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Wayne I. Anderson
University of Northern Iowa

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Iowa Geology: The Early Years

WAYNE I. ANDERSON

Department of Earth Science, University of Northern Iowa, Cedar Falls, IA 50614-0506

In 1975 on the occasion of the first one hundred years of the Iowa Academy of Science, Robert W. Hanson summarized the history of the organization. Additional historical accounts covering many of the science disciplines were published during the centennial year. Although geology was not treated separately in these special articles, the contributions of early geologists were important to the development of science in our state. Consequently, it is appropriate to consider the contributions of early geologists in Iowa in celebration of the one hundredth annual meeting of the Iowa Academy of Science. Included in the present report are the contributions of R. Ellsworth Call, Samuel Calvin, James Hall, Charles Keyes, W.J. McGee, David D. Owen, Frank Springer, Orestes St. John, James Todd, Charles Wachsmuth, Charles White, and A.H. Worthen. Correspondence in 1892 between Charles Keyes and Samuel Calvin provides historical background on the political climate in Iowa at the time of the establishment of the Iowa Geological Survey. Highlights of this correspondence are reported.

INDEX DESCRIPTORS: Iowa geology, History of geology, James Hall, Charles White, Charles Keyes, Charles Wachsmuth, James Todd, R. Ellsworth Call, Samuel Calvin.

Robert W. Hanson (1975) summarized the history of the Iowa Academy of Science during the centennial year of that organization. Although geology was not treated separately in the special articles prepared in celebration of the Academy's centennial year, the contributions of early geologists and geologists-naturalists were important to the development of science in our state. Geologists have long been active in the Academy, and contributions from geology have contributed significantly to the *Proceedings of the Iowa Academy of Science*. Norton (1988) documented 511 geology papers published in *Proceedings*, volumes 1-93, placing geology in third place behind the disciplines of botany (937 papers) and zoology (647 papers).

In recognition of the 100th annual meeting of the Iowa Academy of Science, it is appropriate to look back to the early days of Iowa geology. Approximately 100 years ago, in 1889, James Hall was preparing to assume responsibility as the first president of the newly-organized Geological Society of America. He was 78 at that time. Some 34 years earlier, at age 44, Hall became Iowa's first state geologist. In 1841 at age 30, he had visited Iowa as part of David Dale Owen's survey of the Midwest. Hall's two-volume set on Iowa geology, published in the late 1850's, was a classic work, and called attention to Iowa's remarkable Paleozoic fossils.

James Hall influenced many geologists during his day, including several who did pioneering work in Iowa. Charles White, Iowa's second state geologist, studied with Hall in New York state. Hall had invited White to study in New York in order to gain access to his superb collection of crinoids. White, once a resident of Burlington, had acquired many of his specimens from southeast Iowa.

White, a talented scientist in his own right, soon made his mark on Iowa geology. After completing the MD degree in 1864 and practicing medicine in Iowa City for two years, he was appointed state geologist in 1867 at age 41. He also was appointed professor of geology at the University of Iowa in 1867. White's two-volume set on the Geology of Iowa focused on aspects of our state's geology that Hall had not addressed. Included in White's volumes, published in 1870, were discussions of Iowa coal and the geology of western Iowa.

White left Iowa in 1874 for a position at Bowdoin College in Maine. Prior to leaving the state, he played an important role in a key scientific meeting held in Iowa. Organized in 1848, the American Association for the Advancement of Science, held its first meeting west of the Mississippi River in 1872. This meeting was held in Dubuque and concluded with post-trip field excursions to the McGregor area in northeast Iowa and a traverse across the state from Dubuque to Sioux City. White was the field trip leader, and the participants included five or six state geologists and a number of

notable botanists. The trip was judged to provide an excellent overview of the natural history of our state (Swisher, 1931).

Later, White joined the federal surveys of the western states and was employed successively in surveys directed by George Montague Wheeler, John Wesley Powell, and Ferdinand Vandiveer Hayden. At the conclusion of the survey work, White took positions with the National Museum in Washington, D.C. and with the United States Geological Survey. One hundred years ago, in 1888, White was actively involved in the leadership of the American Association for the Advancement of Science and was a founding father of the Geological Society of America.

In 1888, the time of the first annual meeting of the reorganized Iowa Academy of Science, fewer than 200 geologists lived in North America (Rossbacher, 1988). Included in this group were individuals whose names are still recognized today by most geologists. Several of these early geologists had a connection with Iowa.

The following summary will review the contributions of James Hall and Charles White, examine the status of geology in Iowa from 1870-1892 when no state geological survey was in existence, and conclude with a discussion of personalities and events leading to the formation of a permanent state geological survey in 1892. Historically, the summary spans the years 1855 to 1892.

Franklin Pierce, our nation's fourteenth president, was in office at the start of Hall's early survey of the state; Benjamin Harrison, twenty-third president, was in office when the permanent state geological survey was founded in 1892.

JAMES HALL AND IOWA GEOLOGY, 1855-1860

Several accounts have been published summarizing the contributions of James Hall (Figures 1 and 2). Dott (1985) reported Hall's discovery of the craton. Clarke (1921) prepared a detailed biography of Hall's life and work, and Menzel and Pratt (1968) focused on his work in Iowa. Only the highlights of Hall's career will be discussed herein.

James Hall (1811-1898) completed the Bachelor of Natural Sciences degree at Rensselaer School, Troy, New York in 1832 and the Master of Arts degree there the following year. He was introduced to Midwest geology as a member of Professor David Dale Owen's survey in 1841. Hall later recalled this experience as "time on a flat boat, sleeping on a box, and collecting fossils from Louisville to New Harmony" (Menzel and Pratt, 1968, p. 22).

Governor James W. Grimes, in his first message to the state



Fig. 1. James Hall, preeminent nineteenth century geologist-paleontologist and Iowa's first State Geologist, as he appeared in later years, about 1890. (From frontispiece of Clarke, 1923.)

legislature, recommended a geological exploration of the state. He appointed Hall as State Geologist of Iowa in 1855. Grimes, a Dartmouth graduate and man of intellectual excellence and refinement, actively recruited Hall for the position of State Geologist. He traveled to Albany, New York to interview Hall and pronounced him to be "one of the most modest and unobtrusive men I have ever met" (Clarke, 1923). Others would later characterize Hall as anything but modest and unobtrusive (Fisher, 1978), casting doubt on Grimes' judge of character in this instance.

