls. i iv. 1880.
- TERRIGI, G. Sulla fauna microscopica del calcare zancleano di Palo. <*Atti. dell' Reale Accad. dei Lincei*, ser. 3, vol. vi. 1882.
- TERRIGI, G. Il Colle Quirinale, sua flora e fauna lacustre e terrestre, fauna microscopica marina delgi strati inferiori;—contribuzioni alla geologia del Bacino di Roma. <*Atti. dell'Accad. Pont. d. Nuovi Lincei*, vol. xxv, pp. 145-252, pls. vii-ix. 1883.
- TERRIGI, G. Ricerche microscopiche fatte sopra frammenti di marna inclusi nei peperini laziali. <*Boll. d. R. Com. Geol. d'Italia.*, ser. ii, vol. vi, pp. 148-156. 1885.
- TOURNOUER, M. Sur quelque affleurements des marnes nummulitiques de Bos-d'Siros. <*Actes. Soc Linn.*, sér. 3, vol. v, pp. 243-251. 1864.
- TOURNOUER, R. Sur les Nummulites et une nouvelle espèce d'Echinide trouvées dans le "miocène inférieur" ou "oligocène moyen" des environ



- de Paris. <*Bull. Soc. Geol. de France*, sér. 2, vol. xxvi, pp. 372-373. 1870.
- TOURNOUER, M. Sur le terrain nummulitique des environs de Castellanne. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. xxix, pp. 707-719. 1872.
- TOZZETTI, G. T. Relazioni d'alcuni viaggi fatti in diverse partè della Toscana, 2nd edit., 12 vols. Florence. 1768-79.
- TOZZETTI, T. Relazioni d'alcuni viaggi fatti in diverse parte della Toscana. Firenze. 1792. .
- VANDEN BROECK, E. Observations sur la Nummulites planulata du Panis-élien. <*Bull. de la Soc. Geol. de France*, sér. 3, vol. ii, p. 559. 1874.
- VANDEN BROECK, E. Liste des Foraminifères du Golfe de Gascogne. 8vo. Bordeaux, 1875.
- VASSEUR, G. Sur les terrains tertiaires de la Bretagne (Genus, Archiacina, Mun.—Chal) <*Comptes Rendus*, vol. lxxxvii, pp. 1048-1050. 1878.
- VASSEUR, G. Recherches géologiques sur les Terrains tertiaires de la France occidentale—stratigraphie. <*Ann. des Sci. Geol.*, vol. xiii, pp. 1-431. 1880.
- VERNEUIL, E. (de). Description des coquilles fossiles recuilliès en Crimée. <*Mem. d. Soc. Geol. d. France*, sér. 1, vol. iii, pp. 37-69, plates 5, 6. 1838-39.  
Nummulites irregularis. N. distans N. polygyratus. N. rotularius. N. placentula.
- VERNEUIL, E. DE. Sur les terrain Nummulitique du nord de l'Espagne. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. vi, pp. 522-524. 1849.
- VILLA, C. G. B. Rivista Geologica sulla Brianza. Milano, 1885.
- VON ALBERTI, F. Ueberblick über die Trias mit Berücksichtigung ihres vorkommens in den Alpen. Stuttgart, 1869.
- VON HANTKEN, M., in Fuchs' memoir-ueber den sogenannten "Badne Teger" auf Malta. <*Sitz. d. k. Akad. Wiss. Wien*, vol. lxxiii, p. 67, pl. i. 1876.
- WATERS, A. W. Quelques Roches Alpes vaudoise étudiées au microscope. <*Bull. Soc. Vaud. Sci. Nat.*, vol. xvi, p. 593, pl. xxiv. 1879.
- ZIGNO, A. DE. Nouvelles observations sur les terrains crétacés de l'Italie septentrionale. <*Bull. de la Soc. Geol. de France*, sér. 2, vol. vii, pp. 25-32. 1850.



PART V.

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AUSTRO-HUNGARY, BELGIUM, DENMARK, FINLAND,  
GERMANY, HOLLAND, NETHERLANDS, NOR-  
WAY, SWEDEN AND SWITZERLAND.

AUSTRO-HUNGARY, BELGIUM, DENMARK, FINLAND,  
GERMANY, HOLLAND, NETHERLANDS, NOR-  
WAY, SWEDEN AND SWITZERLAND.

- ACKERMANN, H. Ueber Tiefseeforschungen. <Sitzung d. naturwiss. Gesell., Isis. in. Dresden, Jahrg. 1872, p. 168; Jahrg. 1874, p. 177. 1872-74.
- ALTH, A. Geognostisch-paläontologische Beschreibung der nächsten Umgebung von Lemberg. Foraminifera, Kreidemergel von Lemberg. <Haidinger's Abhand., vol. iii, pp. 171-262-271, plates ix, xiii. 1850.
- ALTH, A. Die Versteinerungen des Nizneover Kalksteines. <Mojsisovics und Neumayr's Beiträge Zur Paläont. von Oesterreich-Ungarn, vol. i, p. 183. 1881.
- ANDRIAN, F. F. V., and K. M. PAUL. Die geologischen Verhältniss der Klein Karpathen und der angrenzenden Landgebiete im nordwestlichen Ungarn. <Jahrbuch, d. K. K. Geol. Reich., vol. xiv, pp. 325-336. 1864.
- AUERBACH, (DR.) L. Ueber die Einzelligkeit der Amöben. <Siebold und Kolliker's Zeitschrift, vol. vii, p. 365. 1856.
- BATSCH, A. I. G. C. Sechs Kupfertafeln mit Conchylien des Seesandes. Jena. 1791.
- BESSELS, E. Haeckelina gigantea. Ein Protist der Gruppe der Monothalamien. <Jenaische Zeitschr., vol. ix, p. 265. 1874.
- BITTNER, A. Ueber das Alter des Tüfflerer Mergels und über die Verwendbarkeit von Orbitoiden zur Trennung der ersten von der zweiten Mediterranstufe. <Verhand. d. kk. Geol. Reichst. 1885, pp. 225-232. 1885.
- BLUMENBACH, J. F. Abbildungen naturhistorischer Gegenstände. Göttingen, 1796-1810.
- BOLL, E. Geognosie der deutschen Ostseeländer zwischen Eider und Oder. 2 plates. Neubrandenburg. 1846.
- BOLL, E. Geognostische Skizze von Meklenburg als Erläuterung zu der von der deutschen geologischen Gesellschaft hexauszugebenden geognostischen Uebersichtskarte von Deutschland. <Zeitschr. d. Deutsch. Geol. Gesell., vol. viii, p. 436. 1851.
- BOLSCHÉ, H. Ein neues Vorkommen von Versteinerungen in der Rauchwacke des südlichen Harz-Randes. <Neues Jahrb. für Min., etc., Jahrg. 1864.
- BORNEMANN, J. G. Ueber die Liasformation in der Umgegend von Göttingen und ihre organischen Einschlüsse. Berlin. 1854.

- BORNEMANN, J. G. Die mikroskopische Fauna des Septarienthones von Hermsdorf bei Berlin. <Zeitsch. d. Deutsh Geol. Gesell., vol. vii, pp. 307-351, pls. xii-xxi. 1855.
- BORNEMANN, J. G. Bemerkungen über einige Foraminiferen aus den Tertiärbildungen der Umgegend von Madgeburg. <Zeitschr. d. Deutsch. Geol. Gesell., vol. xii, p. 156, pl. vi. 1860.
- BONNEMANN, (jun.) L. G. Ueber die Foraminiferengattung Involuntina. <Zeitschr. d. Deutsch. Geol. Gesell., vol. xxvi, pp. 702-740, 2 plates. 1874.
- BOUE, A. Über die Nummuliten Ablagerungen. Sur les dépôts nummulitiques. <Bericht. ueber die Mittheilungen von Freunden der Naturwissenschaften in Wien., vol. iii, pp. 446, —. 1847.
- BOUE, A. Die Nummulitenlager éocèn sein. Le terrain Nummulitique regarde comme éocène. <Oesterreichischen Blatter fur Literatur 14 février, 1848. Berichte ueber die Mittheilungen von Freunden der Naturwissenschaften in Wien, vol. iv, pp. 135-136. 1848.
- BOUÉ, A. Ueber Nummuliten. Sur les Nummulites. <Oesterreichische Blatter fur Literatur. 1848. Berichte ueber die Mittherlung von Freunder der Naturwissenschaften in Wien, vol. iv, pp. 51 et 201. 1848.
- BRADY, H. B. Une Vraie Nummulite carbonifère. Traduit par Ernest Vanden Broeck. Traductions et Reproductions pub. par la Soc. Malac. de Belgique. 1874.
- BREYN, J. P. Dissartatio physica de Polythalamüs, nova Testaceorum classe. 1732.
- BRONN, H. G. System der urweltlichen Konchylien durch Diagnose, Analyse, u. Abbildung der Geschlechter erläutert. Fol. Heidelberg, 1824.
- BRONN, H. G. System der urweltlichen Pflanzenthiere. Heidelberg, 1825.
- BRONN, H. G. Lethæa Geognostica oder Abbildung und Reschrsitung der für die Gebirgsformationen bezeichnendsten Vevsteinerungen, 2 vols., and Atlas of 47 plates. Stuttgart, 1835-8.
- BRONN, H. G. Index Palæontologicus; I, Nomenclator.—Enumerator, 3 vols. Stuttgart, 1848-49.
- BRONN, H. G. Lethæa Geognostica, oder Abbildung und Beschreibung der für die Gebirgs-Formationen bezeichnendsten Versteinerungen, 3 te auflage. Stuttgart, 1851-56.
- BRONN, H. G. Die Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort un Bild. Erster Band. Amorphozoen. Leipzig und Heidelberg, 1859.

- BRUNNER, C. Beitræge zur Kenntniss der Schweizerischen Nummuliten und Flysch-formationen. Documents pour servir à la connaissance de la formation nummulitique et à celle du Flysch en Suisse. < *Mittheilungen der naturforschenden Gesellschaft in Bern*, pp. 9-21, 1-848. Neues Jahrbuch für Mineral, etc. p. 364. 1848.
- BUNZEL, E. Die Fauna des marinen Tegels am Porzteich bei Voitelbrunn unweit Nicolsburg. < *Jarhb. d. K. K. Geol. Reichsanst.*, vol. xix, pp. 202-206. 1869.
- BUNZEL, E. Die Foraminiferen des Tegels von Brünn. < *Verhandl. d. k. k. Geolog. Reichsanstalt*, No. 6, p. 96. 1870.
- BURTIN, F. Xavier. Oryettographie de Bruxelles. Bruxelles, 1784.
- BUTSCHLI, O. Bronn's Klassen und Ordnungen des Thier-Reichs, Wissenschaftlich dargestellt in Wort und Bild. 1. Bd. Protozoa. Neu bearbeitet. Leipzig und Heidelberg, 1880-82.
- CAREZ, L. Observations sur la classification des couches tertiaires des environs de Cassel (Nord) < *Bull. de la Soc. Geol. de France*, ser. 3, vol. xi, pp. 162-164. 1883.
- CAREZ, L. Note sur l'Urgonien et le Néocomien de la vallée du Rhône. < *Bull. de la Soc. Geol. de France*, ser. 3, vol. xi, pp. 351-367. 1883.
- COHN, F. Beiträge zur Entwicklungsgeschichte der Infusorien. < *Siebold und Kolliker's Zeitschrift*, vol. iii, p. 257; vol. iv, p. 253. 1851, 1853.
- COLLIN, J. Om Limifjordens tidligere og nuværende Marine Fauna, med særligt hensyn til Bloddyrfaunaen. (*Foraminifererne*, p. 24.) So Kjobenhavn, 1884.
- CORNET, F. L. et A. BRIART. Compte-Rendu de l'Excursion faite aux environs de Cipy. < *Mem. de la Soc. Mal. de Belg.*, vol. viii, pp. 21-35. 1873.
- CROSSKEY, H. W., and D. ROBERTSON. Notes on the Post-tertiary Geology of Norway. < *Proc. Phil. Soc. Glasgow*, vol. vi, pp. 346-362. 1868.
- CZJZEK, J. Beitrag zur Kenntniss der fossilen Foraminiferen des Wiener Beckens. < *Haidingers naturwissenschaftliche Abhandlungen*, vol. ii, p. 137, plates xii, xiii. 1848.
- DADAY, E. V. Ueber eine Polythalamie der Kochsalztümpel bei Déva in Siebenbürgen. < *Zeits. Wiss.*, vol. xl, pp. 465-480, pl. xxiv, and *Math. Nat. Ber. Ung.* i, p. 357. < Cf. *Ann. N. H.*, (5) xiii, p. 307, and transl. *op. cit.* xiv, pp. 349-363.

Daday describes the only known non-marine Polythalamian Foraminifer (*Entzia tetras-tomella*). It has resemblances to many different families of *Foraminifera*, and "unites the imperforate with the perforate *Polythalamia*." It occurred in a salt pool near Déva, in Transylvania. The test is chitinous, with adherent small plates of quartz; sixteen chambers in a flat dextral spiral. Not seen.

- DEECKE, W. Die Foraminiferen fauna der Zone des *Stephanoceras humphriesianum* im Unter-Elsass. <*Abh. Geol. Spec.*, v. Elsass-Lathringen. iv, 68 pp., 2 p's.  
Not seen.
- DE LA HARPE, P. Note sur les Nummulites de la Crimée. <*Bull. Soc. Vaudoise des Sci., Nat.*, sér. 2, vol. xiii, pp. 267-272. 1874.
- DE LA HARPE, P. Note sur les Nummulites Partschi et Oosteri de la H., du Calcaire du Michelsberg, pres Stockerau (Autriche), et du Gurnigelsandstein de Suisse. <*Bull. Soc. Vaud. Sci., Nat.*, vol. xvii, pp. 33-40. 1880.
- DE LA HARPE, P. Note sur la distribution par couples des Nummulites éocènes. <*Bull. Soc. Vaudoise des Sci. Nat.*, vol. xvii, pp. 429-441. 1881.
- DEWALQUE, F. Note sur la glauconie d'Anvers. <*Ann. de la Soc. de Belg. Mem.*, vol. ii, pp. 3-6. 1875.
- DIESING, C. M. Systematische Uebersicht der Foraminiferen monostegia und Bryozoa anopisthia. <*Sitz. K. Akad. Wiss. Wien.*, 5 Heft, p. 494. 1848.
- D'ORBIGNY, A. Foraminifères Fossiles du Bassin Tertiaire de Vienne (Auriche), découverts par son Excellence le Chevalier Joseph de Hauer. Paris, 1846.
- DUNIKOWSKI, E. v. Ueber einige neue Nummulitenfunde in dem ostgalizischen Karpathen. <*Verh. Geol. Reichsanst.*, vol. xvii, pp. 128-130. 1884.
- DUNIKOWSKI, (DR.) E. v. Einige Bemerkungen über die Gliederung des westgalizischen Karpathensandsteines. <*Verhand. d. K. K. Geol. Reichsanst.*, 1885, pp. 238-240.
- EGGER, J. G. Die Foraminiferen der Miocän Schichten bei Ortenburg in Nieder-Bayern. <*Neues Jahr buch. fur Min. Geol.*, 1857, pp. 266-311, plates 5-15. 1857.
- EHRENBERG, C. G. Ueber dem blossen Auge unsichtbare Kalkthierchen und Kieselthierchen als Hauptbestandtheile de Kreidegebirge. <*Berichte d. Konigl. Preuss. Akad. Wiss. Berlin*, 1838, p. 192. 1838.
- EHRENBERG, C. G. Ueber die Bildung der Kreidefelsen und des Kreidemergels durch unsichtbare Organismen. <*Abhandl. d. k. Akad. d. Wiss. Berlin* (for 1838), p. 59, pls. i-iv. 1838.
- EHRENBERG, C. G. Eine vorläufige Uebersicht seiner Untersuchung der Schnerken-Corallen oder Polythalamien als Thiere. <*Berichte d. Konigl. Preuss. Akad. Wiss. Berlin* (1838), p. 196. 1838.
- EHRENBERG, C. G. Anwendung den bisherigen Beobachtungen auf die Systematik der Polythalamien. <*Abhand. der Konigl. Akad. d. Wissenschaften zu Berlin*. 1838.

- EHRENBERG, C. G. Die Infusionsthierchen als vollkommene Organismen. Leipzig (?) Berlin, 1838.
- EHRENBERG, C. G. Ueber die Bildung sümmetlicher Felsen bei dem Nilufer von Cahira bis Theben u. s. w. ans den mikroskopischen Kalkthierchen der europäischen Kreide. <Berichte d. k. Preuss. Ak. Wiss., 1839, pp. 26, 27. 1839.
- EHRENBERG, C. G. Aufschluss über das Verhältniss der Polythalamien zur Jetztwelt und weitere Kenntniss ihrer Organisation. <Berichte d. k. Preuss. Ak. Wiss., 1839, pp. 27-30. 1839.
- EHRENBERG, C. G. Ueber Mehrere in Berlin lebend beobachtete Polythalamien der Nordsee. <Berichte d. k. Preuss. Ak. Wiss., 1840, pp. 18-23. 1840.
- EHRENBERG, C. G. Meeres-Infusorien die zur Erläuterung räthselhafter fossiler Formen der Keridebildung dienen. <Berichte d. k. Preuss. Ak. Wiss., 1840, pp. 157-162. 1840.
- EHRENBERG, C. G. Über noch jetzt zahlreich lebende Thierarten der Kreidebildung und den Organismus der Polythalamien. <Abhand. d. Akad. d. Wiss. zu Berlin, 1839, pp. 81-174, 4 plates. 1841. Partly translated in Taylor's Scientific Memoirs, vol. iii, p. 319.
- EHRENBERG, C. G. Das unsichtbar wirkende organische Leben-Vorlesung. Leipzig, 1842.
- EHRENBERG, C. G. Hornstein des Bergkalkes von Tula. <Berichte d. Kongl. Preuss. Akad. Wiss. Berlin, 1843, pp. 79, 106. 1843.
- EHRENBERG, C. G. Neue Beobachtungen über den sichtlichen Einfluss der mikroskopischen Meeres-Organismen auf den Boden des Elbbetts bis vor oberhalb Hamburg. <Berichte d. Kongl. Preuss. Akad. Wiss. Berlin, 1843, pp. 161-167. 1843.
- EHRENBERG, C. G. Fortgesetzte Beobachtungen des bedeutenden Einflusses unsichtbar kleiner Organismen auf die unteren Stromgebiete, besondere der Elbe, Jahde, Ems und Schelde. <Berichte de Kongl. Preuss. Akad. Wiss. Berlin, 1843, pp. 259-272. 1843.
- EHRENBERG, C. G. Vorläufige Nachricht über das kleinste leben im Weltmeer, am Südpol und in den Meerestiefen. <Berichte d. k. Preuss. Akad. Wiss., 1844, pp. 182-207. 1844.
- EHRENBERG, C. G. Passatstaub und Blutregen. <Abhan. d. k. Akad. der Wissenschaften zu Berlin, 269-460. Berlin, 1847.
- EHRENBERG, C. G. Mikrogeologie; Das Wirken des unsichtbaren Kleinen Lebens auf der Erde. 2 vols, fol., 40 plates. Leipzig, 1854.
- EHRENBERG, C. G. Weitere Ermittlungen über das Leben in grossen Tiefen des Oceans. <Berichte d. Kongl. Preuss. Akad. Wiss., 1854, pp. 305-328. 1854.



- EHRENBERG, C. G. Systematische Charakteristik der neun mikroskopischen Organismen des tiefen atlantischen Oceans. <Berichte d. Kongl. Preuss. Akad. Wiss., 1854, p. 236. 1854
- EHRENBERG, C. G. Ueber neue Erkenntniss immer grösserer Organisation der Polythalamien durch deren urweltliche Steinkerne. <Berichte d. Kongl. Akad. Wiss., 1855, p. 272. 1855.
- EHRENBERG, C. G. Über den Grünsand und Seine Erläuterung des organischen Lebens. <Abhand. d. Akad. d. Wiss. zu Berlin. 1855, pp. 85-176, 8 plates. 1856.
- EHRENBERG, C. G. Über andere massenhafte mikroskopische Lebensformen der ältesten Silurischen Grauwacken—Thone bei Petersburg. <Monatsberichte der Königl. Akad. der Wissenschaften zu Berlin. p. 324. 1858.
- EHRENBERG, C. G. Ueber die Tiefgrund-verhältnisse des Oceans am Eingange d. Davisstrass und bei Island. <Sitz. d. phys-math kl. Monatsb. Ak. Wiss Berlin. 1862, pp. 275 315. 1862.
- EHRENBERG, C. G. Mikrogeologische Studien über das Kleinste Leben der Meeres-Tiefgründe aller Zonen und dessen geologischen Einfluss. <Abhand. d. Akad. d. Wiss. Berlin. 1872, pp. 131-379, 12 plates. 1873.
- EHRENBERG, C. G. Die zweite deutsche Nordpolarfahrt, vol. ii, pp. 437-467, 4 pls. 4to. Berlin. 1874.  
Translated with notes by T. Rupert Jones. *Arctic Manual*, 800, 1875, p. 571. 1875.
- EHRLICH, C. Verschiedene Versteinerungen aus dem Nummuliten Sandsteine zu Maltsee. sur les fossiles du gres à Nummulites de Maltsee. <Oesterreichische Blätter für Literatur; 1848. Bericht ueber die Mittheilungen von Freunden der Naturwiss., in Wien, tome iv, p. 347. 1848.
- ERTBORN, O. VAN. Note sur les sondages de la province d'Anvers. <Soc. Geol. de Belg. Mem., vol. i, pp. 32-44. 1874.
- FAUJAS de SAINT FOND, BARTHELEMY. Histoire naturelle de la Montagne de Saint Pierre de Maestricht., 4o. Paris, 1799.
- FAUVERGE, H. G. Sur quelques roches et fossiles du bassin confluent du Rhône et de l'Ardèche. <Bull. de la Soc. de France., sér. 2, vol. iii, pp. 11-14. 1846.
- FICHTEL, LEOPOLD, A. V. Testacea Microscopica aliaque minuta ex Generibus Argonauta et Nautilus ad Naturam picta et descripta. 24 plates, Wien. 1798.
- FICHTEL, LEOP. et Moll, J. P. Carol. Testacea microscropia aliaque minuta ex generibus Argonauta et Nautilus, ad naturam delineata et descripta. 4o. Viennæ. 1803.
- FOLIN. — Sur la constitution des Rhizopodes reticulaires. C. R. (Compte Rendu) xcix, pp. 1127-1130. 1884.

The skeletal evolution of Reticular Rhizopods is discussed, and the following 9 tribes are distinguished:—Naked, half-naked, slimy, pasty, globigerinaceous, epicular, arenaceous, porcellanous, and vitreous. Each one of these stages, which lead up from the just described *Bathyopsis* to the last of the vitreous, is a group of organisms clothed in a particular manner and peculiar to it. Not seen.

