

ency. It is interesting to note that with a single exception there was an increased growth of mycelium, with increased ammonia accumulation. In the case of *Zygorhynchus*, there was but a slight growth of mycelium, although a fairly large amount of ammonia was accumulated in the soil. Of the cultures studied, *Trichoderma* showed the largest ammonifying efficiency, which was 48.52 per cent. in soil not containing acid phosphate, and 58.39 per cent. in soil containing 2 per cent. of acid phosphate. On the other hand, *Penicillium I.* showed an ammonifying efficiency of 21.39 per cent. in soil containing no acid phosphate, and 16.45 per cent. in soil containing 2 per cent. of acid phosphate. *Penicillium VI.* showed a very low ammonifying efficiency, which was 10.75 per cent. without acid phosphate, and 12.15 per cent. with 2 per cent. acid phosphate added. A comparison was made of the ammonification of dried blood and cotton-seed meal in the two different soils, inoculating them with *Penicillium VII.* and *Rhizopus nigricans*. More ammonia was accumulated in each soil from cotton-seed meal than from dried blood in the case of both fungi.

The addition of calcium carbonate appeared to inhibit the ammonification of dried blood in the red shale soil with *Rhizopus* and *Penicillium VII.*, but the addition of even small amounts of acid phosphate increased the ammonia accumulation. From some of the results obtained, it appears that the presence of soluble phosphates in the soil, rather than its reaction, determines the amount of ammonia accumulation.

In comparing the ammonifying power of soil bacteria with that of soil fungi using dried blood in the loam soils, the highest amount of ammonia accumulated in the case of the bacteria was with *Bacillus subtilis*, which showed 54.13 milligrams of ammonia nitrogen in the portion not containing acid phosphate and 17.55 milligrams in the portion containing 2 per cent. acid phosphate. In the case of fungi, the highest amount of ammonia accumulated was by *Trichoderma* which showed 75.20 milligrams ammonia nitrogen in the

portion not containing acid phosphate and 90.50 milligrams of ammonia nitrogen in the portion containing acid phosphate.

A more detailed account of these fungi and of the data accumulated by us concerning them will be published at an early date.

HARRY C. McLEAN,
GUY WEST WILSON

N. J. AGRICULTURAL EXPERIMENT STATION,
NEW BRUNSWICK, N. J.

THE IOWA ACADEMY OF SCIENCE

THE meetings of the twenty-eighth annual session of the Iowa Academy of Science were held at Iowa State Teachers College, Cedar Falls, beginning Friday afternoon, April 24, and closing at noon Saturday, the 25th. The meeting was called to order at 1:30 P.M. by the president, Professor C. N. Kinney, of Drake University. After the preliminary business was transacted the academy proceeded to the reading of papers until adjournment to meet at 9:00 A.M. Saturday.

The evening address was given by Dr. N. H. Winchell, of the Minnesota Historical Society, on "The Antiquity of Man in North America in Comparison with Europe."

Following the reading of papers and the final business meeting a luncheon was served in the gymnasium at noon, Saturday.

As officers for the ensuing year the following elections were made:

President, H. S. Conard, Grinnell.
First Vice-president, H. M. Kelly, Mount Vernon.
Second Vice-president, L. S. Ross, Des Moines.
Secretary, James H. Lees, Des Moines.
Treasurer, A. O. Thomas, Iowa City.

It was decided to try the plan at the next annual meeting, to be held at the State University of Iowa, Iowa City, of carrying out the program in two divisions: a general session and sectional meetings.

It was also recommended that the state legislature be urged to appropriate additional funds to enable the Geological Survey to complete the topographic map of the state in the least possible time.

Program

(Abstracts by the authors.)

Sulfonation in Soils: P. E. BROWN AND E. H. KELLOGG.

The Des Moines Diphtheria Epidemic of 1912-13:
CHAS. A. WYLIE.

Bacterial Content of Desiccated Egg: L. S. ROSS.

