

THE IOWA ACADEMY OF SCIENCE

Various institutions, organizations, and associations have been formed throughout the history of Iowa to carry forward and encourage scientific research. Among these, the Iowa Academy of Science has held an important place. Prior to the formation of this organization, as well as in later years, prominent scientists of Iowa have been affiliated with the American Association for the Advancement of Science and various other scientific organizations. Scientists of Iowa have also shown an interest in the State Geological Survey. Accordingly, before entering upon a discussion of the Academy of Science as such, something may be said of the influence of these earlier organizations.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The American Association for the Advancement of Science was organized in 1848 "to promote intercourse between those who are cultivating science in different parts of the United States; to give a stronger and more general impulse and a more systematic direction to scientific research in our country; and to procure for the labors of scientific men increased facilities and a wider usefulness." At the meeting of this Association, held at Albany, in 1851, C. C. Parry of Davenport joined the organization. Two years later Theodore S. Parvin of Iowa City also became a member. At the meeting at Chicago in 1868 two more Iowans — Gustavus Hinrichs of Iowa City and William H. Pratt of Davenport — joined the Association. Due, no doubt, to the influence of these men the Association met at Dubuque, Iowa, in 1872 — the first meeting west of

the Mississippi River. At this session a considerable number of prominent Iowans, including C. E. Bessey of Ames, Asa Horr and T. M. Irish of Dubuque, J. C. Arthur of Charles City, and W. C. Preston of Iowa City, joined the Association.¹ Samuel Calvin and Thomas H. Macbride also attended this meeting.

At the conclusion of the session at Dubuque, members of the Association visited the town of McGregor and the Upper Mississippi River. Upon their return a trip across the State from Dubuque to Sioux City was planned. The group taking this trip consisted of about forty members, including five or six State Geologists, a number of botanists, and others interested in the study of natural history and the pursuits of science. The excursion was directed by Dr. C. A. White of the State University of Iowa, State Geologist of Iowa, who lectured during the two-day trip across the State.

The party stopped at Fort Dodge and devoted some time to a scientific exploration of the surrounding country — visiting the limestone quarries and kilns, coal mines, and the famous gypsum quarries. Members of the party sallied forth in various directions. Some crossed the Big Sioux River into the Territory of Dakota; others crossed the Missouri River into Nebraska. Short rides were taken into these regions, which were chiefly of interest to the botanists of the party. The region around Sioux City was found to be interesting, historically, geologically, and geographically, and many of the bluffs, rivers, forests, and quarries in that vicinity were visited by the geologists, botanists, ichthyologists, and entomologists of the party.

On the return trip the party again stopped at Fort Dodge, and drove across the country some sixteen miles to Spring-

¹ *Proceedings of the American Association for the Advancement of Science*, Vol. XXI, pp. xiii, xv, xli, Vol. XXII, pp. xxv-xl.

vale — now Humboldt — to visit Humboldt College and the quarries and kilns in the vicinity of Dakota City. The excursion, touching as it did various points of scientific interest in the State, led to a better understanding of the materials in Iowa available for scientific study, and developed a closer association among scientists; indeed, it may be looked upon as a significant event in the early development of scientific research in Iowa.²

THE FIRST IOWA GEOLOGICAL SURVEY

On January 6, 1855, Representative Richard Bonson of Dubuque introduced into the Iowa legislature, which was then in session in the Old Stone Capitol at Iowa City, a bill providing for a State Geological Survey. Four days later the measure passed the House of Representatives and was sent to the Senate where, upon motion of Senator Milton D. Browning, further action on the measure was indefinitely postponed. On January 18th the bill was again taken up in the Senate, and after an unsuccessful attempt to have it laid on the table, it passed the Senate by a vote of twenty-four to six. A few days later the measure was approved by Governor James W. Grimes.

This measure authorized the Governor, by and with the advice and consent of the Senate, to appoint a State Geologist who should be "a person of competent scientific and practical knowledge of the science of geology and mineralogy", and should hold office for a term of two years, unless sooner removed by the Governor. As an assistant in this work "a skillful analytical and experimental chemist" was to be appointed. This Geologist and his assistant were authorized to begin, as soon as practicable, a thorough

² *Proceedings of the Association for the Advancement of Science*, Vol. XXI, appendix, pp. 280-290; Wheildon's *Scientific Excursion Across the State of Iowa*, pp. 1-8.

geological and mineralogical survey of the State, and to make an analysis of the character and quality of the soil for agricultural purposes. The assistant was to make full and complete examinations and assays of all rocks, ores, soils, or other substances submitted to him by the State Geologist, and to furnish a complete and detailed account of the results obtained.

The Geologist was directed to forward to the Governor, from time to time during the process of the survey, such specimens of rocks, ores, coals, soils, and fossils as would be proper and necessary to form a complete cabinet of specimens of geology and mineralogy of the State. He was also directed to make annual reports to the Governor setting forth the progress of the work and to present such maps and drawings as were necessary for illustrative purposes.

The salaries of the Geologist and his assistant were to be fixed by the Census Board of the State. An appropriation of two thousand five hundred dollars a year was made to defray expenses.

Under the authority of this act, James Hall, of Albany, New York, was appointed State Geologist, and J. D. Whitney, of Northampton, Massachusetts, became his assistant in the field of chemistry and mineralogy.³

In 1857 ten thousand dollars was appropriated for the continuance of this survey. It was provided at this time that all geological specimens and fossils collected should be given to the State University. The Governor was also authorized to have two thousand copies of the report of the State Geologist printed, transmit a copy to each mem-

³ *Journal of the House of Representatives*, 1854-1855, pp. 182, 195, 218, 353; *Journal of the Senate*, 1854-1855, pp. 141, 144, 230, 286; *Laws of Iowa*, 1855, Ch. 83; Hall and Whitney's *Report on the Geological Survey of the State of Iowa*, Vol. I, pp. xi-xiii.

ber of the General Assembly, and deposit the remainder in the office of the Secretary of State.

Under the provisions of this act, an extensive volume of more than seven hundred pages was published in 1858, setting forth in detail the results of the survey during the previous three years. The first chapter of this volume was prepared by Mr. Whitney and was devoted to a consideration of the physical geography of the State — dealing with such sub-topics as the boundaries, area, and configuration of the surface of the State; obstructions to navigation; tributaries of the Mississippi and Missouri rivers; mounds, prairies, and bluffs; and the soil, vegetation, and climate of Iowa.

The two chapters following were prepared by Mr. Hall, and dealt with the geology of the Northwest, and the geology of Iowa, respectively. Two chapters of the report, presented by A. H. Worthen, were devoted to the geology of the Des Moines Valley, and the geology of certain counties. The work on county geology was continued by Mr. Whitney, who also contributed an additional chapter dealing with chemistry and economic geology. Part two of the report, consisting of some two hundred and fifty pages prepared by Mr. Hall, was devoted to a discussion of the paleontology of Iowa.⁴

Following the publication of this report, no provision was made for continuing this work until the meeting of the Eleventh General Assembly in 1866, when a bill was passed providing for the reorganization of the Survey. This act provided that Charles A. White of Johnson County be appointed State Geologist for a term of two years, and authorized the appointment of a competent assistant, and a "skill-

⁴ Hall and Whitney's *Report on the Geological Survey of the State of Iowa*, Vol. I, see table of contents; *Laws of Iowa*, 1857, Ch. 103; Joint Resolution No. 25, in *Laws of Iowa*, 1857, p. 465.

ful analytical and experimental Chemist", who should report to the State Geologist the analysis of such soils, rocks, coals, ores, and other mineral substances as might be submitted to him.

The salary of the State Geologist was fixed at two thousand dollars, and he was authorized to fix the salary of his assistant at a sum not to exceed fifteen hundred dollars per year. For the purpose of carrying this act into effect an appropriation of six thousand five hundred dollars annually for two years was provided. Chandler Childs of Dubuque was appointed field assistant. A few months later he was succeeded by Orestes H. St. John of Waterloo. Gustavus Hinrichs was appointed chemist.⁵

The work accomplished during the fifties had been confined for the most part to a study of the eastern section of the State. Accordingly, under the authority of this new act, work was commenced and prosecuted with a view to obtaining a knowledge of the geological structure of the western part of the State and gathering all possible information concerning the mineral and other material resources of the State as a whole. Special attention was given to a study of the coal fields, the character of the soil, and the physical features.

In 1867 a preliminary report was prepared to be presented to the General Assembly, and in the spring of 1868 an additional annual appropriation of six thousand five hundred dollars was provided to carry the work forward — the State Geologist and his assistants being directed to complete the survey by January, 1870.⁶

⁵ *Laws of Iowa*, 1866, Ch. 73; *First and Second Annual Report of the State Geologist*, 1868, pp. 5, 6.

⁶ *Laws of Iowa*, 1868, Ch. 178; *White's Report on the Geological Survey of the State of Iowa* (1870), Vol. I, pp. 7-12; *First and Second Annual Report of the State Geologist*, 1868, pp. 1-19.

When the Thirteenth General Assembly met in 1870 a bill was passed authorizing the Census Board to contract with the State Printer for the printing of three thousand copies of the State Geological Report, which it was designated should be "equal in every respect, mechanically, to Hall's Geological Report" — the engravings, views, maps, and diagrams to be equally as well executed.

In accordance with the provisions of this law two volumes of about four hundred pages each were published in 1870. The first volume consisted of three parts. Part one contained three chapters, written by Mr. White, dealing with surface features, surface deposits, and soils. The fourth and final chapter of part one was prepared by T. S. Parvin and was a discussion of climate and climatic conditions. Part two, prepared by Mr. White and O. H. St. John, dealt with the subject of general geology — the Azoic, Lower Silurian, Upper Silurian, and Devonian; Carboniferous; and Cretaceous systems. Part three, prepared by Mr. White, dealt with the geology of southwestern Iowa.

Volume two of this work consisted of two parts. Part one contained a chapter by Mr. St. John dealing with the geology of the middle region of western Iowa. Three chapters written by Mr. White dealt with the geology of northwestern Iowa, the middle region of northern Iowa, and the coal counties. Part two consisted of three chapters, by Mr. White, dealing respectively with peat and petroleum, gypsum, and building materials; and a fourth chapter, by Rush Emery, on the subject of chemistry.⁷

After the discontinuance of this survey under Mr. White no further work was done under State supervision until 1892 — a lapse of more than twenty years. Meanwhile, two private surveys, both of unusual merit and outstanding

⁷ *Laws of Iowa*, 1870, Ch. 111; *White's Report on the Geological Survey of the State of Iowa* (1870), Vols. I and II, see table of contents.

importance in the advancement of scientific research, were made in Iowa. For a number of years W J McGee conducted extensive examinations of the glacial deposits in northeastern Iowa. The results, originally intended to appear in other forms, grew so voluminous that they were finally incorporated in a large monograph and published by the Federal government in the *Eleventh Annual Report of the United States Geological Survey*.

In the field of paleontology, Charles Wachsmuth and Frank Springer conducted comprehensive studies on certain groups of fossils. A report of this work was published in *Memoirs of the Museum of Comparative Zoology* and has been referred to as "one of the most exhaustive contributions ever made to the literature of American science". Both of these studies are highly creditable to the authors and of great value to the State. They would have reflected a much larger share of credit to the Commonwealth, however, had they been supported by the State instead of by private enterprise.⁸

It will be recalled that the law of 1857 provided that all geological specimens and fossils collected by the State Geological Survey should be given to the State University. In 1872 this law was amended to provide that complete sets of specimens should be given to the University and that duplicate specimens should be given to the Iowa State College of Agriculture and Mechanic Arts.⁹

Thus it appears that when the Iowa Academy of Sciences was established in 1875 the field of geology had been studied over a period of more than twenty years and that reports had been made setting forth in a very creditable manner the results obtained. This work, although but a beginning

⁸ *Laws of Iowa*, 1892, Ch. 71; *Iowa Geological Survey*, Vol. I, p. 3, Vol. XXII, pp. 62, 63, 132-139.