- FORSKAL, P. *Descriptions Animalium, etc.* Hafneæ, 1775.
- FORSKAL, P. *Icones rerum naturalium, quas in itinere orientali P. Forskal observavit, etc.; edidit Niebuhr.* 4to, 43 plates. Copenhagen, 1776.
- FRANZENAU, A. Rakosi Foraminiferák. *Földtani Közlemények*, 1881, pp. 83-107, (Beitrag zur Foraminiferen—Fauna der Rákoser (Budapest) Ober—Mediterraneen Stufe). 1881.
- FRANZENAU, V. U. A. Heterolepa, eine neue Gattung ans der Ordnung der Foraminiferen. <*Termesztörténeti Füzetek*, vol. viii, p. 3, 1884. A Museo Nationali Hungarico Budapestinensè vulgate Ungarisch und deutsch. Not seen; taken from Ver. k. k. Geol. Reich. 1884, p. 323.
- FRAUSCHER, C. F. Die Eocän-Fauna von Kosavin nächst Bribir im kroat-ischen Küstenlande. <*Verhandl. d. k. k. Geol. Reichsanstalt*, 1884, pp. 58-62.
- FUCHS, TH., und F. KARRER. Geologische Studien in den Tertiärbildungen des Wiener Beckens. <*Jahrbuch d. K. K. Geol. Reich.*, bd. xx, pp. 113-140. 1870.
- FUCHS, T. und F. KARRER. Geologische Studien in den Tertiärbildungen des Wiener Beckens. <*Jahrbuch d. K. K. Geol. Reich.*, vol. xxi, pp. 67-122. 1871.
- FUCHS, T. und F. KARRER. Geologische Studien in den Tertiärbildungen des Wiener Beckens. <*Jahrbuch d. K. K. Geol. Reich.*, vol. xxiii, pp. pp. 117-136. 1873.
- FUCHS, T. und F. KARRER. Geologische Studien in den Tertiärbildungen des Wiener Beckens. <*Jahrbuch d. K. K. Geol. Reich.*, vol. xxv, pp. 1-67. 1875.
- FUCHS, T. Welche Ablagerungen haben wir als Tiefseebildungen zu betrachten? <*Neues Jahrb. für Min., &c.*, Beilage-Band ii, pp. 487-584. 1882.
- FUCHS, T. Ueber einige Fossilien aus dem Tertiär der Umgegend Rohitsch-Sauerbrunn und über das Auftreten von Orbitoiden innerhalb des Miocans. <*Verhandl. d. K. K. Geol. Reich.*, pp. 378-382. 1884.
- FUSS, C. Fundort fossiler Foraminiferen am rothen Berge bei Mühlbach. <*Verhandl. u. Mittheil. des Siebenb. Vereins*, Jahrg. iii, No. 8. 1852.
- GALEOTTI. Sur la Constitution Geognostique de la province de Brabant. <*Mem. Couronnes par l'Ac. R. de Bruxelles*, vol. xii. 1837.
- GEINITZ, H. B. Charakteristik der Schichten und Petrefacten des sächsischen böhmischen Kreidegebirges. Dresden und Leipzig, 1839-1842.
- GEINITZ, H. B. Die Versteinerungen des deutschen Zechsteingebriges und Rothliegenden. Dresden, 1848.

- GEINITZ, H. B. Dyas, oder die Zechsteinformation und das Rothliegende, Heft I.—Die animalischen Ueberreste der Dyas. Leipzig, 1861.
- GEINITZ, F. E. Die Flötzformationen Mecklenburgs. <Archiv. d. Vereins der Freunde der Naturgeschichte in Mecklenburg, 37 Jahr., 1883, pp. 1-151, pls. i-iii-v, and map. Güstrow, 1883.
- GESNER, C. De omni rerum fossilium genere gemmis. &c., Zurich, 1565.
- GIEBEL, C. G. Thalamopora cribrosa. <Zeitschr. für ges Naturwiss, ser. 2, vol. vii, p. 361. 1873.
- GMELIN, J. F. Systema Naturæ, Linnæi, Ed. xiii, aucta reformata. Lipsice, 1789.
- GOES, A. Om ett oceaniskt Rhizopodum reticulatum, Lituolina scorpiura, Montf., funnet i Osterjön. <Ofvers, K. Vet. Akad. Forhålg. Stockholm, vol. xxxviii, pp. 33-35. 1882.
- GOES, A. On the Reticularian Rhizopoda of the Caribbean Sea. <Kongl. Svenska Vetenskaps-Akad., Handlingar, vol. xix, p. 150, pls. i-xii. 1882.
- GOES, A. Om Fusulina cylindrica, Fischer, fran Spetsbergen. <Æfö. Ak. Forh. 1883, pp. 29-35, with fig.  
Not seen.
- GRAVENHORST, J. L. C. Aus der Infusorienwelt, 40. 1832.
- GRONOVIVS, L. T. Zoophylacium Gronovianum, etc. Lugduni Batavorum, 1763-84.
- GRUBER, A. Der Theilungsvorgang bei Euglypha alveolata. <Jenaische Zeitschr. f. wiss Zool., vcl. xxxv, pp. 432-439, pl. xxiii. 1880.
- GUMBEL, C. W. Die Streiterger Schwammlager und ihre Foraminiferen-Einschlüsse. <Jahreshefte d. Vereins für vaterlande Naturkunde in Württemberg. 1861.
- GUMBEL, C. W. Die Streitberger Schwammlager und ihre Foraminiferen-Einschlüsse. <Württemb. naturw. Jahreshefte, xviii, pp. 192-238, 2 plates. 1862. (Abridge.)
- GUMBEL, C. W. Nummuliten-führende Schichten des Kressenberges und die Lethæa geognostica von Südbayern. Ebendas. 1865. S. 129.
- GUMBEL, C. W. Comatula oder Belemnites in den Nummuliten-Schichten des Kressenbergs. <N. Jahrb. für Min. etc. 1866. S. 563.
- GUMBEL, C. W. Skizze der Gliederung der oberen Schichten der Kreideformation (Pläuer) in Böhmen. <Neues Jahrbuch. für Min. etc., 1867, pp. 795-809, plate 6. 1867.
- GUMBEL, C. W. Foraminiferen in den Cassianer u Raibler Schichten. <Verhandl. d. K. K. Geol. Reich., 1868, pp. 275, 276. 1868.
- GUMBEL, C. W. Ueber Foraminiferen u Ostracoden der St. Cassianer und Raibler Schichten. <Jahrb. d. K. K. Geol. Reichsanstalt in Wien., vol. xix, 1869, s. 175. 186, pl. ii.

- GUMBEL, C. W. Vorläufige Mittheilungen über Tiefseeschlamm. <*Neues Jahrbuch Min.*, 1870, pp. 753-768. 1870.
- GUMBEL, C. W. Ueber die Foraminiferen der Gosau und Belemniten Schichten. <*Sitzungsber der math. phys. cl. der k. b. Akad. der Wissensch.* 1870. S. 278.
- GUMBEL. Die geognostischen Verhältnisse des Ulmer Cementmergels seine Beziehungen zu dem lithographischen Schiefer und seine Foraminiferen-fauna. <*Sitzung d. math. phys. classe d. K. b. Akad. München*, vol i, pp. 38-72, 1 plate. 1871.
- GUMBEL, C. W. Die Sogenannten Nulliporen (*Lithothamnium* und *Dactylopora*), und ihre Betheiligung an der Tusammensetzung der Kalkgesteine. Erster Theil; die Nulliporendes Pflanzenreichs (*Lithothamnium*), pp. 13-52, 2 plates. Zweiter Theil; die Nulliporen des Thierreiches (*Dactyloporideae*) nebst Nachtrag zum ersten Theile pp. 229-290, 4 plates, Abh. d. II. cl. k. Ak. d. Wiss. vol. xi. 1871.
- GUMBEL, C. W. Über zwei jurassische Vorläufer des Foraminiferen-Geschlechtes Nummulina und Orbitulites. <*Neues Jahrbuch für Min. etc.*, 1872, pp. 241-260, plate B, 7. 1872.
- GUMBEL, C. W. Ueber Conodictyum bursiforme Etallon einer Foraminifere aus der Gruppe der Dactyloporideen. <*Sitzung d. math-phys. classe. d. k. b. Akad. Wiss. Munchen*, vol. iii, pp. 282-294, 1 plate. 1873.
- GUMBEL, C. W. Ueber Coccoithen in Eocänmergel vom Kressenberg und über Oolithbildung. <*N. Jahr., für Min etc.* 1873.
- GUMBEL, C. W. Beiträge zur Keuntiness der Organisation und systematischen Stellung von *Receptaculites*. <*Abh. c. II, cl. k. ak. d. Wiss.*, xii bd. pp. 167-215, 1 plate. 1875.
- GUMBEL, C. W. Die geognostische Durchforschung Bayerns, pp. 61-63. Munich, 1877.
- HAAN, GUIL. DE. Monographiæ Ammoniteorum et Goniatiteorum Specimen, 8 maj., Lugdum Batav. 1825.
- HAECKEL, E. De Rhizopodium finibus et ordinibus, 4to. 1861.
- HAECKEL, E. Die Radiolrien (Rhizopode Radiaria) Eine Monographie, 35 pls. Folio. Berlin, 1862.
- HAECKEL, E. Monographie der Moneren. <*Jenaische Zeitschr. für. Med. u. Naturwiss.*, vol. iv, pp. 64-137, pls. ii, iii, 1868. Translated by W. F. Kirby. <*Quart. Journ. Micr. Sci.*, vol. ix, new series, p. 207, pls. ix, x, London. 1868.
- HAECKEL, E. Biologische Studien—Ersts Heft.; Studien über Moneren und andere Protisten, 6 plates, Stuttgart. 1870.
- HAECKEL, E. Ueber die Physemarien, Haliphysema und Gastrophysema. <*Report Brit. Assoc. (Glasgow Meeting)*, p. 153. 1876.

- HAECKEL, E. Biologische Studien, Zweites Heft; Studien zur Gastraca. Theorie, 14 plates, Jena. 1877.
- HAECKEL, E. Das Protistenreich, Leipzig. 1878.
- HAECKEL, E. Ueber die Phæodarien, eine neue Gruppe Kieselschaliger Rhizopoden. <Sitzungsber. d. Jenaischen Gesell. für Med. und Naturw., Jahrg. 1879. Translated. A new class of Rhizopoda. *Nature*, March 11, 1880, p. 449.
- HAECKEL, E. Orders of the Radiolaria. <*Journ. R. Micro. Soc.*, ser. ii, vol. iv, pp. 246, 247. 1884.
- HAEUSLER, R. Note sur une Zone à Globigérines dans les terrains jurassiques de la Suisse. <*Proc. Verb. Soc. Malac. Belg.*, vol. x, pp. ccxli-ccxliii. 1881.
- HAEUSLER, R. Notes on the *Trochamminae* of the Lower Malm of the Canton Aargau (Switzerland). <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. x, pp. 49-67. 1882.
- HAEUSLER, R. (DR.) Notes sur les Foraminifères de la zone à *Ammonites transversarius* du canton d'Argovie. <*Bull. Soc. Vaud. Sc. Nat.*, vol. xviii, 88, pp. 220-228. 1882.
- HAEUSLER, R. (DR.) Liste des foraminifères de la zone à *Ammonites transversarius* (Etage argovien I) du canton d'Argovie. <*Bull. Soc. Vaud. Sc. Nat.*, vol. xviii, 88, pp. 229, 230. 1882.
- HAEUSLER, R. Additional Notes on the *Trochamminae* of the Lower Malm of the Canton Aargau, including *Webbina* and *Hormosina*. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. x, pp. 349-357. 1882.
- HAEUSLER, R. On the Jurassic Varieties of *Thurammina papillata*, Brady. <*Ann., and Mag. Nat. Hist.*, ser. 5, vol. xi, pp. 262-266, pl. viii. 1883.
- HAEUSLER, R. Notes on some Upper Jurassic *Astrorhizidæ* and *Lituolidæ*. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxxix, pp. 25-28, pls. ii, iii. 1883.
- HAEUSLER, R. Die *Astrorhiziden* und *Lituoliden* der *Bimammatuszone*. <*Neues Jahrb. für Min. etc.* 1883, vol. i, pp. 55-61, pls. iii, iv. 1883.
- HAEUSLER, R. Ueber die neue Foraminiferengattung *Thuramminopsis*. <*Neues Jahrb. für Min. etc.*, 1883, vol. ii, pp. 68-72, pl. iv. 1883.
- HAEUSLER, R. Die *Lituolidenfauna* der aarganischen *Impressaschichten*. <*Neues Jahrbuch Min. Geol. u. Palaen.* iv Beilage-Bd, pp. 1-30, plates I-III. 1885.
- HAGENOW, FR. V. Monographie de Kreide-versteinerungen Nenoovpomernsund Rügens. <*Neues Jahrbuch.* 1842.
- HAGENOW, FR. V. In Geinitz, Grundriss der Versteinerungskunde. 1846.
- HADINGER, W. Beobachtungen an der Grenze des *Nummuliten kalkes* und der Sandsteinformation in der Nache von Triest. *Remarques sur la limite des calcaires à nummulites et des grès dans les environs de Trieste.*

- <Oesterreichische Blaetter für Literatur. 1848. Berichte ueber die Mittheilungen von Freunden der Wissenschaften in Wien, vol. iv, p. 158. 1848.
- HAHN, O. Die Meteorite (Chondrite) und ihre Organismen, 56 p. 32 plates. 1880.  
Plate 30, fig. 3. Nummulite of Kempter. The canals can be clearly seen with a loop.
- HAUER, F. VON. On the Neogene Plastic Clay (Tegel) of Olmütz, Moravia. <Quart. Journ. Geol. Soc. Lond., vol. xix, pp. 15, 16. 1863.
- HARTING, P. Die Macht des Kleinen, Deutsch von Dr. A. Schwarzkopf. Leipzig, 1851.
- HARTING, P. De magt van het Kleine zichtbaar in de vorming der korst van onzen aardbol, of oversigt van het maaksel, de geographische en de geologische verspreiding der polyphen, der foraminiferen en polythalamien, der radiolarien of polycistinen en der diatomeën, 2 druk. 800, p. 258. Amsterdam, 1866.
- HEBERT, M. E. On the Nummulitic Strata of Northern Italy and the Alps, and on the Oligocene of Germany. <Quart. Journ. Geol. Soc. Lond., vol. xxii, pp. 19-23. 1866.
- HEBERT. Note sur la couche à dents de squales deconvertée à Bruxelles par M. Rutot. <Ann. de la Soc. Geol. de Belge., vol. i, pp. lxxii-lxxv. 1874.
- HERTWIG, R. Ueber Mikrogromia socialis, eine colonie bildende Monothalamie des süßsen Wassers. <Archiv. für Mikr. Anat. vol. xx; Suppl. p. i, pl. i. 1874.
- HERTWIG, R. Bemerkungen zur Organisation und systematischen Stellung der Foraminiferen. <Jenaische Zeitschr. für Naturwiss., vol. x, p. 41, pl. ii. 1876.
- HERTWIG, R. Zur Histologie der Radiolarien 5 pls. 4to. Leipzig, 1876.
- HERTWIG, R. Der Organismus der Radiolarien, 10 pls. Jena, 1879.
- HERTWIG, R. and E. LESSER. Ueber Rhizopoden und denselben nahestehende Organismen. <Archiv. für Mikr. Anat., vol. xx; Suppl. p. 35, pl. i. 1874.
- HILBER, V. Geologische Studien in den ostgalizischen Miocän Gebieten. <Jahrbuch K. K. Geol. Reich., vol. xxxii, p. 137. 1882.
- HISINGER, W. Lethæa Suecica, seu Petrificata Suecicae iconibus et characteribus illustrata, 4to. Stockholm, 1837.
- JOSZEF-TOL, S. A pharmakosiderite és azúrvölgyet új lelőhelye Sandberg-hegyen. Obhegy közelében. (Az Eocén nemely rétegetei a Nummulitok által jól Vannak jellemezve, pp. 7, 8.) <Zeit. d. Ungarischen Geol. Gesellschaft., xv. 1885.

- KARRER, F. Ueber das Auftreten der Foraminiferen in dem marinen Tegel des Wiener Beckens. <Sitzb. d. K. Akad. Wiss. Wien., vol. xliii, p. 7, pl. 1. 1861.
- KARRER, F. Ueber das Auftreten der Foraminiferen in dem marinen Tegel des Wiener Beckens. <Sitzb. d. mathem.—naturw. cl. bd. xliiv, pp. 427-458, 2 plates. 1862.
- KARRER, F. Ueber das Auftreten der Foraminiferen in den brakischen Schichten (Tegel und Sand) des Wiener Beckens. <Sitzb. d. K. Akad. d. Wiss. mathem.—naturw. cl., vol. xlviii, pp. 72-101, pl. 1. 1863.
- KARRER, F. Ueber die Lagerung der Tertiärschichten am Rande des Wiener Beckens bei Mödling. <Jahrbuch d. K. K. Geol. Reich., vol. xiii, pp. 30-32. 1863.
- KARRER, F. Ueber das Auftreten der Foraminiferen in dem Mergeln der marinen Uferbildungen (Leythakalk) des Wiener Beckens. <Sitzb. d. K. Akad. d. mathem.—naturw. cl., vol. i, pp. 692-721, 2 plates. 1864.
- KARRER, F. Ueber das Auftreten von Foraminiferen in den älteren Schichten des Wiener Sandsteins. <Sitzb. d. k. Akad. Wiss., vol. lii, p. 492, pl. i, 1865.
- KARRER, F. v. Zur Foraminiferenfauna in Oesterreich. — Gesammelte Beiträge. <Sitzb. d. k. Akad. d. Wiss. mathem.—naturw. cl., vol. lv, pp. 331-368, 3 plates. 1867.
- KARRER, F. v. Die miocene Foraminiferen fauna von Kostej im Banat. <Sitzb. d. k. Akad. d. Wiss. mathem.—naturw. cl., vol. lviii, pp. 121-193, 5 plates. 1868.
- KARRER, F. Ueber die Tertiärbildungen in der Bucht von Berchtoldsdorf bei Wien. <Jahrbuch d. K. K. Geol. Reich., vol. xviii, pp. 569-584, plate 15. 1868.
- KARRER, F. and TH. FUCHS. Geologische Studien in den Tertiärbildungen des Wiener Beckens. <Jahrbuch d. K. K. Geol. Reich., vol. xix, pp. 190-206. 1869.
- KARRER, F. Ein neues Vorkommen von oberer Kreideformation in Leitzersdorf bei Stockerau und deren Foraminiferen—Fauna. <Verhandl. d. K. K. Geol. Reich., 1870, pp. 31-33. 1870.
- KARRER, F. Ueber ein neues Vorkommen von oberer Kreideformation in Leitzersdorf bei Stockerau und deren Foraminiferen—Fauna. <Jahrbuch d. K. K. Geol. Reich., vol. xx, pp. 157-184, 2 plates. 1870.
- KARRER, F. Ueber die Foraminiferenfauna der sarmatischen Stufe in den durch die neueren Brunnenbohrungen in Döbling, Grinzing, Brunn am Walde, etc., erschlossenen Tegel-Schichten. <Verhandl. d. K. K. Geol. Reich., 1870, p. 44. 1870.

- KARRER, F. and DR. JOHANN SINZOW. Über das Auftreten des Foraminiferen-Genus *Nubecularia* im sarmatischen Sande von Kischenew. < *Sitzb. d. K. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lxxiv, pp. 272–284. 1 plate. 1876.
- KARRER, F., Geologie der Kaiser Franz-Josefs Hochquellen—Wasserleitung. Eine studie in den Tertiär—Bildungen am Westbände des alpinen Theiles der Niederung von Wien. 20 plates. < *Abhandl. d. K. K. geol. Reichsanstalt.* 1877.
- KARRER, F., Die Foraminiferen der Tertiären Thone von Luzon. In Dr. R. v. Drasche's Fragmente zu einer Geologie der Insel Luzon, p. 75, pl. v., 1878.
- KARRER, F., M. O. TERQUEM. Deuxième mémoire sur les Foraminifères du Système Oolithique (zone à *Ammonites Parkinsoni*) de la Moselle. Metz; 1869. Gesch. d. Verf. < *Vererhandl. d. K. K. geol. Reich.* 1870, pp. 81, 82, 1870.
- KARSTEN, H., Verzeichniss der im Rostocker academischen Museum befindlichen Versteinerungen aus dem Stenberger Gestein, 8vo. Rostock, 1849.
- KAUFMANN, F. J., Der Pilatus, geologisch untersucht und beschrieben. Fünfte Lieferung Beiträge zur geologischen Karte der Schweiz, 4to, 10 plates and map. Bern, 1867.
- KEFERSTEIN, C. Naturgeschichte des Erdkörpers, vol. ii; Palaontologie und Geologie. Leipzig, 1834.
- KLEIN, J. T. Tentamen methodi ostracologicæ sive disposito naturalis Cochlidium et Concharum in suas classes, genera et species, iconibus singulorum generum æri incisus illustrata. 4 maj. Lugduni-Batavorum, 1753.
- KOCH, A. Ueber einige neue Versteinerungen, etc, aus dem Hilsthon in Braunschweig (*Palaontographica* von Dunker und von Meyer, vol. i). 1851.
- KOCH, A. Geologische Studien aus der Umgegend von Eperies. < *Verhandl. d. K. K. Reich.* 1868, pp. 218, 219, 1868.
- KOCH, F. K. L. Über einige neue Versteinerungen und die Perna Mulleti, Desh., aus dem Hilsthon vom Elligser Brink und von Holtensen im Braunschweig'schen. < *Palaontographica Dunker und von Meyer's*, vol. i, pp. 178–173, pl. xxiv, 1848.
- KOCH, F., und W. DUNKER. Beiträger zur Kenntniss des Norddeutschen Oolithgebildes und dessen Versteinerungen. Braunschweig, 1837.
- KOLLIKER, A. Icones Histiologicæ, oder Atlas der vergleichenden gewebelchre, Erste Abtheilung—der feinere Ban der Protozoen. 4to. Leipzig, 1864.
- KUBLER, DR. J. und H. ZWINGLI. Die Foraminiferen des Schweizerischen Jura, nach gemerischäftlichen Forschungen mit Heinrich Zwingli, 4to. Winterthur, 1870.



- KUBLER, J. and H. ZWINGLI. Mikroskopische Bilder aus der Urwelt der Schweiz. <Neu jahrsblatt der Burgerbibliothek in winterthur. 1886.
- LACHMANN, JOHANN, ET CLAPAREDE; See Claparède.
- LAFONT, A. Pour servir a la Faune de la Giron de contenant la Liste des Animaux Marins dont la présence a arcachon a été pendant les années 1867 et 1868. <Actes de la Societe Linn. de Bordeaux, vol. xxvi, ser. 3, vol. vi, pp. 518-531. 1868.
- LANKESTER, E. R. Dredging in the Norwegian Fjords. <Nature, vol. xxvi, pp. 478, 479. 1882.
- LEDERMULLER, M. F. Mikroskopische Gemuths und Augen, Ergotzungen 4to Beyr, 1760-61. Edition in French, 1764-68, Amusement Microscopique, etc., 3 vols. 4to. Neuremberg.
- LINNÆUS, C. A. Systema naturæ, sive regna tria naturæ systematice proposita per classes, ordines, genera et species (Edit. X) Holmiæ.  
Previous editions contained the Polythalamia ("Nantili") enumerated by other writers; but in the ninth Linnæus separates them into species, in the tenth he gives them specific names, and in the twelfth he attaches to them the synonyms of other authors. 1758.
- LINNÆUS, C. Systema Naturæ, per Regna Tria Naturæ secundum classes, Ordines, Genera, et Species; cum characteribus, Differentiis, Synonymis, Locis; editis xii, reformata. Holmiæ, 1766.
- LOUNICKI, M. Vorläufige Notiz über die ältesten tertiären Süßwasser und Meeresablagerungen in Ostgalizien. <Verhand d. k. k. Geol. Reichsanstalt, pp. 275-278. 1884.
- LORIE, (DR.) J. Contributions à la Géologie des Pays Bas. I Résultats géologiques et paléontologiques des Forages de Puits à Utrecht, Goes et Gorkum. <Arch. du Musée Teyler., ser. II, vol. ii, pp. 109-240. 1885.
- MAITLAND, R. T. Descriptio systematic animalium Belgii septentrionalis, etc., pt. 7, p. 3, Rhizopodes. Leyden, 1851.
- MARSSON, T. Die Foraminiferen der weissen Schreibkreide der Insel Rügen. <Mittheil a d. naturw Verein v. Neu Vorpommern u. Rugen, Jahrg x, pp. 115-196, pl. i.-v. 1878.
- MARTENS. Reise nach Venedig, Th. ii. Ulm, 1838.  
Not seen.
- MARTIN, K. Die Versteinerungs-führenden Sedimente Timors, Nach Sammlungen von Reinwardt, Macklot, und Schneider. <Jaarboek van het Mijnwezen in Nederlandsch Oost-Indie, 1882, pp. 69-136, pls. ii, iii. 1882.
- MARTINI, F. H. W., and CHEMNITZ, J. H. Neues systemat. Conchylien Cabinet, geordnet u. beschrieben, 11 vols., 4o. Nürnberg, 1769-95.
- MARTONFI, L. Oslénytani Tanulmányok a Foraminiferakól. 8vo. Kolozsvart. 1880.