The results of about 550 examinations of liquid and of powdered egg are given. The problem of the effect of storage, both with reference to time and temperature of storage, is considered. Results obtained in the experiment show a more rapid diminution of bacteria in storage at incubator temperature than at room temperature. The conclusion is drawn also that good eggs carelessly handled during process of manufacture may show a greater bacterial content than eggs of suspicious quality if carefully handled during the process of breaking and drying. It seems possible that "spots" may be made into a desiccated product, which after storage for some time would give satisfactory results upon a quantitative bacterial examination.

An Incubator Opening to the Outside of the Building: L. S. ROSS.

An incubator was placed in the basement and from this a chute leads upwards and outwards to an opening in the wall of the building. The purpose of the device is to make it possible for physicians or officers of the city board of health to drop diphtheria culture tubes, submitted for diagnosis, into the incubator at any hour of the day or night.

U. S. Kelp Investigations in Alaska: ROBERT B. WYLIE.*The Pollination of Vallisneria:* ROBERT B. WYLIE.*Comparison of Field and Forest Floras in Monona County, Iowa:* D. H. BOOT.

A study made during 1909 and 1910 of the floras of typical areas in Monona county, Iowa, to determine the relationship between them. Studies made of undisturbed prairie, both exposed and sheltered, of cleared forest land and of both exposed and sheltered forest show gradual transition in plant life from the most xerophytic to the most hydrophytic types of habitat. No sudden breaks occur as we go from one area to the next. Complete lists of flowering plants accompany the report.

The Origin of the Cocklebur: CLIFFORD H. FARR.*Notes on a Fossil Tree-fern of Iowa:* CLIFFORD H. FARR.*The Myxomycetes of Puget Sound:* THOMAS H. MACBRIDE.*Some Notes on the Ecology of Iowa Lichens:* ZOE R. FRAZIER.

The following conclusions are suggested by the work for this paper.

Lichens vary in adaptation to habitat; this applies both to different species and to different individuals of the same species.

Variation in habitat is explained, at least in part, by structural adaptations. Lichens show a remarkable power of resistance to drouth.

Preliminary Report on the Flora of Linn County: ELLIS D. VERINK.*The Male Gametophyte of Arisæma:* JAMES E. GOW.*Sunflecks:* W. H. DAVIS.*Some Observations on Sycamore Blight and accompanying Fungi:* J. P. ANDERSON.*Introduced Plants of the Clear Creek Canon:* L. H. PAMMEL.

L. H. Pammel called attention to some of the introduced plants of the Clear Creek Valley, Colorado. The first botanist to visit the region was Dr. C. C. Parry, who collected in this region in 1861. Comparatively few alien plants have been introduced; many of the introduced plants are those common to the plains or boreal species.

Weed Survey of Story County, Iowa: L. H. PAMMEL AND CHARLOTTE M. KING.

This paper gives a brief summary of the ecological distribution of weeds on tilled and untilled land in central Iowa, using the quadrat method of giving the distribution.

Variation in Evaporation in Limited Areas: D. H. BOOT.*Notes on Variation in Micranthes Texana:* L. A. KENOYER.

In southeastern Kansas there is a very small patch of a little saxifrage, *Micranthes texana* (Buckl.) Small. Saxifragaceæ are normally 2-carpellate, but in this patch the carpel number varies from two to six, fluctuating around three as an average. Of the 1,800 flowers examined, 83 per cent. have three carpels each. A mutation seems to have occurred somewhere in the life history of this rare and little-known species, giving rise to a group having three as the normal number of carpels.

Barium in Tobacco and other Plants: NICHOLAS KNIGHT.*Colloidal Common Salt:* NICHOLAS KNIGHT.*The Sand of Sylvan Beach, New York:* NICHOLAS KNIGHT.*Unusual Dolomites:* NICHOLAS KNIGHT.*Electromotive Forces and Electrode Potentials in Mixed Solvents:* J. N. PEARCE AND W. H. FARR.

Equilibrium in the System—Mercuric Iodide-Anilin: J. N. PEARCE AND E. J. FRY.

