The Palimpsest

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THE PURPOSE OF THIS MAGAZINE

THE PALIMPSEST, issued monthly by the State Historical Society of Iowa, is devoted to the dissemination of Iowa History. Supplementing the other publications of this Society, it aims to present the materials of Iowa History in a form that is attractive and a style that is popular in the best sense—to the end that the story of our Commonwealth may be more widely read and cherished.

BENJ. F. SHAMBAUGH
Superintendent

THE MEANING OF PALIMPSESTS

In early times palimpsests were parchments or other materials from which one or more writings had been erased to give room for later records. But the erasures were not always complete; and so it became the fascinating task of scholars not only to translate the later records but also to reconstruct the original writings by deciphering the dim fragments of letters partly erased and partly covered by subsequent texts.

The history of Iowa may be likened to a palimpsest which holds the records of successive generations. To decipher these records of the past, reconstruct them, and tell the stories which they contain is the task of those who write history.

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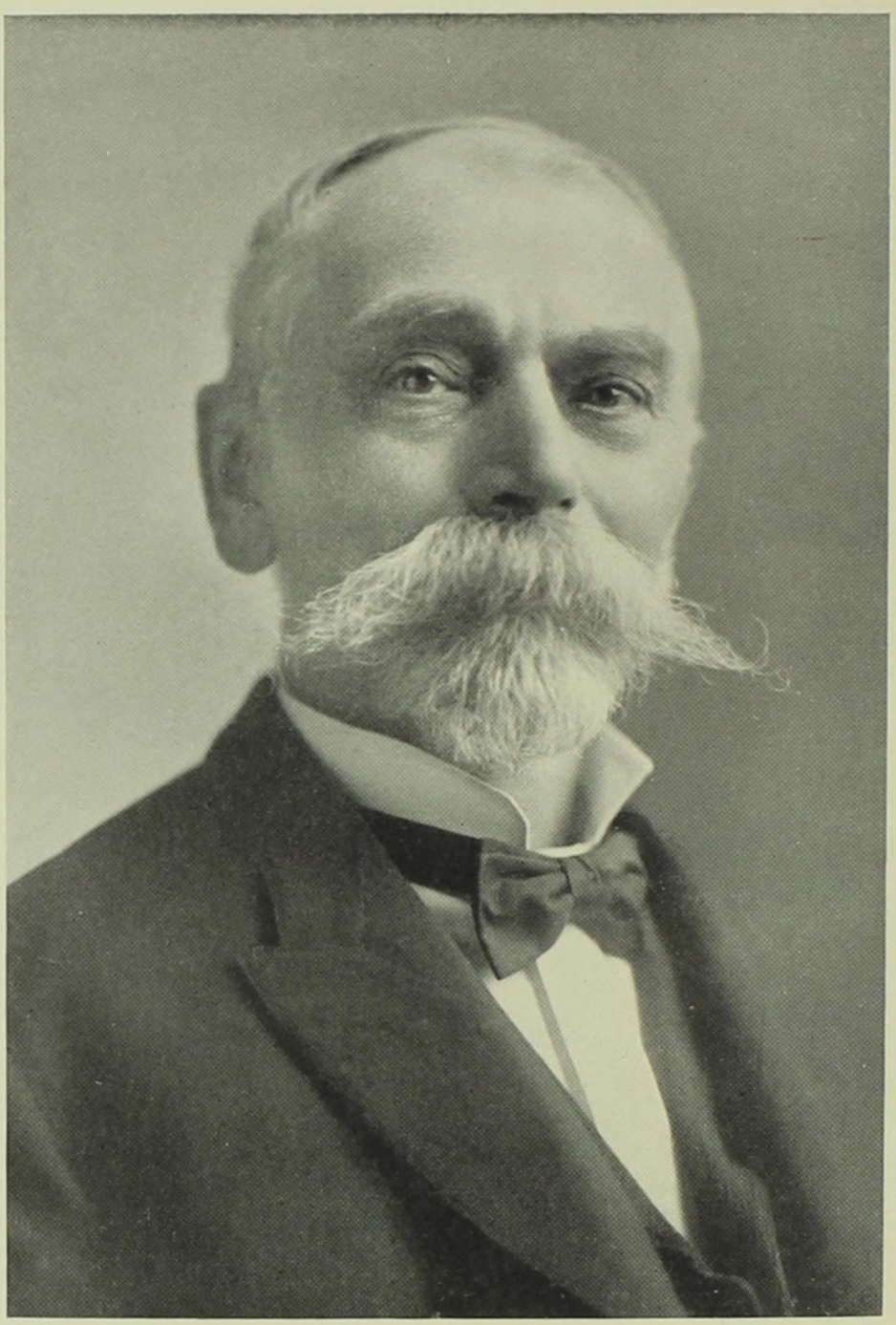