- MARTONFI, L. A. Kolozsvár vidéki harmadkori rétegek Foraminiferai (Fossil Foraminifera from the Tertiaries of Klansberg, Transylvania), orvos-termézetudományi Értesítő. Klausenburg, 1882.
- MAYER, K. Classification der Foraminiferen nach Reuss, Jones und Vanden Broeck, p. 4. (Privately issued.) Zurich, 1877-78.
- MERIAN, P. On the Foraminifera of the neighbourhood of Basle. <Quart. Journ. Geol. Soc. Lond., vol. viii, p. 38. 1852.
- MILLER, H. J., ET E. VANDEN BROECK. Les Foraminifères vivants et fossiles de la Belgique. <Mem. de la Soc. Mal. de Belg., vol. vii, pp. 15-46, 2 plates. 1872.
- MILLER, H. J. Observations sur la *Nummulites planulata* Var *A. minor* d'Arch et Haim. <Bull de la Soc. Mal. de Belg., vol. vii, pp. xx, xxi. 1873.
- MOEBIUS, K. Neue Rhizopoden. <Tageblatt der 49 Versamml d. deutsch. Naturf. in Hamburg, p. 15. 1876.
- MOEBIUS, K. Ueber die Bedeutung der Foraminiferen für die Abstammungslehre. <Tageb. 53 Versamml deutsche Naturf., pp. 81, 82. 1880.
- MOLLER, V. v. Ueber einige Foraminiferen führende Gesteine Persien's. <Jahrbuch d. K. K. Geol. Reich., vol. xxx, pp. 573-586, 2 plates. 1880.
- MULLER, J. Ueber die *Thalassicollen*, *Polycystinen*, and *Acanthometren* des Mittelmeeres. <Abhan. der K. Akad. der Wiss. zu Berlin., p. 1. 1858.
- MURRAY, A. Diss. Fundamenta Testaceologiæ (Linnæus). Upsaliæ, 1771.
- NEUGEBOREN, J. L. Foraminiferen aus dem Tegel-Thon von Felső-Lapugy, unweit Dobra. <Beiblatt zum siebenburger Boten, Jahrg. 1846, No. 94, pp. 433, 434. 1846.
- NEUGEBOREN, J. L. Die ersten Ergebnisse der Untersuchungen des Herrn Kustos Neugeboren in Hermannstadt über die Foraminiferen des Tegels von Felső-Lapugg unweit Dobra in Siebenbürgen. <Haidinger's Berichte über die Mittheilungen, etc., vol. ii, pp. 163, 164. 1847.
- NEUGEBOREN, J. L. Der Tegelthon von Ober-Lapugy und sein Gehalt an Foraminiferen-Gehäusen. <Verhandl. und Mittheil. des Siebenb. Vereins für Naturw. zu Hermannstadt, Jahrg. I, No. 77. 1849.
- NEUGEBOREN, J. L. Mittheilung über die Ergebnisse der weitern Untersuchung des Tegelthones von Ober-Lapugy. <Haidinger's Berichte über die Mittheilungen, etc., vol. iii, pp. 256-260. 1849.
- NEUGEBOREN, J. L. Foraminiferen von Felső-Lapugy unweit Dobra im Karlsburger District; beschrieben und nach der Natur gezeichnet. <Verhand. u. Mittheil. des Siebenb. Vereins für Naturw. zu Hermannstadt, Jahrg. i-iii. 1849-52.
- 1ter Art. *Glandulina*, Jahrg. I., Nos. 3, 4.—1 plate.
- 2ter Art. *Frondicularia* and *Amphimorphina*, Jahrg. I., No. 8.—2 plates.
- 3ter Art. *Marginulina*, Jahrg. II., Nos. 7, 8, 9.—2 plates.
- 4ter Art. *Nodosaria*, Jahrg. III., Nos. 3, 4.—1 plate.

- NEUGEBOREN, J. L. <sup>1)</sup> Schreib über fossile Polythalamien Siebenbürgens. <Meyn. Kieler Monatsschrift; Wahrscheinlich in den Verhandlungen des Siebenbürgischen Vereins für Naturwissenschaften. 1853.
- NEUGEBOREN, J. L. Der *Lingulina costata* als einer für Siebenbürgen neuen Foraminiferen—species. <Verhandl. u. Mittheil. des siebenb. Vereins, Jahrg. iv, No. 2. 1853.
- NEUGEBOREN, J. L. Die Foraminiferen aus der Ordnung der Stichostegier von Ober-Lapugy in Siebenbürgen. <Denkschr. d. math-naturw. cl. d. k. Akad. Wiss., vol. xii, p. 65, pls. i-v. 1856.
- NEUGEBOREN, J. L. Berichtigungen zu den in den Jahrgängen LII and LIII, der Verhandl. und Mittheil. über Foraminiferen von Ober-Lapugy erschienenen aufsatze. <Verhandl. u. Mittheil. d. siebenb. Vereins für Naturw., Jahrg. iii. 1860.
- NEUGEBOREN, J. L. Die Cristellarien und Robulinen aus der Thierklasse der Foraminiferen aus dem marinen Miocan bei Ober-Lapugy in Siebenbürgen. <Archiv. des des Vereines für siebenbürgische Landeskunde, new series, vol. x, p. 273, pls. i—iii. 1872.
- NIEDZWIEDZKI, J. Miocan am Sudwest-Rande des Galizische-Podoischen Plateaus. <Verhandl. d. K. K. Geol. Reich. 1879. pp. 263-268, 1879.
- NIEDZWIEDZKI, J. Bisherigergebnisse der Tiefbohrung in Kossocice bei Wieliczka. <Verhand. d. K. K. Geol. Reich. pp. 331, 332. 1885.
- NILSSON, S. Om de mangrummiga snackor som förekomma i Kritformationen i Sverige. <Stockholm Akad. Handl., vol. xlvi, pp. 329-343. 1825.
- NILSSON, S. Petrificata Suecana formationis cretaceæ, descripta et iconibus illustrata, pt. i, Fol. Lund, 1827.
- N. J. Foraminifères Fossiles du Bassin Tertiaire de Vienne (Autriche) déconvertis par Joseph de Hauer et décrits par Alcide d'Orbigny. Paris, 1846, 1 vol., 4to, with 21 plates. <Quart. Journ. Geol. Soc. Lond., vol. iii, part ii, pp. 69-71. 1847.
- NYST, H., et E. VANDEN BROECK. Observations sur le même sujet. <Bull. de la Soc. Mal. de Belg., vol. viii, pp. xxi-xxv. 1873.
- OLSZEWSKI, DR. ST. Zapiski paleontologiczne, (Foraminifera of the Chalk of Lemberg.) <Schriften d. physiogr. Comm. d. k. k. Ak. Wiss. Krakau., vol. ix, 95 plates. Cracow, 1874.
- PARKER, W. K. and JONES, T. R. Description of some Foraminifera from the coast of Norway. <Ann. and Mag. Nat. Hist., ser. 2, vol. xix, p. 273, 2 plates. 1857.

- PAUL, K. M. Ein Beitrag zur Kenntniss der tertiären Randbildungen des Wiener Beckens. <Jahrbuch d. K. K. Geol. Reich., vol. xiv, pp. 391-395. 1864.
- PETERS, K. F. Über Foraminiferen im Dachsteinkalk. <Jahrbuch d. K. K. Geol. Reich., vol. xiii, pp. 293-298. 1863.
- PICTET, F. J. Matériaux pour la Paléontologie suisse. Sér. 1—Description des fossiles du terrain Aptien de la Pert du Rhône et des environs du St. Croix, par F. J. Pictet et Renevier, pls. i-xxiii. Geneva, 1858.
- PHILIPPPI, R. A. Enumeratio Molluscorum Siciliæ, cum viventium tum in tellure tertiaria fossilum, quæ in itinere suo observavit, 4to, vol. i, 1836, Berlia; vol. ii, 1844. Halle, 1836-44.
- PHILIPPPI, R. A. Versteinerungen in Steinsalz von Wieliezka. <Neues Jahrb. fur Min. &c., 1843, pp. 568 and 569. 1843.
- PHILIPPPI, R. A. Beiträge zur Kenntniss der Tertärenversteinerungen des nordwestlichen Deutschlands. Kassel, 1843.
- PUSCH, GEO. G. Polens Palaontologie. Stuttgart, 1837.
- REICHERT, C. B. Ueber die Bewegungs-Erscheinungen an den Scheinfüssen der Polythalamien. <Monatsb. k. Preuss. Ak. Wiss. Berlin, 1862, pp. 406-426. 1862.
- REICHERT, C. B. Die Sogenannte Körnchenbewegung an den Pseudopodien der Polythalamien. <Archiv f. Naturgesch., vol. xxx, pp. 191-194. 1864.
- REICHERT, C. B. Bemerkungen zu M. Schultze's Journal-Artikel: Reichert und die Gromien <Archiv f. Anat. (Reich. und du Bois), pp. 286, 287. 1866.
- REICHERT, C. B. Über die contractile Substanz (*Sarcodæ*, *Protoplasma*) und ihre Bewegungs-Erscheinungen. <Abhand. d. Akad. d. Wiss. zu Berlin, 1866, pp. 151-293, 7 plates 1867.
- REINSCH, P. F. Notiz über die mikroskopische Fauna der mittleren und unteren frankischen Liasschichten. <Neues Jahrb. fur Min. &c., pp. 176-178. 1877.
- REUSS, A. E. Geognostische Skizzen aus Böhmen, vol. ii, Die Kreidegebilde des westlichen Böhmens. Prague, 1844.
- REUSS, A. E. *Polythalamia*, in Geinitz, Grundriss der Versteinerungskunde. Dresden und Leipzig. 1846.
- REUSS, A. E. Die Versteinerungen der böhmischen Kreideformation, 15 plates. Stuttgart, 1845-6.
- REUSS, A. E. Neue *Foraminiferen* aus den Schichten des österreichischen Tertiarbeckens Wien, aus dem 1 sten Bande der Denkschriften der Math. naturwissenschaftlichen Klasse der K. Academic Wissenschaften, 1849. vol i, pp. 365, —, pls. xlvi—li.

- REUSS, A. E. Die *Foraminiferen* und *Entomostraceen* des Kreidemergels von Lemberg. <*Haidinger's Naturwiss Abhandl.*, Band iv, pp. 17, —, pls. ii-vi. 1850.
- REUSS, A. E. Ueber die fossilen *Foraminiferen* und *Entomostraceen* der Septarienthone der Umgegend von Berlin. <*Zeit. d. Deutsch. Geol. Gesell.* vol. iii, pp. 49-92, 4 plates. 1851.
- REUSS, A. E. Beitrag zur Paläontologie der Tertiärschichten Oberschlesiens. <*Zeitschr. der Deutsch. Geol. Gesell.*, vol. iii, p. 140, pls. vii, ix. 1851.
- REUSS, A. E. Die *Foraminiferen* aus dem Septarienthon des Forts Lepold bei Stettin. Letter to Prof. Beyrich. <*Zeitschr. d. deutsch. Geol. Gesell.*, vol. iv, pp. 16-19, woodcuts. 1852
- REUSS, A. E. *Foraminiferen* des Mainzer Beckens. <*Neues Jahrb. Min. etc.*, Heft 6, p. 670. 1853.
- REUSS, A. E. Ueber *Entomostraceen* und *Foraminiferen* im Zechstein der Wetterau. <*Schriften der Wetterauischen Gesellschaft.* 1853.
- REUSS, (DR.) Ueber einige *Foraminiferen*, *Bryozoen* und *Entomostraceen* des Mainzer Beckens. <*Neues Jahrbuch, etc.*, 1852, pp. 670-679, plate 9. 1853.
- REUSS, A. E. Beiträge zur charakteristik der Kreideschichten in den Ostalpen. <*Denkschriften der Math. Nat. K. K. Acad. der Wiss. zu Wien.*, vol. vii. pls. xxv-xxviii. 1854.
- REUSS, A. E. Beiträge zur Geologischen Kenntniss Mährens. <*Jahrb. d. K. K. Geol. Reichsanst.*, vol. v, pp. 659-765. 1854.
- REUSS, A. E. Ein Beitrag zur genaueren Kenntniss der Kreidegebilde Meklenburgs. <*Zeit. d. d. Geol. Gesell.*, vol. vii, pp. 261-292. 4 plates. 1855.
- REUSS, A. E. Beiträge zur charakteristik der Tertiärschichten im nördlichen und mittleren Deutschland. <*Sitz. d. Kongl. ak. Miss, Wien.*, vol. xviii, p. 197, pls. i-xii. 1856.
- REUSS, A. E. Ueber die *Foraminiferen* von Pietzpuhl. <*Zeit. d. d. Geol. Gesell.*, vol. x, pp. 433-438. 1858.
- REUSS, A. E. Ueber die Verschiedenheit der chimischen Zusammensetzung der *Foraminiferenschalen*. <*Sitz. der Konegl. böhmischen Gesell. der Wiss.* vol. ii, in Prag. 1859, p. 78.
- REUSS, A. E. Ueber *Lingulinopsis*, eine neue *Foraminiferengattung* aus dem böhm. Pläner. <*Sitz. d. Konegl. böhm. Gesell. d. Wiss.*, vol. i, p. 23. 1860.
- REUSS, A. E. Die mariner Tertiärschichten Böhmens und ihre Versteinerungen. <*Sitzb. d. mathem.-naturew., cl.*, vol. xxix, pp. 207-285, 8 plates. 1860.

- REUSS, A. E. Die Foraminiferen der westphälischen Kreideformation. <Sitzb. d. mathem.—naturw. cl., vol. xl, pp. 147-238, 13 plates. 1860.
- REUSS, A. E. Ueber die Foraminiferen aus der Familie der Peneropliden. <Sitz. d. Königl. böhm. Gesell. d. Wiss., vol. i, p. 68. 1860.
- REUSS, A. E. Ueber Atoxophragmium, eine neue Foraminiferengattung. <Sitz. d. Königl. böhm. Gesell. d. Wiss., vol. ii, p. 52. 1860.
- REUSS, A. E. Ueber die Frondicularideen, eine Familie der polymeren Foraminiferen. <Sitz. d. K. böhm. Gesell. d. Wiss., vol. ii, p. 72. 1860.
- REUSS, A. E. Die Foraminiferen des Crag von Antwerpen. <Sitz. d. K. Akad. d. Wiss., vol. xlii. Auch französisch erschienen. 1860.
- REUSS, A. E. Abhandlungen über fossile Krabben und Monographie über Foraminiferen u. deren Schalen-Struktur. <Leon & Brown Jahrb., p. 65. 1860.
- REUSS, A. E. Entwurf einer Systematischen Zusammenstellung der Foraminiferen. <Sitz. akad. der Wiss. Wien., vol. xlv, p. 355, 1861; (abstract in Ann. and Mag. Nat. Hist. ser. 3, vol. vii, p. 190.
- REUSS, A. E. Paläontologische Beiträge II, Die Foraminiferen des Kreideuffs von Maastricht, pp. 304-324. III, Die Foraminiferen der Schreibkreide von Rügen, pp. 324-333. IV, Die Foraminiferen des senonischen Grünsandes von New Jersey, pp. 334-342. <Sitzb. d. mathem.—naturw. cl., vol. xlv, pp. 304-342, 8 plates. 1861.
- REUSS, A. E. Ueber die fossile Gattung *Acicularia*. <Sitzb. d. k. akad. d. Wiss., vol. xliii, p. 7, pl. i. 1861.
- REUSS, A. E. Neuere untersuchungen: 1, Ueber die Foripflanzung der Foraminiferen. 2, Ueber eine neue Foraminiferengattung *Haplostiche*. <Sitzb. d. Königl. böhm. Gesell. d. Wiss., vol. i, p. 12. 1861.
- REUSS, A. E. Kurze Notiz über eine neue Foraminiferengattung *Schizophora*. <Sitzb. d. K. Akad. d. Wiss., vol. ii, p. 12. 1861.
- REUSS, A. E. Beiträge zur Kenntniss der tertiären Foraminiferen—Fauna. <Sitzb. d. mathem.—naturw. cl. xlii, bd, pp. 355-370. 2 pls. 1861.
- REUSS, A. E. Entwurf einer systematischen Zusammenstellung der Foraminiferen. <Sitzb. d. mathem.—naturw. cl., vol. xlv, pp. 355-396. 1862.
- REUSS, A. E. Die Foraminiferen—Familie der Langenideen. <Sitzb. d. mathem.—naturw. cl., vol. xlvi, pp. 308-342; 8 plates. 1862.
- REUSS, A. E. Die Foraminiferen des norddeutschen Hils und Gault. <Sitzb. d. mathem.—naturw. cl., vol. xlvi, pp. 5-100; 13 plates. 1862.
- REUSS, A. E. Die fossilen Foraminiferen, Anthozoen und Bryozoen von Oberburg in Steiermark; 10 plates. <Denkschr. d. Kais. Akad. d. Wiss., vol. xxiii, p. 1, pls. 1-10. 1863.
- REUSS, A. E. Beiträge zur Kenntniss der tertiären Foraminiferen Fauna. <Sitzb. d. K. Akad. d. Wiss., mathem.—naturw. cl., vol. xlviii, pp. 36-71; 8 plates. 1863.

- REUSS, A. E. Les Foraminifères du Crag d' Anvers. < *Bullet. de l'Acad. Roy. de Belg.*, sér. 2, vol. xv, p. 137, pls. i-iii, Traduction de M. Grün. 1863.
- REUSS, A. E. Zur Fauna des deutschen Oberoligocäns. < *Sitzb. k. d. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. 1, pp. 435-482, 5 plates. 1865.
- REUSS, A. E. Über die Foraminiferen, Anthozoen und Bryozoen des deutschen Septarienthones. < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lii, pp. 283-286. 1865.
- REUSS, A. E. Foraminiferen und Ostrakoden der Kreide am Kanara—See bei Küstendsche. < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lii, pp. 445-470, 1 plate. 1865.
- REUSS, A. E. Die fossile Fauna der Steinsalzablagerung von Wieliczka in Galizien. < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lv, pp. 17-182, 8 plates. 1866.
- REUSS, A. E. Paläontologische Beiträge Foraminiferen und Ostracoden aus den Schichten von St. Cassian (pp. 101-107, plate 1.) < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lvii, pp. 79-109, 3 plates. 1868.
- REUSS, A. E. Zur fossilen Fauna der Oligocänschichten von Gaas. < *Sitzb. d. k. Akad. Wien.*, vol. lix, p. 446, pls. i-vi. 1869.
- REUSS, A. E. Die Foraminiferen des Septarienthones von Pietzpuhl. < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, vol. lxii, pp. 455-492. 1870.
- REUSS, A. E. Vorläufige Notiz über zwei neue fossile Foraminiferengattungen. < *Sitzb. d. k. Akad. d. Wiss. Mathem.—Naturw. cl.*, bd. lxix, pp. 277-281. 1871.  
Polyphragma and Thalamopora.
- REUSS, A. D. Die Bryozoen und Foraminiferen des unteren Pläner. aus Geinitz; Das Elbthal-Gebirge in Sachsen, I Theil. Cassel. 1872.
- REUSS, A. E. Die Foraminiferen, Bryozoen und Ostracoden des oberen Pläner, Geinitz; Das Elbthal Gebirge in Sachsen, II Theil. Cassel. 1874.
- REUSS, A. E., and A. FRITSCH. Verzeichniss von 100 Gypsmodellen von Foraminiferen welche unter der Leitung der Prof. A. E. Reuss und Dr. Anton Fritsch gearbeitet wurden. Prague, 1861.
- RICHTER, R. Aus dem thüringschen Zechstein. < *Zeitschrift d. deutsch. Geol. Gesell.*, vol. vii, p. 526, pl. xxvi. 1855.
- ROEMER, F. AD. Die Cephalopoden des Norddeutschen tertiären Meeressandes. < *Neues Jahrb. für Min.*, etc. 1838.
- ROEMER, F. A. Die Versteinerungen des norddeutschen Oolithengebirges, 4to. Halover, 1839.

- ROEMER, F. A. Die Versteinerungen des Norddeutschen Kreidegebirges, pt. 2, pl. xv, 4to Hannov, 1840-41.
- ROEMER, F. A. Neue Kreide-Foraminiferen. <Neues Jahrb fur Min, etc., Jahrg. 1842, p. 272, pl. vii. B. 1842.
- ROLLE, F. Ueber einige neue Vorkommen von Foraminiferen, Bryozoen und Ostrakoden in den tertiären Ablagerungen Steiermarks. <Jahrb. d. k. Geol. Reichsanst., vol. vi, pp. 351-354. 1855.
- RUTIMEYER, C. Ueber das Schweizerische Nummuliten-Terrian. mit besonderer Berücksichtigung des Gebirges zwischen dem Thunersee und der Emme, 4to. Bern, 1850.
- RUTIMEYER, —. Ueber das schweizerische Nummulitenterrain, etc., Inaug., Diss Bern, 1850, p. 69 u. 82 t. 37, 43-45.  
Not seen.
- RUTOT. Note sur une coupe des environs de Bruxelles. <Ann, de la Soc. de Belg. Mem., vol. i, pp. 49-59. 1874.
- SAINT FOND, B. F. and J. D. PASTEUR. Natuurlijke Historie van den St. Pieters Berg bij Maastricht. Numismalen en Madreporen, pp. 246-255, plate xxxiv. 1802.
- SANDAHL, O. Tva nya former af Rhizopoder. <Ofvers af K. Vet. Akad. Forh, xiv, 1857, pp. 299-303, 2 plates. 1858.
- SANDBERGER, F. Die Stellung der Raibler Schichten, Entgegnung, Foraminiferen in deuselben. <Verhandl. d. K. K. Geol. Reich. 1868, pp. 190-192. 1868.
- SARS, G. O. Undersogelser over Handangerfjordens Fauna. I.—Crustacea, etc. <Vidensk.-Selsk. Forhandlinger, 1871, p. 246. 1871.
- SARS, G. O. Indberetninger til Departementet for det Indre om de af ham i Aarene 1864-1878, anstillede Undersogelser angaaende Saltvandsfiskerierne. Christiania, 1879.
- SARS, M. Om de i Nosge forekommende fossile Dyrelevninger fra Quartærpeiroden, et Bidrag til vor Faunas Historie. <Universitetsprogram for foste halvaar, 1864. Christiania, 1865.
- SARS, M. Forsatte Bemærkninger over det dyriské Livs Udbredning i Havets Dybder. <Forhan. Vid. Selsk. 1868, pp. 246-286. 1869. List of Protozoa, pp. 248.
- SHACKO, G. Ueber Vorkommen ausgebildeter Embryonen bee einer Rhizopode, Peneroplis proteus, d'Orb. <Sitz. Gesell. naturf. Fr. Berlin, pp. 130-132. 1882.
- SCHACKO, G. Untersuchungen an Foraminiferen. I. Globigerinen Einschluss bei Orbulina. II. Embry in Peneroplis proteus. III. Perforation bei Peneroplis. <Wiegmann's Archiv. fur Naturgeschichte, Jahrg xlix, pp. 428-454, pls. xii, xiii. 1883.