Hall's position in Iowa originally permitted him but one paid assistant, and had it not been for Governor Grimes' unyielding support, Hall could not have undertaken the Survey. It was a distant undertaking for Hall, for he spent only a month or two in Iowa each year. Josiah D. Whitney, Hall's assistant, was designated Chemist and Mineralogist for the Iowa Survey, and he received equal billing with Hall on title of state reports and publications (Clarke, 1923).

Hall conducted his remote Survey through cleverness and delegation of responsibilities. Whitney was charged with responsibility for economic geology (lead, zinc, coal, and quarry interests). Amos H. Worthen of Warsaw, Illinois became an official assistant to Hall. His salary came directly from that allocated to Hall, however. Worthen's appointment made his fine collection of crinoids and other fossils available for Hall's study and for inclusion in the Iowa reports. Volunteer help was secured from those who could afford to work for the experience. Included here were Dr. C.C. Parry of Burlington and Edward Hungerford from Silliman's laboratory in the East. Hall made a hasty visit to Iowa to initiate the Survey, but subsequent visits were in the winter to deal with the state legislature. Field work was left to

the assistants in what was then frontier country (Clarke, 1923).

Funding for the Hall Survey was always on shaky ground. Whitney and Worthen, had difficulties in getting their state warrants paid. Often they were told there would be no money available until the next tax collection, usually months away. Warrants were sent to Hall in Albany, New York, where he borrowed money against them at a discounted rate. Hall's personal checks were then sent back to Iowa, where they were subjected to further discount charges. In effect, Hall ended up funding some of the state Survey from his own resources (Clarke, 1923).

Another example of funding problems involved construction of a field wagon for the special studies in Iowa's coal fields. A wagon maker was commissioned by one of Hall's assistants to construct a cart for travel and field studies. It was a handsome vehicle with red box and yellow wheels. Many state officials, however, were concerned with the cost of the extravagant field chariot, and it had not been completely paid for when Hall's Survey was discontinued in 1859 (Clarke, 1923).

A number of species were named for Hall's assistants, volunteers, and key supporters. Ten were named to honor A.H. Worthen, and spiriferid brachiopods were named for Josiah Whitney, C.C. Parry, and Edward Hungerford. A large impressive spiriferid brachiopod from the Burlington area was named for Hall's friend and key supporter, Governor James W. Grimes. Some of the Governor's political opponents declared that the Governor had vainly chosen to



Fig. 2. James Hall (1811-1898) comparable in age to when he served as State Geologist of Iowa, 1855-1860. (Presidential portrait for the American Association for the Advancement of Science, 1856; Lithograph by Swinton; from Clarke, 1923.)

glorify himself by having his name given to such an object (Clarke, 1923)!

Although both Hall and Whitney had appointments at the State University, neither is known to have delivered a lecture there. In 1860, the Iowa State Legislature refused to make further appropriations for the continuation of the Survey. For several years following, Hall still regarded himself as State Geologist of Iowa, contending that the legislature was without power to repeal his contract with former Governor Grimes. By that time, Grimes had been elected United States Senator (Clarke, 1923).

Hall took great pride in his two volume publication on Iowa's geology; the volume on Iowa fossils (Paleontology of Iowa) was particularly pleasing to him. There was some general unhappiness in Iowa, however. Hall's reports covered only the eastern part of the state and a sumptuous volume on fossils brought little pleasure to the Iowa taxpayer (Clarke, 1923).

Hall's two-volume set on Iowa's geology was widely distributed, including 250 copies to governments and scientific societies of Europe. Copies of Iowa's Geological Survey of 1855-58 are found in the South Africa Museum at Capetown and in museums in Russia, France, England, Belgium, Spain, and Greece (Menzel and Pratt, 1968).

Keyes (1897) listed the accomplishments of the Hall Survey as follows: "determination of the character and relations of the general geological features of the region; an investigation of the lead and zinc deposits; a preliminary examination of the coal fields along the chief lines of transportation; a detailed consideration of the resources of six counties; and a description of the characteristic fossils of the several geological horizons".

Amos Worthen, Hall's chief paleontological assistant for the Iowa Survey, went on to a distinguished career as State Geologist of Illinois. The final published results of Worthen's survey of Illinois totaled more than 4,000 pages and included 1,975 full-page plates of fossils (Merrill, 1924). See also Kent (1982) for documentation of the Worthen collection at the Illinois State Geological Survey.

CHARLES WHITE AND THE IOWA GEOLOGICAL SURVEY, 1866-1869

Charles Abiathar White's family had moved to the frontier near Burlington in the newly-organized Territory of Iowa in 1838. Charles was 12 years old at the time, and his interests were stimulated by the local surroundings. He developed a love of nature and went on to become a naturalist of the old school. White made large collections of fossils, including the crinoids that have made Burlington famous among paleontologists. These fine collections of fossils served to introduce White to James Hall, Fielding Bradford Meek, Amos Henry Worthen, and other geologists of the day. These contacts further stimulated White's interest in geology and paleontology (Malone, 1936).

It was difficult to make a living as a scientist in White's day, so he turned to the study of medicine. He began studies with a local physician, later studied at the University of Michigan, and graduated from Rush Medical College in Chicago in 1864. He worked in Iowa City as a physician for two years after graduation, prior to his appointment as State Geologist in 1866 and Professor of Geology at the University of Iowa in 1867 (Malone, 1936).

In 1866, the state legislature authorized a second geological survey, primarily to inventory the resources of the western half of the state. Charles A. White, M.D., was appointed state geologist and Orestes St. John was appointed chief assistant geologist (Figure 3). According to Parker (1972), the legislature appropriated \$6,500 annually for a four year span to fund this survey. The White survey continued until the end of 1869 and resulted in two royal octavo volumes, comprising 443 pages, and including a colored geological map of the entire state



Fig. 3. Staff of the second geological survey of Iowa, 1866-1869. Left to right: C.A. White, Rush Emery, and Orestes St. John. Charles White (1826-1910) was Iowa's second State Geologist and the first Iowan to be named to the National Academy of Science. (From Merrill, 1924, plate 22.)

(Merrill, 1924).

It is clear from Hall's correspondence that he wished to be reappointed to head the revived survey, claiming that he was originally appointed for no specific time other than what it took to complete the survey of the entire state. Finding that White was likely to receive the appointment to resurrect the Survey, Hall was at first disappointed but later accepted the course of events. He continued to request reimbursement for personal outlays that he had made on the previous state survey, however (Merrill, 1924).

White and Hall were well acquainted as they had spent time together in New York state studying paleontology. Hall had arranged for White's stay in Albany in order to have access to his splendid collection of Iowa crinoids (Clarke, 1923).