GUSTAVUS DETLEF HINRICHS

THE PALIMPSEST

EDITED BY JOHN ELY BRIGGS

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Gustavus Detlef Hinrichs

Gustavus Detlef Hinrichs was one of the ablest scientists connected with the University of Iowa in its early years, and probably as versatile a man as American science has produced.

Born on December 2, 1836, at Lunden, Holstein, then a province of Denmark but now included in Germany, he went north to Copenhagen for study at the age of seventeen and, early in 1860, he passed, with the mark "excellent", the examinations required by the University of Copenhagen for qualification as a teacher in the higher scientific schools. At about this time the national antagonisms in that part of Europe were breaking out anew and, like many other able young men of that time, he decided to emigrate to America. Before leaving Denmark, in April, 1861, he married Auguste Springer of his native province of Holstein. She died in 1865. Two years later he married her sister, Anna Springer.

For a time after coming to America, Hinrichs taught in a city high school, and then, in 1862 when the University of Iowa was looking for a man to head the new department of Modern Languages, he secured the position. He was, no doubt, well qualified for the position, but his training and interest were in the physical sciences, and the following year he became Professor of Natural Philosophy, Chemistry, and Modern Languages. In 1864, the University secured another man for the language work, so that Hinrichs was able to devote all of his efforts to natural philosophy and chemistry. For five years he continued in this position and then became Professor of Physical Science. In 1871 his title was changed to Professor of Physical Science and Director of the Laboratory, which title he held until he left the University.

Professor Hinrichs was a pioneer in developing the laboratory method of teaching science. About 1870, the University of Iowa was listed by an eastern professor as having one of the four leading science laboratories in America. For this type of teaching it was then necessary to write new textbooks. In 1870 and during the years immediately following, Professor Hinrichs published several texts for use in his science classes. For the main course he used a two-volume book — Volume I being *Elements of Physics* and Volume II the *Elements of Chemistry and Mineralogy*. Other books and pamphlets included *Principles of Pure Crystallography,*

School Laboratory of Physical Science, Principles of Chemistry and Molecular Mechanics, and *First Course in Qualitative Chemical Analysis*. The development of laboratory work in the physical sciences under Professor Hinrichs at Iowa attracted favorable attention not only from other American universities but also in Europe.

Professor Hinrichs was very much interested in meteorology, and in 1875 founded the first State weather and crop service in the United States. He obtained from the State of Iowa appropriations sufficient to buy the necessary instruments for the director and the volunteer observers over the State, but it was necessary for both director and observers to work without salary. Professor Hinrichs directed the Iowa Weather Service from 1875 until he left the State in 1889.

In February, 1875, one of the great meteors of modern times burst over the Amana colonies, some twenty miles west of Iowa City. Hinrichs was one of the very first, and the most active, of the scientists investigating this meteoric fall. He succeeded in obtaining most of the meteorites for distribution to the great museums of the world, and later he published books and articles in French, German, and English on the Amana meteorites. Nor did he lose interest in meteoric phenomena, but was the first to investigate and publish a description of the Estherville meteor of 1879 and less important falls in 1892 and 1894.

In 1885 and 1886 there occurred at the University of Iowa one of those unpleasant incidents which happen now and then in university circles. Departmental rivalry, colored by jealousy, involved Professor Hinrichs in a bitter controversy with President Pickard and other members of the faculty. Hinrichs was dismissed from the Collegiate Faculty in June, 1885, and a year later he was asked to resign from the Medical and Pharmacy staff on account of alleged misconduct as a consulting chemist.