- SCHAFHAEULT, K. E. V. Ueber die Nummuliten des bayer, südöstl. Gebirges mit Abbild. <*Neues Jahrbuch für Min., etc.*, 1846, 4 Heft., p. 406.
- SCHAFHAEULT, K. Das Em., Sud-Bayerns Lethaea geognostica. Der Kresenberg und die südlichen Hochalpen mit ihren Petrefacten. Fol., with Atlas. Leipzig, 1863.
- SCHAFHAEULT, C. E. v. Die Nummuliten fürrenden Schichten des Kresenberges als Nachtrag zum Aufsatz gleichen Titels im zweiten Hefte des neues Jahrb. für Min., etc., 1865, Nr. 769 bis 788.
- SCHLICHT, E. v. Die Foraminiferen des Septarienthones von Pietzpuhl, 38 plates, 4o. Berlin, 1870
- SCHLOTHEIM, E. F. v. Die Petrefactenkunde. Gotha, 1820.
- SCHMARDA. Neue formen von Infusorien, folio. 1849.
- SCHMID, E. E. Ueber die kleineren organischen Formen des Zechsteinkalks von Selters in der Wetterau. <*Neues Jahrb. für Min., etc.*, Jahrg. 1867, p. 376, pl. vi. 1867.
- SCHLUTER, C. *Celotrochium Decheni*, eine Foraminifere aus dem Mitteldevon. <*Zeitschr. deutsch. geol. Gesell.*, vol. xxxi, pp. 668-675, wood cuts. 1879.
- SCHMELCK, L. On Oceanic Deposits. <*Den Norske Nordhavs-Expedition, 1876-1878. [The Norwegian North-Atlantic Expedition, 1876-1878,—IX Chemistry—pt. ii.]* pp. 71, 2 maps. Christiania, London, Leipzig, Paris. 1882.
- SCHNEIDER, A. Beiträge zur Naturgeschichte der Infusorien. <*Müller's Archiv*. p. 191, 1854; translated in *Ann. and Mag. Nat. Hist.*, ser. 2, vol. xiv, p. 321. 1854.
- SCHNEIDER, A. Beiträge zur Kenntniss der Protozoen. <*Zeitschr. f. wissensch. Zool.*, vol xxx, Suppl., pp. 446-456, pl. xxi. 1878.
- SCHREIBERS, K. v. Versuch einer vollständ. Conchylienkenntness nach Linné's System. Wien, 1793.
- SCHROETER, J. S. Volständige Einleitung in die Kenntniss und Geschichte der Stein und Versteinerungen, 4 vols. 1774-84.
- SCHROTER, J. S. Einleitung in die Konchylien-kentniss nach Linne. Halle, 1783-86.
- SCHROTER, J. S. Ueber Kleine natürliche Ammonshörner. <*Der Naturforscher*, vol. xvii. Halle, 1782.
- SCHROTER, J. S. Ueber einige Entdeckingen und Beobachtungen an Schalthieren aus den linnäischen Geschlecht Nautilus, aus einigen Arten von Seesande. <*Neue Litteratur und Beiträge zur Kenntniss der Naturgeschichte, sonderlich der Conchylien und der Steine*, 8vo. Leipzig. 1784.

- SCHULTZE, MAX. Über den Organismus der Polythalamien (Foraminiferen) Nebst Bemerkungen über die Rhizopoden im Allgemeinen. S. F. 7 plates. 1854.
- SCHULTZE, M. Beobachtungen über die Fortpflanzung der Polythalamien. <Muller's Archiv, p. 165, 1856; abstracted in Quart. Journ. Micro. Sci. vol. v, p. 220, 1857.
- SCHULTZE, M. Die Gattung Cornuspira unter den Monothalamien, und Bemerkungen über die Organisation und Fortpflanzung der Polythalamien. <Wiegmann's Archiv., vol. ii, p. 287, 1860; translated in Ann. and Mag. Nat. Hist., vol. vii, p. 306, 1861.
- SCHULTZE, M. S. Das Protoplasma der Rhizopoden und der Pflanzenzellen. Leipzig, 1863.
- SCHULTZE, M. S. Über Polytrema miniaceum, eine Polythalamie. <Weigmann's Archiv. für Naturg., xxix Jahrg., vol. i, p. 81, pl. viii. 1863.
- SCHULTZE, M. S. Die Körnchenbewegung an den Pseudopodien der Polythalamien. <Archiv. f. Naturgesch., vol. xxix, pp. 361, 362, 1863.
- SCHULZE, F. E. Zoologische Ergebnisse der Nordseefahrt, vom 21 Juli bis 9 September, 1872. I, Rhizopoden; II, Jahresb. d. Komm. zur Untersuchung. d. deutsch. Meere in Kiel, p. 99, pl. ii. 1874.
- SCHULZE, F. E. Rhizopodstudien. <Archiv. für mikros. Anat., vols. x-xiii. 1874-76.
- I. Ueber den Bau und die Entwicklung von Actinosphærium Eichhornii., vol. x, p. 328, pl. xxii.
  - II. Raphidiophrys pillida, etc., vol. x, p. 377, pls. xxvi, xxvii.
  - III. Euglypha, Quinqueloculina fusca, vol. xi, p. 394, pls. xv, vii.
  - IV. Quadrula symmetrica, etc., vol. xi, p. 329, pls. xviii, xix.
  - V. Mastigamoeba aspera, etc., vol. xi, p. 583, pls. xxxv, xxxvi.
  - VI. Ueber den Kern der Foraminiferen. 2 Hypothetischer Stammbaum der Rhizopoden, vol. xiii, p. 9, pls. ii, iii.
- SCHWAGER, C., in Dittmar's Die Contorta-Zone, p. 198, pl. iii. 1864.
- SCHWAGER, C. Beitrag zur Kenntniss der mikroskopischen Fauna Jurassischer Schichten. <Wurttemb. naturw. Jahreshefte. vol. xxi, p. 82-151; 5 plates. 1865.
- SCHWAGER, C., in Dr. W. Waagen's—Ueber die Zone des Ammonites transversarius, von Prof. Dr. Albert Oppel. <Bencke's Geognostische-palaontologische Beiträge, vol. i, Heft ii, pp. 205-318, woodcuts. 1866.
- SCHWAGER, C. Foraminiferen aus der Zone des Ammonites Sowerbyi (Unter-Oolith). <Geognost. palaont. Beitr. von Bencke, Schlenker und Waagen, vol. i, Heft iii, pp. 645-665, pl. xxxiv. 1867.
- SCHWAGER, C. St. C. Foraminiferen aus der Zone des Amm. Sowerbyi (Unter-Oolith). <Verhandl. d. K. K. Geol. Reich. 1870, p. 248. 1870.
- SCHWAGER, C. Ueber die paläontologische Entwicklung der Rhizopoda. <Bronn's Klassen und Ordnungen des Thier-Reichs., Edit. Bütschli, pp. 242-260. 1881.

- SCHWEIGGER, A. F. Handbuch der Naturgeschichte der Skelctlosen ungegliederten Thiere. Leipzig, 1830.
- SIEBOLD, C. T. E. v. Bericht über die im Jahre 1841 und 1842, erschienenen Arbeiten in Bezug auf die Classen der Echinodermen, Acalephen, Polypen und Infusorien. <Wiegmann's Archiv. Jahrg. 1843, vol. II.
- SPENGLER, L. Beskrivelse over nogle i Havsandet nylig opdagede Kokillier; in Nye Samling af det Kong. Danske. Viden. Selskabs Skrifter; Kiøbenhavn, vol. i. 1781.
- SPENGLER, L. Schriften der naturforsch. Gesellschaft in Kopenhagen. 1793.
- SPEYER, O. Die Tertiär-Fauna von Sollingen bei Jerxheim in Herzogthum Braunschweig, 4to. Cassel, 1864.
- STACHE, G. Die Eocengebiete in Inner-Krain und Isbrien. <Jahrbuch d. K. K. Geol. Reich., vol. xiv, pp. 11-114. 1864.
- STACHE, G. Geologische Reisenotizen aus Istrien. <Verhandl. d. K. K. Geol. Reichsanstalt, 1872, p. 215. 1872.
- STACHE, G. Neue Fundstellen von Fusulinenkalk zwischen Gailthal und Canalthal in Kärnthén. <Verhandl. d. K. K. Geol. Reich., 1872, p. 283. 1872.
- STACHE, G. Neue Petrefactenkunde aus Istrien. <Verhandl. d. K. K. Geol. Reichsanstalt, 1873, p. 147. 1873.
- STACHE, G. Die Graptolithen-Schiefer am Osternig-Berge in Kärnten. <Jahrb. d. k. k. Geol. Reich., vol. xliii, p. 175. 1873.
- STACHE, G. Die Paläozoischen Gebiete der Ostalpen. <Jahrb. d. K. K. Geol. Reich., vol. xxiv, 1ter Absch. p. 135; 2ter Absch., p. 333. 1874.
- STEINMANN, G. Über Fossile Hydrozoen aus der Familie der Coryniden. <Palaeontographica, vol. xxv, p. 101, pls. xii-xv. 1878.
- STEINMANN, G. Mikroskopische Thierreste aus dem deutschen Kohlenkalke Foraminiferen und Spongien. <Zeitschr. d. deutsch Geol. Gesell., 1880, p. 394, pl. xix. 1880.
- STEINMANN, G. Zur Kenntniss fossilie Kalkalgen (triphoneen). <Neues Jahrb. fur Min., &c., vol. ii, pp. 130-140, pl. v. 1880.
- STEINMANN. Die Foraminiferengattung Nummuloculina. <Neues Jahrb. fur Min., &c., Jahrg. 1881, p. 31, pl. ii. 1881.
- STUR, DIONYS, VON. Bericht über die geologische Ueber-ichtsaufnahme des südwestlichen Siebenbürgen im sommer 1860. <Jahrbuch, d. K. K. Geol. Reich., vol. xiii, pp. 33-120. 1863.  
List of Foraminifera pp. 82, 83.
- STUR, D. v. Fossilien aus den neogenen Ablagerungen von Holubica bei Pieniaky, südlich von Brody im östlichen Galizien. <Jahrbuch, d. K. K. Geol. Reich., vol. xv, pp. 278-282. 1865.

- STUR, D. Beiträge zur Kenntniss der stratigraphischen Verhältnisse der marinen Stufe des Wiener Beckens. <Jahrbuch, d. K. K. Geol. Reich., vol. xx, pp. 301-342. 1870.
- STUR, D. Geologie der Steiermark. Gratz, 1871.
- TARANER, K. J. Bohemian Nebelidae. <Journ. R. Micro. Soc., ser. ii, vol. iv, pp. 247-249, 1884, (Translation). See also *Abh. Bohm. Gesell. Wiss.*, vol. xi, (1882) 55 pp. (5 pls.)
- THURMANN, J. and A. ETALLON. Lethæa Bruntrutana ou Etudes paléontologiques et stratigraphiques sur le Jura Bernois et en particulier les Environs de Porrentruy, partie 1, 4to. 1861.
- TIETZE, (DR) E. v. Beiträge zur Geologie von Lykien. <Jahrb. d. K. K. Geol. Reichs., vol. xxxv, pp. 283-386. 1885.
- TOULA, F. Die Tiefen der See—Ein Vortrag Plate and map. Vienna, 1875.
- TOULA, F. Die Tiefsee—Untersuchungen und ihre wichtigsten Resultate. <Mittheil. d. Geogr. Gesell. in Wien. Jahrg., 1875, No. 2, Plate and Map. 1875.
- TOULA, F. Ueber Orbitoiden und Nummuliten führen—de Kalke vom Goldberg "bei Kirchberg am Wechsel." <Jahrbuch, d. K. K. Geol. Reich., vol. xix, pp. 123-136. 1879.
- UHLIG, V. Die Jurabildungen in der Umgebung von Brünn. <Mojsisovics und Neumayr's Beiträge zur Palæont. von Oesterreich-Ungarn, vol. i, pp. 111-182, pls. xiii xvi. 1881.
- UHLIG, V. Über einige oberjurassische Foraminiferen mit agglutinirender Schale. <Neues Jahrb. für Min., etc., vol. i, p. 152. 1882.
- UHLIG, V. Vorkommen von Nummuliten in Ropi in West-Galizien. <Verhandl. d. K. K. Geol. Reichsanstalt, Jahrg. xvi, pp. 71, 72. 1883.
- UHLIG, V. Über Foraminiferen aus dem rjasan'schen Ornatenthone. <Jahrb. d. K. K. Geol. Reichsanstalt., vol. xxxiii, pp. 735-774, pls. vii-ix. 1883.
- UHLIG, V. Über die geologische Beschaffenheit eines Theiles der ost und mittelgalizischen Tiefebene. <Jahrb. d. K. K. Geol. Reichsanstalt., vol. xxxiv, pp. 175-231, pls. ii, iii. 1884.
- VANDEN BROECK, E. et H. J. MILLER. Observations sur la Nummulites planulata. <Bull. de la Soc. Mal. de Belg., vol. viii, pp. 31, 32. 1873.
- VANDEN BROECK, E. Quelques considérations sur la découverte, dans le calaire Carbonifère de Namur, d'un Fossil Microscopique nouveau. <Soc. Geol. de Belge Mem., pp. 16-27. 1874.
- VANDEN BROECK, E. Note sur les sondages de la Province d'Anvers par M. O. Ertborm. <Soc. Geol. de Belge Mem. Ann., vol. i, pp. 28-31. 1874.
- VANDEN BROECK, E. Une vraie Nummulite carbonifère par H. B. Brady (traduit). <Ann. de la Soc. Mal., de Belg. 1874.

- VANDEN BROECK, E. Quelques considérations sur la découverte, dans le calcaire carbonifère de Namur, d' un fossile microscopique nouveau (genre Numinulite). <Ann. de la Soc. Geol. de Belg. 1874.
- VANDEN BROECK, E. Note sur les Foraminifères de l' Argile des Polders. <Ann. Soc. Belg. Micros , vol. iii. 1876.
- VANDEN BROECK, E. Instructions pour la Récolte des Foraminifères vivants. <Ann Soc. Belge de Micros., vol. iv, p. 5. 1878.
- VANDEN BROECK, E. Notes sur les Foraminifères du littoral du Gard. Mines imp Clavel-Ballwet. <Bullet. soc. d' Etude Sci. Nat. de Mines, 6 Année, p. 18. 1878.
- VANDEN BROECK, E. Monographie des Foraminifères carbonifères et permieniens (le genre Fusulina ecepte) par H. B. Brady. <Ann. de la Soc. de Belg , vol. v, Bibliographie III, pp. 7-12. 1878.
- VANDEN BROECK, E , and P. COGELS. Observations sur les Couches Quaternaires et Pliocènes de Merxem près d'Anvers. <Ann. Soc. Malac. Belg., vol.; Bulet de Séances, p. 68. 1877.
- VERBEEK, R. D. M. Geologische Notizen über die Inseln des Niederlandisch-Indischen Archipels im Allgemeinen, und über die fossilführenden Schichten Sumatra's im Besonderen, 4to. Batavia, 1880.
- VINCENT, G. Matériaux pour servir a la Faune Laekenienne des environs de Bruxelles. <Mem. de la Soc. Mal. de Belg., vol. viii, pp. 7-15. 1873.
- VINCENT, G., et A. RUTOT. Relevé des sondages exécutés dans le Brabant par M. Van Ertborn. <Ann. de la Soc. de Belg. Mem., vol. v, pp. 67-99. 1878.
- VINCENT, G., et A. RUTOT. Note sur un sondage exécuté à la brasserie de la Dyle, à Malines. <Ann. de la Soc. de Belg. Mem., vol. vi, pp 13-27. 1879.
- VINCENT, G., et A. RUTOT. Coup d œil sur l'état actuel d'avancement des connaissances géologiques relatives aux terrains tertiaires de la Belgique. <Ann. de la Soc. de Belg. Mem., vol. vi, pp. 69-155. 1879.
- VON DADAY, E. On a Polythalamian from the Salt-pools near Déva in Transylvania. <Ann., and Mag. Nat. Hist., ser. 5, vol. xiv, pp. 349-363. 1864.
- Translation by W. S. Dallas, F. L. S., from the Zeitschrift for Wissenschaftliche Zoologie, vol. xi, pp. 465-480.
- VON DER MARCK (Dr.) Ueber fossile Coccolithen und Orbulinen der oberen westfalischen Kreide. Sitz. d. naturh. Ver. d. pr. Rheinl. u. Westphal, vol. xxviii, Corr.-Bl., pp. 60-62. 1871.
- VON DUNIKOWSKI, E. Nowe Foraminifery Kredowego Marglu Lwowskiego. <Kosmos, pl. i. Lemberg, 1879.

- VON DUNIKOWSKI, E. Die Spongien, Radiolarien und Foraminiferen der unterliassischen Schichten vom Schafberg. <Denkschr. d. math. naturw. cl. d. k. Akad. d. Wiss. Wien, vol. xlv, pp. 163-194, pls. i-vi. 1882.
- VON HAGENOW, A. E. Die Bryozoen der Maastrichter Kreide-Bildung, 4to. Cassel, 1850.
- VON HANTKEN, M. v. Die Tertiargebilde der Gegend westlich von Ofen. <Jahrbuch d. K. K. Geol. Reich., vol. xvi, pp. 25-58. 1866.
- VON HANTKEN, M. Akis-czelli talyag foraminiferai. <Magyar Foldt. Fursulat Munkalatai, vol. iv, p. 75, pls. i, ii. 1868.
- VON HANTKEN, M. Die geologischen Verhältnisse des Graner Braunkohlengebietes. <Jahrb. d. k. ungar. Geol. Anstalt, vol. i, p. 1, pls. i-v. Pest, 1872.
- VON HANTKEN, M. Der Ofner Mergel. <Jahrb. d. k. ungar. Geol. Anstalt, vol. ii, p. 208. 1873.
- VON HANTKEN, M., and S. E. VON MADARASZ. Katalog der auf der Wiener Weltausstellung im Jahre 1873, ausgestellten Nummuliten. Budapest, 1873.
- VON HANTKEN, M. Neue Daten zur geologischen und paläontologischen Kenntniss des südlichen Bakony. <Jahrb. d. k. ungar. geol. Anstalt., vol. iii, pp. 340-371, pls. xvi-xx. 1875.
- VON HANTKEN, M. Die Fauna der Clavulina Szabóí Schichten, 1 Theil—Foraminiferen. <Jahrb. d. k. ungar. geol. Anstalt., vol. iv, p. 1, pls. i-xvi. 1875.
- VON HANTKEN, M. Catalogue des Nummulites à Exposition de Paris. 1878.
- VON HANTKEN, M. Die Mittheilungen der Herrn Edm. Hébert und Munier-Chalmas über die ungarischen alttertiären Bildungen. <Literar. Bericht. aus. Ungarn, Jahrg. iii, pp. 687-719, pls. i, ii. 1879.
- VON ROBOZ, Z. Calcituba polymorpha, nov. gen., nov. spec. <Sitz. d. k. Ak. Wiss. Wien., vol. lxxxviii, pp. 420-432, 1 plate. 1883.
- VON SCHLOTHEIM, E. F. Beiträge zur Naturgeschichte der Versteinerungen in geognostischer Hinsicht. <Leonhard's Taschenbuch, vol. vii, pp. 1-134. Frankfurt, 1813.
- VON SCHAUROTH, K. F. Übersicht der geog. Verhältnisse der Gegend von Recoaro im Vicentinischen. <Sitz. d. k. Ak. Wiss. Wien., vol. xvii, pp. 481-562, pls. i-iii, and Map. 1855.
- WALCH, J. E. I. Die Naturgeschichte der Versteinerungen zur Erläuterung der knorr'schen Sammlung von Merkwürdigkeiten der Natur., 4 vols., fol. Suremberg. 1768-73.
- French translation, 1777-78, Recueil des Monuments des Catastrophes que le Globe Terrestre a essuies, contenant des Petrifications dessinees et enluminees d'après les originaux, avec l'histoire naturelle de ces corps. 4 vols. fol. Nuremberg.

- WALCAB UND KNOBR. Sammlung von Merkwürdigkeiten der Natur, etc. 1771.
- WATERS, A. W. Remarks on Fossils from Oberburg, Styria. <Quart. Journ. Geol. Soc. Lond., vol. xxx, pp. 337-341. 1874.
- WOLF, H. v. Die Stadt Oedenburg und ihre Umgebung. <Jahrbuch d. k. Geol. Reich., vol. xx, pp. 15-61. 1870.
- WINTHER, G. Fortegnelse over de i Danmark levende Foraminiferer. <Naturhistorisk Tidsskrift, 3 R, 9 B, p. 101. 1874.
- WRISBERG. Obser de Animalculis Infusorius, 1765. *Folding plate, 14 micro. figures.*  
Not seen.
- ZITTEL, K. A. Die obere Nummulitenformation in Ungarn. <Sitzungsb. d. K. Ak. Wiss. Wien., vol. xlvi, p. 353, pls i-iii. 1862.
- ZITTEL, (DR.) On the Upper Nummulitic Strata of Hungary. <Quart. Journ. Geol. Soc. Lond., vol. xix, p. 8. 1863.
- ZITTEL, K. A. Ueber Radiolarien der oberen Kreide. <Zeitschr. d. deutschen Geolog. Gesellsch., 1876, 130, Bd. 28, S. 75.
- ZITTEL, K. A. Ueber fossile Spongien und Radiolarien. <Neues Jahrb. für Min. 1876.
- ZITTEL, K. A. Handbuch der Paläontologie unter Mitwirkung von W. Ph. Schimper München. Oldenbourg, 1876. I Bd. 1 Lieferung.
- ZSIGMONDY, W. Der artesische Brunnen im Stadtwäldchen zu Budapest. <Jahrb. d. K. K. Geol. Reichsanstalt, vol. xxviii, p. 659. 1878.





PART VI.

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RUSSIA AND TURKEY.

## RUSSIA AND TURKEY.

- ABICH, H. Vergleichende Grundzüge der Geologie der Kaukasus, wie des armenischen und nordpersischen Gebirge. <*Mem. d. l' Acad. Imp. Sci. St. Petersbourg*, ser. 6, vol. vii, p. 528. 1858.
- ABICH, H. Ueber das Steinsalz und seine geologische Stellung im russischen Armenien Paläont Theil. <*Mem. Acad. Imp. Sci. St. Petersbourg*, vol. ix, p. 61, pls. i-x. 1859.
- ABICH, H. Geologische Forschungen in den Kaukasischen Ländern. II Theil,—Geologie des armenischen Hochlandes I Westhälfte, 4to, Atlas, 19 plates, map, &c. Vienna, 1882.
- DUCAN, P. M. Karakoram Stones or Syringosphæridæ. <*Scientific Results of the Second Yarkand Mission*, 4 plates, 4to. Calcutta, 1879.
- EHRENBERG, C. G. Bergkalk am Onega See in Russland zum Theil ganz aus sehr deutlich erhaltenen Polythalamien bestehend. <*Berichte d. Kongl. Preuss. Ak. Wiss.*, 1842, pp. 273-275. 1842.
- EHRENBERG, C. G. Ueber den Gehalt an unsicht kleinen Lebensformen aus einigen von Hrn. Prof. Koch aus Constantinopel eingesandten Proben der Meeresablagerungen in Marmora Meer und in Bosporus. <*Berichte d. Kongl. Preuss. Akad. Wiss.*, Berlin 1843, pp 253-257. 1843.
- EHRENBERG, C. G. Ueber die obersilurischen und devonischen mikroskopischen Pteropoden, Polythalamien und Crinoiden bei Petersburg in Russland. <*Sitz. d. Phys.—Math. Kl. Monatsb. Ak. Wiss. Berlin*, 1862, P. 599, pl. i. 1862.
- EICHWALD, E. Zoologia Specialis, etc., vol. ii, pp. 21-25. 1829-31.
- EICHWALD, E. Lethæa Rossica, ou Paléontologie de la Russie, 5 vols., 8vo, and atlas 4to. Stuttgart, 1855-61.
- FISCHER DE WALDHEIM, G. Adversaria Zoologica, 4to, 7 plates. Moscow, 1819.
- FISCHER DE WALDHEIM, G. Ueber Fusulina. <*Bull. de la Soc. Imp. des Nat. de Moscou*, vol. i, p. 329. 1829.
- FISCHER DE WALDHEIM, G. Oryctographie du Gouvernement de Moscou Fol. Moscow, 1829-37.
- GREWINGK, C. Die geognostischen und orographischen Verhältnisse des nördlichen Persiens. <*Verhandl. k. k. Mineralog. Gesellsch. St. Petersburg*, p 208; woodcuts.
- GRIMM, O. A. (The Caspian Sea and its Fauna, pt 1). St. Petersburg, 1876.