⁹ *Laws of Iowa*, 1857, Ch. 103, 1872, Ch. 105; *Revision of 1860*, Sec. 187.

in a limited field, served as a foundation upon which to build the more diversified work which was to be undertaken by the Academy of Sciences.

THE IOWA ACADEMY OF SCIENCES
1875-1884

On August 27, 1875, a meeting of persons interested in the organization of a scientific association for the State of Iowa met at the State University. This group consisted of C. E. Bessey, D. S. Fairchild, and J. K. Macomber, of Ames; Gustavus Hinrichs, W. C. Preston, and E. F. Clapp, of Iowa City; W. D. Middleton of Davenport; and A. G. Field of Des Moines. These men, together with Samuel Calvin of Iowa City, Asa Horr of Dubuque, C. C. Parry of Davenport, P. J. Farnsworth of Clinton, and J. E. Todd of Tabor, who were not present but had previously expressed their desire to join such an organization, became the charter members of the Iowa Academy of Sciences.

The constitution which was adopted at this time set forth as the purpose of the Academy "the promotion of Science, more particularly that pertaining to the State of Iowa". A president, vice president and a secretary-treasurer, who were jointly to constitute a board of trustees, were to be elected annually. Fellows in the organization were to be limited in number to thirty and to "such persons as have done good scientific work". Provision was made that the Academy should hold at least two meetings a year — one in the spring at Iowa City, and one in the fall at such other place as might be designated. Election of officers resulted in the naming of C. E. Bessey, as president, W. D. Middleton, as vice president, and W. C. Preston, as secretary-treasurer.

Plans were made to hold the next meeting in Des Moines on the evening preceding the regular meeting of the State

Medical Society in February, 1876. It was agreed that at this Des Moines meeting each charter member should be allowed to present the name of one candidate for membership. Recommendations and reasons based upon the scientific work of the candidate were to be forwarded to the secretary-treasurer before the date of the meeting.¹⁰

In accordance with the plans previously made, the Academy met in the office of Dr. A. G. Field in Des Moines on the evening of January 25, 1876. This session is referred to in the reports as the first semi-annual meeting of the Academy. Only five members — Hinrichs, Middleton, Farnsworth, Fairchild, and Field — were present. In the absence of President Bessey and Secretary Preston, Dr. Middleton, vice president of the Academy, presided; and Dr. Fairchild was elected secretary *pro tem*. During the business session articles of incorporation were presented and approved, and five candidates — D. S. Sheldon and R. J. Farquharson, of Davenport, C. M. Hobby of Wilton, G. C. Carpenter of Indianola, and F. M. Witter of Muscatine — were nominated for membership in the Academy.

A paper on "Changes of Climate in Iowa" was presented by Professor Hinrichs. After a full exposition of the investigation of climatic changes in various parts of the world, Professor Hinrichs entered into an exhaustive discussion of the meteorological observations that had been made in Iowa. These, he said, showed that the summers had been growing steadily warmer and the winters colder. He observed, moreover, that if these changes continued at the same rate during the next seventy-five years the summers

¹⁰ *Iowa Academy of Sciences, 1875-1880*, pp. 2, 5, 6. This pamphlet was published by John P. Irish in 1880. So far as the writer knows there are but two copies remaining. One of these is in the possession of James H. Lees at Des Moines; the other was bound by Samuel Calvin with several other pamphlets and designated as *Paleontology Pamphlets*, Vol. I, and is now (1931) in the Geology Library at the State University of Iowa.

would become like those of Louisiana and the winters like those of Duluth, Minnesota. The importance to the State of securing correct observations of these changes, for the purpose of determining whether such changes were likely to make further progress, and what means might be employed to check them, was fully set forth by Professor Hinrichs. The paper elicited an interesting discussion, at the conclusion of which the meeting adjourned.¹¹

The first regular annual meeting of the Academy convened in the natural history room of the State University at Iowa City on June 23, 1876, with President C. E. Bessey presiding. The members present were C. E. Bessey, Gustavus Hinrichs, F. M. Witter, P. J. Farnsworth, Samuel Calvin, and W. C. Preston.

President Bessey presented "A Preliminary Catalogue of the Lichens of Iowa". His list of twenty-six species, collected principally in central Iowa, included, it was believed, about one-fifth of the lichens of the State. He also presented "A Catalogue of the Orthoptera of Iowa", including thirty-nine species found in central and southeastern Iowa. Dr. Farnsworth read a paper on "Mounds and Mound Builders" in which he presented the view that the mound builders were identical in race with the North American Indians. His evidence was based upon resemblances of anatomical structure and the modes of burial of the mound builders and the Indians.

Dr. Hinrichs presented maps and diagrams of the severe hail storm in Iowa, on April 12, 1876. Dr. Calvin described seven new species of Paleozoic fossils found in Howard and Floyd counties. He also presented a paper, entitled "Notes on a Probable New Species of Fossil Elephant", from the modified drift near West Union. "The Deposits

¹¹ *Iowa Academy of Sciences*, 1875-1880, pp. 6, 7; *Iowa State Register* (Des Moines), January 26, 1876.

of the Chemung Group in Iowa" was also discussed by Dr. Calvin. F. M. Witter read a paper on the land and fresh water shells found near Muscatine, of which he had determined fifty-two species. W. C. Preston discussed "Thermic Wind Rose for Iowa City", showing the relation between wind and temperature, as deduced from three years' observation at the State University of Iowa.

Two other papers, one by Dr. Bessey on "The Colors of Iowa Wild Flowers", and one by Professor Hinrichs on "The Constitution of the Water from the Deep Lying Rocks of Iowa", concluded the program. The discussion by Mr. Hinrichs was based upon an analysis of water from an artesian well twenty-five hundred feet deep at Oskaloosa and a well twelve hundred feet deep at Mount Pleasant. This chemical analysis showed that the water from the deep well more nearly resembled water of the sea than did surface water. Professor Hinrichs exhibited to the members present a photograph of the Amana Meteorite Collection which he had made.

Candidates nominated for membership in the Academy included W. H. Herrick of Grinnell, F. E. Nipher of St. Louis, Missouri, Thomas Pope of Ames, P. H. Philbrick of Iowa City, and Chas. Wachsmuth of Burlington. A motion was passed that any member of the Academy who was absent for two consecutive years and failed to contribute a paper during that time should be dropped from the roll of membership. It was agreed that the fall meeting of the Academy should be held at Ames. The officers who had served during the preceding year were reelected for another term.¹²

The second semi-annual meeting of the Academy was held at Ames on October 6, 1876, with President C. E.

¹² *Iowa Academy of Sciences, 1875-1880*, pp. 7-10; *Iowa City Daily Press*, June 27, 1876; *The University Reporter*, October 15, 1876.

Bessey presiding. In the absence of W. C. Preston, G. C. Carpenter served as secretary *pro tem*. Only four members of the Academy were present, and the program consisted chiefly of papers by Dr. Bessey. The first of these was "Some Observations upon the Growth of Plants Made by Means of the Arc-Indicator". A second paper by Dr. Bessey was upon the subject "A Case of Natural Selection". In this paper the writer noted the rapid increase of *Trifolium repens* and *Panicum sanguinale* upon a certain lawn, as a result of a closer and more frequent mowing. These decumbent plants, not being as much injured by this treatment as the ordinary lawn grasses, were enabled to increase more rapidly. Another paper presented by Professor Bessey dealt with "Observations on Silphium Laciniatum, the so-called 'Compass Plant' ". This latter paper gave in detail the result of a large number of observations upon the polarity of the leaves, and was published in the *American Naturalist* for August, 1877. Still another paper, prepared by Herbert Osborn, but read by Professor Bessey, dealt with "The Odonata of Central Iowa". Professor Macomber presented a paper on "A Method of Representing the Various Meteorological Phenomena on Charts".¹³

The next meeting of the Iowa Academy of Sciences — the second annual meeting — was a two-day session held at the State University at Iowa City on May 3 and 4, 1877. President C. E. Bessey presided. The first paper read on this occasion was one by Dr. Charles Wachsmuth of Burlington, dealing with "Paleozoic Crinoids". Burlington was referred to as "the El Dorado of the world for the study of these fossils". Dr. Wachsmuth who had lived at Burlington for eighteen years and had collected more than four hundred species was well qualified to speak on the sub-

¹³ *Iowa Academy of Sciences, 1875-1880, p. 10.*

ject presented. Professor Calvin commented upon the presentation made by Dr. Wachsmuth, "and warmly congratulated the Academy on the possession of a member who could present so able a paper". Professor Hinrichs read a paper, which was referred to as "all too short", on "The Relation between Cloudiness and Solar Radiation". Professor Hinrichs had of recent years been "the leader in the west in the study of meteorology" and presented in this paper the results of much study and observation.

At the evening session, Professor Preston presented a paper, "The Relation Between Winds and Barometric Pressure", based upon some two thousand observations made during the years 1873-1875. G. C. Carpenter presented a discussion of the "Origin of the Iowa Prairie Soil", in which he refuted the statement that Iowa soil is unfit for the growth of forests. The absence of forest trees, it was explained, was due to the fact that "too short a time has intervened since the withdrawal of the fresh-water lakes", and to the closeness of the turf, preventing germination of tree seeds.

On the second day of the session Professor Carpenter presented a contribution on "The Birds of Warren County", enumerating eighty-six distinct species which he had collected. Professor Calvin gave an account of the finding of the jawbone of a fossil American elephant, near Marengo, and presented the specimen to the Academy. Considerable discussion followed on the subject of fossils. At the business session the following officers were elected for the ensuing year: C. E. Bessey, president; W. H. Herrick, vice president; and Samuel Calvin, secretary. An assessment of five dollars was levied on each member of the Academy for the purpose of publishing its proceedings, and Professor Hinrichs was appointed editor. The next meet-

ing, it was agreed, should be held at Ames on the last Wednesday of September.¹⁴

On September 26, 1877, the semi-annual meeting of the Academy convened at Ames. The members present were: Bessey, Macomber, Pope, Fairchild, Hinrichs, Calvin, Todd, and Field. President Bessey presented a paper on "Further Observations upon *Silphium Laciniatum*", this being a continuation of the subject discussed by him the previous year at the semi-annual meeting. Professor Todd presented "Notes on the Distribution of Timber in Southwestern Iowa, with Inferences Concerning the Origin of Prairies", and also spoke of the remains of an elephant found at the bottom of the bluff deposit near Glenwood. Professor Hinrichs spoke of storms on July 31 and August 27-29, 1877, and Professor Calvin presented notes on an interesting deposit of travertine near Decorah. The Academy then adjourned to meet at Iowa City at the call of the president.¹⁵

In the spring of 1878 the Academy met for a two-day session at Iowa City. The members present, in addition to President Bessey, were Wachsmuth, Hinrichs, Preston, Philbrick, Clapp, Hobby, Witter, and Calvin. At the opening session Professor Bessey presented a paper, "On the Affinities of the Uredineae". Professor Hinrichs discussed "The Great Storm of April 21, 1878", and Dr. Wachsmuth presented the subject, "Zoological Position of the Blastoida".

On the second day of the session a business meeting was held at which Professor Hinrichs reported that no publications had been issued, as previously planned, chiefly because abstracts of papers had not been forwarded to him. Ac-

¹⁴ *Iowa Academy of Sciences*, 1875-1880, pp. 11, 13; *Iowa City Daily Press*, May 4, 1877.

¹⁵ *Iowa Academy of Sciences*, 1875-1880, pp. 13, 14.

cordingly, it was voted that proceedings with titles of papers be published during the ensuing year.