For three years following his resignation he occupied himself with research problems on molecular mechanics and atomic weight, producing a remarkable number of papers most of which were published in *Comptes Rendus* of the Academy of Science of Paris. Articles also appeared in the British journal, *Nature*, in the *Proceedings* of the American Association for the Advancement of Science, and in German publications. Twenty-one articles were published during 1891 in the foreign periodicals.

In 1889, Hinrichs was selected Professor of Chemistry in the College of Pharmacy of St. Louis University, and he retained his connections with that school until his permanent retirement from teaching in 1907 at the age of seventy-one. He continued his research work for a few years longer, however, publishing regularly each year, until his last article, "True Atomic Weight of Bromine," appeared in 1913. He died at his home in St. Louis on February 14, 1923, in his eighty-seventh year.

In looking over the record of Professor Hinrichs, one notices at once the great number of years covered by his research activities. His first publication, a small book of seventy pages, appeared in Hamburg in 1856. Four years later four articles were published and, beginning in 1864, the year in which the University of Iowa relieved him of the language work, articles, usually several, were printed almost every year, to the conclusion of his research activity in 1913. The complete list includes some three hundred publications, twenty-five of which would be called books, and his contributions to knowledge cover a period of fifty-seven years. Although born in Germany, educated in Denmark, and a resident of America, Professor Hinrichs showed a marked preference for the French research journals. For example, during the years from 1891 to 1893 inclusive, twenty-four articles appeared in the French *Comptes Rendus*, written in French. Eight articles were written in German for German periodicals, and three were written in English for British technical journals. During that period he published no articles in the American technical journals, but did present eight papers at the meetings of the American Association for the Advancement of Science, and abstracts of these appeared in the *Proceedings* of the Association. As another illustration of his preference for European publication, the articles on the Amana meteorites may be cited. Four of these were published in

Comptes Rendus, and one additional in another French journal. A pamphlet, or small book, was published in the German language in Germany. An article of a rather popular nature appeared in the *Popular Science Monthly* published in New York City. A small pamphlet was published at Iowa City in 1875, and a booklet of 104 pages was published in St. Louis in 1905.

The reason for this habit of European publication appears to be that Hinrichs was offended when the editors of one of the leading American journals used a blue pencil on some of his early articles and did not publish them as promptly as he desired. Many of the American technical journals have a habit of submitting nearly all papers to a referee — supposedly one of the best authorities in the field in which the paper is written. This naturally delays the publication of the paper to some extent, and the referee frequently suggests minor changes. Most scientific writers are not offended by such procedure — in fact they often welcome the suggested changes as improvements.

Professor Hinrichs, however, was very sensitive about his scientific reputation, especially since his views on important points were in conflict with some of the other prominent American chemists, though the opinions of leading French chemists coincided with his own. He also suspected that some of the changes implied that he was not expert in the use of the English language, which was not his native

tongue. But whatever the reasons may have been, he practically discontinued publication in American journals and sent his scientific articles to European technical journals. The editors of *Comptes Rendus,* being in sympathy with his viewpoint, saw to it that his articles were published promptly and without change. This circumstance may account for the supposition that Hinrichs was more famous in Europe than in America, though his scientific reputation in America was beyond reproach.

Doubtless, however, the foreign publication actually prevented some of his work from being known as well as it should have been. For example, Professor Hinrichs announced the fall of the Amana meteor in *Comptes Rendus* and followed up the announcement with other articles in French journals. His only contemporary accounts published in America were an article in *Popular Science Monthly* and a privately printed pamphlet published in Iowa City. This meant that his work was not well known in America, and there was much confusion as to the location of this important meteoric fall.

Foreign writers naturally sought in American journals for accurate information on a meteoric fall occurring in America, and so Professor Hinrichs's notes in the French journals were overlooked by many European writers. Had he contributed a few articles to the leading American journals immediately after the fall, much of the confusion and error would probably have been avoided.

A similar habit, due no doubt to his desire for perfect freedom in writing, was the private publication of his books and pamphlets. In his later years most of his books were published by his son, Carl G. Hinrichs, of St. Louis, Missouri.