Although White was loyal to Hall and appreciated his association with the renowned paleontologist, he realized that Hall was no longer held in favor by state legislators in Iowa. White was both willing and able to assume leadership of the second state-sponsored Survey. The following communication from White to Hall, tells the story:

"May 2d, 1865.

The repeated refusal of the legislature of Iowa to respond to your requests for the appropriation of money to resume and complete the State Geological Survey or to refund to you the money actually expended by you on the work after your term of appointment had expired, would of itself convince one that there is great dissatisfaction among the people and their

representatives with the result of your labors here, if I had not the additional assurance of the fact from the mouths of a number of the members of the legislature who have told me that it was the definite intention of the legislature not to recognize you as State Geologist after the expiration of the term for which Governor Grimes appointed you. Every scientific man however knows that your report was a valuable addition to science and the objection urged against it by others does not arise from a disbelief in your ability, but they consider that you are more desirous of adding to your scientific name than of instructing the people of the State in relation to its resources. I have earnestly endeavored to have our legislature comply with your wishes in this matter, as you are thus aware, without any expectation of personal advantage, but since it has become certain that we are to have peace, I have addressed a number of my scientific and other friends, suggesting the probability that I should ask our legislature next winter to make an appropriation to resume and complete the work and appoint myself in charge of it" (Clarke, 1923, p. 358-359).

According to Keyes (1897), as originally planned, reorganization of the Geological Survey was to do for the western half of the state what Hall's Survey had accomplished for the eastern half, thus completing a reconnaissance of the entire state.

White's survey was more than a general reconnaissance, however. Many districts were examined in detail and reports were made on the natural resources of several counties. Coal resources of the state received particular attention. The published results were in the form of two large volumes, similar in character to the two volumes issued by Hall's survey (Keyes, 1897). Keyes (1919) credited White's determination of thicknesses of Iowa's strata as a significant contribution to Iowa geology.

Orestes Hawley St. John, White's assistant on the 1866-1869 survey, drew the diagrams, maps, and sketches that illustrate the two-volume set *Report on the Geological Survey of the State of Iowa*, published in 1870. Prior and Milligan (1985) noted the significance of St. John's original landscape sketches in documenting historical changes in land use in Iowa over the past century. St. John later joined Worthen at the Illinois Geological Survey. He received acclaim for his studies of fossil fish, an interest he first developed in Iowa (Keyes, 1919).

Orestes St. John's childhood was spent in Waterloo, Iowa, where he developed an interest in paleontology through personal collections made from the locally-fossiliferous Devonian strata. His collections of fish remains attracted the attention of Harvard's Louis Agassiz, who encouraged him to become a naturalist. It was Agassiz who recommended St. John to White as an assistant on the Iowa Geological Survey (Prior and Milligan, 1985).

White left Iowa for a distinguished career as paleontologist for the federal government. He was the first Iowan to be named to the National Academy of Science (Keyes, 1897).

ABSENCE OF A STATE GEOLOGICAL SURVEY, 1870-1892

AAAS Meeting in Dubuque, 1872

Although Iowa was without a permanent state geological survey from 1870-1892, several individuals and organizations contributed to the understanding of Iowa's geological history during this span of time. Charles White, University of Iowa, led a geologic excursion across Iowa as part of the American Association for the Advancement of Science's annual meeting at Dubuque in 1872. This was the group's first meeting west of the Mississippi River. White's post-meeting trip featured the McGregor area and a traverse across Iowa from Dubuque to Sioux City. He was accompanied by five or six state geologists, a number of botanists, and others interested in the natural history of the

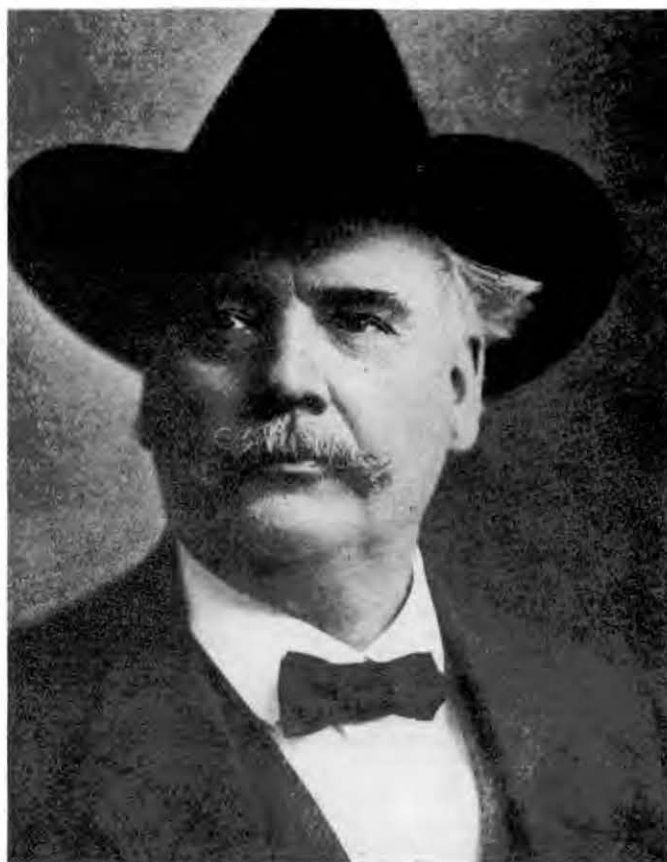


Fig. 4. William John McGee (1853-1912) contributed to the understanding of Iowa's Ice Age history. He had a distinguished career with the federal government and served as the first editor of the *Bulletin of the Geological Society of America*. (From Keyes, 1919.)

state. Total attendance on the trip was approximately 40 (Swisher, 1931).

White lectured during the two-day trip across the state, and the field party visited the Fort Dodge area to study limestone quarries and kilns, coal mines, and the well-known gypsum quarries. Botanists ventured further west into Nebraska and into Dakota territory. On the return trip, quarries and kilns near Humboldt were examined. The excursion featured a variety of the state's natural features and led to a better understanding of Iowa's natural resources. In addition, closer working relations were developed among the field-trip participants. The trip was seen as a "significant event in the early development of scientific research in Iowa" (Swisher, 1931, p. 317).

Work of W J McGee

William John McGee (1853-1912; Figure 4) was born in a log cabin near Farley, Iowa. He developed an early interest in the natural sciences and conducted independent geologic studies in northeast Iowa. Findings were reported in the *American Journal of Science* (1878-82). McGee's work attracted the attention of the United States Geological Survey, and in 1883, at age 30, he was invited by Major John Wesley Powell to join the USGS. He was known professionally as W J McGee and used no periods after his initials (Malone, 1936).