At this meeting Frank Springer of Cimarron, New Mexico, was elected to fellowship and Professor Barnard of Oskaloosa, W. H. Barris of Davenport, J. D. Putnam of Davenport, and Fred Reppert of Muscatine were proposed for membership. Upon invitation of Professor Herrick of Iowa College it was agreed to hold the next meeting at Grinnell.

At the close of the business session the following papers were presented: "On the Size and Strength of Tree Trunks, above and below the Point of Branching", by B. F. Hoyt; "Some Geological Phenomena near Solon, Iowa", by Samuel Calvin; "The Rain Maps of the State for the Several Months of 1877", by Gustavus Hinrichs; and "Some Defects in Vision," by F. M. Witter. In presenting this latter subject the speaker expressed the view that "many of the defects in vision are due to excess of reading in early life, often much earlier than might be expected, say from ten to fifteen years of age. Poor print, dim light, unseasonable hours, what is commonly known as 'light reading' is in every way well calculated to produce a race of men and women with weak and defective eyes."¹⁶

The Iowa Academy of Sciences held its next meeting in the chemical lecture room at Iowa College, Grinnell, on October 18, 1878. The group which attended this meeting was not large but it represented the most advanced scientific thought of the day. C. E. Bessey, Gustavus Hinrichs, D. S. Fairchild, W. H. Herrick, Thomas E. Pope, P. J. Farnsworth, J. E. Todd, and Samuel Calvin were among those present.

The following members presented papers: Professor

¹⁶ *Iowa Academy of Sciences, 1875-1880*, pp. 14-16.

Herrick, "Observations on Prairie Soil"; Professor Bessey, "On the Distribution of the Seventeen-year Cicada of the Brood of 1878, in Iowa"; Professor Todd, "On the Roots and Root-marks found in the Loess"; and Professor Hinrichs, "Results of the Magnetic Survey of Iowa in 1878". Professor Todd presented a second paper dealing with the cross-fertilization in flowers, in which he discussed the adaptations of the Iris and other plants for cross-fertilization by insects.¹⁷

No record appears of any meeting of the Academy in the spring of 1879. In October of that year, however, a two-day session was held at Iowa City and an interesting program was presented. The members present were Bessey, Hinrichs, Preston, Wachsmuth, Todd, Farnsworth, Hobby, Clapp, Philbrick, Macomber, Fairchild, and Calvin. Thomas H. Macbride of Iowa City, who had been nominated for membership at a previous meeting, and W J McGee of Farley, who came on invitation, were also present at the meeting. At the business session Mr. Macbride was elected to membership in the Academy, and W J McGee, Nathan R. Leonard of Iowa City, and Foster E. L. Beale of Ames were nominated for membership.

The Academy gave special attention to active membership. In 1876 a motion had been passed that any member who should fail to be present or contribute a paper for two years should be dropped from the roll of membership. At the business session in 1879 a motion was made and carried that the secretary be instructed to strike the names of inactive members from the list.

The papers presented at this meeting covered a wide range of subjects. Dr. Hobby presented a "Preliminary Report upon the Fresh Water Algae of Iowa", giving a list of sixty-two species and twenty-six genera. Professor

¹⁷ *Iowa Academy of Sciences, 1875-1880*, pp. 16, 17.

Todd spoke again, as he had the previous year, on the subject of cross-fertilization of plants. Dr. Bessey presented a botanical map of the United States. Professor Macomber spoke of "The Chambers Lightning Protection"; and Professor Hinrichs presented "Results of the Magnetic Survey of Iowa and Missouri".

On the second day of the session, papers were presented by Dr. Wachsmuth, Professors Bessey, Todd, and Hinrichs, and Mr. W J McGee. As a closing number on the program, Professor Hinrichs discussed the publications of the Iowa Weather Service.

The committee on nominations reported, recommending the election of the following officers: C. E. Bessey, president; F. M. Witter, vice president; and Samuel Calvin, secretary. The report was adopted, and Professor Bessey was elected president for the fifth time, having served continuously since the organization of the Academy in 1875.¹⁸

The annual meeting in 1880 convened on June 24th, at Iowa City for a two-day session. A paper dealing with recent wind action upon the loess, and another discussing the charcoal streak in the loess, both of which were prepared by Professor Todd, were read by Mr. McGee. Professor Witter presented a paper on "The Cabbage Butterfly", and Professor Bessey discussed "The Morphology of the Iris Leaf". Other papers were presented by Professor Herrick, Dr. Wachsmuth, and Professor Preston.

At the evening session Professor Preston appeared again, reading a paper prepared by Professor Herrick on the subject "A Gasoline Combustion Furnace". Professor Philbrick presented the subject of "Applied Mechanics — Analysis of Double Intersection Bridges". Professors Bessey and Hinrichs also appeared on the evening program.

¹⁸ *Iowa Academy of Sciences, 1875-1880*, pp. 17-21.

On the second day of the session Professor Macbride spoke on "Observations on Cyclosis". Dr. Hobby presented a study of fresh water algae in Iowa. Professor Philbrick discussed new methods of finding the approximate roots of numbers; and Professor Hinrichs spoke on the subject — "Tornado Tracks and Tornado Warnings". At the closing session, officers were elected for the ensuing year, C. E. Bessey being reelected president. Charles Wachsmuth was named vice president, and C. M. Hobby secretary-treasurer.

The *Proceedings* of the Academy from 1875 to 1880 were published in pamphlet form by John P. Irish. Whether these were paid for by the Academy or by Mr. Irish or others does not appear. A meeting of the Iowa Academy was held on September 5, 1882, and it is probable that other meetings were held as late as 1884. After that date no meetings were held, and the organization ceased to exist, because of a lapse of membership — it having previously been provided that members failing to attend a meeting or present a paper for two consecutive years should be dropped from the membership roll.¹⁹

THE IOWA ACADEMY OF SCIENCE
1887-1900

In 1887 interest in an organization which should foster scientific research and development was revived, and steps were taken to reorganize the Iowa Academy of Science. In response to a circular letter sent out by a committee consisting of Samuel Calvin, T. H. Macbride, L. W. Andrews, Herbert Osborn, and R. E. Call a meeting was held in Des Moines at the Kirkwood House in December, 1887, and a new Iowa Academy of Science was organized

¹⁹ *Iowa Academy of Sciences, 1875-1880*, pp. 21-26; *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 9; minutes of meeting of September 5, 1882, in the Secretary's Record, p. 48.

much after the fashion of the one which had disappeared a few years before. In addition to the men who had signed the invitation calling the meeting, J. E. Todd, B. D. Halsted, F. M. Witter, and H. W. Parker attended the meeting and became charter members of the new organization. Among the men who participated in the work of reorganization, four members — Calvin, Macbride, Todd, and Witter — had been members of the former Academy prior to 1880.²⁰

The situation facing the Academy in its early years can, perhaps, best be presented in the words of Herbert Osborn, first president of the new organization. "In the founding of this Society", he said, "we have recognized the existence of problems in our State demanding scientific investigation. We have recognized, too, the well known principle of advantage in organized effort, the added stimulus and benefit accruing to associated work. We find the field broad and the work in waiting great. We find our numbers small and frequently broken into by removals of our members to more remunerative or attractive fields of labor. We find much that might discourage, but we may look with profit to what has been here accomplished under conditions possibly more discouraging than ours."²¹

The growth of the Academy during the first decade of its history was not rapid, but gradual, and a matter of distinct encouragement to those interested in its development. During the first year of its existence only four new names were added to the membership roll. During the second year seven new members were added. With a comparatively small initial membership the Academy experienced difficul-

²⁰ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, pp. 6, 7. The constitution adopted, as printed in the first volume of *Proceedings* gave the name "Iowa Academy of Science", but the plural "Sciences" was used in the *Proceedings* until about 1906, when the term "Science" came to be generally used.

²¹ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, pp. 38, 39.

ty in financing the publication of its proceedings. Indeed, the printing of the first proceedings was financed by Herbert Osborn, who was later reimbursed for the money expended. It was not long, however, until the value of these proceedings was recognized, and in 1892 the Twenty-fourth General Assembly provided for their publication as an appendix to the reports of the State Horticultural Society. At the following session of the General Assembly an act was adopted providing for the separate publication of these reports.²²

All members of the Academy were at first of equal rank and were designated as "fellows".²³ In 1894, however, the constitution provided for associate members and corresponding fellows in addition to those members who were designated as fellows. Under this plan of organization residents of the State engaged directly in scientific research were made eligible to membership as fellows. Any resident of Iowa interested in the progress of science, although not engaged in original research, might become an associate fellow. Persons engaged in scientific work but residing outside of the State of Iowa might become corresponding fellows. Any fellow upon his removal from the State might retain membership in the organization as a corresponding fellow. An entrance fee of three dollars and an annual fee of a dollar were prescribed. Any member who failed to pay his dues for two years in succession was to be dropped from the roll.²⁴

By 1890 membership in the Academy had grown to forty-three, thirty of whom were fellows, five associate fellows and eight corresponding fellows.²⁵ At the decennial meet-

²² *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 3; *Laws of Iowa*, 1892, Ch. 62, 1894, Ch. 86.

²³ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 5.

²⁴ *Proceedings of the Iowa Academy of Science*, Vol. II, p. 10.

²⁵ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, pp. 3-5.

ing in 1896 Herbert Osborn, then secretary-treasurer, spoke encouragingly in his report of the work in hand. "Comparison with our modest beginning, and with our struggles in earlier years to secure a solid foundation and to provide for the publication of results", he said, "warrants us in a feeling of satisfaction and of encouragement for renewed effort for the future." By 1900 something of the hopes and aspirations of the members of the organization had been realized. Membership had increased to more than one hundred and fifty — fifty-six fellows, fifty-three associate fellows, and forty-five corresponding fellows.²⁶

A detailed study of the activities of the various members of the Academy during the early years of its history would be both interesting and profitable. Obviously, however, a biographical sketch, however short, of each member of the organization would be beyond the scope of this study. It is equally apparent that to select any group of men who seem to be outstanding in this organization would be to omit from consideration other groups who were equally zealous, and who worked with equal diligence for the welfare of the Academy and for the advancement of science. Thus to mention the services of Herbert Osborn, Samuel Calvin, Thomas H. Macbride, and L. H. Pammel, and these alone, great as their services have been, would be to omit from consideration the outstanding contributions made by J. E. Todd, L. W. Andrews, C. C. Nutting, Bohumil Shimek, and a long list of others who were active in making the history of the early years of the Academy.

The presidents of the Academy prior to 1900 were, without exception, men well qualified for leadership in the organization. The list includes the following men: Herbert Osborn, J. E. Todd, F. M. Witter, C. C. Nutting, L. H.

²⁶ *Proceedings of the Iowa Academy of Science*, Vol. III, p. 13, Vol. VII, pp. 8-10.

Pammel, L. W. Andrews, H. W. Norris, T. P. Hall, W. S. Franklin, T. H. Macbride, W. S. Hendrixson, and W. H. Norton. Each of these men served for but a single term during this period, except Mr. Nutting who served for two terms. During a later decade Mr. Pammel was again elected president and thus served a second term. The office of secretary-treasurer, upon which much of the work of the organization devolved, was held during these years by R. Ellsworth Call, 1887-1891; Herbert Osborn, 1892-1898; H. F. Bain, 1899; and S. W. Beyer, 1900.²⁷

The marked increase in the number and variety of papers presented before the Academy gave evidence of the growth of interest in the organization and the principles for which it stood. At the first meeting twelve papers were presented, and the abstracts of nine of these were printed.²⁸ At each succeeding annual meeting the number of papers increased. For the period from 1887 to 1900 some three hundred and fifty papers were presented by about eighty different men. Among the contributors were anthropologists, archeologists, biologists, botanists, chemists, geologists, physicists, and zoölogists — each working for the advancement of science in his particular field.²⁹

According to its constitution the Academy had for its aim and purpose "the encouragement of scientific work in the State of Iowa".³⁰ Such work might well be pursued for its cultural effect — a study of science for the delight and satisfaction which it affords. An examination of the reports indicates, however, that members of the Academy

²⁷ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 2, Pt. 2, p. 3, Vol. VI, p. 4, Vol. VIII, p. 1.