- KEYSERLING, C. Bemerkungen über einige Structurverhältnisse der Nummuliten. < *Verhandlungen der kais. russischen. mineralog. Gesellschaft zu Petersburg.* 1847
- MARESCHKOWSKY, K. S. Studien über die Protozoen des nördlichen Russland, Russisch. 133 p. u 3 Taf. St. Petersburg.  
Not seen.
- MOLLER, V. v. Die Spiral-gewundenen Foraminiferen des Russischen Kohlenkalks. < *Mem. de l' Acad. des Sci. de St. Petersbourg*, 7 série, vol xxv, 147 pp., 15 plates. 1878.
- MOLLER, V. v. Die Foraminiferen des russ. Kohlenkalks. < *Mem. Acad. des Sci. St. Petersburg*, ser. 7, vol. xxvii. 1879.  
Not seen.
- MOELLER, V. Über die Fusulinen und ahalische Foraminiferan-Formen des Russ. Kohlenkalks (vorläufige notiz). < *Neues Jahrbuch. für Min Geol. u. Pal.*, pp. 139-146. 1877.
- MOLLER, V. Die spiralgewundenen Foraminiferen des russ Kohlenkalks, U. 13 Taf. St. Petersburg, 4to. 1878.  
Not seen.
- MURCHISON, DE VERNEUIL AND DE KEYSERLING. Geology of Russia in Europe, vol. ii, Palæontology. 1845.
- ROUILLIER AND VOSINSKY. Etudes progressives sur la Géologie de Moscou. (*Bull. de la Soc. Imp. des Natur. de Moscou*, xol. xxii), pp. 337, pl. K. 1849
- ROUSSEAU. Voyage dans la Russie Méridionale, etc., sous la direction d' Anatole de Démiloff, vol ii. 1840.
- SPRATT, T. On the Geology of Varna and the Neighbouring parts of Bulgaria < *Quart. Journ. Geol. Soc. Lond.*, vol. xiii, pp. 72-83. 1857.
- VON KEYSERLING, GRAF A. Bemerkungen über einige Structurverhältnisse der Nummuliten. < *Verhandl. d. K. russisch. min. Gesellschaft*, Jahrg. 1847, pp. 16-22. 1847.
- VON MERESCHKOWSKY, C. Studien über Protozen des nordlichen Russland. < *Archiv für mikroskop. Anatomie*, vol. xvi, pp 153-248, pls. x. xi. 1878.
- ZBORZEWSKI, A. Recherches Microscopiques sur quelques Fossiles rares de Podolie et de Volhynie. < *Nou. Mem. Soc. Imp. des Natur. de Moscou*, vol. iii, pp 301-306, plate xxviii. 1834.
- ZBORZEWSKI, A. Raretés Microscopiques Podoliennes et Volhyniennes *Microphytozoa* < *Nou. Mem. Soc. Imp des Natur. de Moscou*, vol. iii, pp. 307-312. 1834.



PART VII.



AFRICA AND ASIA.

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- BACON, J. Notices of *Polythalamia*, in the sand of Sahara Desert. <Proc. Bos. Soc. Nat. Hist., vol. ii, p. 164. 1848.
- BAILY, W. H. Descriptions of Invertebrata from the Crimea. <Quart. Journ. Geol. Soc. Lond., vol. xiv, pp. 133-161. 1868.
- BARKER-WEBB, P., and BERTHELOT, J. Histoire Naturelle des I'les canaries., vol. ii, p. 123; Foraminifères par. M. D'Orbigny. Paris, 1835-40.
- BELLARDI, L. Liste des fossiles nummulitiques d'Egypte de la collection du musée de mineralogie de Turin. <Bull. de la Soc. Geol. de France, ser. 2, vol. viii, pp. 261-263. 1851.
- BRADY, H. B. On some Fossil Foraminifera from the West-coast District, Sumatra. <Geol. Mag., new series, dec. II, vol. ii, p. 532, pls. xiii, xiv. 1875.
- BRADY, H. B. On some fossil foraminifera from the West-coast District, Sumatra; with two plates. <Geol. Mag., pp. 532-539. 1875. Ook opgenomen in het Jaarb. Mijnwezen, 1878, I oplbz. 166 vindt men daar de beschrijving der bolronde fusuline (schwagerina), met afbeelding op platt I, fig. 6 a, b en c.
- BRADY, H. B. Ueber einige arktische Tiefsee-Foraminiferen gesammelt während der österreichisch-ungarischen Nordpol-Expedition in den Jahren 1872-74. <Denkschr. d. k. ak. Wissensch. Wien., vol. xliii, pp. 91-110, pls. i, ii. 1881.
- CARTER, H. J. On *Foraminifera*, their Organisation and their Existence in a Fossilized State in Arabia, etc. <Journ. Bomb. Br. Roy. Asiatic Soc., vol. iii, pp. 158-183, plates viii, ix. 1848.
- CARTER, H. J. On the Form and Structure of the Operculina (*Operculina Arabica*, Crtr.) <Journ. Bomb. Br. Roy. Asiatic Soc., vol. iv, p. 430, pl. xviii. 1852.  
Same Reprinted in the *Ann., and Mag. Nat. Hist.*, ser. 2, vol. x, p. 161, pl. iv. 1852.
- CARTER, H. J. Description of *Orbitolites Malabarica* (H. J. C.), illustrative of the Spiral and not Concentric Arrangement of Chambers in D'Orbigny's Order Cyclostègues. <Bomb. Br. Roy. Asiatic Soc., vol. v, p. 142, pl. ii, A. 1853.  
Same Reprinted in the *Ann., and Mag. Nat. Hist.*, ser. 2, vol. xi, pp. 425-427, pl. xvi. B. 1853.
- CARTER, H. J. Descriptions of some of the large Forms of Fossilized Foraminifera in Scinde; with Observations on their Internal Structure. <Journ. Bomb. Br. Roy. Asiatic Soc., vol. v, pt. 1, p. 124. 1855.  
Same Reprinted in the *Ann., and Mag. Nat. Hist.*, ser. 2, vol. xi, pp. 161-171, pl. vii. 1853.

- CARTER, H. J. On the true position of the Canaliferous Structure in the Shell of Fossil Alveolina (D'Orbigny). <Ann. and Mag. Nat. Hist., ser. 2, vol. xiv, p. 99, pl. iii. B. 1854.
- CARTER, H. J. Additional Notes on the Freshwater Infusoria in the Island of Bombay. <Ann. and Mag. Nat. Hist., ser. 2, vol. xx, p. 34. 1857.
- CARTER, H. J. On Contributions to the Geology of Western India, including Sind and Beloochistan. <Journ. Bomb. Br. Roy. Asiatic Soc., vol. vi, p. 161. 1860.
- CARTER, H. J. Further observations on the Structure of Foraminifera, and on the larger Fossilized Forms of Scinde, &c., including a new Genus and Species. <Journ. Bomb. Br. Roy. Asiatic Soc., vol. vi, p. 31. 1861.  
Same Reprinted in the Ann., and Mag. Nat. Hist., ser 3, vol. viii, p. 309, pls. xv, xvi, xvii. 1861.
- CARTER, H. J. Notes on the Freshwater Infusoria of the Island of Bombay. <Ann. Mag. Nat. Hist., ser. 2, vol. xviii, pp. 115-221. 1865.
- CARTER, H. J. Discription of a Siliceous Sand-Sponge found on the south-east coast of Arabia. <Ann. and Mag. Nat. Hist., ser. 4, vol. iii, pp. 15-17. 1869.
- DE GROOT, M. C. Notes on the Mineralogy and Geology of Borneo and the adjacent Islands. <Quart. Journ. Geol. Soc. Lond., vol. xix, pp. 515-517. 1863.
- DE LA HARPE, P. Monographie der in Ægypten und der libyschen Wüste vorkommenden Nummuliten. In Zittel's—Beitrage zur Geologie u. Paläontologie der libyschen Wüste u. der angrenzenden Gebiete, pp. 157-216, pls. xxx-xxxv. Paleontographica, vol. xxx. 1883.
- D'ORBIGNY, ALCIDE Des. Faune des Isles Canaries. (Historie des Isles Canaries, par M. M. Barker—Webb et Bertholet.) Folio. Paris, 1839.
- EHRENBERG, C. G. Verbreitung des jetzt wirkenden Kleinsten organischen Lebens in Asien, Australien und Afrika, und Bildung auch des Oolithkalkes der Juraformation aus kleinen polythalamischen Thieren. <Berichte d. Kongl. Preuss. Adad. Wiss. Berlin., 1843, pp. 100, 133, 137. 1843.
- EHRENBERG, C. G. Organische Kreidegebilde in Europa und Afrika. <Abhandl. d. K. Preuss. Akad. d. Wiss., (for 1844), pp. 57-97. 1844.
- EHRENBERG, C. G. Ueber das Kleinste Leben an mehreren bisher nicht untersuchten Erdpunkten; mikroskopische Organismen in Portugal, Spanien, Süd-Afrika, im indischen Ocean, Ganges, &c. <Berichte d. Kongl. Preuss. Akad. Wiss., 1845, pp. 304-322, and 357-377. 1845.
- EHRENBERG, C. G. Beitrag zur Kenntniss der unterseeischen Agulhas-Bank an der Südspitze Afrikas als eines sich kundgebenden grünsandigen Polythalamien-Kalkfelsens. <Monatst. d. K. Preuss. Akad. Wiss. Berlin., (1863), pp. 379-394. 1863.

- ETHERIDGE, R. (jun). A catalogue of Australian Fossils (including Tasmania and the Island of Timor), stratigraphically and Zoologically arranged, 8vo. Cambridge, 1878.
- GEINITZ, H. B. und W. v. d. MARCK. Zur Geologie von Sumatra. <*Paleontographica*, vol. xxii, pp. 399-414. 1876.
- GRANT. Memoire to illustrate a geological Map of Cutch. <*Trans. Geol. Soc. Lond.*, second series, vol. v, part ii. 1840.
- HAMILTON, A. On the Foraminifera of the Tertiary Beds at Petane, near Napier. <*Trans. New Zeal. Instit.*, vol. xiii, pp. 393-396, pl. xvi. 1880.
- HAMILTON, W. J. On a specimen of Nummulitic Rock from the neighbourhood of Varna. <*Quart. Journ. Geol. Soc. Lond.*, vol. xi, pp. 10, 11. 1855.
- HITCHCOCK, E. Notes on the Geology of several parts of Western Asia, founded chiefly on Specimens and Descriptions from American Missionaries. <*Trans. Assoc. Amer. Geol. and Nat.*, 1840-42, pp. 340-421, plate xv. 1843.
- HUGUENIN, J. Note on a Species of Foraminifera from the Carboniferous Formation of Sumatra. <*Abstracts Proc. Geol. Soc.* No. 321, p. 4. 1876.
- JEFFREYS, J. G. The Post-Tertiary fossils procured in the late Arctic Expedition, with notes on some of the Recent and living Mollusca from the same expedition. <*Ann., and Mag. Nat. Hist.*, ser. 4, vol. xxii, pp. 229-241. 1877.
- JONES, F. W., O. RYMER. On some Recent forms of Lagenæ from Deep-sea Soundings in the Java Seas. <*Trans. Linn. Soc. Lond.*, vol. xxx, p. 45, pl. xix. 1872.
- JONES, T. R., in Dr. G. A. Mantell's—Notice of the Remains of the Dinornis and other Birds, and of Fossils and Rock Specimens, recently collected by Mr. Walter Mantell in the Middle Island of New Zealand, with Additional Notes on the Northern Island. <*Quart. Journ. Geol. Soc. Lond.*, vol. vi, pp. 319-342, pls. xxviii, xxix. 1850.
- JONES, T. R., in Heaphy's paper on New Zealand—Foraminifera from Orakei Creek. Auckland. <*Quart. Journ. Geol. Soc. Lond.*, vol. xvi. p. 251. 1860.
- JONES, T. R. Notes on some Specimens of Nummulitic Rocks from Arabia and Egypt. <*Quart. Journ. Geol. Soc. Lond.*, vol. xxv, p. 38. 1869.
- KARRER, F. Die Foraminiferen-Fauna des tertiären Grünsandsteines der Orakei-Bay bei Auckland. <*Novara-Exped. Geol. Theil.*, vol. I, Palaont p. 71, pl. xvi. 1864.
- LARTET, L. Essai sur la géologie de la Palestine et des contrées avoisinantes, etc. *Ann., des. Sci. Geol.*, vol. iii. 1869.



- LARTET, L. Exploration Géologique de la Mer Morte, de la Palestine, et de l'Idumée, 4to. Paris, 1877.
- MACDONALD, J. D. Observations on the Microscopic Examination of Foraminifera observed in deep-sea bottoms in the Feejee Islands. <Ann., and Mag. Nat. Hist., vol. xx, 2d series, p. 195. 1857.
- MANTELL, DR. G. A. On the Geology of New Zealand. <Quart. Journ. Geol. Soc. Lond., vol. vi. 1850.
- MANTELL, W. Sketch of the Geology of part of the Eastern Coast of the Middle Island of New Zealand. <Quart. Journ. Geol. Soc. Lond., vol. vi, pp. 319-342, 2 plates. 1850.
- MARTIN, K. Untersuchungen über die Organisation von Cycloclypeus, Carp., und Orbitoides, d'Orb. <Niederländisches Archiv für Zool., vol. v, p. 185, pls. xiii, xiv. From Junghuhu's Die Tertiärschichten auf Java Palaont., Theil, Lfg. 3. 1880.
- MOBIUS, K. Foraminiferen von Mauritius. <Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen, bearbeitet von K. Mobius, F. Richters und E. von Martens, 4to, 22 plates. Berlin, 1880.
- MARTIN UND WICHMANN. Sammlungen des geol. Reichs Museums in Leyden. <Beitrag zur Geologie Asiens un Australiens (Java, p. 105). 1881.
- PARKER, W. K. On the Miliolitidæ (Agathistégues, D'Orbigny) of the East Indian Seas Part I, Miliola. <Trans. Micr. Soc. Lond.; Quart. Journ. Micr. Sci., vol. vi, pp. 53-59. 1858.
- PARKER, W. K. AND T. R. JONES. Note on the Foraminifera from the Bryozoan Limestone near Mount Gambier, South Australia. <Quart. Journ. Geol. Soc., Lond., vol. xvi, p. 261. 1860.
- ROEMER, F. Ueber eine Kohlenkalk-Fauna der Westküste von Sumatra. <Palaentographica, vol. xxvii, pp. 1-11, plate 1. 1880 81.  
Schwagerina Verbeeki, Geinitz sp. Fusulina granum-avenae, Roem.
- RICHTHOFEN, F. VON F. Über das Vorkommen von Nummulitenformation auf Japan und den Philippinen. <Zeit. d. d. Geol. Gesell., vol. xiv, pp. 357-360. 1862.
- RICHTHOFEN, BRON. VON. On the existence of the Nummulitic formation in China. <Amer. Journ. Sci., vol. i, ser. 3, pp. 110-113. 1871.
- RUSSEGER, M. On altered tertiary rocks near Cairo. <Quart. Journ. Geol. Soc. Lond., vol. v, part ii, pp. 1-4. 1849.
- SCHWAGER, C. Dr. Fossile Foraminiferen von Kar-Nikobar. <Reise der Osterreichischen Fregatte Novara um die Erde. Geologischer Thiel., vol. ii, pp. 187-268, 4 plates. 1866.
- SCHWAGER, C. Carbonische Foraminiferen aus China und Japan. <Richtofen's-Beiträge zur Palaentologie von China, pp. 107-169, pls. xv-xviii. (Dated 1883.) 1882.

- SCHWAGER, C. Die Foraminiferen aus den Eocanablagerungen der libyschen Wüste und Ägyptens. In Zittel's-Beiträge zur Geologie u. Palaontologie der libyschen Wüste u. der angrenzenden Gebiete; pp. 81-153, pl. xxiv-xxix. <Palaeonographica, vol. xxx. 1883.
- SOWERBY, J. DE C. Appendix to Capt. Grant's-Memoir to illustrate a Geological Map of Cutch. <Trans. Geol. Soc. Lond., 2nd ser., vol. v, part ii, pl. xxiv. 1840.
- STACHE, G. Foraminiferen der tertiären Mergel des Whaingaroa Hafens (Provinz Auckland). <Novara-Exped., Geol. Theil., vol. i.—Palaont., p. 161, pls. xxi-xxiv. 1864.
- STACHE, G. Fusulinenkalke aus Ober-Krain, Sumatra and Chios. <Verhand. d. k. k. Geolog. Reichsanstalt, No. 16, pp. 369-371. 1876.
- STOLICZKA, F. Cretaceous Fauna of South India, vol. iv—Rhizopoda or Foraminifera. pp. 61, 62, pl. xii, fig. 3-5. Mem. Geol. Survey of India, 1872-3. 1873.
- STOLICZKA, F. Description of a species of Sponges and one of Foraminifera from the Cretaceous deposits of South India. <Mem. Geol. Sur. India Palaeon Indica, vol. iv, pp. 59-62, plate 12. 1872-3.  
Orbitoides Faujasi (Defrance.)
- VANDEN BROECK, E. On some Foraminifera from Pleistocene Beds in Ischia. <Quart. Journ. Geol. Soc. Lond., vol. xxxiv, pp. 197, 198. 1878.
- VERBEEK, R. D. M. Die Nummuliten des Borneo-Kalksteins. <Neues Jahrbuch, Min., 1871, pp. 1-14, 3 plates. 1871.
- VERBEEK, R. D. M. On the Geology of Central Sumatra. <Geol. Mag., new series, dec. II, vol. ii, p. 477. 1875.
- VERBEEK, R. D. M. Topographische en Geologische Beschrijving van een gedeelte van Sumatra's Westkust, 415 Batavia, 1883. Fusulina granum avenac, n. sp. p. 261.
- VERNEUIL, E. P. de. Liste de Fossiles des Terrains tertiaires des environs d' Alger. <Bull, Soc. Geol. de France., vol. xi, pp. 74-82. 1839.
- VON FRITSCH, K. Einige eocene Foraminifern von Borneo. <Palaeontographica, 1878, Suppl. III, pt. i, pp. 139-146, pls. xviii, xix. 1878.
- WOOD, J. E. T. On some Tertiary Deposits in the Colony of Victoria, Australia. <Quart. Journ. Geol. Soc. Lond., vol. xxi, pp. 389-394. 1865.

## ERRATA.

- Page 177, line 10 from top—before word proper insert the.  
 Page 178, line 3 from top—for xxv read xv.  
 Page 178, line 4 from bottom—for Rocks read Limestones.  
 Page 179, line 15 from top—for xl read xl.  
 Page 179, line 16 from top—for This read The.  
 Page 180, line 20 from top—for S. W. read J. W.  
 Page 181, line 23 from top—for appearance read appearances.  
 Page 181, line 1 from bottom—for 66 read 68.  
 Page 182, line 8 from bottom—for 1886 read 1868.  
 Page 183, line 8 from bottom—for organic read inorganic.  
 Page 185, line 22 from top—for Notizer read Notizen.  
 Page 190, line 5 from bottom—for J. B. read J. W.  
 Page 191, line 4 from top—for 1871 read 1875.  
 Page 191, line 5 from top—for 1872 read 1876.  
 Page 191, line 6 from top—for Englypha read Englypha.  
 Page 191, line 10 from top—for *Pascedlas* read *Pasceolus*.  
 Page 191, line 16 from top—for viii read vii.  
 Page 191, line 26 from top—for *Valulina* read *Valvulina*.  
 Page 191, line 27 from top—for *deceurrens* read *decurrrens*.  
 Page 191, line 28 from top—for *plicata* read *plicata*.  
 Page 191, line 30 from top—for *Rotælia* read *Rotalia*.  
 Page 192, line 9 from top—for *Mantelii* read *Mantelli*.  
 Page 192, line 28 from top—after Pembina insert Mountain.  
 Page 193, line 18 from top—for Tadaissac read Tadoussac.  
 Page 193, line 12 from bottom—for Meridinale read Meridionale.  
 Page 194, line 10 from bottom—for Krede read Kreide.  
 Page 194, lines 12, 13 from top—for *polythalmia* read *polythilamia*.  
 Page 196, line 1 from top—for 2881 read 1881.  
 Page 196, line 14 from top—for *Lepidoiites* read *Lepidolites*.  
 Page 197, line 6 from top—for Om read On.  
 Page 197, line 1 from bottom—for Carribean read Caribbean.  
 Page 198, line 10 from top—for South read Southern.  
 Page 198, line 8 from bottom—for Foraminifera read Foraminiferen.  
 Page 200, line 2 from top—for Murry read Murray.  
 Page 201, line 14 from top—for Palaontologre read Palaontologie. Analysisster read Analysisirter.  
 Page 204, line 17 from top—for tublos read tubulosa.  
 Page 206, line 3 from bottom—for vii read iv.  
 Page 208, line 23 from top—for vii read viii.  
 Page 210, line 19 from top—for Polders read Polytre mata.  
 Page 211, line 2 from top—for Roy read Ray.  
 Page 212, line 24 from top—for Polythemata read Polytre mata.  
 Page 212, line 1 from bottom—for v read iii.  
 Page 213, line 13 from bottom—for 1882 read 1883.  
 Page 214, line 4 from bottom—for House read Howse. Kirkly read Kirkby.  
 Page 216, line 1 from top—for Prestwick's read Prestwich's.  
 Page 217, line 10 from top—for Mendon read Meudon.  
 Page 217, line 8 from bottom—for Tumanowiczie read Tumanowiczii.

- Page 218, line 10 from top—for Kirkly read Kirkby.  
Page 218, line 2 from bottom—insert pp 264-266, 1 plate. For xxi read xx.  
Page 219, line 11 from bottom—for Southerndown read Southerndown.  
Page 219, line 15 from bottom—for S R read St.  
Page 219, line 1 from bottom—for xvi read xxvi.  
Page 220, line 3 from top—for Britanica read Britannica.  
Page 220, line 9 from top—for xl read xi.  
Page 221, line 6 from top—for Protozon read Protozoa.  
Page 222, line 5 from top—for xl read xi.  
Page 222, line 6 from bottom—insert xlv.  
Page 224, line 6 from top—for Snyopsis read Synopsis.  
Page 224, line 19 from bottom—for 297 read 292.  
Page 224, line 13 from bottom—insert Park.  
Page 224, line 11 from bottom—for D read Dr.

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## VII.

## NEW SPECIES OF FOSSILS.

---

BY N. H. WINCHELL.

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**CRYPTOZOON MINNESOTENSE, n. sp.**

Plates I and II,

(Compare *Cryptozoon proliferum*, Hall, thirty-sixth regents' report on the New York State Cabinet, plate VI.)

In 1875, and again in 1877 specimens of doubtful organic forms were collected by the writer at Northfield from the magnesian limestone beds that outcrop along the left bank of the Cannon river a mile and a mile and a half below the city. These were registered in the General Museum of the University with the numbers 2391, and 2563 without special description. In May, 1885, the same form was seen more abundantly in the uppermost layers of similar limestone at Cannon Falls, in Goodhue county, and was registered as a "supposed stromatopora," with the number 5865. In both cases this fossil has been found in the upper layers of this limestone, directly beneath the St. Peter sandstone, which can be seen in both places, in outcrop but a few rods away. The museum is indebted to Mr. W. H. Scofield of Cannon Falls, for the finest and largest perfect specimen of this fossil that has yet been seen. A specimen having the same laminated structure and from the same formation (so far as could be judged from the lithology and the geographical position) was found in the drift in Fillmore county; and silicified masses of laminated rock are referred to in the report on that county in vol. i of the final report, p. 283, where they are compared to *Eozoon canadense*. It is highly probable that all these belong to the same generic form, and probably to the same species, though there is a constant difference in outer

shape between those seen at Northfield and those at Cannon Falls.