A complete curve representing the conditions of equilibrium between mercuric iodide and anilin has been plotted for temperatures between -11.48° and 199.9° . The region of stability of the three solids $\text{HgI}_2 \cdot 2\text{C}_6\text{H}_7\text{N}$, red mercuric iodide, and yellow mercuric iodide have been established. Sixteen solubility measurements of mercuric iodide in anilin are given, all in duplicate and mostly in triplicate. A new compound corresponding to the formula $\text{C}_6\text{H}_7\text{N} \cdot \text{HgI}_2$ has been identified and described. The compound $\text{HgI}_2 \cdot 2\text{C}_6\text{H}_7\text{N}$ has been made by direct combination of mercuric iodide with anilin. A method for the determination of mercuric iodide as mercuric sulphide in the presence of an easily oxidized organic solvent has been tested.

The Electrical Conductivity of Solutions on Certain Electrolytes in Organic Solvents: J. N. PEARCE.

Earth Movements and Drainage Lines in Iowa: JAMES H. LEES.

The paper aims to bring together existing knowledge concerning drainage conditions in northeastern Iowa and to show that the present system is the resultant of uplifts and warpings of the strata at different periods and from various centers. The fact that the streams are flowing far above the bottoms of their valleys is attributed to changes necessitated by glacial action and to lowering of the land surface.

Some Evidences of Recent Progress in Geology: GEORGE F. KAY.

In this paper reference is made to some of the most important geological papers published during the last ten years and which indicate the lines along which the greatest progress has been and is being made.

Siouan Mountains: An Iowan Triassic Episode: CHARLES KEYES.

The true significance of the abrupt cutting off to the northward of the Iowa belted Paleozoics is obscured by the fact that Cretacic sediments overlie points at which critical evidence might be expected. Lately, deep-well records and other data have disclosed a substructure that is quite remarkable. It is now known that over the high arch extending from Lake Superior southwestward into South Dakota the Cambrie, Ordovician, Silurian, Devonian and Carbonian formations were spread out. The uprising appears to have taken place in Tri-

assic times; and in Comanchian time the entire mountainous ridge, 5,000 feet high, was planed off and completely base-leveled. Upon this peneplained surface the Mid Cretacic sediments were laid down. This period of base-leveling also appears to fix the date of peneplain forming the Lake Superior highlands.

Serial Unit in Stratigraphic Classification: CHARLES KEYES.

The recent movement to test the validity of each formational unit by criteria other than that of the contained fossils has led to important and rather unexpected advancements in stratigraphical classification. The fact that this movement is also in the direction of simplicity argues for its still wider adoption. In Iowa, Illinois and Missouri the Early Carbonian succession is a good illustration of the point under consideration. By emphasizing the paleogeographical and diastrophic factors and adapting, so far as is possible, the nomenclature already in use the various terranes may be grouped into three grand divisions having serial rank. These groups are the Waverleyan series, the Mississippian series and the Tennessean series. At divers times other names have been proposed, that might be used but for the fact that they are preoccupied. The division is essentially the same as that first suggested by Owen more than sixty years ago.

Stratigraphic Position of Our Oldest Rocks: CHARLES KEYES.

Although the Sioux quartzite, which crops out where the three states of Iowa, Minnesota and South Dakota meet, has been long known and repeatedly described, little has ever been learned of its tectonic relationships or of its real position in the general geologic column. The Corson diabbases, the Hull porphyries and the Tipton sandstones now appear to belong to the Keewenawan series of the Proterozoic era. The Split-Rock slates, the Sioux quartzite and the Jasper conglomerates are Animikian in age. The Archeozoic is not represented. The gneisses of Le Mars and the schists of Sioux City form a part of the Azoic complex.

On Precious Stones in the Glacial Drift: GARRETT A. MUILENBURG.

A New Section of the Railway Cut near Graf, Iowa: A. O. THOMAS.

This artificial section exposed along the Chicago Great Western railway in Dubuque county has been made famous by the writings of James and of Calvin. It has recently been cut back for quite a

distance while making some improvements in the road-bed.