²⁸ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, pp. 8-18.

²⁹ This information was compiled from the cumulative index in Vol. XXV of the *Proceedings of the Iowa Academy of Science*.

³⁰ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 5.

were practical men of affairs and not merely theorists, and that many of the researches were made in connection with the practical scientific problems of the day.

At the first annual meeting of the second Academy reference was made to the work that might be accomplished by means of a geological survey. Within five years such a survey was established by the legislature, and from the date of its establishment in 1892 until the present time its work has been carried forward in a manner commensurate with the needs of the State.³¹

The attention of the Academy was early directed to the natural resources of the State, not only in one but in many fields. Interest was shown in a study of underground water and the possibility of drilling artesian wells. Papers dealing with the subject of deep and artesian wells were presented by various members of the Academy during the decade of the nineties. In 1894 Arthur J. Jones presented a "Record of the Grinnell Deep Boring". The following year Francis M. Fultz discussed "Some Facts Brought to Light by Deep Wells in Des Moines County", and in 1898 he discussed "The Burlington Artesian Well". The subject was presented in a more comprehensive manner by R. Ellsworth Call in 1891 in a paper on "Artesian Wells in Iowa". The author pointed out that four-fifths of the area of the State had been demonstrated to possess artesian conditions. He stated, however, that in the southwestern and south-central parts of the State it would probably not pay to drill for artesian water.³²

Papers were likewise frequently presented on the chemical analysis of water. In 1892 in a paper on the "Analysis

³¹ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 28; *Laws of Iowa*, 1892, Ch. 71.

³² *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, pp. 57-63, Vol. II, p. 31, Vol. III, p. 62, Vol. VI, p. 70.

of Water for Railway Engines", C. O. Bates gave a comparison of the water taken from a well at Albert Lea, Minnesota, and that from the Cedar River at Cedar Rapids, Iowa. The water from the river was shown to be better than that from the well as it contained a smaller per cent of solids and also less alkali in solution. In 1900 an analysis of potable water was presented in which it was shown that the water from a well at Mt. Vernon contained from 20 per cent to 25 per cent less calcium and magnesium carbonates than any other water of the State which had been examined.³³

The discovery of natural gas in several places in Iowa was commented upon from time to time during the first decade of the existence of the Academy. Its occurrence was first noted in 1886. In 1890, when F. M. Witter presented a paper on the "Gas Wells Near Letts, Iowa", a more widespread interest in the subject was shown by members of the Academy. At that time there were several wells in Muscatine and Louisa counties that were furnishing gas for light and heat in surrounding communities. In 1892 Charles Rollin Keyes discussed the possibility of the extensive use of natural gas and oil in Iowa. He expressed the view that although gas and oil are widely distributed throughout the State, the geologic structure is such that these products can not be made available in any large quantities. Apparently the last mention made of gas and oil, before the Academy during the period under consideration, was in 1896 when A. G. Leonard read a paper on "Natural Gas in the Drift of Iowa".³⁴

The coal beds in Iowa have likewise been frequently dis-

³³ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 3, p. 27, Vol. VIII, pp. 104-109.

³⁴ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 68, Pt. 3, p. 15, Vol. IV, p. 41.

cussed by members of the Academy. In 1891 Charles Rollin Keyes discussed some of the popular misunderstandings regarding the extent and location of coal beds. He pointed out that the earlier formed coal seams are more extensive, both geographically and vertically, than the later ones. The coal of Iowa may be regarded as distributed in innumerable lenticular basins, sometimes several miles in diameter and six or seven feet in thickness, sometimes only a few hundred yards in extent. Mr. Keyes also stated that although the aggregate amount of coal is greater than was previously supposed, the small basins may be so located that a boring may pass through a score or more coal horizons without meeting more than one or two veins of sufficient thickness for profitable working.

In a paper presented in 1893 on the subject of "Coal Measures of Poweshiek County", A. J. Jones discussed the probability of coal in paying quantities in that county. Coal had been found in paying quantities in adjoining counties and some three feet of coal had recently been found at a depth of 157 feet in the southeastern part of the county. Mr. Jones expressed the belief that coal measures extended over the entire southern tier of townships, including the towns of Searsboro, Montezuma, and Deep River. In 1896 Mr. Keyes presented a paper on "Stages of the Des Moines, or Chief Coal-bearing Series of Kansas and Southwest Missouri and Their Equivalents in Iowa". In 1900 he again discussed the subject of "Names of Coals West of the Mississippi River".³⁵

Other natural resources which were discussed at meetings of the Academy included clay, zinc, aluminum, lead, and cement materials. Papers dealing with the value of the extensive supply of clay in Iowa appeared in 1891 and

³⁵ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 27, Pt. 4, p. 59, Vol. IV, p. 22, Vol. VIII, p. 128.

in 1895. In the first of these — “Brick and Other Clays of Des Moines” — Charles Rollin Keyes called attention to the fact that since clays have a variety of properties, an indiscriminate working of deposits is not attended by the highest economic results. In the second paper — “Clays of the Indianola Brick, Tile, and Pottery Works” — L. A. Youtz arrived at the same conclusion and also stated that if the clay of the Indianola deposits were mixed with the necessary amount of free silica, a very superior fire brick could be made. The fusibility of brick made by this method had not been determined, but Mr. Youtz believed that the experiment would prove successful.³⁶

The aluminum industry is closely associated with clay. Charles Rollin Keyes in a paper read in 1891 — “Aluminum in Iowa” — pointed out that there was at Hampton, Iowa, a plant which was working clay that yielded three ounces more aluminum to the bushel than that obtained in any other known locality in the West and probably in the United States. Mr. Keyes expressed the view that Iowa has within its borders inexhaustible supplies of good clay admirably suited to this purpose. It was his prediction that when “the industry shall have become thoroughly established the gold fields of California, of Australia, of indeed the whole world will sink into insignificance as compared with the wealth coming from this source”.³⁷

A. G. Leonard was the author of two papers on lead and zinc in Iowa. The first — “The Occurrence of Zinc in Northeastern Iowa” — was presented in 1893, and the other — “Lansing Lead Mines” — in 1894. It was shown that, contrary to the usual situation, lead and zinc are frequently found together in Iowa, and in one instance a mine which

³⁶ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 29, Vol. III, p. 40.

³⁷ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, pp. 29, 30.

had produced \$25,000 worth of lead was reworked and produced \$50,000 worth of zinc.³⁸

An interesting dissertation appeared in 1894 on "Cement Materials in Iowa", by E. H. Lonsdale. The discovery had previously been made that a mixture of chalk with clay or river mud produced a very satisfactory substitute for portland cement. Because of the existence of chalk beds in Woodbury County, and other places throughout the State to a lesser extent, combined with extensive clay deposits, Mr. Lonsdale expressed the view that there is no reason why the Iowa material might not be used with success equal to that attained at other points.³⁹

Among the papers presented at a meeting of the Academy during these early years of its history were several dealing with the subject of bacteriology. In the year 1893, L. H. Pammel, the president, addressed the society on "Bacteria, Their Relation to Modern Medicine, the Arts and Industries". Mr. Pammel dealt with the subject under six heads — history, methods of study, structure, question of species, hygienic problems, and the relation of bacteria to agriculture and other industries — in an effort to correct some of the contemporary notions regarding bacteria.

Besides this comprehensive study, other papers dealing with more limited phases of the subject appeared from time to time. In 1892 Mr. Pammel had presented a paper on the bacteria of milk, cream, and cheese, explaining the nature and action of certain bacteria in rendering milk sour.

In 1899 Dr. G. H. Hill, a representative of the medical profession, demonstrated the practical utility of bacteriology in a paper on the "Klebs-Leoffler Bacillus" — the germ which causes diphtheria. He showed the remarkable

³⁸ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 4, p. 48, Vol. II, p. 36.

³⁹ *Proceedings of the Iowa Academy of Science*, Vol. II, p. 172.

results which were obtained during the first few years after the discovery of the germ and the antitoxin used to combat it.

In 1900 C. H. Eckles contributed two articles on methods of determination of bacteria in milk, and two articles were presented on the bacteriological analysis of water, dealing with water mainly as a source of typhoid fever.⁴⁰

One of the outstanding interests of the Academy and one of the fields in which it had a great deal of influence even in these early years was in the matter of conservation of natural resources of the State. This interest was due, in a large measure, to the efforts of Dr. T. H. Macbride, who has been a constant devotee to such endeavor. In 1896 two resolutions were adopted by the Academy — one petitioning the Twenty-sixth General Assembly to take some action toward the preservation of our lakes to maintain some of the original conditions of the State. The other was presented to the Congress of the United States, calling to its attention the necessity of further legislation looking to the preservation and rational use of the remaining forests of our country.

The same year Dr. Macbride presented to the Academy two papers dealing with the conservation of Iowa's woodland. The first of these was a plea for the establishment of county parks which he considered essential for the promotion of public health and happiness, for proper education, and for the preservation of the beauty and grandeur of primeval nature. He also presented a paper on "Forest Distribution in Iowa", in which he showed that loess was the natural home of forests. He strongly advocated that our remaining forests should be left undisturbed.

In 1897, Dr. Macbride carried the argument for the pres-

⁴⁰ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 94, Pt. 4, p. 66, Vol. VII, p. 199, Vol. VIII, pp. 91, 139, 144, 262.

ervation of Iowa's woodlands further, dwelling mainly upon the practical value of forests in the conservation of our surface moisture. He lamented the fact that so much woodland was being cleared and so many of the forests hewed down, seeing as he did the resultant drying up of Iowa's rivers and springs, as well as the aesthetic value of the original conditions.

Dr. Macbride saw in the Academy means of remedying the existing situation. His purpose was to arouse public interest in education, since he felt that the people would act immediately if the situation were clearly understood. He urged the members of the Academy to investigate the natural conditions of the State, and to stimulate in the local communities a deeper interest in the primeval. These addresses are the germs of the widespread conservation movement of today. Few men have equalled Dr. Macbride in the unselfish service rendered to Iowa in his advocacy of the preservation and conservation of its resources.⁴¹

During the decade of the nineties several papers were presented to the Academy dealing with practical problems of interest to the farmers and the horticulturalists of the State. Perhaps the most active member of the Academy in presenting such problems was L. H. Pammel. In 1889 Mr. Pammel presented a paper on "Some Fungous Diseases of Fruit Trees in Iowa", and another dealing with "A Cherry Disease". In 1891 he presented a paper on "Corn Smut", the following year one on "The Relation of Frost to Certain Plants", and in 1894 one on "Diseases of Plants at Ames". In 1899 he presented the subject of "Powdery Mildew of the Apple", and the next year he discussed "The Thistles of Iowa, with Notes on a Few Other Species". This latter subject appears in an extensive and well illus-

⁴¹ *Proceedings of the Iowa Academy of Science*, Vol. III, pp. 15, 16, 91, 96, Vol. V, pp. 12-23, Vol. VII, p. 47, Vol. VIII, pp. 13, 14, 196-198.

trated article in Volume VIII of the *Proceedings of the Iowa Academy of Science*.⁴²

Since the majority of the membership of the Academy was composed of men connected with Iowa colleges and universities one would expect to find numerous references to work being done in the various institutions. Such references, however, are few. The first mention of college work appears to have been made in 1891 by Professor C. C. Nutting. In a paper on "Systematic Zoology in Colleges" he suggested that smaller colleges, where first class apparatus was not available, should adopt a policy whereby some branch of zoölogy could be offered which would bring the student close to nature. In 1893 two papers dealing with work at the Iowa State College of Agriculture were presented: one related the methods of experimental engineering, and the other dealt with some results obtained in the botanical laboratory. From time to time, also, a number of papers appeared describing biological laboratories in other States. The establishment of such a laboratory in Iowa to give students an opportunity to study common forms of life in the midst of their activities was urged at various times. In 1896, L. S. Ross of Drake University proposed that such a laboratory be set up under control of the Iowa Academy of Science.⁴³

Aside from the many papers of a very practical nature which were presented before the Academy during the early years of its history, many problems of a more technical or academic nature appear. Among these may be mentioned "Notes on the Gross Anatomy of *Campeloma*", by R. E. Call; and "Mechanism for Securing Cross Fertiliza-

⁴² *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, pp. 91, 92, Pt. 2, p. 95, Pt. 3, p. 77, Vol. II, p. 201, Vol. VII, p. 177, Vol. VIII, p. 214.