The most striking feature, however, is the versatility of the man. He came to Iowa as a Professor of Modern Languages and was transferred to work in the Physical Sciences. His publications include at least five distinct fields of science. He prepared articles on astronomical subjects, such as "Inclination of Planetary Orbits to the Invariable Plane". His papers on meteors and meteorites include astronomical and geological work. He published a text-book on physics, and certain articles on terrestrial magnetism would be classified as work in that field. He wrote numerous papers on meteorology, most of them published in the twelve-year period during which he was the head of the Iowa State Weather Service. His text-book on mineralogy and research articles on crystallography caused a writer in a mineralogical magazine to rate him as one of the foremost crystallographic men in America in his day.

Professor Hinrichs's favorite branch of science, however, was physical chemistry, and his greatest contributions to knowledge were made in the field of molecular mechanics and atomic weights. It was for this work that American chemists gave his name a star in the first edition of *American Men of*

Science in 1906, a distinction accorded to him in succeeding editions as long as he lived.

His first papers on "Atomechanics" appeared in 1867, and his publications in that subject appeared regularly until the end of his research activity, nearly half a century later. Much of his work on the atom was directed toward the demonstration of the "Unity of Matter". In this, as in much other work, he was distinctly a pioneer; and the modern practice of reducing the atoms of all elements to electrons and protons shows that he was correct in his fundamental assumption of the essential similarity of all matter.

CHARLES CLAYTON WYLIE

The Iowa Academy of Science

In 1873 Asa Gray, addressing the American Academy for the Advancement of Science which met at Dubuque, made a stirring appeal for a deeper appreciation of the beauties of nature. He admonished scientists especially to "consider the lilies how they grow". Samuel Calvin heard the appeal. Thomas H. Macbride had journeyed sixty-five miles to attend the meeting. This trio — Gray, an old man and a great scientist, Calvin and Macbride, young men full of hope and aspiration — met for the first time, and the influence of that meeting radiates through the years.

The Iowa Academy of Science was founded and has developed largely under the influence and inspiration of these men. Organized in 1875 with thirteen members and reorganized twelve years later by an equally small number of men, the Iowa Academy grew until in 1919 it was accorded a place of first rank among the State Academies of Science in America. It has numbered among its members the most eminent Iowa scientists, and has been the forum for the discussion of the most advanced scientific thought.

The first meeting of the Academy was at the State University of Iowa in August, 1875. The purpose of the Academy as set forth in the Constitution was

"the promotion of Science, more particularly that pertaining to the State of Iowa". Membership in the organization was limited to thirty persons who "have done good scientific work". Provision was made for the Association to meet at least twice a year — in the spring at Iowa City and in the fall at some place to be designated.

Among the founders of the first Academy of Science were men of outstanding prominence in the early development of science in Iowa — C. E. Bessey, Samuel Calvin, Gustavus Hinrichs, and J. E. Todd. Mr. Bessey was elected president. Indeed, he was the only man who served the first Academy as president, being reëlected annually until 1884. In addition to the charter members, F. M. Witter, Charles Wachsmuth, and Thomas H. Macbride were among those who joined the Academy at a very early date. Dr. Macbride, who joined in 1879, still retains his membership after more than fifty years.

The papers presented at meetings of the Academy, even in those early days, were of a wide variety and full of interest. In discussing "Paleozoic Crinoids" in 1877, Charles Wachsmuth referred to the vicinity around Burlington as "the El Dorado of the world" for the study of such fossils. Dr. Wachsmuth, who had resided at Burlington for eighteen years, had collected more than four hundred specimens and was well qualified to speak authoritatively concerning them. Professor Calvin commented upon the paper, and "warmly congratu-

lated'' the Academy on the possession of a member who could prepare such an able essay.

Several papers were in the field of historical geology. G. C. Carpenter discussed 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 was explained by the theory that ''too short a time has intervened since the withdrawal of fresh-water lakes'', and by the closeness of the turf which prevented germination of tree seeds.

In appearing before the Academy, scientists have usually confined their discussion to a consideration of past and present conditions. Occasionally, however, one has entered the field of prophesy and attempted to predict what future scientific development might reveal. In 1876 Gustavus Hinrichs read a paper dealing with ''Changes of Climate in Iowa''. Meteorological observations, he said, showed that the summers in Iowa had been growing steadily warmer and the winters colder. He observed that if these changes continued at the same rate during the next seventy-five years the summers would become like those of Louisiana, and the winters like those of Duluth. During the half century since then, however, weather reports indicate that climatic conditions have not changed enough to be noticeable.