The specimens obtained at Northfield (Pl. II., fig. 4) are sub-cylindrical with a conical upward apex. They are from one to three inches long, the length depending apparently on the circumstances that attended their removal from the enclosing rock, and from one to two inches in diameter. They appear, outwardly, like a succession of cups, or thimbles, piled on each other, the lower end of each covering the upper, closed end of the one below it. But the lower edge of each cup is ragged and capriciously fractured, due to the weathering out of the specimen from the enclosing rock, for it is probable that the specimens would not be discovered except for the distinctness of the cup-shaped lamination which is made conspicuous by exposure to the weather. It is evident that they are not always cylindrical, nor sub-cylindrical, since the impressions of the apices of several, remaining on the under surface of a small slab of rock, are somewhat elongated, though the most of these are concave, and shaped like the conical tops of the most of the detached specimens. The frayed edges of the laminæ vary in frequency and in thickness. Generally two or three occupy the space of a quarter of an inch, but the intimate structure shows, in a thin section, a much finer lamination, viz.: from six to ten laminæ in a quarter of an inch.

The specimens from Cannon Falls show a similar but much finer lamination, the laminæ being as frequent as six or eight laminæ in a quarter of an inch, as visible to the eye. In a thin section the fine lines indicating the sections of the laminæ are as numerous as ten to fourteen in a quarter of an inch (Pl. II., Fig. 3). Furthermore the Cannon Falls specimens are quite different in outward form. They are shaped like the fossil from the Trenton which is well known under the name *Chætetes petropolitanus*, but attain an immense size. The largest perfect specimen seen, detached, is that kindly furnished by Mr. Scofield, who found it at Cannon Falls, weathered out from the Shakopee limestone, and is nearly sixteen inches in diameter across the base, and eight inches in height. Its form is well represented by figure 42 (A),\* on page 317 of Mr. Nicholson's *Palaeozoic*

\*Now separated by Mr. Nicholson under the name *Monticulipora (Diplotrypa) Whitervesii*.

*tabulate corals*. Numerous others of equally symmetrical outlines, varying in size from three inches to ten inches in transverse diameter have been gathered at Cannon Falls. They are also seen to overlap each other and to be of various shapes when crowded in the rock. The surface of the rock is nearly covered with them over a space of a square yard or more at a point in the highway near the depot of the Chicago, Milwaukee and St. Paul railway. The under surfaces of perfect specimens are concentrically striated or ridged. This form has been seen at Mankato where it occurs in the upper portion of the bluffs, in the limestone that is used for quicklime, the diminished representative of the Shakopee limestone. It is more common than that seen at Northfield, and the name *minnesotense* is applied to it. The resemblance of the Northfield form to the Phrygian cap suggests for this variety the distinctive term *libertatis*.

These forms may be varieties of Prof. Hall's species *proliferum*; but they differ markedly from that in the manner of growth. They are convex upwardly, instead of concave, and while having apparently a main central point of attachment from which growth proceeded, they spread laterally over the surface, and each grand added layer of growth seems to be expressed in the concentric undulations seen on the base, which has a central depression rising toward the center of the mass.

Prof. Hall has kindly supplied me with a specimen and a mounted thin section of *Cryptozoon proliferum*, for comparison, from which it is seen that the lamination is quite similar in general character, but much finer in the Minnesota forms.

*Locality and formation*: Cannon Falls, Northfield, and Mankato in the Shakopee limestone.

*Museum Register* numbers 2391, 2563, 5865, and 6487.

### **RHYNCHONELLA AINSLIEI, n. sp.**

Plate II, figs. 5 and 6.

Of this species only the exterior is known. It varies from a quarter of an inch, or less, to three quarters of an inch in transverse dimension. Mature specimens measure somewhat more than half an inch from front to rear. The plications are finer and more numerous than in *R. capax*, with which it is constantly

associated, but from which it can easily be distinguished by this, obvious character. It is also a broader shell, generally, and, like *R. Capax*, has not been known to acquire in Minnesota those rotund proportions which the latter exhibits in Indiana and Ohio.

The smaller, or dorsal, valve has an upward, rounded flexure at the center which extends from the front about three-fourths of the distance to the beak, where it blends with the general convex surface of the valve. The corresponding flat depression of the ventral valve can be traced perhaps a little further toward the beak. On the dorsal valve are from 28 to 34 plications, of which six or seven are on the mesial fold. On the ventral valve, which has a distinct, free, perforate, curved beak, are about the same number of plications, of which six or seven are in the depressed mesial lobe. On each valve, the outer ones of those plications embraced in the mesial fold are partly on the sloping surface from the fold to the general surface of the valve. The mesial flexure of the valves is much less marked in the young specimens.

The beak of the dorsal valve is wholly hid by the curvature of the beak of the ventral valve. The beak of the ventral valve is perforated at the apex by a circular foramen which, however, is coalescent with the deltidium, which extends to the hinge-line with slightly diverging lateral margins. On either side of the deltidium of the ventral valve is a curving faintly striated lamella, simulating a cardinal area such as is seen in *Orthis*.

The plications of the shell are crossed diagonally by fine striations of growth, but in no case have these striations been seen so conspicuous and ornamental as in some specimens of *R. capax* from Ohio. Indeed they are hardly visible except under a magnifier:

*Locality:* This fossil is found throughout the southeastern part of the State wherever the Trenton shales appear in outcrop, and extends as far north as Minneapolis where it is common in the shales that overlie the Trenton limestone.

*Museum numbers* 324, 734, 4031, 5480, 5489, 5521, 5492, 5512, 5505, 5517.

The specific name is given in honor of Mr. N. S. Ainslie, of Rochester, Minn., at the request of Prof. R. P. Whitfield.



**ORTHIS REMNICA**, n. sp.

Plate II, fig. 7.

Shell about an inch in transverse diameter and about three-quarters of an inch in length, from front to rear; it is regularly oblong-oval, with the greater diameter transverse, marked by coarse, bifurcating costæ which radiate from the beak. The ventral valve has a shallow mesial depression which begins near the beak and widens toward the front so as to occupy on the front margin nearly a third of the width of the shell. The beak is not prominent, and in all the specimens seen, which are rather poor, it seems not to rise beyond the hinge area; the cardinal angles are rounded, so far as preserved in any specimens seen.

No other characters of this shell can be given, as it is only seen in fragments which are but rarely large enough to satisfactorily characterize the genus *Orthis*. Very many impressions and fragments of its valves are found in a brownish magnesian limestone at Red Wing, which lies beneath the surface of the grade of the street, from two to six feet, at the corner of Brush and Main streets. This limestone was excavated in the construction of the city sewers, and seems to be a lenticular layer but a foot or two in thickness.

*Formation:* This layer is in the St. Croix formation, about 125 or 150 feet below the limestone which there rises in the summits of the bluffs.

*Museum Register numbers* 6041 and 6070.

Before this the only mention of *Orthis* at this low horizon seems to be that of Prof. A. Winchell, who has described *Orthis barabuensis*\* from Devil's lake, Wisconsin. (*Am. Jour. Sci.*, vol. xxxvi, p. 229. 1864); *Orthis pepina*, described by Prof. James Hall in 1863, (Sixteenth Report on the New York State Cabinet, p. 134,) who reported it from Reed's Landing, Minnesota, and Osceola, Wisconsin; *Orthis coloradoensis*, described by B. F. Shumard from Burnet county, Texas, (*Trans. St. Louis Acad.*, vol. 1, p. 627), who incidentally (*loc. cit.*) referred to an *Orthis* "from the Potsdam sandstone of Minnesota," found in casts in a fine-grained sandstone, but which he never described, and *Orthis*

---

\*Prof. R. P. Whitfield (*Geol. of Wis.*, vol. iv, p. 171.) regards this as more likely to be a *Leptaena*

*curekensis*, recently published by C. D. Walcott, from the Eureka district of Nevada. (Palæontology of the Eureka District, p. 22). The species described above differs widely from all these, and cannot be mistaken for either of them.

**ORTHIS SANDBERGI**, n. sp.

Plate II, Figs. 8 and 9.

Associated with the last are distinct impressions of a four-lobed brachiopod which is doubtfully referred to the genus *Orthis*. The greatest width of the shell is on the hinge-line, amounting to half an inch, or somewhat less; from the ends of which the margins of the valves retreat abruptly, producing acute cardinal angles. After a shallow re-entrant angle, or curve, the lateral margins swell out again in passing the anterolateral spaces, forming rounded lobes, one on each side of the median line. As they approach the center of the front, they again crowd inward forming at the front an indentation. These lobes on the larger valve are coincident with elevations on the exterior of the shell, and the retreating angles with depressions, both of which extend from the margin to the beak, the aspect in general being rather spiriferoid or four-lobed. The specimens are all casts or impressions, the shell substance having been absorbed. These impressions are smooth, though there is in one case an appearance as if the outer surface of the large valve were marked by radiating costæ. The beak is apparently inconspicuous.

*Formation and locality*: Same as the last.

*Museum register number* 6490.

The name is given to this species in honor of Dr. J. H. Sandberg, of Red Wing, who called attention to this inconspicuous fossiliferous bed. Associated with this and the last, are occasional traces of what appear to be crinoidal remains, in the form of sections of the stems, about an eighth of an inch in diameter.

## VIII.

A SUPPOSED NATURAL ALLOY OF COPPER AND  
SILVER FROM THE NORTH SHORE OF  
LAKE SUPERIOR.

---

BY N. H. WINCHELL.

---

In the course of preparation of the exhibit of the Minnesota department of geology, fauna and flora, at the late exposition at New Orleans, I obtained at Duluth a mass of native copper, similar to numerous others that have been found in the drift-deposits in the northwest. This was loaned for the use of the exposition, and was exhibited during its continuance. It is owned by Hon. G. C. Greenwood of Duluth, and is said to have been found near the mouth of Temperance river, in Minnesota.

This piece of copper had been assayed to ascertain its content of silver, which was evidently present throughout the most of the specimen. Several holes had been drilled through it for the purpose of getting a fair average by the use of the drillings, and the prevalent opinion of the amount of the silver was stated, from recollection, to be five pounds of silver and three pounds of copper, and it was thus labeled, while on exhibition at New Orleans, the official statement of the assayer having been lost.

On the return of this specimen from New Orleans I was struck with the appearance which it presents. The two metals are plainly, but not homogeneously, alloyed. It has been stated that these two metals are never thus found alloyed, though in immediate contact, in the copper-bearing rocks of Lake Superior.

Dr. C. T. Jackson, who was the first to call public attention to this point, so far as I have been able to ascertain, stated in 1849,\*

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\*Report on the geological and mineralogical survey of the mineral lands of the United States, in the State of Michigan, 1849, pp. 386, 461.

“that only one other locality is known in the United States of a mixture of native copper and silver, and that is in Somerville, N. J.” He saw a mass of native copper taken from the old Bridgewater mines which had numerous lumps of silver projecting from its surface, though firmly united to the copper at the point of contact. He calls attention to a “series of facts altogether new in practical geology, viz., the occurrence of veins of solid metallic copper, admixed with native silver and not alloyed with it.” He affirms that he has “analyzed hundreds of specimens without ever finding any true alloy of the copper and silver. In cases where it was first supposed to have been an alloy, it was subsequently found to be merely a mechanical mixture of the two metals. Had they no affinity for each other the particles could not have been more separate, but since we know that molten copper and silver readily and most quickly unite, forming an alloy when they are brought in contact, and know also that the copper requires a much higher temperature for its fusion, it is difficult to conceive that the metallic lode of the mine was deposited in a molten condition.”

Messrs. Foster and Whitney in their report on the Lake Superior land district\* in 1850, refer to the unalloyed condition of copper and silver in these rocks. Though it had been asserted that some of the native copper contains a small portion of silver alloyed with it, they found no silver in the specimens which they examined unless particles of that metal were visible in the mass. A specimen of native silver from the Minnesota mine was found to contain a trace of copper; though in general, they stated these metals do not occur alloyed with each other, as would naturally be supposed on the theory that they have been forced up together in a state of fusion from the heated interior of the earth. “The silver is scattered through the metallic copper in such a manner that each metal remains entirely free from alloy with the other, although the junction of the two at their edges is a perfect one. The silver is often interspersed in the mass of copper so as to form a species of porphyry, the former metal occurring in small patches and particles perfectly soldered to the enclosing mass of copper, yet, chemically speaking, entirely distinct from it.”

\*Report on the “copper lands” of the Lake Superior land district in Michigan, 1850, p. 178.

Prof. R. Pumpelly never found these metals in the least alloyed together, though constantly occurring in intimate union.\* *Dana's mineralogy* mentions no instance of silver and copper found naturally alloyed. Pumpelly states that the union between them is often so slight that on being rolled out into a sheet the silver becomes more or less separated and may be wholly detached.

Under these circumstances, when those who have carefully studied the metallurgy and paragenesis of these substances in their native places have not been able to find a single instance of a natural alloy, the conditions which can be seen plainly shown by this specimen are certainly a matter of surprise and of scientific interest. On asking Prof. Dodge, of the University of Minnesota, to make an assay of this specimen, he stated that he made the former assay, nearly two years ago, and he kindly gave me the following statement of the two trials which he made. He drilled six one-fourth inch holes through it, to obtain the drillings for each assay:

## FIRST RESULT.

Copper .....	99.04 per cent.
Silver .....	.06 per cent.
Iron.....	traces.
Gold.....	none.

## SECOND RESULT.

Copper .....	99.004
Silver .....	.096
Iron.....	traces.
Gold .....	none.

The average proportion of silver is less than one per cent, but it is evident that in some parts of the mass the silver is much more, and would perhaps reach from five to ten per cent. There are also some evidently nearly pure silver streaks or blotches, which are revealed by freshly abraiding the surface.

This mass having been found on the surface mingled with the drift pebbles, there is no certainty that it is natural. Indeed there are some outward signs, in the specimen itself, aside from

\*Geological survey of Michigan, Vol. I, copper bearing rocks, pp. 110, 35.

the *a priori* improbability, that it may have been in the hands of the ancient miners who once wrought the copper-mines of Lake Superior, and that its present condition is due to their mining methods.

(1.) In the first place, it is in the form of a sheet from a fourth to a half an inch in thickness, of the shape nearly of an equilateral triangle.

(2.) It is coiled at one corner so that the corner nearly touches the opposite side, and has the appearance of having been forced into this shape.

(3.) If this were uncoiled, the straightened edge would form nearly a right line, about eight inches in length, a fact which is improbable with a piece of native copper in its original condition.

(4.) This edge, and also another edge for a distance of about two inches, has a roughly laminated, or sheeted structure, such as might have been produced by some pounding and crowding when in a semi-molten condition.

(5.) There is, all over the exterior, on one side of the specimen, a roughness of fine reticulated corrugations, alternating ridges and furrows, not long continuous, but broken, varying from a thirty-second part of an inch apart to an eighth of an inch, simulating a somewhat disturbed fluidal surface cooled. In some cases these little furrows enclose rounded, or somewhat polygonal spaces, as two or more systems seem to cross each other, resembling the shrinkage crack of drying clay, or the basaltic structure of the top of a lava flow.

(6.) On the other side, where there are some traces of malachite, this surface structure is almost wanting; but instead of it there is a coarse, but smoother, imprint of irregular forms that may have been due to the nature of the rock or other substance on which, as a molten mass, it may have lain.

When, in connection with these indications, it be remembered that the ancient miners, who were probably the ancestors of the present Indians, used to extract the copper from the rock by the aid of fire, it seems very reasonable to suppose that this piece had been thus affected, and that it had been dropped by them in their journey from Isle Royale to the southern or western tribes. Such pieces were seen in the hands of the Indians in the 16th

century, by Cartier and Champlain. One of the chiefs drew from a sack a piece of copper a foot long and gave it to Champlain. When he was more questioned as to its source, the chief answered that they had gathered it in lumps, and having melted it, spread it out in sheets, smoothing it with stones.\*

This piece not only appears to confirm the report of Champlain as to the primitive methods of metallurgy of copper, but perhaps will throw some light on the so-called *hardening*, or tempering, of copper which has been attributed to the early miner. Mr. P. R. Hoy, of the Wisconsin Academy of Sciences, argues that the ancients did not melt their copper, nor cast the implements they made, but attributes to them the skill necessary for "swedging" hatchets, &c., in moulds, hardening their edges by hammering. It may be that a slight alloy of silver, taken so as to affect the edge of the implement, could be as readily made to harden it as the supposed pounding in the process of swedging.

Owing to doubts expressed by some archæologists as to the genuineness of this find, on the occasion of the reading of the foregoing paper at the Ann Arbor Meeting of the American Association for the Advancement of Science, in the Summer of 1885, the following sworn affidavits were obtained of parties who were concerned in handling it since its discovery, and of the person who found it:

STATE OF MINNESOTA, COUNTY OF ST. LOUIS.—SS.

L. Augustus Taylor, being duly sworn, deposes and says that he is a resident of Duluth, Minnesota, that he discovered an alloy specimen, now reported as the Greenwood specimen in the University of Minnesota Museum, as deponent is informed and believes, that he discovered the same in the year 1883 in the Temperance river in the bed of the stream about two miles from the mouth of the stream, and about one mile from the North Shore Silver and Copper Mine in Cook county, Minnesota. That this deponent gave the specimen to B. B. Spalding and is informed by the latter that he gave the same to George Greenwood and that no change of any kind was made in said specimen from the time this deponent obtained it until he delivered it to said Spalding.

L. A. TAYLOR.

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\*Voyage du Sieur de Champlain, Paris, 1613, p. 246.

Sworn to and subscribed before me this 1st day of October, 1885.

[Notarial Seal.] SHUBAD F. WHITE,  
Notary Public,  
St. Louis Co., Minn.

STATE OF MINNESOTA, COUNTY OF ST. LOUIS.—SS.

B. B. Spalding, being duly sworn, deposes and says that he received the specimen of alloy mentioned in the foregoing affidavit from L. Augustus Taylor who made said affidavit and delivered the same unchanged, except by the cutting off of a piece weighing about one-half pound, to George Greenwood of Duluth.

B. B. SPALDING.

Subscribed and sworn to before me this 1st day of October, 1885.

[Notarial Seal.] SHUBAD F. WHITE,  
Notary Public,  
St. Louis Co., Minn.

STATE OF MINNESOTA, COUNTY OF ST. LOUIS.—SS.

Geo. C. Greenwood, being duly sworn, deposes and says that he received the specimen referred to in the foregoing affidavits, from B. B. Spalding, the affiant in the last above affidavit, and delivered the same unchanged to Prof. N. H. Winchell of the University of Minnesota, and that the same was, when he last saw it in the University of Minnesota Museum, within a week past, in the same condition as when he delivered it to said Prof. Winchell, with the exception of a small hole since drilled in it.

G. C. GREENWOOD.

Subscribed and sworn to before me this 1st day of October, 1885.

[Notarial Seal.] SHUBAD F. WHITE,  
Notary Public,  
St. Louis Co., Minn.



## IX.

REVISION OF THE STRATIGRAPHY OF THE CAMBRIAN  
IN MINNESOTA.

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By N. H. WINCHELL.

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In the ascent of the Minnesota valley for the purpose of geological examinations, in 1873, two different formations of limestone were met with, separated by a white sandstone. These were designated from the towns at which their characteristic outcrops occurred, the Shakopee limestone, the St. Lawrence limestone, and the Jordan sandstone. The thickness of neither one of these was known accurately, but the Shakopee limestone was said to be "about seventy feet," the Jordan sandstone "about seventy feet," and of the St. Lawrence limestone not more than fifteen feet could be affirmed.

In subsequent years as the survey progressed southeastwardly through Fillmore, Houston and Winona counties, these three parts were distinctly recognized, and this three-fold division was described at Lanesboro, Troy, Lewiston (near Stockton), and in western Wabasha county. In ascending the Mississippi valley in the progress of the survey, the intervening sandstone, as recognized in the southeastern part of the State, and the Shakopee limestone, gradually lose the development which they were seen to have in the southeastern part of the state, and the "Lower Magnesian" as defined by Dr. Owen, seems to become one great limestone stratum by the union of the two limestones through the omission of the Jordan sandstone. This omission, however, is not found to prevail everywhere even in the more northern counties, since in Goodhue and Washington counties this sand-rock is plainly preserved, and has an observed thickness of five to ten feet, occurring in lenticular strata.

Again, about in the same proportion and rate of progress, as the sandstone separating the two limestones shrinks in thickness, another limestone is developed in the Mississippi bluffs at a considerably lower horizon, increasing toward the north and northwest. This change has been the cause of some mistaken identifications of stratigraphy by the survey, both in the Mississippi valley and in the Minnesota valley, and it is the intention of this revision to correct these, and to exhibit, briefly, the stratification of this portion of the Cambrian as it is developed in Minnesota, so far as the facts at hand will allow. For the purpose of adjusting some of the apparent discrepancies the writer recently made a cursory re-examination of those points in the Minnesota valley which were likely to throw light on the problem. The stratigraphic facts brought out by this re-examination are expressed below. Prior to this Mr. Upham had called attention to the great apparent thickness of the Shakopee limestone as developed by deep wells at Shakopee, which would make it parallelize with the chief limestone formation in the bluffs of the Mississippi at Hastings, instead of with the upper member which had been traced, under the name of Shakopee limestone, from Houston county to Hastings, and had shown by a study of the deep wells of the central part of the state that a calcareous member, comparable to the St. Lawrence limestone at St. Lawrence, exists below that which had been regarded its equivalent in the Mississippi bluffs.

With the facts all in mind, it was deemed best to make a special search, in the Minnesota valley, for the thin upper sandstone which had been found gradually thinning out toward the north, and that overlying upper limestone which had been identified since 1873, as the Shakopee limestone in the valley of the Mississippi, and to ascertain their actual relations to the Shakopee at Shakopee, and to the St. Lawrence at St. Lawrence. It is evident, whatever might be the result, that the extension of the strata there seen, and those only, would constitute the Shakopee and St. Lawrence limestones in their development further southeast and east.

This search was successful, but before the sandstone was actually found *in situ*, a fresh examination was made of the quarries at St. Lawrence. This was sufficient to show to any

one familiar with the lower-most of the limestones of the Mississippi valley, quarried at Lake City and at Hokah, that the actual St. Lawrence limestone must be parallelized with it and not with the great limestone member which forms the conspicuous escarpments of the great valley. This is evident not only from its lithology but also from its thickness, and from facts which were observed afterward at higher points in the Minnesota valley. This being established, it is evident that the sandstone which directly overlies it (the Jordan) must be the upper portion of the St. Croix in the Mississippi-bluffs, having a thickness of nearly a hundred feet.

Having thus once determined the equivalents of the St. Lawrence and the Jordan, in the Mississippi valley, it also became evident that the regular order would require that the principal limestone in one place should parallelize with that of the other, and that hence the great limestone, as supposed to exist at Shakopee could be no other than the great stratum seen at Hastings.

The existence of the great thickness of this limestone at Shakopee rests on the uncertain testimony of the deep wells there which have penetrated it. But although the details of these wells are not obtainable so as to show the possible existence or non-existence in this limestone of any thin beds of sandrock, yet they unite with sufficient testimony to demonstrate that there is under Shakopee village, extending far below any rock exposed in the quarries, a stratum of limestone, or what the well-drillers denominate wholly limestone, that is entirely comparable to that in the bluffs at and near Hastings, and should be parallelized with it. The quarries at Shakopee involve only from 15 to 20 feet of the uppermost layers of this stratum, and to these layers the term *Shakopee* should be applied—and only to these, or, at most, to those underlying layers that extend downward to the thin sandstone which is known to exist, with more or less persistence, in this great formation, about 25 feet below its top (see reports on Fillmore, Houston, Winona, Wabasha, Olmsted, Goodhue, Dakota and Washington counties) and which has been supposed hitherto to represent the Jordan, but which is really another and distinct member of the Cambrian.