⁴³ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 2, p. 102, Pt. 4, pp. 16, 93, 112, Vol. IV, p. 167, Vol. VIII, p. 110.

tion in *Salvia Lanceolata*", by G. W. Newton. Bohumil Shimek read a paper on "A Theory of the Loess" and another entitled "Is the Loess of Aqueous Origin"? These two papers set out evidence that the loess of the Mississippi Valley is of eolian (wind) origin, and not aqueous as was generally assumed. The second of these papers became the center of a symposium on the loess, in which representatives of the United States Geological Survey and the State Geological Surveys of Minnesota, South Dakota, and Iowa took part. The eolian origin of loess is now generally accepted by scientists.

Papers of this type were of interest primarily to those specializing in particular fields, but the Academy, interested in all phases of scientific research and development, afforded an ideal forum in which to present them. This fact was emphasized by Dr. Macbride when as president of the Academy he said: "Science is nothing if not beneficent. Her object is, and ever has been, the discovery and promulgation of natural truth, and the knowledge of truth is always practical. Not less valuable, therefore, even from a practical standpoint, are those researches which may seem to-day to have no direct bearing on man's physical well being. Theory in science, as elsewhere, often precedes practice, and pure science lays evermore the foundations for invention. . . . And so although I may seem to-night to commend especially those scientific labors which bear immediate fruit, I would not for a moment discourage other investigations which tend to no direct outcome of the visible, practical sort, but which find their justification on the yet higher plane where they offer satisfaction to the inquiries of genius and solace to the lovely spirit of enlightened man."⁴⁴

⁴⁴ *Proceedings of the Iowa Academy of Science*, Vol. I, Pt. 1, p. 16, Vol. III, p. 82, Vol. IV, p. 109, Vol. V, pp. 15, 32.

In the early nineties it became the custom to publish each year the address of the retiring president. The presidential address published in 1894 was on "Recent Advances in the Theory of Solutions", by L. W. Andrews. The following year - 1895 - "Needed Changes in Scientific Methods" was the subject of the presidential address delivered by H. W. Norris. Considered in the light of subsequent scientific development this address is filled with interest. The speaker said: "We live in a period that sees wonderful attainments in science and art, so that in theory and practice many think the *summum bonum* has been reached. It is preëminently the age of science and the application of scientific methods to all phases of human activity." He continued by saying that while there were many skilled surgeons, there were also many quacks; while the scientific spirit predominated there was also much of the unscientific. Accordingly, he pleaded for a hastening of the day "when empiricism and its twin brother dogmatism will yield the field to the scientific spirit".⁴⁵

In the presidential address in 1898, Dr. Macbride took as his subject "The Academy and the People". In 1899 - at the close of the century - W. S. Hendrixson discussed "Some Features of the Science of a Hundred Years Ago". After reviewing the advancement that had been made in chemistry, physics, biology, and geology during the past century, he said that the glory of science lies no more in its past achievement than in its promise for the future. "However difficult the conception, and however impossible it may be to predict the developments of the future, the legitimate inference from the past is", he said, "that the developments of the next century will be quite as great as those of the present one. We know that much remains

⁴⁵ *Proceedings of the Iowa Academy of Science*, Vol. II, p. 13, Vol. III, pp. 17-28.

to be done, and we have a right to expect that scientific thought will continue to broaden and deepen, leading ever toward a fuller knowledge of the physical universe and a truer Philosophy."⁴⁶ Thus in the annals of the Academy the century closed with an historical review of what had been accomplished in the field of science and in the Academy, and a prophecy of the still greater things to be accomplished in the future.

THE ACADEMY FROM 1901 TO 1910

During the period from 1901 to 1910 the Academy continued to grow, although the growth was not so rapid as it has been in later years. In 1901 there were one hundred and sixty-three members — the largest membership in the history of the Academy up to that time. In 1910 there were one hundred and ninety-four members. Among the leading scientists of the State who became members of the Academy during this decade were George F. Kay, D. W. Morehouse, E. W. Rockwood, C. E. Seashore, A. O. Thomas, and R. B. Wylie.⁴⁷

The presidents of the Academy during the first decade of the twentieth century included A. A. Veblen, H. E. Summers, Bruce Fink, Bohumil Shimek, M. F. Arey, C. O. Bates, John L. Tilton, Samuel Calvin, Frank F. Almy, and Gilbert L. Houser. In 1900 the office of secretary-treasurer was divided and both a secretary and treasurer were elected. During the decade which followed, the office of secretary was held by S. W. Beyer, A. G. Leonard, T. E. Savage, and L. S. Ross. None of these men served less than two years, and Mr. Ross served from 1906 until 1914. During

⁴⁶ *Proceedings of the Iowa Academy of Science*, Vol. VI, p. 16, Vol. VII, pp. 22, 39.

⁴⁷ *Proceedings of the Iowa Academy of Science*, Vol. VIII, pp. 7-10, Vol. XVII, pp. v-ix.

this period the office of treasurer was held by J. B. Weems, Bohumil Shimek, H. W. Norris, H. E. Summers, and George F. Kay. The last named, elected in 1908, was reelected annually until 1914.⁴⁸

During the years from 1900 to 1910 two hundred and fifty-three papers were reported in the *Proceedings* of the Academy. This does not include all of the papers presented, however, for during the early years the volumes of *Proceedings* were limited to 250 pages. In 1902 this limit was raised to 300 pages. Even this, however, was found to be inadequate, necessitating the abstracting of some of the papers and the entire omission of others from the reports. After considerable agitation on the part of members of the Academy the Thirty-sixth General Assembly in 1915 removed this restriction. Since that date the volumes have been larger and better suited to the needs of the organization.⁴⁹

The papers reported during this period were contributed by some ninety-six men. About half of these were active in the work of the Academy only during these years. Some had been active in the organization during the earlier years and continued their interest. Others came in during these years and remained active in the years which followed. Some sixteen of the men present a record of long and active membership extending on both sides of the decade here under consideration. This group includes F. F. Almy, M. F. Arey, C. O. Bates, A. A. Bennett, C. F. Curtiss, David E. Hadden, W. S. Hendrixson, H. M. Kelly, Charles Rollin Keyes, T. H. Macbride, A. Marston, H. W. Norris, C. C. Nutting, L. H. Pammel, Bohumil Shimek, E. W. Stanton,

⁴⁸ *Proceedings of the Iowa Academy of Science*, Vols. VIII-XXI, see list of officers in the front of each volume.

⁴⁹ *Laws of Iowa*, 1892, Ch. 62, 1894, Ch. 86, 1902, Ch. 7, 1915, Ch. 299.

and J. L. Tilton. Several of these men have retained membership in the Academy to the present time, and throughout the years have contributed liberally to the advanced scientific thought of the times.⁵⁰

The field of research represented by the Iowa Academy of Science during the first decade of the century was widely extended. One of the fields of study which developed interest was the application of scientific knowledge to problems of health and sanitation. Before 1900 no thorough and comprehensive survey of the water supply of the State had been made. At about this time members of the Academy became interested in this problem, and from that time until the present, sanitation and the problem of obtaining a pure water supply have continued to be of major interest at meetings of the Academy.

The movement of population from the rural districts to the urban centers tended to make the health and sanitation problems more acute. However, in two papers dealing with municipal hygiene, C. O. Bates in 1905 and 1906 presented the view that under proper conditions the death rate is not necessarily higher in urban than in rural areas. In municipal hygiene, he pointed out, three points demand special attention — pure air, pure food, and pure water — the most important of these being pure water. Mr. Bates explained that the city water supply could be properly guarded, inspected, and treated; but rural and outlying wells, not regularly inspected, were a constant menace. Not only were these wells a source of disease in themselves, but at any time they might contaminate the milk supply of a large number of individuals. In this connection Mr. Bates urged the members of the Academy to “call for a bacteriological, biological and chemical survey of the vari-

⁵⁰ *Proceedings of the Iowa Academy of Science*, Vol. VII, pp. 7, 8, Vol. XIX, pp. vi-viii.

ous water basins, so that we may know what to expect and how to combat the deleterious agencies in the water".⁵¹

Other members of the Academy discussed the problem of water supply at various times. Alfred N. Cook in 1901, 1902, and 1903 reported upon the Sioux City water supply. In 1904 John L. Tilton discussed the water supply at Indianola, advocating the use of river water purified by the quick filtration system. In 1907 L. H. Pammel discussed "Some Municipal Water Problems", dealing largely with the frequency of typhoid fever resulting from the water supply. In this connection it was shown that in cities which had adopted a filtration system the death rate from typhoid had been greatly reduced. Tables showing the death rate before and after filtration were presented.⁵²

During the early years of the period under consideration members of the Academy were interested in the passage of pure food legislation. In 1900 a committee, of which J. B. Weems was chairman, was appointed by the Academy to foster pure food legislation. The following year a resolution was passed providing that "the attention of the legislature be called to the necessity and value of pure food laws in the state." The resolution further declared: "The state should not remain an open field for imposing adulterated food products upon our citizens to the detriment of both health and pocketbooks." Iowa, it was said, was not abreast with other States in this matter and laws should be passed to protect its citizens. At the legislative session in 1902 a pure food bill, similar to that adopted in other States, was presented, and the Academy through its legislative committee urged its passage. The measure failed

⁵¹ *Proceedings of the Iowa Academy of Science*, Vol. XII, p. 75, Vol. XIII, p. 17.

⁵² *Proceedings of the Iowa Academy of Science*, Vol. IX, p. 90, Vol. X, p. 122, Vol. XI, p. 133, Vol. XII, p. 143, Vol. XIV, p. 115.

to pass, however, and such a law was not adopted in Iowa until 1906.⁵³

In 1903 Dr. Gershom H. Hill discussed "The Importance of Vital Statistics in the Study of Social Science". In this paper he showed the value of statistical data and pointed out that Iowa was not keeping pace with other States in providing statistical records. He urged upon members of the Academy the need of adequate laws on vital statistics, and expressed the hope that the Thirty-first General Assembly would enact such legislation. Such laws were not enacted, however, until the meeting of the Thirty-ninth General Assembly in 1921.⁵⁴

The effort to educate landowners to the necessity of preserving the natural conditions of the State — the work begun by Dr. Macbride and fostered by him for many years — was continued during this period. In 1901 a resolution was passed by the Academy commending President Theodore Roosevelt for his policy of conservation, and advocating the passage of laws for the preservation of forests and other natural resources. Again in 1910 the Academy passed a resolution reaffirming "its endorsement of the general movement toward the conservation of our forests, rivers, lakes and mineral resources by the national government".⁵⁵

Dr. Shimek was especially concerned during this period with the protection of the remaining forests of Iowa. In 1901 he presented a comprehensive paper, "Forestry in Iowa", in which he showed that little attempt was made by the pioneers to protect the woodlands. Only in recent

⁵³ *Proceedings of the Iowa Academy of Science*, Vol. IX, pp. 18, 19, Vol. X, p. 19; House File No. 146, in the *Journal of the House of Representatives*, 1902; *Laws of Iowa*, 1906, Ch. 166.

⁵⁴ *Proceedings of the Iowa Academy of Science*, Vol. XI, p. 55; *Laws of Iowa*, 1921, Ch. 222.