Keyes (1919) hailed McGee's "Pleistocene History of Northeastern Iowa", published in the Eleventh Annual Report of the U.S. Geological Survey, as one of the major geologic achievements of the day, in that it helped establish the concept of successive glacial episodes.

McGee headed the federal Bureau of American Ethnology in 1893

and later was appointed by the Secretary of Agriculture to administer water resources at the national level. He served as the first editor of the *Bulletin of the Geological Society of America*, 1888-91 (Malone, 1936).

Wachsmuth and Springer

Charles Wachsmuth (Figure 5) and Frank Springer (Figure 6) collaborated on a set of important paleontological works during this time. Wachsmuth, a merchant from Burlington, and Springer, a native of Wapello and noted attorney, gained international recognition for their publications on fossil crinoids. Keyes (1919, p. 418) listed the contributions of Wachsmuth and Springer as noteworthy in the early development of geology in our state, and he described their publication of "North American Fossil Crinoidea Camerata" as "one of the unique literary productions in new world paleontology."

Davenport Academy of Science

At the time of the first annual meeting of the reorganized Iowa Academy of Science in 1888, the Davenport Academy of Science had already been in existence for 21 years. The Davenport Academy of Science published a "Proceedings of the Academy" which featured a variety of papers on natural history and geology. Its museum was described as "undoubtedly the largest in the west, containing collections, especially in entomology, paleontology, and archaeology" (Putnam, 1893, p. 240).

THE FIRST IOWA ACADEMY OF SCIENCE, 1875-1884

Swisher (1931) noted that the meeting of the AAAS in Dubuque in 1872 probably had much to do with laying the groundwork for the



Fig. 5. Charles Wachsmuth (1829-1896), a Burlington merchant, became an international authority on fossil crinoids. He collaborated extensively with Wapello native, Frank Springer. (Photo from *Annals of Iowa*, 1896.)

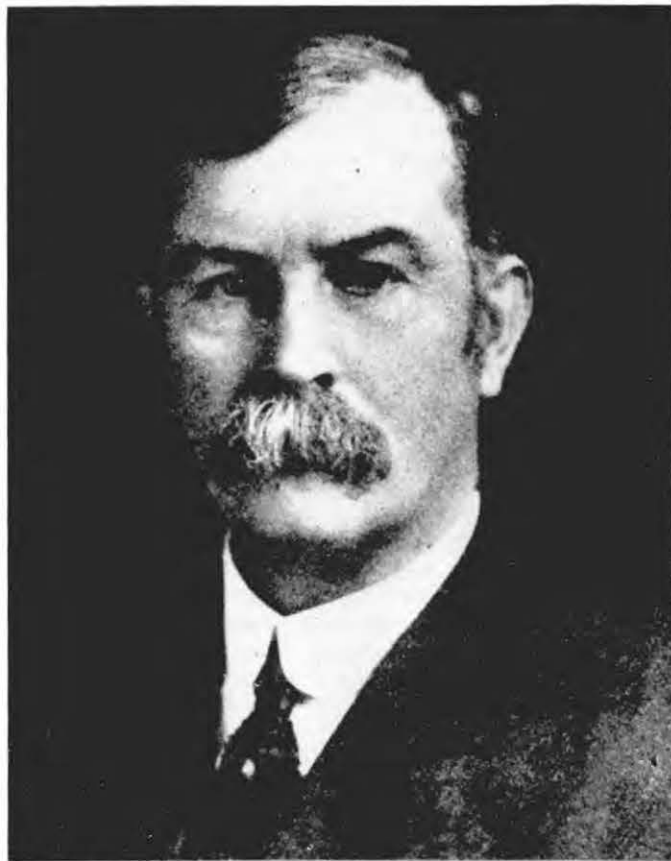


Fig. 6. Frank Springer (1848-1927) was a man of many talents. A prominent New Mexico attorney, he returned to Burlington at frequent intervals to pursue paleontological studies with Charles Wachsmuth. (From Keyes, 1919.)

first meeting of the IAS. As many Iowa Academy of Science members will recall, our organization celebrated its centennial in 1975, although the anniversary of the one hundredth annual meeting was not commemorated until 1988.

Six members attended the first regular meeting of the Academy, held at the University of Iowa in June of 1876. At the session, Samuel Calvin presented papers on Paleozoic fossils, fossil elephants, and Paleozoic stratigraphy. Charles Wachsmuth of Burlington was proposed for membership (Swisher, 1931).

At the second annual meeting of the IAS held in Iowa City, May 3-4, 1877, Wachsmuth reported on Paleozoic crinoids. He described Burlington, Iowa as the "The Eldorado of the world" for the study of fossil crinoids (Swisher, 1931, p. 327). Calvin was elected secretary of the Academy at the second annual meeting and served from 1877-1880 (Swisher, 1931).

At the semi-annual meeting of the Academy in Ames, September 1877, James E. Todd of Tabor presented two papers: one on timber lands and prairies of southwest Iowa and one on remains of fossil elephants found near Glenwood (Swisher, 1931). Todd's presence and participation at Academy meetings were exemplary. He was a naturalist with broad interests and contributed papers to both geology and biology (Keyes, 1923; Parmmel, 1912).

At the spring Academy meeting in 1878, Frank Springer of Cimarron, New Mexico was proposed for membership (Swisher, 1931). Springer, a native of Wapello, returned to Burlington periodically, to collaborate with Wachsmuth on crinoid studies. The contributions of Wachsmuth and Springer have been discussed more

completely elsewhere (Anderson and Furnish, 1983). Charles Wachsmuth was elected Vice President of the IAS at the annual meeting in 1880 (Swisher, 1931).

The present Academy is a descendant of an organization with the same name that went out of existence in 1884 because of membership lapses. A clause in the original constitution stipulated that members were dropped if they failed to attend a meeting or present a paper in two consecutive years. These strict requirements led to the demise of the early Academy (Hanson, 1975, p. 30). No published records of meetings of the original IAS beyond 1880 are known (Swisher, 1931).

THE REORGANIZED IOWA ACADEMY OF SCIENCE

A new Iowa Academy of Science was organized in 1887 by its former members, but with less rigid attendance requirements. According to Swisher (1931), four members of the original Academy participated in reorganizing the society. They were Samuel Calvin, T.H. Macbride, J.E. Todd, and F.M. Witter. Others involved in the reorganization included L.W. Andrews, Herbert Osborn, R.E. Call, B.D. Halsted, and H.W. Parker. At the first meeting, 12 papers were presented and 9 abstracts were printed. Printing of the first proceedings was financed by Herbert Osborn, who was later reimbursed (Swisher, 1931). In 1892, the Twenty-fourth General Assembly provided for publication of the IAS Proceedings. The Academy had a membership of 43 in 1890 and by 1900, membership had reached 150. A steady increase in papers is noted from 1887 to 1900 (Swisher, 1931).