It was for the purpose of seeking for evidence of this thin

sandstone in the Minnesota valley that the recent examination was made. At Shakopee there is no direct evidence of this sandstone. All the evidence there is is that derived from the deep wells, which do not mention it; but it is well known that a thin stratum of sandstone, only five to ten feet thick, might be pierced by a drill, in sinking a deep well without the knowledge of the operator, the difference in the *chuck* of the drill, and the infrequency of pumping not being sufficient to detect it when the underlying and overlying strata were similar and somewhat arenaceous limestones.

However, at a short distance above Shakopee, at the Louisville limekilns, and between them and the river, before the appearance of the Jordan sandstone in the river, this limestone underlying the city of Shakopee is significantly divided into two parts, each part extending horizontally over considerable distances forming a marked terrace-flat. These parts exhibit different outward lithological aspects and intimate stratigraphic structure. The upper one is that which is wrought for quick lime at the limekilns at Louisville, and rises to the height of 75-100 feet above the other. It is set off markedly from the other by a bluff which is composed largely of river-terrace gravel, and is so hid by this material that its existence is known only at a few places. It apparently exists as island-like remnants in this region, since it was not found in Mr. Jacob Thorn's well situated in section 15, Jackson, Scott Co., just east (a little north) of the quarries at Louisville, which went through gravel and sand 130 feet, blue clay 4 feet, and then entered a reddish limerock in which the drill was working at a depth of three feet at the time of this visit, and which is the equivalent of the lower reddish rock seen in the terrace that separates the limekilns from the river. The thickness of lime rock involved in this upper terrace of Louisville cannot be seen to exceed 30 feet, but it rises, apparently, about as high as the top of Mr. Thorn's well, and may exceed that thickness. The stone is very irregular in its bedding, and like the real Shakopee limestone, answering to the descriptions, given before, of the exposures at Shakopee, at (or near) Quincy, in Winona county, and at Northfield. The beds undulate, swell out, anastomose, become vesicular, then compact, change to shale which is green, are interbedded with shale, &c., &c., and do not resem-

ble at all the main body of limestone along the Mississippi bluffs. These rough upper beds swing back from the river in their line of strike, a little to the northeast of Merriam Junction, and are not known to occur in outcrops again, in their entirety, in the Minnesota valley. These are the beds which properly and correctly represent the Shakopee limestone, and they manifest their tendency to retreat from sight here, and further up the Minnesota valley, in the same manner as they have been seen to do in all places in the Mississippi valley. It is the lower limestone, that which forms the lower terrace at Louisville, which returns in force along the Minnesota valley above the rapids near Carver. The only evidence, at Louisville, of the existence of any intervening sandstone consists in the fact of the separation of this formation into two terrace-like expanses, one of which continues thence invisible, and the other extends as an independent formation as far as Mankato. The disintegrating action of a few feet of crumbling sandstone in an otherwise homogeneous limestone formation, along a great valley of erosion is a well known agent in causing the retreat of the upper portion, in its line of strike, farther away from the river. When the beds overlying the sandrock are themselves more irregular and likely to be carried away on the removal of the crumbling sandrock, the retreating habit of these upper layers is easily accounted for.

The limestone in the lower terrace, west from the Louisville kilns, is reddish, resembling the rock at Kasota, and rises about 45 feet above the flat on which the Minneapolis and St. Louis railroad passes from Carver, about a quarter of a mile distant, on its course to Merriam Junction. By reason of the dip this also soon passes off eastward, giving place to the Jordan sandstone, which is conspicuously exposed in many places. In regular order, the dip continuing in the same direction, the lower-most limestone appears at St. Lawrence, about four miles further west. At Belle Plaine, the salt well struck no limestone. The river runs over the St. Croix, presumably, for several miles above Belle Plaine, the beds of which are so erodible that they do not make their appearance through the heavy drift-sheet which prevails generally in that part of the state. Not mentioning the conjectural exposure of rock in the bluff at Rocky Point, near Blakeley, which was not visited on the recent trip, the next

appearance of the limestones of the valley is on the west side, where, at Faxon, and again at points somewhat further south, in Jessenland, are outcrops of thin-bedded limerock, as recorded in the second annual report, which appertain, with great probability, to the horizon of the St. Lawrence limestone. There is no further outcrop, so far as known, before reaching Ottawa, where the beds that are the equivalent of the layers of the lower terrace at Louisville return and are wrought by numerous quarries. Considerable time was spent in examining these quarries, where may be found some remnants of the Cretaceous filling cavities in the older rock in the same manner as at Mankato. These quarries show all the characters of the stone quarried at Kasota. They are underlain by a white sandstone, which displays itself in the bluff to the thickness of 55 feet (including the talus) at the quarry of Mr. Schwartz, three-fourths of a mile below the station. This sandstone contains isolated patches and also some thin leaves or laminations of green shale which fades to white. It was evidently deposited in an agitated water, as it contains sudden changes in the sedimentation-lines, even angular fragments of itself, one and two inches across, that are discordant with the enclosing sedimentation. It may be on the parallel with that conglomerate seen at the crossing of Van Oser's creek, near Louisville, in the upper part of the Jordan sandstone where, (recently) were seen some pebbles of red granite over an inch in diameter, and scales of ochery shale, or rusted soft rock, embraced in the white sandstone.

The limestone quarried at Ottawa lies in heavy but undulating layers, similar to those at Kasota, and furnishes a good building stone. These are near the bottom of the limestone to which they belong. The Shakopee beds probably exist in the eastern and southern (higher) portions of the Le Sueur prairie, which thus repeats the upper prairie at Louisville, while the flat on which Ottawa is situated owes its existence to the same cause as the lower terrace at Louisville.

After another interruption of five miles the same horizon returns at St. Peter, the beds having a fair exposure in the low river bluffs near the asylum. At the highway bridge at St. Peter there is no limestone preserved; the bluff on which the bridge rests at the west end consisting wholly of sandrock. On the top

of this sandrock is a thin deposit of reddish shale which amounts to about four feet, as it can be traced back from the river up a little ravine. Back from the river it is lighter colored. This is believed to be Cretaceous, though there is no evidence of it except its anomalous stratigraphic position. It may be a representative of the shale overlying the Jordan sandstone at the cement works at Mankato, though at no other point, north of the cement works, has such a shale been seen immediately overlying the Jordan—not even in the northern confines of Mankato. The limestone beds overlying this sandstone were not re-examined. Some information concerning them can be found in this report, at page 12, where the record of the hospital deep well is printed. It is probable that No. 3 of that record is the true St. Lawrence limestone, but that it was not wholly a magnesian limestone; also that the St. Peter rock, as quarried at the asylum, is the equivalent of the Kasota and Mankato quarries, and that, hence the true Shakopee beds will be found in the upper prairie level back of the asylum, into the composition and origin of which those beds enter with the same agency as at Louisville and at Ottawa. Indeed, the prevalence of large northern boulders on the hillsides and on the upper prairie flats back of St. Peter, points to the same cause as where they are strewn over the Shakopee terrace, between Shakopee and Louisville, and at other places that could be mentioned, where the immediate cause thereof is known to be the underlying firm beds of magnesian limestone. The sandstone seen at the old asylum quarry in 1873 (see the second annual report, p. 132), is also now regarded as Cretaceous. It has not been seen since 1873, but the sandstone of the lower Cretaceous is well known to cover all the Cambrian strata unconformably, in this part of the state, (see the report on Blue Earth county, vol. 1, final report), and traces of it are visible as far north as the quarries at Louisville, where pockets of white sand are found in the upper portion and are reported on the top of the quarried beds of the Shakopee. Similar patches of arenaceous Cretaceous are found at the asylum farm near St. Peter, and were fully identified as such in 1873. Second annual report, p. 177.\*

\*Capt. Beatty states that there is a large deposit of sandstone, more or less disintegrated, probably of Cretaceous age, in the bluffs east of the railroads at Mankato.

The river only intervenes between St. Peter and Kasota, and all the characters seen at the former place are repeated at the latter.

From Kasota to Mankato, a distance of six and a half miles, no great change is apparent. The St. Peter and Kasota terrace continues all the way to Mankato, and its uniform composition is manifested not only by the outward terrace-like aspect, but by several important quarries, and by exposures along the river bluff, intermediate. The difference between the limestone at Kasota and Mankato is one of difference of thickness. At Mankato the bluff contains an aggregate of about sixty feet of the limestone corresponding to the limestone of the lower terrace at Louisville, and at Kasota this limestone shows not more than twenty-one feet. In both cases they lie on the Jordan sandstone.

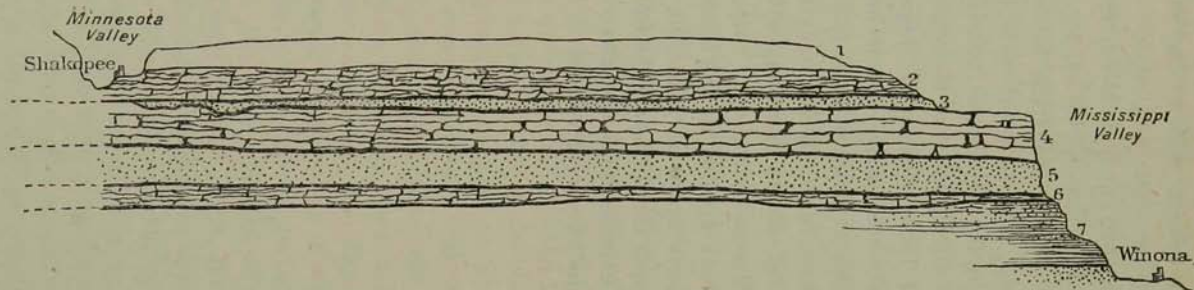
The most interesting observations respecting these limestones were made at Mankato. In the first place owing to the great thickness of the quarried beds, it was probable that the terrace north from the city was nearly on the level of the supposed thin sandstone stratum which had been presumed to exist between the true Shakopee limestone and the beds there quarried. Hence a careful search was instituted for traces of this sandrock. It was not long before angular or sub-angular masses of white arenaceous quartzite were met with in traveling over the prairie north from Mankato, resembling the angular pieces that have been described at about the same horizon, weathered out from this sandstone in Winona and Houston counties. In several places were found bared spaces of this white hard sandrock, or quartzite, forming the natural surface of the prairie, this being wholly above the beds quarried at the city. In several other places still further north, were found isolated low mounds of magnesian limestone rising three to six feet above the rest of the prairie, while about their flanks, near the level of the prairie, were bare areas of the same flat-lying, white, hardened sandrock, so situated as to show that it continued uninterruptedly beneath, and formed the base of the mounds. These mounds are therefore remnants of the true Shakopee limestone and this hardened white sandstone, here not more than four feet in thickness, and sometimes wanting entirely by reason of the surface destruction



due to the action of the river in early times, is the western extension of the thin sandstone which had been so often described in counties further east and styled Jordan. Still further north, and a little further from the river, the limekiln which was formerly owned by Geo. C. Clapp, sec. 17, Kasota, is probably based on the limestone overlying this sandstone, and hence on the true Shakopee. Further evidence of the parallelism of these upper beds with the true Shakopee consists in the fact that the fossil described in another part of this report, *Cryptozoon minnesotense*, is found in loose weathered fragments on the prairie on which these mounds occur, and it has before been found only in the Shakopee at Cannon Falls and at Northfield.

After the discovery of these facts, all the topography and geology of the Minnesota valley are in harmony with themselves, and with the same in the Mississippi valley. Some changes must be made in the designations applied to the limestones in both valleys, and new designations must be found for the two new strata thus added to the upper Cambrian. The following general diagrammatic section will express the comparative and correlative geology of these beds in the two great valleys:

Fig. 10.



## EXPLANATION OF FIGURE 10.

1. Drift and Trenton and St. Peter.....	
2. Shakopee limestone.....	20-40 feet.
3.     White sandstone.....	0-40 feet.
4.     Magnesian limestone.....	75-175 feet.
5. Jordan sandstone.....	75-100 feet.
6. St. Lawrence limestone (shaly).....	0-30 feet.
7. Sands and Sandy shales.....	at least 200 feet.

*Notes on the Foregoing Figure:* The St. Croix formation includes all below No. 4, and extends down to the great sandstone which is struck in deep wells at Red Wing and Lake City, and appears at Hinckley and in the gorge of the Kettle river in Pine county. This lower great sandstone is more likely to be the Potsdam of New York state than the sandstone No. 5, or any part of this section.

No. 2 is the Shakopee limestone at Shakopee, as there exposed, and as described in the counties in the southeastern part of the State, in the reports of progress and in vol. 1 of the final report. It is the limestone burned for quicklime at Northfield and at Louisville. It is the same as the Willow river limestone, of L. C. Wooster. (Geol. Wis., vol. iv, p. 106).

No. 3 is a white sandstone which has not, till recently, been identified in the Minnesota valley, but it has been described, erroneously, as the Jordan sandstone in the southeastern part of the State. It was first described at Lanesboro, in 1875, under that name, but as the Jordan sandstone lies lower it is obviously necessary to find some other designation for this member. In the report of the Wisconsin Geological Survey for 1877, Mr. L. C. Wooster describes a similar white sandstone in the upper part of the lower Magnesian, near New Richmond, in Wisconsin, and remarks that this may represent the Jordan sandstone of Minnesota (as the Jordan had then been described in Fillmore and Houston counties), but he applied no designation. However, in the final report of the Wisconsin Survey, (vol. iv, pp. 106, 127), Mr. Wooster applies the term *New Richmond beds*, to this sandstone, and that term might be extended, being prior in its correct application, to this sandstone in Minnesota.

No. 4. This is the limestone which is generally known as the Lower Magnesian. It was supposed, till lately, to be the actual extension of the St. Lawrence limestone into the eastern part of the State, and has been so named in the reports of progress, and in vol. 1 of the final report. It has never received a distinguishing appellation—except that Prof. Irving has styled it the “Main body of limestone,” (*Am. Jour. Sci.*, June, 1875, p. 440), though at Madison, where this term was applied, it is no more than 85 feet thick. It is the limestone which forms the lower terrace at Louisville, which is wrought at Ottawa, appears at St. Peter, and

extends conspicuously along the Minnesota river from Kasota to Mankato. Along the Mississippi it forms the precipitous escarpments at the tops of the bluffs.

No. 5. The Jordan sandstone is the upper most member of the St. Croix. The name Jordan was applied to this in 1873, in the annual report of that year. Prof. Irving has named it Madison sandstone in Wisconsin. (*Am. Jour. Sci.*, June, 1875, p. 440.) This sandstone has been correctly described throughout the Minnesota valley in all the reports of progress, but it was wrongly identified in the eastern part of the state.

No. 6. The St. Lawrence limestone was so named in the report of progress for 1873. It is the same that Prof. Irving named, in 1875, "Mendota limestone." This limestone is unfavorably exposed in the Minnesota valley. Its greatest thickness, known there, is only about 15 feet, but it seems to extend, with some shaly components, distinctly over a thickness of about 30 feet in the Mississippi valley; while, if the shaly beds with which it is associated, and into which it seems to graduate, be included under this term, it will include beds to the amount of nearly 200 feet. This is the chiefly fossiliferous portion of the St. Croix formation. It is found at Red Wing, to contain some new fossils, described in another part of this report. It is quarried at Lake City and contains *graptolites*, and at Hokah, where it affords *Dikellocephalus*.

No. 7. These shales and shaly sandstones graduate upward into the St. Lawrence limestone, as above mentioned. They are underlain by a gray micaceous sandstone which is known recently as the *Dresbach sandstone*, from a town in Winona county, where it is wrought for construction.

There are therefore, in Minnesota and Wisconsin, three magnesian limestones, and four saccharoidal sandstones, not including some shales and lower sandstones, involved in regular alternation in the Cambrian, thus—

St. Peter sandstone.  
Shakopee limestone.  
New Richmond beds.  
Main body of limestone.

St. Croix. { Jordan sandstone. (Potsdam?)  
St. Lawrence limestone.  
Shales.  
Dresbach sandrock. (Potsdam?)  
Shales.  
Hinckley sandrock. (Potsdam?)  
Red shales and red sandrock passing into the Cuprif-  
erous? (Potsdam?)

## X.

NOTES OF A TRIP UP THE THIEF RIVER AND AT  
LAKE MILLE LACS.

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BY F. L. WASHBURN.

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MINNEAPOLIS, NOV. 27, 1885.

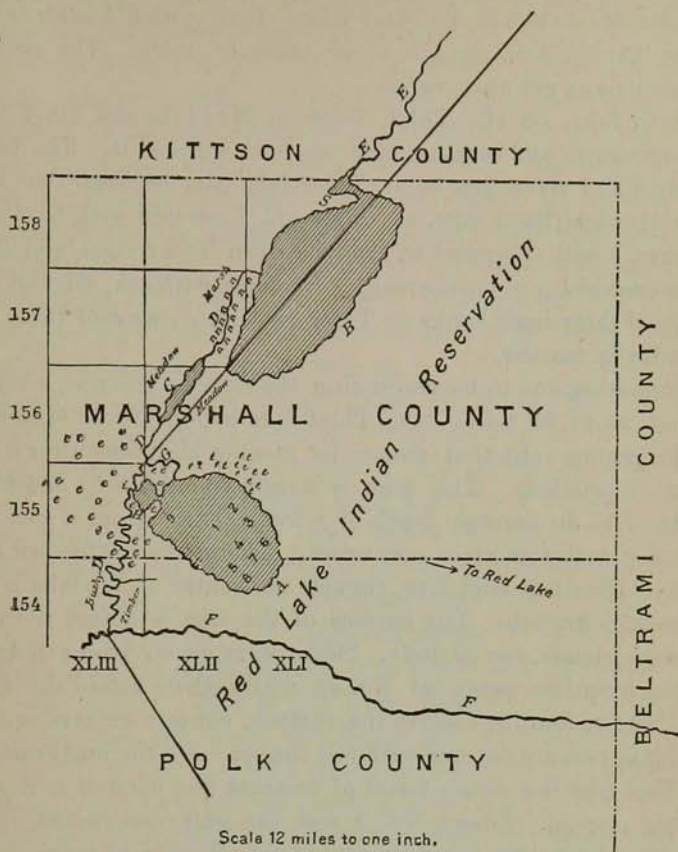
*Prof. N. H. Winchell:*

DEAR SIR.—At your request I send you the following account of the Thief River region and append thereto a map which may be somewhat of an auxiliary to my necessarily rather meagre description of the country.

Thief river forms part of the southwestern boundary of the *Red Lake Indian Reservation*, and has a general north and south direction. At the northeast corner of T. 43, R. 155, it is met by Mud river, a small stream, 10 yards wide, a mile and a half long and about  $2\frac{1}{2}$  feet deep, flowing from Mud lake and entering the Thief from the east. My northward progress, as you know, was stopped here and I was compelled, by bad weather and lack of time, to turn back. Beyond this point, to the north, the river is reported to be navigable for a canoe through Basil lake and as far as Thief lake. In other words, Thief river is navigable its entire length, from Thief lake to its mouth, on the Red Lake river.

Thief lake is a body of water about 14 miles long and 6 wide, a favorite resort for aquatic fowl. Its shores are reported more or less wooded with hard and soft timber and much of the shore lies in unsurveyed territory. At its very northern extremity, hidden behind the point S (Poplar Point), an opening is found which takes one into Moose river, flowing from the north, which

## Map of Thief River Country.



EXPLANATION OF THE MAP.—A, Mud lake; B, Thief lake; C, Basil lake; DD, Thief river; EE, Moose river; "very crooked, sluggish and deep for 25 miles from its mouth." FF, Red Lake river; G, Mud river; about 10 yards wide, 2 feet deep and  $2\frac{1}{2}$  miles long, flowing from Mud lake to the Thief river. H, a muddy estuary of Mud lake, connected with it by a reed-grown passage containing a few small grassy islands and opening into Thief river by a narrow passage (i) just wide enough for two canoes to pass one another.

1, 2, 3, 4, 5, large islands in Mud lake, numbered in order of their relative size, No. 1 (the only one visited), containing about  $1\frac{1}{2}$  acres; all the larger islands apparently have timber upon them. 6, 7, 8, smaller islands; 9, a grassy knob or knoll, of which there seem to be many.

n n n n n, high banks along Thief river, just after leaving Thief lake, "covered with hardwood timber." The narrow strip of land (marked p p) between the lake and the river is covered with oak, ash and elm.

S, Poplar Point.

t t t t t, tamarac, and back of it the ground rises a little. e e e e e, impassable marshy land, filled with reeds, rushes and tall grass, running west from Mud lake 8 miles or more before striking straggling timber.

is said to be a stream "very crooked, sluggish and deep for 25 miles from its mouth at Thief lake," from which I infer that it must have a total length of 40 miles or more. The country about it is as yet unsurveyed.

Basil lake, on the Thief, between Mud lake and Thief lake, has meadows and marshy land on both sides of it. The banks along Thief river, just below Thief lake and between that body of water and Basil lake, are high and "covered with hardwood timber," and the point of land between Thief river and Thief lake (marked p p) on the map, is timbered with oak, ash and elm. Beyond these high banks on Thief river, *i. e.*, west of them, the country is marshy.

Supposing one to be descending the river in a canoe, a ride of about 25 or 30 miles from Thief lake brings him to Mud river and turning into that stream he reaches Mud lake after a half hour of paddling. This lake is nearly 10 miles long and 4 to 6 wide, with an average depth of 4 feet. The bottom is soft mud but the water is clear and sweet. The banks are fringed with cane, rushes and wild rice, though the center of the lake is free from such growth. The surface of the lake is dotted with numerous islands, ten or more. Some were grassy knolls or knobs rising from the water (as No. 9), while others attain the height of three or four feet above the surface, contain an acre or more of land, and are covered with tall timber. On the northeast side of Mud lake is a dense forest of tamarac and back of it slightly rising ground. Island No. 1 was the only one visited, rough weather during my short stay there not allowing of much canoeing. This island contained about an acre and a half and was covered with ash, elm, willow, and, I think, oak. In places on it I found large limestone rock; its beaches were composed of a clayey sand, and from its northern end ran a large sand-bar, on which were a few granite boulders about four feet in diameter.

The islands are apparently more numerous at the eastern end than near the outlet on the northwestern shore, and I have so indicated them on the map.

The muddy estuary *H.* on the west end of the lake and connected with it by a very shallow weed-grown passage, has a depth scarcely twelve inches, contains numerous low, grassy islands, roosting places of aquatic fowl, and opens again into



Thief river, about a mile below the mouth of Mud river by a narrow passage, which I have marked (i) on the map, just wide enough for two canoes to pass one another.

Paddling down the Thief from the mouth of Mud river, one reaches, in a few minutes, the narrow opening (i) through which a glimpse of the muddy estuary H is obtained. Continuing down stream, the canoe gliding swiftly along with the current, the banks are lined for a distance of about twenty miles with tall cane, six or eight feet high, which stretches back some distance from the river. This occurs on both sides but is rather more abundant on the Reservation side. On this part of the river there is no timber with the exception of a little scrub willow, mostly at a distance from the stream.

After that distance of twenty miles has been passed however, and after going through a region which has been burnt over and has dead tamarac standing upon it, the timber is continuous, almost entirely on the Reservation side, for a distance of ten miles or more, to Red Lake river into which the Thief empties.

This timber consists of willow, poplar, elm, ash, sugar maple, and oak, with small growth of Prickly Ash (*Xanthoxylum americanum*), hazel bushes, high bush cranberries (*Viburnum opulus*), wild plums (*Prunus americana*), wild grapes and rosebushes.

On the opposite side of the river, most of the land of any value has been claimed. The farms are comparatively few in number, however, the land being so covered with brush that farmers have a hard time to obtain a living therefrom.

The river gradually widens from a width of ten yards at the entrance of Mud river to about thirty yards at its mouth on the Red Lake river. The current is fairly strong and the average depth is about two and one-half feet. In places there are rapids where occur large boulders of granite (from two to four feet in diameter) and limestone rock. These rocks and boulders, however, are not found in the river as one approaches Mud lake. The bed of the river is sandy with gravel in some places and the banks are clayey mud with occasional small fragments of limestone. The water of the river is slightly yellowish, and at date of visit (Sept. 1) very cold. At the mouth of the river, there is, or was this fall, an encampment of Red Lake Indians, and about eight miles up stream is another village which subsist

on fish and game, the former procured from a stone fish trap which runs across the river here in the shape of a V, the point down stream. This is easily passed in a canoe, however by temporarily removing a number of branches and rock, on one side. On our way to Mud lake we passed the remnants of several of these traps that had been used for a time by the Indians and then abandoned.