During the early eighties interest in the Academy waned and meetings became less and less frequent. The constitution provided that members of the

Academy who absented themselves from meetings for a period of two years should thereby forfeit their membership. By 1884 practically all of the members had become inactive and the Academy ceased to exist. Three years later, however, interest was revived. A circular letter was issued by persons interested, a meeting was held at the Kirkwood House in Des Moines, and a new Academy very similar to the former one was organized. Samuel Calvin, Thomas H. Macbride, J. E. Todd, and F. M. Witter, who had been members of the first Academy, became charter members of the second.

Herbert Osborn, the first president of the new Academy, in discussing its organization, said: "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 look with profit to what has been here accomplished under conditions possibly more discouraging than ours."

The growth of the new Academy during the first decade of its existence was very slow. In the first year only four names were added to the membership roll, while the second year produced a gain of seven. All members of the Academy at first were of the same type and designated as "fellows". In 1894, however, provision was made for associate and corresponding members. Any resident of Iowa engaged directly in scientific work was eligible to

membership as a fellow. Residents of Iowa, interested in science but not engaged in scientific work, might become associates; persons residing outside of the State might become corresponding members.

The marked increase in the number and variety of papers presented before the Academy gave evidence of interest in the organization. At the first meeting twelve papers were read, the abstracts of nine of which were printed. At each succeeding annual meeting the number increased. During the period from 1887 to 1900 some three hundred and fifty papers were presented by more than eighty different men. Among the contributors were anthropologists, archeologists, botanists, chemists, geologists, physicists, and zoologists — each working for the advancement of science in his particular field.

The attention of the Academy was early directed to the natural resources of the State, not only in one but in many fields. In discussing the subject of underground water and the possibilities of obtaining artesian wells, R. Ellsworth Call in 1891 expressed the belief that four-fifths of the State possessed 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.

The possibility of developing oil wells in Iowa was likewise a subject of frequent discussion. In 1892 the view was expressed that gas and oil are widely distributed throughout the State, but that

the geologic structure is such that these products can not be made available in any large quantities.

In 1891 Charles Rollin Keyes presented a paper on "Aluminum in Iowa", in which he called attention to the fact that Iowa possesses clay that will yield more aluminum per bushel than can be obtained in any other locality in the west, and probably in the United States. He expressed the view that when this 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 that source." In more recent years it has become apparent that although aluminum in abundance might indeed be produced from Iowa clay, it is more readily accessible in other States, thus rendering the Iowa supply of less relative value than was formerly estimated.

One of the prevailing interests of the Academy and one of the fields in which it had a great deal of influence even in those early years was in the preservation of the natural conditions of the State. This interest has been due in a large measure to the efforts of Thomas H. Macbride who has been a constant devotee of such endeavor. In 1896 two resolutions were adopted by the Academy. One petitioned the Twenty-sixth General Assembly of Iowa to take some action toward the preservation and protection of our lakes to maintain some of the original conditions of the State. The other was pre-

sented to Congress, calling attention to the necessity of conserving the natural forests.

In the same year Dr. Macbride presented to the Academy two papers dealing with the conservation of the woodlands of Iowa. 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 read a paper on "Forest Distribution in Iowa", in which he showed that loess was the natural soil for forests, and he strongly advocated that our remaining forests should be left undisturbed.

In 1897, Dr. Macbride carried the argument for the preservation of Iowa's woodlands still further. He saw in the Academy an opportunity to promote his program of public interest and education, feeling as he did that the people would act immediately if the situation were clearly understood. He therefore 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 wide-spread conservation movement and the development of State parks, thirty-six of which have now been established in Iowa.

The geological aspect of conservation likewise received due attention by members of the Academy. James H. Lees, in discussing this subject, said,

"Iowa 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 streaking away beyond the farthest ken". That this estimate is in general true and accurate, he admitted, but "the most attractive region of the state is 'The Switzerland of Iowa', with its "picturesque hills and deep cut valleys". Mr. Lees referred to a number of the beautiful geological formations — Columnar Cliffs, Devil's Den, Castle Rock, Pilot Knob, and other places of interest — which, if conserved, would "increase the feeling of pride with which every Iowan regards his state".