Academy presidents prior to 1901 included J.E. Todd, T.H. Macbride, and W.H. Norton. Geologists will recognize these individuals for their contribution to Iowa geology; Todd also contributed to biology and Macbride was an outstanding botanist. Norton founded the geology program at Cornell College and his association with that institution spanned seven decades (Medary, 1953). R. Ellsworth Call, a geologist-naturalist, served as IAS Secretary-Treasurer from 1887-1891. The work and influence of Calvin, Todd, and Call are discussed separately below, as is the work of Charles Rollin Keyes.

SAMUEL CALVIN, 1840-1911

Samuel Calvin (Figure 7) was one of the giants of early Iowa Geology. Thornton (1947) prepared an excellent biography of Calvin, and much of which follows is summarized from that source. Hokanson (1978) described Calvin's work as a photographer, an area where he displayed considerable talent.

Calvin was born in Scotland and emigrated to the United States with his family at age 11. After three years in New York state, the Calvin family moved to a farm in Buchanan County, Iowa. He studied at Lennox College in Hopkinton, Iowa, and later became an instructor there. Thomas Macbride became one of Calvin's students at Lennox College, and later both served on the faculty at the University of Iowa (Thornton, 1947).

After service as county superintendent of schools for Delaware County 1867-1868, and principal for the Dubuque schools, 1869-1873, Calvin succeeded C.A. White as Professor of Natural History at the University of Iowa. Calvin initially taught physiology, botany, zoology, and geology, although later he was able to concentrate exclusively on geology (Parmmel, 1912).

Calvin became State Geologist, in addition to his duties as Professor of Natural History, when the State Geological Survey was established on a permanent basis in 1892. He continued as Head of the Survey until 1904 and resumed the duties again from 1906-1911. Seventeen volumes of the Iowa Geological Survey annual reports were completed under Calvin's direction. These volumes proved to be of great practical value, and they are still important references to the

geology and natural history of our state (Thornton, 1947).

In addition to his leadership in the Iowa Academy of Science and the State Survey, Calvin also played key roles in other organizations. He was one of the founders in 1888 of the journal *American Geologist* and served as its editor-in-chief until 1894. He was a member of the Geological Society of America, serving as the organization's President in 1908. In addition, Calvin was a Fellow in the American Association for the Advancement of Science and its President in 1894. Calvin served as President of the IAS in 1908 (Thornton, 1947).

Calvin's research work was largely in paleontology and stratigraphy. He considered his discovery and interpretation of an interglacial mammalian fauna from western Iowa as his most significant research contribution (Thornton, 1947).

Calvin's work was held in high regard by early Academy members, and at the quarter centennial meeting of the IAS in 1912, a committee was appointed to arrange for a portrait of Doctor Calvin to be presented to the Academy and hung in the art room of the State Historical Department. Macbride's remarks at the dedication of the Calvin Memorial Portrait eloquently describe Calvin's service to our state:

"Fifty years ago, and for many continuous years thereafter, I saw a man go forth; in an open wagon, sometimes borrowed, more often hired, sometimes his own, traversing the roadless, bridgeless prairies of northern Iowa; enduring the heat of August suns, chilled by the damp of night, shelterless, tortured by mosquitoes, drenched by wild thunderstorms that made terrible the midnight hours; breakfasting at dawn and



Fig. 7. Samuel Calvin (1840-1911) contributed much to the understanding of Iowa's geologic past. He served as State Geologist from 1892-1904 and 1906-1911. (From Keyes, 1919.)



Fig. 8. James Edward Todd (1846-1923) was an active contributor to the early IAS. Todd was Chair of Natural History at Tabor College, a school that no longer exists. He served as State Geologist of South Dakota from 1893-1903. (From Keyes, 1923.)

toiling until his campfire burned beneath the evening star. From Lansing to Clarinda, from Dubuque to Mason City, to Winterset, to Ottumwa; athwart the state, across the state, around the state he moved; climbing all rocky heights of nature's carving, pondering the talus of every open quarry, every wall of crumbling rock or sliding shale, wading the creek beds and tracing the banks of larger streams, away from home for weeks together — I knew such a man. In such fashion, and not otherwise, did he win the rich experience and world wisdom presently brought in such overflowing measure to service of the state of Iowa!" (Macbride 1922, p. 454-457)

JAMES EDWARD TODD, 1846-1923

James Todd (Figure 8), son of a Congregational minister, moved to southwest Iowa (Tabor, Fremont County) in 1850 with his family. Tabor College, a Congregational school, was founded nearby. Todd received Bachelor's and Master's degrees from Oberlin College in Ohio. After completing additional studies at Sheffield Scientific School, Yale, Todd joined the faculty at Tabor College in 1871, serving 21 years as Chair of Natural History (Keyes, 1923).

Active in the Iowa Academy of Science, Todd read some 40 papers before the Academy. He was a charter member of the original IAS in 1875, and one of eight in attendance when the Academy was reorganized. He served as second President of the reorganized Academy, 1888-89. While at Tabor College, Todd conducted summer field work for the U.S. Geological Survey. He left Tabor College

to conduct special investigations for the Geological Survey of Missouri and for the Minnesota Geological Survey. Todd was chair of geology at University of South Dakota, Vermillion and director of the South Dakota State Geological Survey, 1893-1903. He was author of a dozen folios in the USGS Geological Atlas of United States series. Todd completed his career at the University of Kansas, accepting a professorship there in 1907 and becoming professor emeritus in 1917 (Keyes, 1923).

Most of Todd's research was confined to the Missouri River basin, and he published papers in both biology and geology. Charles Darwin was favorably impressed with one of Todd's botanical papers on cross-fertilization (Parrmel, 1912).

Todd wrote a number of papers on loess and its origin. He favored a lucustrine origin for loess as did others at the time. Keyes (1923, p. 37) makes reference to this in a memorial tribute to Todd: "In yellow loess, about which during all his life he had thought so much, his mortal remains lie enshrouded, under a Tabor oak grove."