⁵⁵ *Proceedings of the Iowa Academy of Science*, Vol. IX, p. 17, Vol. XVII, p. 5.

years has it been recognized that preservation of the forests is essential to the conservation of moisture and protection of the soil. Dr. Shimek expressed the view that trees could be successfully grown practically anywhere in Iowa. He urged the passage of a measure, which was then before the General Assembly, designed to encourage the planting of forest and fruit trees by reducing the taxes on land thus used. This measure was not adopted, but a similar law was adopted in 1906.⁵⁶

In 1908 Hugh P. Baker discussed "Some Forestry Problems of the Prairies of the Middle West". He included in this study the States of Minnesota, North Dakota, South Dakota, Iowa, Nebraska, and Kansas, and expressed the view that in these States there were large tracts of land which could be used to a better advantage economically in the production of timber than under cultivation.⁵⁷

In "Some Geological Aspects of Artificial Drainage in Iowa", G. G. Wheat presented an interesting view of some of the work done by the early settlers. Prior to 1900 floods due to rainfall were infrequent. In early days numerous upland lakes, marshes, ponds, and swamps caught and retained much of the rainfall. Only the overflow and that which fell directly upon the watershed contributed to the increased flow of the rivers. Deposition of soil eroded from the watershed was small, and the streams were, for the most part, clear. By 1900, however, many of these natural reservoirs had been drained by open ditches. This increased the erosion, clogged the larger streams, and increased the probability of floods. Mr. Wheat regarded the adoption of tile ditches as essential, since they greatly increase the power of absorption of the soil, prevent erosion,

⁵⁶ *Proceedings of the Iowa Academy of Science*, Vol. IX, p. 53; *Laws of Iowa*, 1906, Ch. 52; *Code of 1927*, Sec. 7110.

⁵⁷ *Proceedings of the Iowa Academy of Science*, Vol. XV, p. 91.

and feed the streams more gradually, thus reducing the danger of floods.⁵⁸

In accordance with the broadening scope of scientific research during this decade a wider interest was manifested on the part of members of the Academy in the work of colleges and universities which they represented. Several papers dealing with laboratory apparatus and methods were presented to the Academy. In 1901 A. A. Veblen discussed "Some Improved Laboratory Devices and Apparatus". In 1904 John L. Tilton spoke of "The Switchboard and Arrangement of Storage Battery at Simpson College". Two years later D. W. Morehouse explained the "Photographic Accessories of the Drake Observatory", and in 1908, H. J. H. Hoeve discussed certain methods of brain dissection as carried on in medical laboratories.⁵⁹ Other titles were presented dealing with various laboratories rather than with methods employed. Maurice Ricker, in 1901, discussed "The University of Montana Biological Station". In 1906 Frank F. Almy discussed "The Physical Laboratory at Iowa College".

The following year A. C. Page spoke on "The Physical Science Laboratory of the State Normal", and two years later Thomas H. Macbride presented a paper on "The Okoboji Lakeside Laboratory". In this paper Dr. Macbride presented the advantages at Okoboji. The varied topography, the forest and prairie flora, and "all kinds of habitat conditions" make this an almost ideal place for scientific research. In presenting these advantages Dr. Macbride said: "Ever since the immortal Agassiz stood bareheaded with that famous company on the rocks of Pennikese, the naturalists of the world, at least, have realized that the

⁵⁸ *Proceedings of the Iowa Academy of Science*, Vol. XVII, p. 151.

⁵⁹ *Proceedings of the Iowa Academy of Science*, Vol. IX, p. 34, Vol. XII, p. 139, Vol. XIII, p. 15, Vol. XV, p. 183.

proper and reverent place for the study of natural objects is in their natural surroundings. Dry dead fungi are dusty labelled things, as meaningless as the stuffed skin of mammal or bird, or a fossil in a box; better than no exhibit at all, to be sure, but poor indeed as compared with the natural world where the fungus starts in the forest shade, the wings of bird or insect fan the sunny air, or the fossil speaks its significance from the stony pages of the riven quarry stone. The lakeside laboratory shall afford to all interested, for once at least, a chance to see the real world, nature alive, accomplishing her miracles in their own silent splendor, often needing not, for the student's appreciation, the voice of interpreter or teacher."⁶⁰

A considerable number of the papers presented before the Academy during this period, as in earlier years, were of a technical or academic type. Among the papers of this character may be mentioned "Mutual Induction and the Internal Resistance of a Voltaic Cell" and "J. J. Thompson's Theory of Matter", both of which were presented by L. Begeman; "A Method for the Determination of Hydriodic and Hydrobromic Acids", by W. S. Hendrixson; "The Relative Frequency of Arterio-Sclerosis of the Various Arteries", by W. E. Sanders; and "Some Observations on the Embryology of Chironomus", by W. N. Craven. Many other papers of this specialized type were presented before the Academy, but any attempt at analysing them is beyond the purport of this review.⁶¹

The addresses delivered by the various presidents of the Academy during this decade were of outstanding significance. In 1901 President A. A. Veblen took for the sub-

⁶⁰ *Proceedings of the Iowa Academy of Science*, Vol. IX, p. 122, Vol. XIII, p. 227, Vol. XIV, p. 271, Vol. XVI, pp. 131, 132.

⁶¹ *Proceedings of the Iowa Academy of Science*, Vol. XII, pp. 9, 49, Vol. XIII, p. 219, Vol. XVI, pp. 193, 221.

ject of his presidential address "The Relation of Physics to the Other Material Sciences". He presented the view that "physics stands in the relation of an elder sister" to the other branches of science. This department, he said, "has enjoyed the privilege of first establishing and defending the methods and criteria which must surely prevail until science shall undergo some radical and now unsuspected change in its essentials. Until such a time arrives physics will continue to be at once the most severely exact of the sciences and the one among them whose privilege it is to lend and to give in the most unstinted measure both methods and means for their growth and perfection."⁶²

At the annual meeting in 1902 H. E. Summers in his presidential address discussed "Some Problems of Heredity and Evolution". The following year President Bruce Fink gave an address in the field of historical botany on the subject, "Two Centuries of North American Lichenology". In this connection he presented not only a development of the lichens but gave an extensive bibliography of authors and titles dealing with this subject.

Under the title, "Botany in its Relation to Good Citizenship", Bohumil Shimek, in 1904, presented an interesting presidential address. "No scientific branch", he said, "is more intimately connected with our everyday lives than botany. To plants we owe, directly or indirectly, practically all our food, and much of the shelter and protection which we enjoy. Agriculture, horticulture, and countless industries owe their existence to plants, and are based on scientific botanical principles. To plants we are also indebted for the comfort and beauty of our surroundings, and in every relation and activity of life, from the cradle to the grave, we have more or less to do with them. These

⁶² *Proceedings of the Iowa Academy of Science*, Vol. IX, pp. 21-32.

relations involve not only personal profit and private interests, but common weal and public welfare as well. It follows that a knowledge of plants — a knowledge of botany — will the better enable us to derive the greatest benefit from this close relation. It will enable us to perpetuate and utilize that which is useful, and to protect ourselves against that which is harmful. It will convince us that we must concern ourselves not only with immediate profit, but with future consequences.’⁶³

At the three succeeding annual meetings of the Academy the presidential addresses were: “A Review of the Development of Mineralogy”, by Melvin F. Arey; “Influence of Modern Science in the Formation of Ideals”, by C. O. Bates; and “Science Required for a General Education”, by John L. Tilton. In presenting his address, Mr. Tilton argued that science was being unnecessarily neglected. He advocated that high schools should require courses in botany, physics, and chemistry. Many students, he said, neglected science either because they feared it or because they did not understand it, both of which reasons might be dispelled if such courses were required.⁶⁴

In 1909 Samuel Calvin, as president of the Academy, presented “The Work of the Iowa Geological Survey”. He referred to the services of James Hall and Charles A. White in the early geological studies, and traced the history and activities of the present Geological Survey from the date of its organization in 1892 to 1909. In concluding his address he said: “As an aid to public education, helping the people to see and appreciate and correctly interpret the geological phenomena which lie all about them, help-

⁶³ *Proceedings of the Iowa Academy of Science*, Vol. X, p. 26, Vol. XI, p. 11, Vol. XII, pp. 1-6.

⁶⁴ *Proceedings of the Iowa Academy of Science*, Vol. XIII, p. 7, Vol. XIV, p. 7, Vol. XV, p. 13.

ing them to view the world in which they live understandingly, instead of looking at it with the vague, dull, comprehensionless mental attitude of the unlearned savage, the Iowa Geological Survey has earned its place as an important factor in contributing to the general intelligence of this most beautiful, most prosperous, most intelligent state."⁶⁵

In this statement Professor Calvin summarized not only the work of the Geological Survey, but in a measure the work of the Academy of Science as well, since the Survey was organized in accordance with plans formulated by members of the Academy.

THE ACADEMY FROM 1911 TO 1920

With the opening of a new decade, interest and membership in the Academy continued to grow. By 1911 life membership had been provided for, and twelve members were enrolled as "life fellows". There were at this time sixty-nine fellows, one hundred and eleven associate members, and forty corresponding members — a total enrollment of two hundred and thirty-two members. By 1920 honorary fellowships had been established and the designation of corresponding fellows had been discontinued. Six men — J. C. Arthur, Thomas H. Macbride, Herbert Osborn, J. E. Todd, William Trelease, and J. A. Udden — had obtained the rank of honorary fellows. There were at this time twenty-two life fellows, one hundred and fifty-eight fellows, and one hundred and thirty-four associates, making a total membership of three hundred and twenty. In 1919 a membership of three hundred and fifty was reported. This was the largest membership of any State Academy in the United States. Among the many men prominent in various fields of science who became members of the Academy during this decade were Bird T. Baldwin, Ellsworth Faris, Charles

⁶⁵ *Proceedings of the Iowa Academy of Science*, Vol. XVI, pp. 11-18.

Reuben Keyes, H. L. Reitz, Dayton Stoner, and A. C. Trowbridge.⁶⁶

It may be observed that by the year 1920 the personnel of the Academy had been greatly changed, not only by the addition of new members but by the loss of a considerable number of the group. Early in the history of the Academy notices of the passing of members appeared in the *Proceedings*. Throughout the decade now under consideration almost every volume of the *Proceedings* contained a necrology. In some instances the record of the death of several members appeared in a single volume. Among those passing from membership during these years may be mentioned F. M. Witter, S. E. Meek, Charles E. Bessey, G. E. Patrick, Harriette Kellogg, Arthur G. Smith, Glenn I. Tenney, Robert B. Dodson, Byron D. Halsted, and R. Ellsworth Call.

The men who served as presidents of the Academy during this period included Louis Begeman, A. A. Bennett, C. N. Kinney, Henry S. Conard, Harry M. Kelly, George W. Stewart, L. S. Ross, S. W. Beyer, T. C. Stephens, and Nicholas Knight. As was previously noted, the offices of secretary and treasurer for a number of years prior to 1914 were filled by L. S. Ross and George F. Kay respectively. At the annual meeting in 1914 James H. Lees was elected secretary to succeed Mr. Ross, and A. O. Thomas was selected as treasurer. During the remainder of the decade these two men were reëlected annually to their respective offices, and throughout the years they assumed much of the responsibility in making the meetings of the Academy a success. Mr. Lees continued to serve as secretary until 1924, while Dr. Thomas retained the office of treasurer until his death in 1931 — thus establishing a

⁶⁶ *Proceedings of the Iowa Academy of Science*, Vol. XVIII, p. vi, Vol. XXVII, pp. 4-14.

record of long and efficient service as an officer in the Academy.⁶⁷

The papers which were presented to the Academy during this period of its history were numerous and of wide variety. Because of a lack of space in the *Proceedings*, and also because very frequently abstracts were not available for publication, many of the papers presented were not published. Many others, however, were published either in full or in the form of abstracts. Accordingly, much that is of value and interest in making up an historical record of the development and activities of the Academy has been preserved. A study of the titles published indicates that, as in former decades, the subjects may be classified roughly into groups which signify dominant interests or trends of scientific development.