The fresh section affords an excellent opportunity for studying this phase of the Maquoketa shales. Several feet of interesting beds higher up than those described by the writers mentioned have been exposed. The new section is described and a revised list of the fossils is given.

The Surface Clay of Adair County (Second Paper): JAMES E. GOW.

Evidences of Sand Dune Formation in Cedar Rapids and Vicinity: WASHBURN D. SHIPTON.

Pleistocene Exposures in Cedar Rapids, Iowa and Vicinity: WASHBURN D. SHIPTON.

Preliminary Report of Geological Work in Northeastern Iowa: ARTHUR C. TROWBRIDGE.

Field work is now being carried on in northeastern Iowa by students and faculty of the geology department of the State University of Iowa. Much new material is being found, along the lines of stratigraphic, structural, paleontologic, economic and physiographic geology. The region is particularly rich in physiographic problems, and a continuation of the work is expected to yield much additional knowledge of the Mesozoic and Cenozoic history of this part of North America.

The Origin of Eskers: ARTHUR C. TROWBRIDGE.

There are many difficulties with the generally accepted subglacial theory for the origin of eskers, which says that these interesting ridges are deposited by streams flowing beneath continental glaciers. It seems more likely that they are formed by the slow recession of the edges of glaciers during the deposition of kames, and a resulting drawing out of the kames into long lines.

An Area of Wisconsin Drift farther South in Polk County, Iowa, Than Hitherto Recognized: JOHN L. TILTON.

One mile south of the bridge over Raccoon River at Valley Junction there is a small area of Wisconsin drift about a third of a mile in diameter.

Indian Pottery of the Oneota or Upper Iowa Valley in Northeastern Iowa: ELLISON ORR.

The Oneota or Upper Iowa, a small river about eighty miles in length, flows through Winneshiek and Allamakee counties in Iowa close to their northern border, which is also the line between this state and Minnesota. It flows through a beautiful winding valley which has a width of half a mile, and is bounded by precipitous bluffs. The glacial terraces which extend up this valley for forty

miles to Decorah have afforded very abundant evidences of a former considerable Indian population. Earth embankments, mounds and camp sites have yielded up a treasure of implements, weapons and ornaments. Notable among these are the large number of small earthen vessels found in burial places and the fewer large ones which seem to have been buried by themselves. The writer has been quite successful in finding or securing a number of well-preserved specimens of both classes, some of which he describes in detail. The material used in the manufacture was common clay tempered by pulverized clam shells. In shape this pottery is symmetrical but the attempts at ornamentation are crude. The vessels all have a rounded pot-like bottom and if upset, will at once resume an upright position. "In short, these prehistoric potters, while they were able to produce very shapely ware, were unable to add to its beauty by elaborate, intricate or symmetrical designs." The paper is illustrated by nine plates.

Longitude by Wireless: D. W. MOREHOUSE.

Illumination Power of Kerosenes Used in Iowa: WILLIAM KUNERTH.

The results of this series of experiments can be summarized as follows:

1. By the application of ordinary photometric methods great differences in the illuminating power of different samples of kerosene oils have been shown.
2. Oils from the east have a lower density and are sold at a higher price than those from the west.
3. Those oils which have a high illuminating power were found also to be high in density, index of refraction, viscosity, surface tension, flash point and burn point. The length of wick charred was shorter and the fogging of the chimney was more marked than for the oils having low illuminating power.
4. The oils which were retailed at lower cost gave more light.
5. By putting coloring matter into an oil the illuminating power is decreased.
6. By exposing oil to light, the illuminating power is decreased.
7. Draft reduces the illuminating power.
8. The denser the oil the greater is the intrinsic brilliancy of the flame.
9. Air in oil seems to decrease the illuminating power.
10. For a given flux of light the cost of illumination by kerosene oil lamps is about the same as that by tungsten lamps.
11. The oils used in this state have practically the same burning quality.
12. Kerosene oil lamps are not very desirable as standards of comparison.
13. The quantity of oil received for a gallon is often very deficient.