R. ELLSWORTH CALL, 1856-1917

Keyes (1920) paid tribute to Call (Figure 9) through the "In Memoriam" section of the 1920 IAS Proceedings. Both vied for

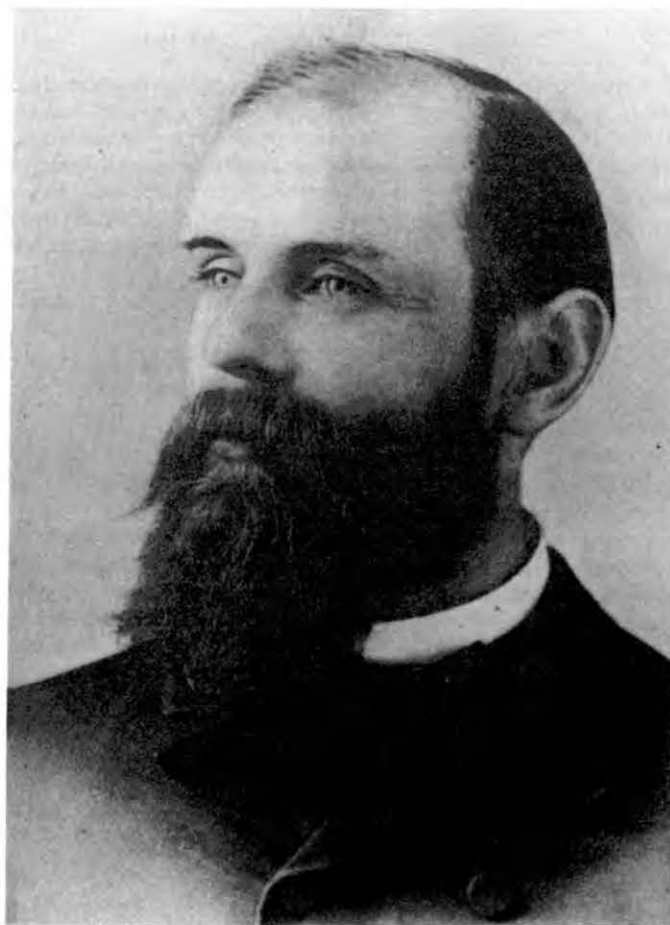


Fig. 9. R. Ellsworth Call (1856-1917), charter member of the reorganized IAS and Professor of Natural Science at West Des Moines High School, waged an unsuccessful campaign for the position of State Geologist of Iowa in 1892. (From Keyes, 1920.)

appointment as State Geologist when the Iowa Geological Survey was reorganized in 1892. The following section is summarized from Keyes (1920).

Call was born in Brooklyn, New York in 1856, and, at age 31, he was a charter member of the reorganized IAS in 1887. He served as Secretary of the IAS from 1887-1891, during which time he was Professor of Natural Science at West Des Moines High School. Apparently, Call was notoriously forgetful, and when he was IAS Secretary, he often lost or misplaced minutes, records, abstracts, and other items from the early IAS (Keyes, 1920).

Call learned much on his own, but he also held A.B. (1890) and A.M. (1891) degrees from Indiana University and the M.D. degree from Hospital College of Medicine in Louisville, Kentucky, 1893. Call finished his career as Curator for the Children's Museum of the Brooklyn Institute of Arts and Sciences in New York.

During his geological career, Call was employed by the USGS in 1885 to study the mollusks of Lake Bonneville, and he worked with W J McGee on gastropod shells from loess deposits in central Iowa. During the summers of 1888-1892, Call was assistant geologist of the Arkansas Survey.

In Keyes' memorial tribute, Call is characterized as follows: "Call was really a brilliant mind. Had he been set in a congenial environment and had he not been continually hampered by his teaching, which he was always forced to follow in order to gain a livelihood, he doubtless would have developed into one of the greatest naturalists of his country and perhaps his day."

CHARLES ROLLIN KEYES, 1864-1942

A native of Des Moines, Charles Rollin Keyes (Figure 10) received the B. A. in geology from the University of Iowa in 1887 and his Master's degree there in 1890. After graduation, he worked in Burlington for Charles Wachsmuth and Frank Springer, assisting in their laboratory as a paleontologist and artist. From 1889-92, Keyes was a university scholar at Johns Hopkins, receiving his Ph.D. there in 1892. During some of the same time interval, 1889-90, he was assistant geologist for the USGS.

From 1892-94, Keyes was Assistant State Geologist of Iowa, serving as Samuel Calvin's chief assistant. He had campaigned vigorously for the top position at the Iowa Geological Survey but finished second instead. Background on this campaign will be covered in a subsequent section of this report.

Keyes assumed the directorship of the Missouri Bureau of Geology and Mines in 1894 and served there until 1897. From 1898-1902, he was engaged in writing. He served as President of New Mexico School of Mines, Socorro, from 1902-1906. Later years were spent in travel, study, writing, and consulting as a mining geologist.

Keyes was a prolific writer and was author of numerous geological articles, including several in the *Proceedings of the IAS*. In 1922, he created the *Pan American Geologist* and served as its owner, publisher, and editor until his death. Keyes amassed more published titles than any other U.S. geologist; his 1,335 publications included many short notes and abstracts, gleaned largely from papers by other geologists (Rossbacher, 1989). He was the Democratic nominee for U.S. Senator from Iowa in 1918. Described as a man of scholarly presence, Keyes had broad interests in geology, as his publishing record clearly indicates. He also was greatly interested in birds and made a fine collection that he mounted and donated to the University of Iowa. (Section on Keyes summarized from *The National Cyclopaedia of American Biography*, 1944, p. 94-95).