The question of providing a pure water supply continued to be a problem of vital concern to members of the Academy. In 1913 Dr. Henry Albert discussed "The Pollution of Underground Waters With Sewage Through Fissures in Rocks". Jack J. Hinman, Jr., in 1917 presented an interesting study on "Waterworks Laboratories". The following year, the problem of obtaining pure water for soldiers being an important one, Mr. Hinman discussed "Some Problems of Water Supply for Troops", and in 1920 he presented a paper on "Some Experiences with Laboratory Control of Field Water Supplies". The same year James H. Lees presented a study of "The Conservation of Underground Waters".⁶⁸

One of the outstanding problems before the Academy

⁶⁷ *Proceedings of the Iowa Academy of Science*, Vol. XVII, p. 7, Vol. XXI, pp. iii, 11, Vol. XXII, p. 11, Vol. XXIII, pp. 17-19, Vol. XXIV, p. 19, Vol. XXV, pp. 25-29, Vol. XXVI, p. 31, Vol. XXVII, p. 35, Vol. XXXI, p. 3.

⁶⁸ *Proceedings of the Iowa Academy of Science*, Vol. XX, p. 7, Vol. XXIV, p. 501, Vol. XXV, p. 457, Vol. XXVII, pp. 187, 253.

during this decade was that of conservation. In 1917 James H. Lees discussed "Some Geological Aspects of Conservation". "Iowa", he said, "is usually considered as primarily a prairie state, one whose chief aesthetic attraction lies in the satisfaction that accompanies the outlook over wide spreading grain field or level plain stretching away beyond the farthest ken". In general, he said, this is true, but "the most attractive region of the state is 'The Switzerland of Iowa,' so named because its picturesque hills and deep cut valleys with their winding streams make of it a land comparable with the 'Playground of Europe.'" Mr. Lees referred to a number of the beautiful geological structures of the State — Columnar Cliffs, Devil's Den, Castle Rock, Pilot Knob, Jasper Pool, and other places of interest. He urged conservation of the many beauty spots of the State. Their perpetuation, he said, "will increase the feeling of pride with which every Iowan regards his state and so will add in every way to the state's resources and attractiveness."⁶⁹

In 1918, R. L. Webster presented a paper on "Food Conservation and Economic Entomology", and the following year Samuel W. Beyer devoted his presidential address to the subject "Some Problems in Conservation". Nor was the work of conservation confined to the preparation and presentation of papers before the Academy. In 1920, a committee, consisting of W. H. Davis, Bohumil Shimek, H. E. Jaques, G. B. MacDonald, and G. A. Chaney, made a report recommending that steps be taken in the interest of conservation. Among other things this committee recommended that immediate action be taken for the preservation of streams and lakes "because when once lost they can never be reclaimed". It endorsed the policy of plant

⁶⁹ *Proceedings of the Iowa Academy of Science*, Vol. XXIV, pp. 133-154.

and game preserves in the rough lands and along the streams, and the further purchase of land for State and county parks. It advocated certain changes in the law relative to open and closed seasons for hunting and fishing, and the passage of a law relative to the preservation of Indian mounds and burial grounds. It also expressed approval of the plant disease survey which was being carried on by the United States Department of Agriculture.⁷⁰

Problems of value to the agricultural interests of the State were frequently discussed before the Academy. In 1912 J. N. Martin discussed "Some Points on the Floral Development of Red Clover". In 1914 Mr. Pammel presented a paper on "Weed Survey of Story County". In 1916 E. L. Palmer presented "A Seed Key to Some Common Weeds and Plants". In the same year John A. Krall presented a study of "The Formalin Treatment for Controlling Oat Smut", and the following year Dayton Stoner presented "Notes on Some Iowa Rodents". In this paper he observed that much damage is caused by rodents and that the bounty system as a means of combating them met with small success. "If every farmer would see to it that the pests are destroyed on his own premises without consideration for the bounty", Mr. Stoner said, "the difficulty would be solved and the funds now expended in bounties could be invested in some manner that would be likely to yield greater returns". In 1919, "Grass-Hopper Control Work in Iowa" and "The Barberry in Iowa and Adjacent States" were the subjects of papers presented by H. E. Jaques and L. H. Pammel respectively.⁷¹

⁷⁰ *Proceedings of the Iowa Academy of Science*, Vol. XXV, p. 117, Vol. XXVI, pp. 37-46, Vol. XXVII, p. 21.

⁷¹ *Proceedings of the Iowa Academy of Science*, Vol. XIX, p. 129, Vol. XXI, p. 115, Vol. XXIII, pp. 335, 593, Vol. XXIV, pp. 353-356, Vol. XXVI, pp. 133, 193.

During this decade, frequent reference was made to the work accomplished in the various fields of science. The year 1912 being the twenty-fifth anniversary of the founding of the Academy of Science, it was an appropriate time for a review of the accomplishments of science in the various fields. Much of the space in the *Proceedings* for that year was devoted to reviewing the work of the previous years. "Twenty-five Years of Botany in Iowa" was the subject of a paper presented by T. H. Macbride. During the years preceding, the trend of science in every field and laboratory had been toward the immediate and directly practical. How better to obtain oil, or gas, or steel; how better to develop and manage the electric current; how more profitably to extract gold or silver from the ores; how better to raise corn or cattle; how to control disease? Dr. Macbride presented the view that those practical triumphs were, however, only the smaller fraction of scientific accomplishment. Pure science includes infinitely more. In conclusion he expressed the belief that botany would in the near future "show itself, as it really is, the most fascinating, productive, beautiful", and withal the most instructive science.⁷²

Melvin F. Arey presented a "History of Geology in Iowa for the Last Twenty-five Years", in which he discussed the work of leading geologists and the Geological Survey. "The Progress in Physics in Iowa in the Quarter Century" was presented by Frank F. Almy, who reviewed the progress made in this science in Iowa colleges and gave a list of the papers dealing with physics which had been presented before the Academy of Science. "The Progress of Zoology in Iowa during the Last Twenty-five Years" was the subject of a report made by C. C. Nutting. In this, Mr. Nutting

⁷² *Proceedings of the Iowa Academy of Science*, Vol. XIX, pp. 43-50.

reviewed the work of several leading zoölogists, as well as the development of the science itself, and pointed to the fact that at least seven of the presidents of the Academy had been zoölogists and others had been interested in that field although more closely affiliated with other sciences.⁷³

During the latter part of the decade papers presented to the Academy were classified according to the various branches of science with which they were concerned. Botany, chemistry, geology, physics, and zoölogy were all well represented. In 1919 a study of State Academies of Science throughout the United States was made, and it was found that the Iowa Academy ranked first in membership with a total of three hundred and fifty. Of these members, sixty were botanists, thirty chemists, forty geologists, eighteen mathematicians, twelve physicians, thirty physicists, sixty zoölogists, and one hundred were unclassified.

The field of experimental psychology became one of increasing interest during this decade. In 1920 Dr. C. E. Seashore and a number of his assistants presented to the Academy a "Symposium: Some Results of Current Research in the Psychological Laboratory of the State University of Iowa".⁷⁴

The presidential addresses presented during the decade under consideration were filled with interest. The first of these appeared in the *Proceedings* of 1912, when Louis Begeman presented "The Mission and Spirit of the Pure Scientist". "The spirit of pure science", he said, "has many times been expressed in the unselfish sacrifice of some great man's life in the cause of truth in order that humanity might be brought to higher standards of living. It is the spirit which glories in victory over ignorance, prejudice,

⁷³ *Proceedings of the Iowa Academy of Science*, Vol. XIX, pp. 65, 73, 79-83.

⁷⁴ *Proceedings of the Iowa Academy of Science*, Vol. XXVII, pp. 9-16, 227; *State Academies of Science in Science* (New Series), Vol. L, pp. 517, 518.

and unreasoning tradition". As an example of a pure scientist of the highest type he referred to the life and work of Michael Faraday.⁷⁵

In 1917 G. W. Stewart in his presidential address discussed the advances made in physics, and the functions and responsibilities of the Academy. He pointed out that Iowa is favorably situated for the development of science, and that the Academy should have a distinct part in such development. "Our Academy exists", he said, "not merely for Iowa but for the world, serving as a means of assisting Iowa to make generous contributions to the welfare of this nation and of the entire world".⁷⁶

In the presidential address in 1918 L. S. Ross made a plea for a study of the history of science. He expressed the view that a study of history is too often confined to a study of military or political affairs, and that it should be made to include the progress of scientific thought.⁷⁷

As was previously noted Samuel W. Beyer in 1919 devoted his presidential address to a consideration of "Some Problems in Conservation". He made a plea for the conservation of water for agricultural purposes. In this connection he expressed the belief that "a hydrometric survey would demonstrate the wisdom of preserving large tracts of land in their natural state". Such reserves, he said, "would aid the Mississippi Valley to maintain its position as the *Granary of the World*." In 1920 T. C. Stephens in his presidential address discussed "The Taxonomic Unit" — a subject of interest primarily to those working in the field of biology.⁷⁸

⁷⁵ *Proceedings of the Iowa Academy of Science*, Vol. XIX, pp. 11-15.

⁷⁶ *Proceedings of the Iowa Academy of Science*, Vol. XXIV, pp. 29-32.

⁷⁷ *Proceedings of the Iowa Academy of Science*, Vol. XXV, pp. 33-38.

⁷⁸ *Proceedings of the Iowa Academy of Science*, Vol. XXVI, pp. 37-46, Vol. XXVII, p. 41.

Aside from the papers presented before the Academy, and the opportunities afforded for the publication of such studies, the Academy in its annual meetings has always provided opportunities for social intercourse among scientists from various parts of the State. With the increase in membership in the Academy during the years prior to 1920 this social feature and its attending influences came to be more and more a significant factor in the development of the Academy. The social contacts thus formed tend to promote good fellowship among institutions as well as among individuals, and encourage research in the smaller colleges as well as in the larger institutions of the State.

THE ACADEMY FROM 1921 TO 1931

Notwithstanding the growth which the Academy had made prior to 1920, and the position of prominence which it had attained as compared with other State Academies, the expansion in more recent years has been even more striking. In 1921 there were three hundred and sixty-three members. Seven years later, in 1928, this number had increased to more than six hundred — a very substantial gain over all previous records. Of this number five were honorary fellows, twenty-five were life members, two hundred and ninety-two were fellows, and two hundred and eighty-one were associate fellows.

This increase in membership brought into the Academy a considerable number of men outstanding in various fields of science. During these years, too, death removed several prominent members of the Academy. Among these were E. W. Stanton, Gustavus Hinrichs, James E. Todd, A. G. Field, W. S. Hendrixson, L. T. Weeks, C. C. Nutting, J. H. Paarmann, Bruce Fink, Bird T. Baldwin, A. O. Thomas, and L. H. Pammel.

The presidents of the Academy during this period in-

cluded D. W. Morehouse, R. B. Wylie, L. H. Pammel, O. H. Smith, R. I. Cratty, C. E. Seashore, L. D. Weld, George F. Kay, L. B. Spinney, H. L. Reitz, and James H. Lees. The election of Mr. Pammel in 1923 was unique, as he had served as president of the Academy on a former occasion more than twenty years before. Mr. Pammel and Mr. Nutting are the only men who have been twice elected to the office of president of this Academy.