14. The lighter the oil the more nearly white is the flame.

Certain Diffraction Experiments in Sound: HAROLD STILES AND G. W. STEWART.

This paper describes three experiments in sound diffraction, viz., the shadow of a rigid sphere, the passage of sound through narrow slits and the sound through circular apertures.

Previous theoretical investigations are verified to within a reasonable degree in all three experiments. The paper is published in full in the *Physical Review* for April, 1914.

The Variation of Sound Intensity with Distance from the Source; An Interesting Case of Deviation from the Inverse Square Law: G. W. STEWART.

This paper shows that when a source of sound is located on a rigid sphere the intensity does not decrease inversely as the square of the distance from the source or from the center of the sphere. Data are given for the variation in intensity in different directions from the sphere, at different distances and with a variation of wave length.

Notes on the Construction of Selenium Bridges: E. O. DIETERICK.

The Adaptation of Selenium to Measurements of Energy Too Small to be Measured by Other Devices: L. P. SIEG AND F. C. BROWN.

The Effect of Pressure on the Light-sensibility of Metallic Selenium Crystals: F. C. BROWN AND L. P. SIEG.

Sex Linked Factors in the Inheritance of Rudimentary Mammary in Swine: EDWARD N. WENTWORTH.

The Effect of Calcium and Protein Fed Pregnant Swine upon the Size, Vigor, Bone and Coat of the Resulting Offspring: JOHN M. EVVARD, ARTHUR W. DOX AND S. G. GUERNSEY.

To determine the relative effects of calcium and protein when added to a basal ration of corn when fed pregnant swine on the developing fetus many separate experiments were conducted. It was clearly shown that the addition of protein to corn increased the size, vigor, condition, coat quantity and coat covering of the offspring. Duroc Jersey swine were used; these are red in color. The addition of calcium also increased the size, vigor, condition, coat quantity and coat color, but not so markedly as did the protein. However, the calcium did have more effect on the bone development and the condition or degree of fatness than did the protein. That the addition of protein had such influence upon the offspring is due in large

measure to the fact that the corn protein is deficient in the amino acids, tryptophane, lysine and glycocoll. The source of the protein was black albumen, whereas the calcium was furnished in the form of both chloride and carbonate. The carbonate was found to be more efficacious than the chloride, presumably because it did not induce acidosis as the chloride probably did.

A Study of the Crow: FRANK C. PELLETT.

Butterflies of Chance Occurrence in Cass County: FRANK C. PELLETT.

Nature and Birds: FRED BERNINGHAUSEN.

Color Vision in Animals: MABEL C. WILLIAMS.

Effect of Low Temperature on the Oyster-shell Scale, Lepidosaphes Ulmi Linn: R. L. WEBSTER.

The effect of the low temperatures of January, 1912, on the eggs of the oyster-shell scale in Iowa. An account based on samples of scale sent in a year later. In most cases the eggs had been killed by the severe winter.

A Catalogue of the Lepidoptera of Linn County: GEORGE H. BERRY.

Notes on Variation in Micranthes Texana: L. A. KENOYER.

Coleoptera of Henry County, Iowa: INEZ NAOMI KING.

There are listed about 500 species of Coleoptera representing those that are known to occur in Henry county, Iowa. Most of these species have been collected by the author during the years 1912, 1913 and 1914.

"The Coleoptera of Indiana," by W. S. Blatchley, has been used for the larger part in naming the specimens taken, although some of the names have been determined through various sources.

An Observation of Longitudinal Division of Hydra: L. S. ROSS.

An account of the observation of two specimens of the brown *Hydra* in the process of longitudinal division, one being divided through the length of the body to the foot, while the other had divided through the hypostome and only a short distance into the body. Also a brief account of the accidental injury of one of the tentacles resulting in the union of two tentacles into a loop that persisted a few days and then separated again into two distinct tentacles.

A Convenient Table for Microscopic Drawing: L. S. ROSS.

JAMES H. LEES,
Secretary