The only drawback to this country becoming a favorite resort for sportsmen is its inaccessibility, for though it is comparatively easy to get to the mouth of the river, going by rail as far as St. Hilaire, and then teaming to the mouth, a distance of 18 miles, the transportation of camp equipage to Mud lake or beyond is a matter of no small difficulty. There are but few farms along the river, the last one being situate about 20 miles from the mouth. The people are very hospitable however, and never refuse a lodging, such as it is, to belated or weatherbound travelers. Again, though Mud lake lies, in a straight line only 15 miles from the mouth of Thief river, the country around the lake is of such a marshy nature, that teams can approach only within about 10 miles of the lake on the Thief.

These difficulties surmounted however, the large number of aquatic fowl along the river and at the lake would amply repay an enthusiastic sportsman for his trouble.

Very truly yours,  
F. L. WASHBURN.

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*A few notes on Otter Tail County and Lake Mille Lacs—Topography—Archæology, etc.*

*Otter Tail County:* The abundance of flint arrowheads and fragments of ancient pottery throughout this county I noticed particularly, though for that matter these relics are abundant throughout the State, I believe. The pieces of pottery that I saw contained specks of pure silver, and scientists and many others, not scientists, when visiting that country have sought long but fruitlessly for the clay beds whence material for this pottery was obtained, thinking to find therein a boundless wealth of the ore.

*Lake Mille Lacs:* The country east of Brainerd, toward Mille Lacs, is rather bleak and dreary. Patches of second growth, and scrubby, bushy timber characterize the first part of the way, with an occasional long meadow filled with coarse wild grass. On our ride frequent belts of middling sized poplar were passed, and as we approached lake Mille Lacs, we met with more timber, oak, maple, birch, butternut, "butternut hickory" and soft pine, tamarac and spruce with some Norway and Jack pine. The distance from Brainerd to the lake is about 25 miles, and the road, which near the town is comparatively good, as it approaches the lake becomes rough, stony, and somewhat hilly.

Lake Mille Lacs, on account of its large size and the sameness of its shores, is not as attractive, I think, as many smaller lakes seen in Otter Tail county. Along the northwest shore the water is very shallow and the beach is sandy, and on the southeast shore, at one place the depth, for a mile from shore, does not exceed three feet. In other places, however, as on the south shore and along the north shore, the land is high and the banks are very precipitous and rocky, and the water close to shore is deep. Along the northwest shore for a distance of two miles or more is a very regular ridge, about 20 yards above the level of the lake, which with the beach makes a very well formed terrace, although probably formed by glacial action.

Near the southeast shore of the lake, about a mile from the land, there is said to be a broad granite ledge perfectly flat on top, which, at low water is about three feet above the surface and at high water just below the surface. Another outcrop of this granite is seen in townships south and west of the lake. Three barren and rocky islands a short distance from the southeast shore, the largest one containing about three-fourths of an acre, and known as Stone island (called Spirit island by the Indians) form breeding places for countless gulls.

In conversation with Mr. Johnson, an old salt-water sailor, who has lived on the lake for nine years, I learned that the Indians have never seen the lake so low as it is now.

Johnson is of the opinion, too, that Rum river has not always been the outlet from the lake, but that years ago the water found an exit by way of Knife river, some miles east of Rum river. Although the Knife is now but a small brook, he says that the

broad meadow overgrown with tamarac which extends many miles on both sides of the stream, shows indications of at one time being the bed of a large stream, and also says that on the high banks, at the edge of the meadow, he has found smooth, waterworn boulders.

His theory is that at some former time, when the water in the lake was much higher than it is now, not only did a stream run down the Knife river bed, but the water must have broken over the high banks then existing on the shore of the lake at Rum river and cut its way down through, eating out the channel which is now Rum river and cutting it down so low that its bed was below the bed of Knife river, so that now, the lake being much lower than formerly, the Rum river channel receives what water flows out.

Quoting from my diary of Nov. 8, I here write down the substance of a conversation held with Mr. O. E. Garrison, at lake Mille Lacs:

“South of lake Mille Lacs, at the very edge of the lake, and running southwest from Lake Superior to the southwestern part of Minnesota and beyond, is a line of granite which, theory says, is made by upheaval. In places it is covered with a layer of sandstone of the nature of drift. Again, in T. 24, R. 43, according to Garrison’s map, near the center of the square, is a mass of granite, somewhat elevated, with a fissure on the northern side. In this region, two summers ago, about July 15th, Garrison was surveying with a friend and they found in that fissure, even at that date, a large amount of solid ice.”

Mr. Garrison lives upon an old battle-field of the ancient mound-builders. Just back of his house are three mounds which would indicate that hostile tribes had a fight there at one time, and that the dead were interred on the spot. Running southwest from the mounds is an almost obliterated ridge averaging three feet in height. This ridge, he thinks, was at one time an old fortification of the mound-builders.

The largest of these three mounds is forty feet in diameter and from ten to fifteen feet high. This was opened a year ago and numerous skeletons found sitting upright, and so old that the thin pieces of bone crumbled away as soon as touched. In the same mound were found stone implements and weapons, and some pottery.

## XI.

## CHEMISTRY.

REPORT OF PROF. JAS. A. DODGE.

MINNEAPOLIS, MINN., May 27, 1886.

*Prof. N. H. Winchell:*

DEAR SIR:—I hereby report to you the results of certain analyses made at this laboratory, for the State Geological Survey, since my last report.

*Chem. Series No. 174.* A mineral from lake Superior, No. 575, of the geological survey series.

Silica, $\text{SiO}_2$ .....	45.47	per cent.
Alumina, $\text{Al}_2\text{O}_3$ .....	21.01	"
Peroxide of iron, $\text{Fe}_2\text{O}_3$ .....	3.60	"
Lime, $\text{CaO}$ , combined with silica.....	18.87	"
Lime, $\text{CaO}$ , combined with carbonic acid..	5.22	"
Carbonic acid, $\text{CO}_2$ .....	4.10	"
Magnesia, $\text{MgO}$ .....	.16	"
Potash, $\text{K}_2\text{O}$ .....	.21	"
Soda, $\text{Na}_2\text{O}$ .....	.93	"
Water, $\text{H}_2\text{O}$ .....	.83	"
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	100.40	

This mineral appears to be a kind of zoisite.

*Chem. Series No. 175.* Water from the deep well at Brown's Valley.

	Parts per Million.	Grains per U. S. Gallon.
Silica, $\text{SiO}_2$ .....	13.00	.7583
Alumina, $\text{Al}_2\text{O}_3$ .....	.40	.0233
Protoxide of iron, $\text{FeO}$ .....	.70	.0408
Calcium sulphate, $\text{CaSO}_4$ .....	51.80	3.0215
Magnesium sulphate, $\text{MgSO}_4$ .....	27.90	1.6270
Sodium sulphate, $\text{Na}_2\text{SO}_4$ .....	1452.60	84.7302
Calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$ ..	5.00	.2916
Sodium chloride, $\text{NaCl}$ .....	912.70	53.2378
Potassium chloride, $\text{KCl}$ .....	traces.	
Carbonic acid, $\text{Co}_2$ .....	traces.	
Nitrates .....	traces.	
	<hr/>	<hr/>
Total mineral matter ....	2464.10	143.7305

Test for organic matter, with permanganate of potash, amount of oxygen consumed, 1.63 parts per million.

This water is remarkable for the large amount of sulphates.

*Chem. Series No. 176.* This number was a sample of cupriferos rock. It was assayed by myself, for gold, silver and copper. The results of the assay were as follows:

Gold .....  $\frac{1}{10}$  Troy ounce per ton.  
 Silver.....  $\frac{2}{10}$  " " "  
 Copper.....  $\frac{4.7}{100}$  of one per cent.

*Chem. Series No. 177.* This was also a sample of cupriferos rock. It was assayed with the following results:

Gold.....  $\frac{2}{100}$  Troy ounce per ton.  
 Silver.....  $\frac{1}{10}$  " " "  
 Copper.....  $\frac{1.1}{100}$  of one per cent.

*Chem. Series No. 178.* Kaolin brought by Col. J. B. Clough in February, 1836.

Silica, SiO <sub>2</sub> .....	49.66 per cent.
Alumina, Al <sub>2</sub> O <sub>3</sub> .....	37.29 "
Peroxide of iron, Fe <sub>2</sub> O <sub>3</sub> .....	.76 "
Lime, CaO.....	.61 "
Magnesia, MgO.....	.02 "
Potash, K <sub>2</sub> O.....	1.23 "
Soda, Na <sub>2</sub> O.....	.71 "
Water, H <sub>2</sub> O.....	9.72 "
Carbonic acid, Co <sub>2</sub> .....	traces.
Organic matter.....	traces.

10000

The analysis shows that this is a kaolin of good quality. It is comparatively free from oxide of iron and lime. The small amounts of oxide of iron, lime, magnesia, potash and soda would not, in my opinion, interfere with its use for the usual purposes to which kaolin is applied. The water reported in the analysis belongs to the chemical composition of the substance and would only be expelled by burning. The mineral was analyzed after drying at a temperature not exceeding 100 degrees centigrade.

Very respectfully yours,

JAMES A. DODGE,

Professor of Chemistry.

## XII.

## ORNITHOLOGY.

REPORT OF DR. P. L. HATCH.

*Prof. N. H. Winchell:*

DEAR SIR:—I have the honor to report that while relaxing no measures hitherto employed in the acquisition of all information possible relating to the avi-faunæ of the state, I am pursuing the preparation of a report as fast as the onerous demands of my other duties will permit.

By personal observations, and a somewhat extended correspondence with gentlemen competent to communicate reliable information in different parts of the state, together with the invaluable aid of Mr. F. L. Washburn, who spent some time in field-work last fall in the Red River Valley, I am able to report progress in still accumulating valuable facts to be embodied in the report, which but for reasons known to you, and a prolonged detention by sickness, would have ere this been closed. The labor has been much greater than my experience had anticipated, especially in consideration of the impossibility of consecutive engagement in it. I hope now before a great while to finish the land birds, and enter upon the water birds, which will be very much less voluminous.

Very respectfully yours,

P. L. HATCH.

1015 Mary Place, June 1st, 1886.





18.	Mus. Reg. No. 6209.	Drillings have a mixed composition; though mainly of magnesian limestone, yet of different grain and color; also containing considerable sand, and some chert and fine crystals of silica referable to geodes in the rock; one large fragment is distinctly arenaceous, from.....	234 feet.
19.	Mus. Reg. No. 6210	Mainly white quartz sand, rounded and also angular; the rest is magnesian limestone, readily effervescing; both are in fine grains and fragments, from.....	26 feet.
20.	Mus. Reg. No. 6211.	Same as the last, from.....	237 feet.
21.	" " " 6212.	Same as the last, from.....	240 feet.
22.	" " " 6213.	Mainly a homogeneous, buff, magnesian limestone, with some quartz sand, from.....	241 feet.
23.	Mus. Reg. No. 6214.	The drillings consist, mainly of the same, light-buff magnesian limestone, but contain also numerous pieces of a dark earthy shale, not inflammable nor combustible, from.....	243 feet.
24.	Mus. Reg. No. 6215.	Reddish-buff magnesian limestone, with some fragments of opaque white silica and some rounded sand, from.....	248 feet.
25.	Mus. Reg. No. 6216.	Same as the last, from.....	250 feet.
26.	" " " 6217.	The same without silica and sand, from.....	254 feet.
27.	" " " 6218.	Reddish-buff, compact, magnesian limestone, from.....	258 feet.
28.	" " " 6219.	The same, from.....	260 feet.
29.	" " " 6220.	Reddish-buff, compact, magnesian limestone, mottled with gray, from.....	265 feet.
30.	Mus. Reg. No. 6221.	The same, without gray mottlings, but with some chert and some sand, from.....	270 feet.
31.	Mus. Reg. No. 6222.	Light-gray to buff, crystalline magnesian limestone, with rare beads from crinoid filaments, from.....	275 feet.
32.	Mus. Reg. No. 6223	Buff magnesian limestone, from.....	285 feet.
33.	" " " 6224.	Light-buff magnesian limestone, some of the drillings being unwashed, and then, dried, resembling a light gray shale, from.....	295 feet.
34.	Mus. Reg. No. 6225.	Vesicular, buff, magnesian limestone, resembling the upper part of the Niagara limestone, from.....	300 feet.

There is but little to serve as a guide in assigning these limestone strata to their geological horizon. There is, in the Albert Lea well, a thickness of about 186 feet of limestone which does not vary very much lithologically, extending from 114 feet to 300 feet. It is shaly in some places, and also arenaceous. These characters would not preclude the Galena limestone, which is thought to be the most probable rock in that geographical area. If, however, the Devonian limestones extend as far north as Albert Lea, these beds could all be assigned to that age, as far as their lithology is concerned, except Nos. 33 and 34 which have a greater resemblance to the Niagara. This would bring the Devonian upon the upper Silurian, as supposed in the deep well at Austin. The shale extending from 155 to 220 feet, a thickness of 65 feet, would, in that case, represent the Austin rock, and the mixed and arenaceous beds extending from 220 feet to 240 feet would parallelize with the conglomerate of the Austin well. There would be then 45 feet of magnesian limestone in the Albert Lea well, below the

conglomerate horizon, before the lithology of the Niagara is recognizable. This would fall into the upper part of No. 8 of the Austin well.

*Joseph Goar's well, near Morristown, Rice County.* This peculiar well was noted in the final report on Rice county. (vol. i, p. 671.) It is in N. E.  $\frac{1}{4}$  sec. 33, Morristown. In a recent communication Mr. Goar gives more particulars concerning the action of this well.

It was dug fourteen years ago, to the depth of seventy feet. At about twenty feet, sand was struck with occasional beds of gravel, largely consisting of limestone. At fifty feet a sound resembling escaping steam was heard. The well being curbed as fast as dug little more was heard or noticed of this. Water to the depth of sixteen or eighteen inches was secured. The well was open, water being drawn by a bucket. In winter the bucket would freeze fast, and finally the whole surface was permanently frozen solid till warm weather came again. Then it was found that when the wind was strong from the north, or a little east or west of north, water could not be got, but a few hours wind from the south or southeast would insure plenty of water. At first it would look as if it had been agitated by wind, but soon became clear. Small black frogs, "with feet like chickens, no web between the toes," were sometimes drawn up, were said to have been drawn up often. These were so small they would get inside the links of an old fashioned trace chain.

More lately the well has been sunk about five feet deeper, an iron pump and pipe put into it, and filled up about seventeen feet with gravel and the opening at the top covered. It is now found that a strong current of air passes sometimes in and sometimes out of the top. The water is clear and softer than the common well-water of the country round. By keeping the well closely covered there is but little trouble from freezing. When it blows out it thaws everything about the top. The force of air going in or out, if confined to a small vent, has been heard at a distance of a hundred yards.

This can only be explained by supposing some connection with the surface through gorges in the rock, or through some gravel bed. The condition of the surface of the country, in Morristown,

prior to the drift epoch, may have been somewhat like that in Winona and Houston counties, and after the deposition of the drift some subterranean passages were still unfilled.

*The Tracy deep well.* This well was drilled by Messrs. Swan and Stacey, in the winter of 1885-86. Its depth is 724 feet four inches, and penetrates the granite about thirty-one feet. Water was found at about one hundred and fifty feet, which rose to within about thirty-seven feet of the surface. It did not apparently change in respect of hydrostatic pressure after it was first struck.

Through the courtesy of Hon. W. O. Musser, president of the village council, and the co-operation of Messrs. Swan and Stacey, the subjoined record of the depths of the different strata of this well has been obtained. This record was accompanied by a set of drillings, and from these the writer has made out the descriptive notes. The corresponding numbers of the museum register are 6492 to 6516.

No. of Sample.	No. of feet deep.	Total No. of feet.	DESCRIPTION.
1	1	1	Black loam soil.
2	19	20	Yellowish, pebbly clay.
3	100	120	Blue till.
4	5	125	Fine gravel, largely of limestone, having a nearly black general aspect, owing to fine disseminated organic matter. This contains some fine sand, and some soil-like matter. It also contains a few fragments of slag or furnace-clinker, of vegetable fiber, Cretaceous lignite, small pieces of pyrite apparently from the Cretaceous, and fibers of metallic iron evidently from the drill.
5	20	145	Fine blue clay, Cretaceous?
6	20	165	Coarse gravel, embracing numerous pieces of buff limestone, and of crystalline rock, also of grey and dark or reddish quartzite, pieces ranging from an inch in diameter to a thirty-second part of an inch, or finer. The whole being dirty and looking as if gathered on the surface of the ground in the soil and unwashed. There are in this lot several pieces of grey, gritty quartzite evidently from the Cretaceous, and of grey conglomerate or coarse sandstone, and of concretionary iron pyrites. But the most singular portion is the slag similar to that mentioned in No. 4. This shows all stages of solidification from loose light pumice to black obsidian, and to black sub-crystalline hard rock. It is in fragments as large as three-fourths of an inch in longest diameter, and in pellets round as shot, no larger than the eye of a needle. It is nearly all black, and is often amygdaloidal, some of it being magnetic. Embraced in this lot are also beds of lignite and of concretionary pyrites. On one of the angular black masses of stone, evidently broken from the formation, are very evident remains of woody fiber, now in the form of charcoal. Fibers of metallic iron are equally common in this as in No. 4.
7	12	177	Fine blue clay, evidently Cretaceous.
8	20	197	Fine sandstone, homogeneous, light greenish-blue, Cretaceous.
9	213	410	Dark gray shale, Cretaceous, occasionally containing a rounded small pebble of buff limestone.
10	60	470	Fine light-blue or greenish sand.
11	43	513	Blue clay or shale, not fissile but rather massive, with fine kaolinic and micaceous particles.
12	32	545	Cretaceous grit, consisting of angular and sub-angular grains of white quartz, also embracing numerous pieces of concretionary iron pyrites.
13	5	550	Fine grey sandstone.
14	30	580	Blue clay, like that of No. 11.
15	7	587	Angular and rounded grains of sand, mainly white quartz, but also containing pieces of pyrite, and films of iron from the drill.
16	24	611	Dark, unctuous, fine clay.
17	8	619	White, kaolinic clay, becoming reddish, then bluish and gritty; mingled in the lot with sub-angular grains of quartz.
18	8	627	White and grey quartz sand, the latter in concretionary lumps, cemented by pyrite.
19	10	637	The same as the last, but containing kaolinic material.
20	25	662	White kaolin, clouded with blue clay, and containing some grit.
21	2	664	White angular quartz sand, grains opaque, containing dull, olive colored siliceous lumps apparently made up of a great number of small grains cemented; also some kaolin, some shale, and some pyrite.
22	2	666	The same as the last.
23	6	672	The same as the last, but finer, more rounded and more homogeneous.
24	18	690	White sand, mainly angular, fine and homogeneous, but containing some coarse grains of angular quartz and some kaolinic material, the latter apparently resulting from the decay of grains of feldspar after deposition in the sandstone.
25	2	715	Reddish orthoclastic granite becoming chloritic.

The most interesting thing about this record is found in Nos. 4, 5 and 6. Here we find, separating the drift from the more evident cretaceous beds, a remnant of the old soil which accumulated on the Cretaceous rocks during the Tertiary age. There are two gravelly deposits separated by a fine blue clay. This clay may be a representative of the Tertiary. The lower gravelly bed, containing much slag and coarse gravel, can be supposed to have accumulated on the Cretaceous after the withdrawal of the Cretaceous ocean; the slag coming from the combustion of the lignites contained in the strata, in the same manner as seen at the present time in Dakota and Montana, producing many of the phenomena of volcanoes. After a submergence, and the accumulation of twenty feet of (Tertiary?) blue clay, another soil accumulated over the blue clay similar in all characters to the former. On this, afterward, was brought the glacial till by the operations of the post-Tertiary age. This history is indicated by the presence of these igneous particles in the drillings from this depth, and it is no more than might be expected from the abundant ashes and charcoal that accompany the Cretaceous lignites in their exposures at and near Redwood Falls. These particles of slag, however, may have been adventitiously introduced in the drillings from some coal-stove or other fire-box; and this is strengthened by the fact that in No. 4 is also found a fragment of an eight penny nail of iron.

*The deep well at Gibbon, on the Minneapolis and St. Louis railway. Sec. 2, T. 112, R. 31, Sibley Co.*

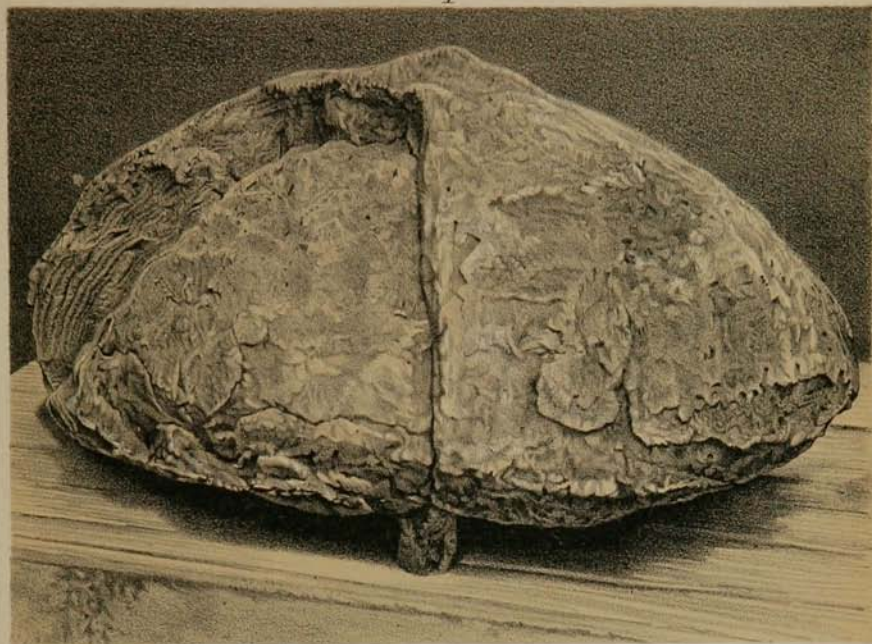
This was drilled by the Minneapolis and St. Louis railway, and Mr. W. B. Hixson has supplied the following facts:

- |  |           |
|--|-----------|
| 1. Blue clay, dry, with small gravel-stones and an occasional boulder.....   | 275 feet. |
| 2. Sand, with water which rose forty or fifty feet above the sand; also containing remains of wood, having the appearance of modern drift-wood (6245 and 6246) | 20 feet.  |
| 3. Red granite (62-7).....   | 30 feet.  |

### EXPLANATION OF PLATE I.

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2. View of the same specimen showing the base, reduced to one-fourth the natural size, from a photograph. This specimen, as represented, is coated on the bottom with a layer of calcareous tufa, which renders the concentric ridges much less evident and continuous.	

1



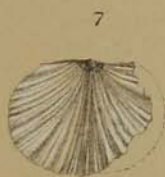
2



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## II. FINAL REPORT.

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*Winchell*; the Geology of Olmsted, Dodge and Steele counties, by *M. W. Harrington*; and the Geology of Waseca, Blue Earth, Faribault, Watonwan, Martin, Cottonwood, Jackson, Murray, Nobles, Brown, Redwood, Yellow Medicine, Lyon, Lincoln, Big Stone, Lac qui Parle and Le Sueur counties, by *Warren Upham*. Distributed gratuitously to all public libraries and county auditors' offices in the state, to other state libraries and state universities, and to leading geologists and scientific societies; the remainder are held for sale at the cost of publication, \$3.50 per copy in cloth, or \$5 in grained half roan binding, upon application to Prof N. H. Winchell, Minneapolis.

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