AUTHORIZATION OF A PERMANENT STATE GEOLOGICAL SURVEY IN 1892

Personal correspondence in 1892 from Charles Rollin Keyes to

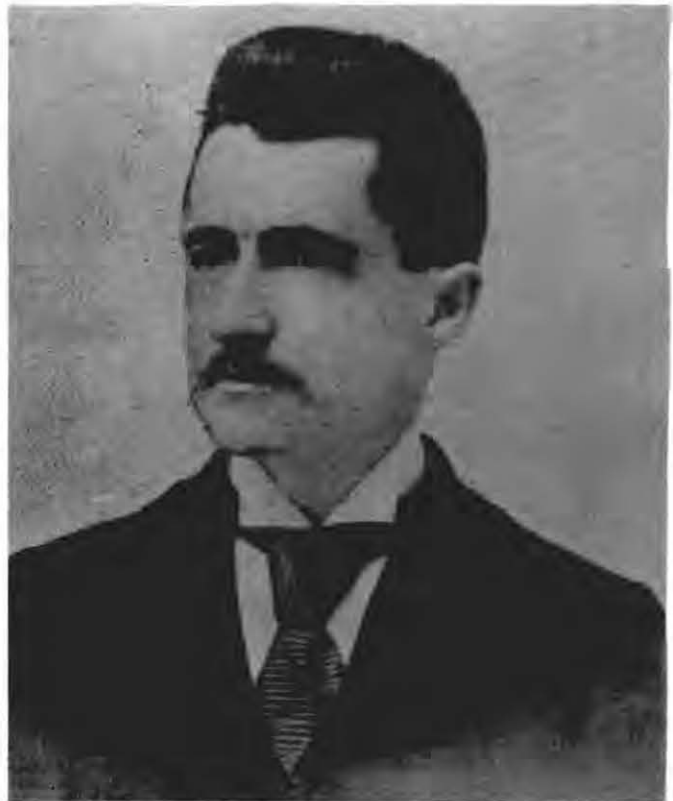


Fig. 10. Charles R. Keyes (1864-1942), geologist, (not to be confused with a State Archaeologist of the same name) actively pursued the position of State Geologist in 1892, but ended up as Assistant State Geologist instead. (Photo from *Annals of Iowa*, 1897.)

Samuel Calvin provides background on developments leading to the authorization of a permanent state geological survey in 1892. The following section summarizes highlights of the correspondence and documents Keyes' intense interest in being named to head the Iowa Geological Survey. Keyes was finishing a Ph.D. program at Johns Hopkins University, Baltimore, Maryland at the time of the correspondence. Although Keyes was a relatively inexperienced doctoral student, he demonstrated considerable chutzpah, courting the support of the principal scientists and politicians of the day.

Keyes' letters to Calvin were all handwritten and somewhat difficult to decipher. Although the following summary is shortened and paraphrased from Keyes' original correspondence, an attempt was made to retain the original flavor of the writing. Keyes comes across as eager, ambitious, and somewhat conniving. The correspondence also demonstrates that politics, then as now, often plays a key role in scientific pursuits.

Personal Correspondence from Charles R. Keyes to Professor Samuel Calvin, March 25, 1892 - July 1, 1892

Des Moines, March 25, 1892

Keyes informed Calvin that the geological bill (legislation to form a permanent state geological survey) passed the House and the Senate. Keyes believed that R. Ellsworth Call of Des Moines and Floyd Davis of Drake University would be candidates for state geologist. He requested that Professor Calvin inform Dr. Charles A. Schaeffer, President of the University of Iowa, "The full plan of things", apparently meaning a campaign to promote Keyes for the top position on the Iowa Geological Survey.

Keyes informed Calvin that in his view the salary for the state geologist should be at least \$2,500, and that it is actually worth at least \$10,000 to "stay three months with an Iowa, or any other kind of, legislature." Keyes later stated that a salary of \$3,000 per year would be appropriate for a state geologist who needs to spend a great deal of time dealing with the state legislature.

Keyes told Calvin that "everyone is dreadfully afraid that the Survey will fall into the hands of the University of Iowa". "The Ames men" are worried about this specifically, according to Keyes. He cautioned Calvin that "every effort should be made to circumvent this impression." According to Keyes, "it will be absolutely necessary" to have an office in the capitol building in order to procure the office supplies for the Survey. He advised Calvin that this should be regarded as the *only* office of the Survey until things are running smoothly.

April 3, 1892
Baltimore, Maryland

Keyes informed Professor Calvin that he returned to Baltimore knowing that the bill to create a state geological survey was in good hands. Keyes was certain that the bill would be acted on favorably by the Governor.

President Schaeffer informed Keyes that a board meeting to name a state geologist would not occur for at least a month. Therefore, Keyes returned to Baltimore. (The Board referred to is the Geological Board which included the President of the University of Iowa, President of Iowa State University, the President of the Iowa Academy of Science, and the State Auditor).

Keyes had discussed the bill to form a State Survey with W J McGee of the U.S. Geological Survey. McGee was pleased to learn of the legislation and proposed to write to each member of the board saying that he (McGee) will be a candidate for state geologist provided that Keyes is not a candidate for the position." McGee believed that this would serve to bring Keyes name before board members in a favorable way.

Keyes related that Floyd Davis of Drake University told him repeatedly that he (Davis) would not be a candidate for state geologist if Keyes became a candidate. Keyes thought "it would be a good plan for President Schaeffer to write to the Governor and request that the Governor not commit himself in regard to a state geologist." Keyes informed Professor Calvin that all looked good for completion of his Ph.D. degree this year. Keyes asked Calvin if a formal application should be sent to the board.

April 7, 1892
Baltimore, Maryland

Keyes informed Calvin that he sent the board a list of his (Keyes') publications and an outline of his work experiences. Keyes offered to return to Iowa if it would be helpful. He suggests that Dr. Schaeffer and Professor C.C. Nutting of the University of Iowa would need to be very careful in what is said about the University of Iowa and the Survey, "as the Ames folks are fearfully jealous and might take offense at the least little thing." Keyes suggested that Professor Nutting write to President William M. Beardshear and Professor Herbert Osborn of Iowa State University to seek their support for Keyes' application for state geologist.

According to Keyes, W J McGee of the U.S. Geological Survey probably didn't really want the state geologist's position, but, still, some concern is shown. "Survey men are always ready to gobble up everything" related Keyes.

April 11, 1892
Baltimore, Maryland

Keyes told Calvin that he (Keyes) had written to Professor Osborn informing Osborn that the Agricultural College (Iowa State) will not suffer if Keyes is appointed to the top position on the Survey. Osborn is asked to convey to President Beardshear that the Survey "will not be

run in the interest of one institution to the detriment of another."

Keyes suggested that it would be well if Dr. Schaeffer would request that the Governor nominate Keyes at the next board meeting and urge his application.

April 24, 1892
Baltimore, Maryland

Keyes informed Calvin that Professor Osborn will be supportive. Keyes was concerned that R. Ellsworth Call might become a candidate for the state geologist's position. According to Keyes, Call was "claiming all honor for pushing the survey bill through and getting recommendation through this means."

Keyes asked if Calvin knew what James Todd's views were regarding the position. Had Todd recommended anyone for the state geologist position? Keyes requested a letter of recommendation from Calvin to supplement his (Keyes') credentials. Keyes looked forward to Professor Nutting's support in that Nutting was President of the Iowa Academy of Science at the time. In addition, Keyes courted the State Mine Inspector's support.

April 30, 1892
Baltimore, Maryland

Keyes informed Professor Calvin that he had written to Professor Todd, Professor Osborn, and others asking them for recommendations, believing that by so doing he will be able to determine where they stand with respect to who they are supporting for state geologist. Keyes believed that Osborn was supportive. However, he feared that Todd might be influenced by Call.