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 connection with these problems was L. H. Pammel. In 1889 Professor Pammel read 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 another on "Diseases of Plants at Ames". In 1899 the same author presented the subject of "Powdery Mildew of the Apple", and the following year he discussed "The Thistles of Iowa, with Notes on a Few Other Species".

Problems of a more technical or academic nature have likewise frequently been considered. These have usually been for the benefit of those specializing in particular fields, but the Academy, interested as it is in all phases of scientific research and development, has afforded an ideal forum in which to present theoretical as well as practical problems. Dr. Shimek read a paper on "A Theory of the Loess" and another on "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. This symposium was the turning point in the history of this much discussed problem, and the eolian origin is now generally accepted.

The study of science for its cultural effect, for the satisfaction which it affords, and for its theoretical as well as its practical value was emphasized by Dr. Macbride when, as president of the Academy, he asserted that "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 today

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 foundation for invention."

Following 1894, it became the custom to publish the annual address of the retiring president in the *Proceedings* of the Academy. In his presidential address in 1895 H. W. Norris spoke of the rapid advance in scientific thought. "We live", he said, "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 scientfic spirit predominated, superstition still held wide sway. Accordingly, he pleaded for a hastening of the day "when empiricism and its twin brother dogmatism will yield the field to the scientific spirit".

Under the title "Botany in Its Relation to Good Citizenship", Bohumil Shimek, in 1904, made 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 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."

In an address on "American Science", Nicholas Knight in 1921 expressed the view 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 America stands in the forefront and, in the development of science in America, Iowa scientists and the Academy of Science have "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."

It has been said that the "spirit of pure science has many times been expressed in the unselfish sacrifice of some great man's life". This being true the Iowa Academy of Science, through the service and influence of its members, has played an important part in the development of scientific thought. Indeed, if one were to call the roll of the men who have contributed most to the study and advancement of science in Iowa—Samuel Calvin, Thomas H. Macbride, Charles C. Nutting, L. H. Pammel, Bohumil Shimek, W. H. Norton, and all the rest of that long list of distinguished scientists—he would find that without exception they were interested and active members of the Academy. He would find, moreover, that each has rendered "unselfish sacrifice", for the welfare of the Academy and for the advancement of scientific thought. The Iowa Academy of Science stands to-day as a testimony of this unselfish service, and as a beacon light pointing the way to still further advancement.

J. A. Swisher

A Unique Survey

"Are there any Indian mounds about here?" This was the question asked by a vigorous, sunburned man who, nearly a half century ago, first landed from a river steamer at one of the towns of northeastern Iowa. On receiving an affirmative answer—for Indian mounds were too numerous on the Mississippi bluffs to escape the attention of even the least observing—he shouldered his engineer's level and, with leather-bound notebooks dangling in a pouch at his side, quickly disappeared in the steep, forest-covered hills. Apparently but few people learned his name or his real errand. None learned the deeper motive of his work or the vast extent of the survey in which he was engaged.

That his survey was to involve, first and last, more than ten thousand miles of travel on foot, not to mention the tens of thousands of miles traversed by rail, steamer, and with horse and buggy, was enough in itself to make his effort unique. That his objective, the accurate mapping of Indian mounds and other antiquities, was so lacking in any material aim and yet sustained for fifteen years on purely private resources and initiative also places the survey in the category of those things that happen only once.

Theodore Hayes Lewis, born in Richmond, Vir-

ginia, in 1856, removed early to the Chillicothe region of Ohio, where he both went to school and taught school in the midst of the great mound groups made famous during the forties by the archeological discoveries of Squier and Davis, and there he acquired his deep interest in American antiquities. Always with a desire to devote his life to research in archeology, but without finding the possibilities of a livelihood in this field, he followed somewhat aimlessly in various places a number of different callings, both in the North and in the South. While still in his twenties, a fortunate turn of events brought him to St. Paul, Minnesota, where he met a civil engineer who, although more than twenty years his senior and without the rugged physique called for in the survey of American antiquities, was possessed, nevertheless, of a strong desire to do constructive work in archeology.