Mention has been made of the fact that James H. Lees served as secretary of the Academy from 1914 until 1924. He was succeeded at that time by P. S. Helmick who served until 1929, when he in turn was succeeded by J. C. Gilman. In 1925 members of the Academy elected an editor — an officer long needed and one able to render valuable service to the organization. Willis DeRyke was elected editor in 1925 and served until August, 1926, when he resigned and the executive committee appointed G. H. Coleman as his successor. In 1927 Mr. Coleman was elected editor, and the following year was reelected. During the year 1928 he went to Europe and in his absence James H. Lees was appointed editor. Upon his return Dr. Coleman was reelected in 1929 and continues to serve as editor.⁷⁹

During this decade interest in the various branches of science and the influence of specialization in a particular field is more clearly apparent than in former years. During the years from 1921 to 1928 inclusive there were, aside from the presidential addresses, 1174 papers presented to the Academy. Of this number 736 were published in the *Proceedings* either in full or in abstract form, while 438 were not published by the Academy. A considerable number of these papers were printed in other publications, such as

⁷⁹ Data compiled from *Proceedings of the Iowa Academy of Science*, Vols. XXVIII-XXXV. See also *The Des Moines Register*, May 4, 1930.

the *Journal of Bacteriology* and *The American Mathematical Monthly*.

The papers classified according to subjects are as follows:

	Unpublished	Published	Total
Archeology ⁸⁰		2	2
Bacteriology	32	50	82
Botany	69	133	202
Chemistry	88	116	204
Geology	65	97	162
Mathematics	93	5	98
Physics	28	154	182
Psychology	22	61	83
Zoology	32	109	141
Unclassified	9	9	18
Totals	438	736	1174

Chemistry leads the list in the number of presentations with 204 papers. Botany is second with 202 papers, while the largest number of papers published was in the field of physics, where 154 out of a total of 182 papers were published in the *Proceedings*. Very few papers were presented in the field of archeology, and few of the papers in mathematics were published by the Academy. This latter situation is due in a large measure to the fact that many of the papers presented in this field were published elsewhere.⁸¹

The practical application of the papers presented, which has been apparent throughout the history of the Academy, still continues. Papers of interest in the field of agriculture and horticulture frequently appear. Subjects dealing with conservation, with health, and with the promotion of public welfare are among those presented. In 1921 H. E.

⁸⁰ Two titles — *Indian Quartzite Quarry Near Hot Springs, South Dakota*, by Paul S. Rowe, and *An Apparently Very Old Prehistoric Camp Site*, by Ellison Orr — which are classified in the *Proceedings* under "Geology" might well have been classified as "Archeology".

⁸¹ Data compiled from *Proceedings of the Iowa Academy of Science*, Vols. XXVIII-XXXV.

Jaques discussed "The 1921 Outbreak of the Clover-leaf Weevil in Iowa". In 1926 the same author read a paper on "A Preliminary Survey of May Beetles in Iowa". A paper dealing with the sod webworms in Iowa was presented by R. L. Webster in 1923.⁸²

In 1924, Julian E. McFarland presented a paper on "Chemical Engineering and Agriculture". He pointed out in this connection that chemical engineering is coming to play an important part in the development of agriculture. This is particularly true in the preparation of fertilizers to enrich the soil and in the better utilization of waste agricultural products, such as corncobs and oathulls. In 1922, L. W. Durrell read a paper on "The Nodal Infection of Corn by *Diplodia Zeae*". At each of the two following annual meetings Winfield Scott presented a discussion of the selection, methods of testing and the preservation of seed corn.⁸³

In 1924 Bohumil Shimek discussed the subject, "Drainage in Iowa". He said that the whole problem of over-drainage should receive more attention, and be carefully studied by those who are competent to determine not only whether a given area *could* be drained but also whether it *should* be drained. "It is evident", he said, "that we should adopt a system of selective drainage in place of the present reckless system which operates on the groundless assumption that *all* drainage is beneficial." In conclusion he said, "the Academy, and especially the Botanical Section, should consider this problem, as it involves scientific investigation of our natural conditions, and is particularly concerned with the interests of plants. We should take a stand for

⁸² *Proceedings of the Iowa Academy of Science*, Vol. XXVIII, p. 127, Vol. XXX, p. 147, Vol. XXXIII, p. 337.

⁸³ *Proceedings of the Iowa Academy of Science*, Vol. XXIX, p. 346, Vol. XXX, p. 254, Vol. XXXI, pp. 217, 284.

the sane investigation and solution of the problems involved before it is too late."⁸⁴

The purification of the water supply of the State was a subject frequently presented to the Academy. In 1924 George Bennett presented a paper on "Keeping Iowa's Water Pure". This was a plea for keeping the lakes and streams free from industrial waste and city sewage in the interest of wild life conservation. At the same meeting at which this paper was presented, the Committee on Biological Survey reported, recommending that the Iowa Geological Survey be invited to undertake a natural history survey of the State. This, it was suggested, should include an investigation of such problems connected with the native plant life and animal life as may be of importance to the agricultural interests, the fish and game resources, the recreational privileges, and the educational standards of the people of the State. It was also recommended that three members of the Academy of Science be appointed to act in an advisory capacity to assist the Iowa Geological Survey in this task. And it was urged that the Academy endorse a legislative appropriation of \$2000 to carry forward this work.

Two papers on water purification were presented by Jack J. Hinman, Jr., one in 1926 dealing with "The Present Tendencies in the Bacteriological Examination of Water", and the other in 1927 relative to the "Measurement of the Quality of Water". In 1928 A. H. Wieters discussed the "Status of Stream Pollution in Iowa". He called attention to the fact that stream pollution had in the past been quite common, but that conditions were being improved. Industries and municipalities, he said, "are co-operating and taking cognizance of their deficiencies in this matter and

⁸⁴ *Proceedings of the Iowa Academy of Science*, Vol. XXXI, pp. 149-155.

it appears that Iowa is entering into a new era as far as stream pollution is concerned."⁸⁵

The matter of conservation, which has been of interest to members of the Academy from an early date, continues to be of outstanding importance. A report of the Committee on Conservation presented in 1927 clearly sets forth the views of the Academy on this subject. The committee in this report called attention to the fact that there is a growing tendency to make State parks merely recreation centers. The committee agreed that these parks should provide for recreation in part, "but they should also serve as sanctuaries for the remnants of our native plant and animal life for scientific and general conservation purposes, as was originally intended." The committee also recommended that the Academy give its approval to the policy of setting aside certain portions of the larger parks, and other smaller suitable areas, especially in the vicinity of educational institutions, for the preservation of wild life and natural conditions.

"The protection of both the waters and the forests", the committee said, "is a great economic necessity, as it is essential to the preservation and propagation of all wild life, and these two great problems, or rather divisions of one great problem, form a common bond of interest which must unite all conservationists."⁸⁶

As in former decades a considerable number of the papers presented to the Academy were of a technical or academic nature. As has been pointed out, however, the purely scientific approach—the study of science for its intellectual and cultural effect, for the delight and satisfaction which it affords—frequently precedes and is funda-

⁸⁵ *Proceedings of the Iowa Academy of Science*, Vol. XXXI, pp. 21, 431, Vol. XXXIII, p. 65, Vol. XXXIV, p. 69, Vol. XXXV, pp. 63-67.

⁸⁶ *Proceedings of the Iowa Academy of Science*, Vol. XXXIV, pp. 31-33.

mentally a part of the later development and practical application of science. Accordingly, an inestimable value attaches to the papers of a purely scientific nature which have been presented to the Academy. Among the papers of this type which have been presented in recent years may be mentioned "Notes on Iowa Fungi", by G. W. Martin; "The Effect of Pressure on Chemical Reaction", by F. E. Brown; "Studies on Germination of Trees and Woody Plants", by L. H. Pammel; and "The Electric Conductivity of Kerosene and Gasoline as a Function of the Temperature", by C. A. Morehouse.⁸⁷

The presidential addresses delivered since 1920 contain much that is of interest not only to members of the Academy but to students of science everywhere. The address in 1921 by Nicholas Knight dealt with a wide and comprehensive subject — "American Science". He said that Egypt, Greece, Rome, France, England, and Germany had each in turn been looked upon as the center of the world's intellectual life. Since the war, however, America stands in the forefront. "In these reconstruction days", he said, "the Iowa Academy of Science has an important mission to perform. We delight to think of it as an organization making its contribution to knowledge, encouraging its members to build up the waste places in Iowa science, and doing our part in every possible relation." In conclusion he said: "Our number of specially trained should increase, and the work we do should be sufficient in quantity and of that high quality that will give us a good standing among other learned societies. We have our own part in making our nation a world power in the field of productive scholarship."⁸⁸

⁸⁷ *Proceedings of the Iowa Academy of Science*, Vol. XXXII, p. 219, Vol. XXXIII, pp. 97, 145, Vol. XXXIV, p. 271, Vol. XXXV, p. 241.

⁸⁸ *Proceedings of the Iowa Academy of Science*, Vol. XXVIII, pp. 33-36.

During the summer of 1922 a number of Iowa scientists organized an expedition to the Fiji Islands and New Zealand, and a number of papers dealing with scientific conditions in those islands were presented to the Iowa Academy of Science. Among these may be mentioned "A Zoological Park in New Zealand", by Dayton Stoner; and the presidential address by R. B. Wylie in 1923 on the subject "Botanical Notes on Fiji and New Zealand". In this latter address Dr. Wylie discussed the beauties of the tropics and the wealth of botanical material available there. In speaking of conditions in Fiji he said: "the luxuriance of the vegetation was rather less than had been anticipated; the trees seem to stand relatively far apart and they are not as large as I had expected to find in a region of tropical rain forests. But the somewhat scattered look of the forest, viewed from afar, is quite misleading, for near approach reveals a jungle of smaller plants, and attempts to leave the beaten path reveal barriers in the form of dense growths of all types — lianas, creeping vines, outflung roots, and tall rushes growing up from a soil that is itself often bare of ground vegetation and where one's foot falls into soft mud, the light being too dim to promote a surface growth." Many other interesting facts relative to Fiji and New Zealand were presented by Dr. Wylie.⁸⁹

In 1924 L. H. Pammel in his presidential address — "A Century of Botany in Iowa" — discussed many of the advancements made during the past hundred years, referring to many scientists and their work. Other presidential addresses delivered during the decade include: "The Cosmology of the Universe", by D. W. Morehouse; "The Social Responsibility of Science", by Orrin H. Smith; "The Ministry of Science", by R. I. Cratty; "The Evolution of

⁸⁹ *Proceedings of the Iowa Academy of Science*, Vol. XXX, pp. 45-54, 143, Vol. XXXI, p. 331.

an Idea", by Carl E. Seashore; "Atomicity in Physical Nature", by L. D. Weld; and "Contributions to the Pleistocene Deposits of Iowa", by George F. Kay.⁹⁰

A review of the work of the Iowa Academy of Science reveals the fact that throughout its history its growth and development has been gradual and constant. Beginning with a very limited membership it has grown both in size and in influence until it has attained a place of high rank. Its published proceedings, at first very limited in scope, have likewise grown to large and representative proportions, and throughout the years they have preserved a wealth of historical and scientific material. Interest has been stimulated and maintained in the various branches of science. Bacteriology, botany, chemistry, geology, mathematics, physics, psychology, and zoölogy have each received due recognition. Scientists in every field of learning, whether ripe with years of experience or youthful and aspiring in the field of research, have been encouraged to prepare studies for presentation. A closer fellowship among individuals and a closer coöperation among institutions have also been attained. Most of all, after more than three-quarters of a century of development and growth, the Academy moves on to ever widening spheres of influence. In the words of a former president, the Academy "exists not merely for Iowa but for the world, serving as a means of assisting Iowa to make generous contributions to the welfare of this nation and of the entire world."⁹¹

⁹⁰ *Proceedings of the Iowa Academy of Science*, Vol. XXIX, pp. 41-48, Vol. XXXI, pp. 45-68, Vol. XXXII, pp. 47-54, Vol. XXXIII, pp. 49-57, Vol. XXXV, pp. 45-53.

⁹¹ *Proceedings of the Iowa Academy of Science*, Vol. XXIV, pp. 29-32.

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