Keyes learned that President Schaeffer would not be back in Iowa until the 10th of May, so the geological board would not meet before mid to late May. Keyes hoped that Schaeffer would have an opportunity to visit with the Governor before the board meeting. He hoped that President Schaeffer would put in a good word for him with the Governor.

May 9, 1892
Baltimore, Maryland

Keyes informed Professor Calvin that all of his work would be finished toward the Ph.D. at Johns Hopkins by the 19th or 20th of May.

According to Keyes, Governor Horace Boies wrote to Senator William Boyd Allison in regard to the Iowa Geological Survey. Keyes will go with McGee to see Senator Allison about the Survey. Keyes also planned to talk with Major John Wesley Powell about the matter.

May 26, 1892
Baltimore, Maryland

Keyes indicated that he talked with Dr. Schaeffer in Washington some weeks earlier, and Dr. Schaeffer recommended that he not get more than a few recommendations. Keyes requested recommendations from Dr. Charles White and Charles Walcott of the U.S. Geological Survey. He also secured a letter of support from Dr. James Hall. Major John Wesley Powell promised to send a letter, if needed.

Keyes made plans to return to Iowa by train, leaving on the evening of May 23rd and arriving in Iowa City early on the 25th. He also planned to visit Des Moines and Ames.

Keyes met with Senator Allison and discovered that Clement Webster had written to the Senator seeking support for a position on the Iowa Survey. Webster's letter was written from Charles City.

May 29, 1892
926 North Street
Des Moines, Iowa

Keyes had been "up to Ames", and he thought that "Ames is all right" (that is — Keyes had support there).

Professor Herbert Osborn and President Beardshear were "down on Mr. Call" as far as an appointment to the Survey was concerned. Keyes

visited personally with Professor Osborn and President Beardshear. Keyes believed that both Professor Osborn and Professor L.H. Pammel at Iowa State would be supportive. Professor Osborn suggested that Keyes get letters of recommendation from as many members of the Iowa Academy of Science as possible, so Professor Nutting, current President of the Iowa Academy of Science, could use this to good advantage when the geological board meets.

According to Keyes, Professor Osborn believed that Professor Todd of Tabor College might still declare as a candidate for the Survey position. Although Call didn't have much support at Iowa State, Professor "Tama Jim" Wilson still attempted to drum up support for him there. Keyes believed that if a contest developed for the position, it would be with Floyd Davis of Drake, not with Call.

Keyes met Call in the Mine Inspector's Office (May 29, 1892) and Call was taken by surprise. Keyes informed Calvin that he was scheduled to see the Auditor, Governor, and Floyd Davis on Monday or Tuesday of the following week.

Keyes learned that "some of Call's warmest friends realize that he is too careless in money matters to run the financial part of the Survey". However, they thought the board could look after the finances and let Call do the scientific work; or if this could not be done, Call could have second or third place on the Survey staff.

Keyes asked if Professor Calvin thought "it would be a good idea to line up the support of the different members of the Iowa Academy of Science." If so, Calvin is requested to contact Professor F.C. Witter of Muscatine and the Iowa City members of the Academy.

June 10, 1892

Des Moines, Iowa

Keyes reported to Calvin on the sentiment in Des Moines. It was being said that Keyes was not an "Iowa man" (having studied in Maryland), and that he was "just out of school". Those opposed to Keyes characterized him as "an SUI man", one who would transfer all of the Survey's functions to Iowa City. According to Keyes, those people were doing everything they could to stir up jealousy among the "Ames people". Keyes advised that supporters in Iowa City "should not appear too anxious for a certain plan." That is they should not be too vocal in their support for him for fear of strengthening the opposition.

Keyes talked with the State Auditor on June 9 and felt that they had "a satisfactory chat", although the Auditor had heard that Keyes was "just out of school".

Keyes talked with the Governor for a few minutes on June 10. He noted that Call and his supporters were anxious for the board to meet immediately. Several articles had been written for local newspapers by Call's supporters, criticizing the Governor for not calling the (geological) board together. Call wrote to "all of the bureaucratic politicians in the state" asking them to write to the Governor on his behalf. Floyd Davis did not apply for the position, and he offered to combine forces with Keyes and Calvin.

June 19, 1892

Des Moines, Iowa

Keyes reported that Call and his supporters were anxious for the geological board to meet immediately. Call asked Keyes yesterday (June 8) if he would be willing to accept second place in the Survey. Keyes met Mr. Sage, (one of Call's key supporters in the State Legislature), in the State Printing Office; Sage advised Keyes to combine forces with Call and take second place under him. Sage reported that he was in Iowa City recently and found that Major Powell had recommended Professor Calvin for first place and Keyes for second place and that the two Iowa City members on the board were going to push that combination through.

When Keyes was in Missouri recently, he learned that Professor Todd had written several letters to the Governor regarding the Survey positions. Keyes assured Calvin that "all is okay", and there is nothing

to fear, however.

July 1, 1892

Des Moines, Iowa

In a brief letter, Keyes reported to Calvin that the Governor will call a meeting of the geological board for July 8.

According to a 1892 news item in *The American Scientist* of which Calvin was editor: "After considering the claims and recommendations of the various applicants, the Board unanimously elected Professor Samuel Calvin of the State University of Iowa to the position of State Geologist, notwithstanding the fact that he was not an applicant and had been doing all in his power to secure the election of another." By the selection of Professor Calvin to head the Survey, it was believed that the Survey would be a valuable adjunct to the State University, a plan that had worked well in other states. The board, however, believed that the interests of the state would be best served if the Survey had a central office at the capitol. Arrangements were made by which Calvin could devote an equivalent of one-half of his time to the survey work. Charles Keyes was appointed Assistant State Geologist and placed in charge of the headquarters at Des Moines. Professor G.E. Patrick, of the Agricultural College at Ames, was appointed chemist for the Survey (Keyes, 1897).

SUMMARY

In Iowa, 1855-1892, saw the completion of geological surveys by James Hall and Charles White and the establishment of a permanent state geological survey under the leadership of Samuel Calvin. Geologists were active in the Iowa Academy Science during this interval and contributed to the first IAS, 1875-1884, as well as to the reorganized IAS in 1887. Geologists active in the early studies of Iowa's geology went on to leadership positions as heads of the state geological surveys of Illinois, Missouri, and South Dakota. The early years of Iowa geology provided an important base for future studies and greatly enhanced our knowledge of Iowa's geologic history and natural resources.

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