Alfred James Hill, born in London in 1823, apparently acquired his interest in archeology through contact with Stonehenge and other British antiquities. He came to America early enough to serve in the Corps of Topographical Engineers of the Union army during most of the Civil War. Both at Red Wing, Minnesota, where he lived for a time, and at St. Paul, where the last forty years of his life were spent, he was much impressed by the numerous Indian mounds and greatly disturbed that these antiquities were being so rapidly destroyed. He surveyed a few mound groups in the vicinity of

St. Paul and with his own hands, skilled in draftsmanship, drew out their plans in beautiful and permanent form. For information from afar, however, he resorted at first to correspondence to bring in the necessary facts. As this method proved unsatisfactory, he began to dream of that unknown man who might be hired to make the field surveys while he as an engineer should turn the collected data into permanent plats of the rapidly disappearing ancient monuments.

It was a fortunate thing for the archeological records of many of the States in the Mississippi Valley when finally, about 1880, the robust youth from Richmond, eager for and competent in field work, met the trained engineer who possessed both the professional talent and the financial ability to guide and support an archeological survey—years before any public institution thought of such an undertaking, and fortunately early enough to find a majority of the antiquities still intact. Hill and Lewis soon entered into a formal contract; active field work was started by Lewis in 1881 and continued without interruption until the death of Hill in 1895. As both men were bachelors, the home of Hill became the headquarters of both and thus the house at 406 Maria Avenue, St. Paul, became the center of the most extensive archeological activities ever privately initiated and supported on the American continent.

The survey, as originally planned, was to include

the eleven north central States in so far as they lay north of the great Cahokia mound opposite St. Louis, that is to say, Minnesota, North Dakota, South Dakota, Wisconsin, Iowa, Illinois, Indiana, Nebraska, Missouri, Kansas, and Michigan. The Province of Manitoba was later included. Inasmuch, however, as Lewis was a Southerner and an out-of-doors man and ill content, therefore, to endure the discomfort and the inactivity of the long northern winters, he spent most of the winter months in the southern States, where his observations added much information concerning the antiquities of Arkansas, Kentucky, Tennessee, Mississippi, Alabama, Georgia, and southern Ohio. Thus the survey reached eighteen States and Manitoba.

Covering so vast an extent of territory, it was inevitable, of course, despite the fact that both men worked faithfully for fifteen years, that the survey should be very thin in many places and that it should leave large regions entirely untouched. It was most intensive in Minnesota, southern Wisconsin, northeastern Iowa, and in certain areas in the eastern parts of the Dakotas. Data were recorded for a grand total of thirteen thousand and eighty-seven mounds, and the presence and approximate numbers of many others were noted which, cultivation having started, were no longer in a state permitting of accurate survey. Moreover, some fifty inclosures were surveyed (small and large ceremonial areas surrounded by earthen ramparts, or village sites

surrounded by both ramparts and ditches); further about a hundred large tissue-paper sheets of original, full-size rubbings of rock carvings, mostly from the cliffs overlooking the Mississippi River, were added by Lewis to enrich his already impressive accumulation of archeological facts; and finally, the neat plats of mound groups, inclosures, and individual mounds (the effigy, or animal-shaped, mounds were drawn on a large scale and a separate plat devoted to each), all from the deft hand of Hill on data furnished by Lewis, reached a total of nearly a thousand sheets. Not regarded by either man as a part of the survey proper, but nevertheless of great importance, are some hundreds of letters to Hill, written from the field by Lewis, which were fortunately kept with the survey manuscripts.

Where do these precious materials now rest and why, even among archeologists, does one hear so little of the long-continued labors of Lewis and Hill? In the first place, the manuscripts of the survey remained for ten years in the hands of the Hill heirs, and a decade is enough to produce partial oblivion, especially as the survey was quietly made and its nature and extent known to very few persons other than its makers. In the second place, when the survey materials, through a fortunate purchase by the State of Minnesota, were finally deposited in the library of the Minnesota Historical Society at St. Paul, interest in mounds, the chief objective of the survey, had shifted somewhat toward antiquities

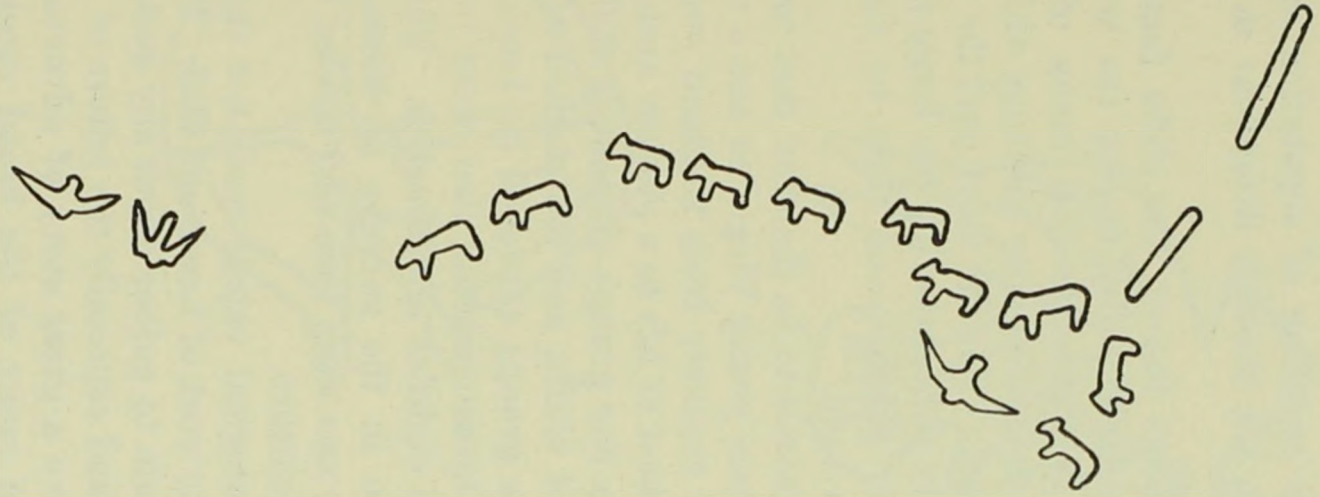
of other forms. Also it is possible that some students find work in the field more congenial than weeks spent at a library table over thousands of pages of manuscripts. At any rate, with the exception of part of the Minnesota materials, nearly all of the great survey remains to this day unpublished—a vein of gold to any archeologist who attempts to study the territory covered more than a generation ago by the footsteps of Lewis.

The reason is obvious enough. It is only necessary to compare the areas surveyed by Lewis with the same territory as it stands to-day. In Iowa, for example, all along the Mississippi bluffs from the Minnesota line to Dubuque, the region of the effigy mounds in which both surveyors were particularly interested, the timber belt has grown ever narrower as time passed, and in places the plow has very nearly reached the edge of the great gorge. The result is the near or total destruction of many a fine group of mounds that Lewis surveyed. How fine it is, under the circumstances, to learn from the notebooks of Lewis and the drawings of Hill the full facts concerning those beautiful animal mounds that formerly stood on the bluffs near the mouth of the Turkey River!

In the opposite corner of Iowa, on the Big Sioux in Lyon County, it is still possible to count on the great Blood Run village site a total of sixty-four mounds. In 1889 Lewis actually surveyed one hundred and forty-three mounds on this site, as well as

the fifteen-acre inclosure at the south end of the ancient village. It is just as well to know, when one visits the site to-day, that forty years of cultivation have obliterated the inclosure, as well as more than half of the mounds.

An even more remarkable story of mounds is told in a penciled note in one of the field books. Visiting in 1892 the "prairie" or river terrace, some three miles long by one mile wide, on which stands the village of Harper's Ferry in Allamakee County, Lewis found the terrace covered with mounds, nearly all of which were under cultivation. He surveyed only five mounds, four bear effigies and one round-base or conical mound, but fortunately made a count and record of the others: "This group consisted of 107 tailless animals [*probably bear mounds*], 67 birds, 98 embankments that were probably animals, 154 embankments [*linear mounds*] and 240 round mounds the largest of which is now about 6 feet high. Total number of effigies in sight including 4 surveyed, 276. Total number of mounds including surveyed, 671. Add 229 small round mounds (estimated) that have been destroyed by cultivation makes a total of 900 mounds of all classes." This note is believed to be the record of the largest mound group ever erected by the prehistoric inhabitants of America. In August of 1927, the writer walked over the entire extent of this terrace and was able to count only eighteen mounds, a few even of these rather doubtful. The soil is quite sandy and, once



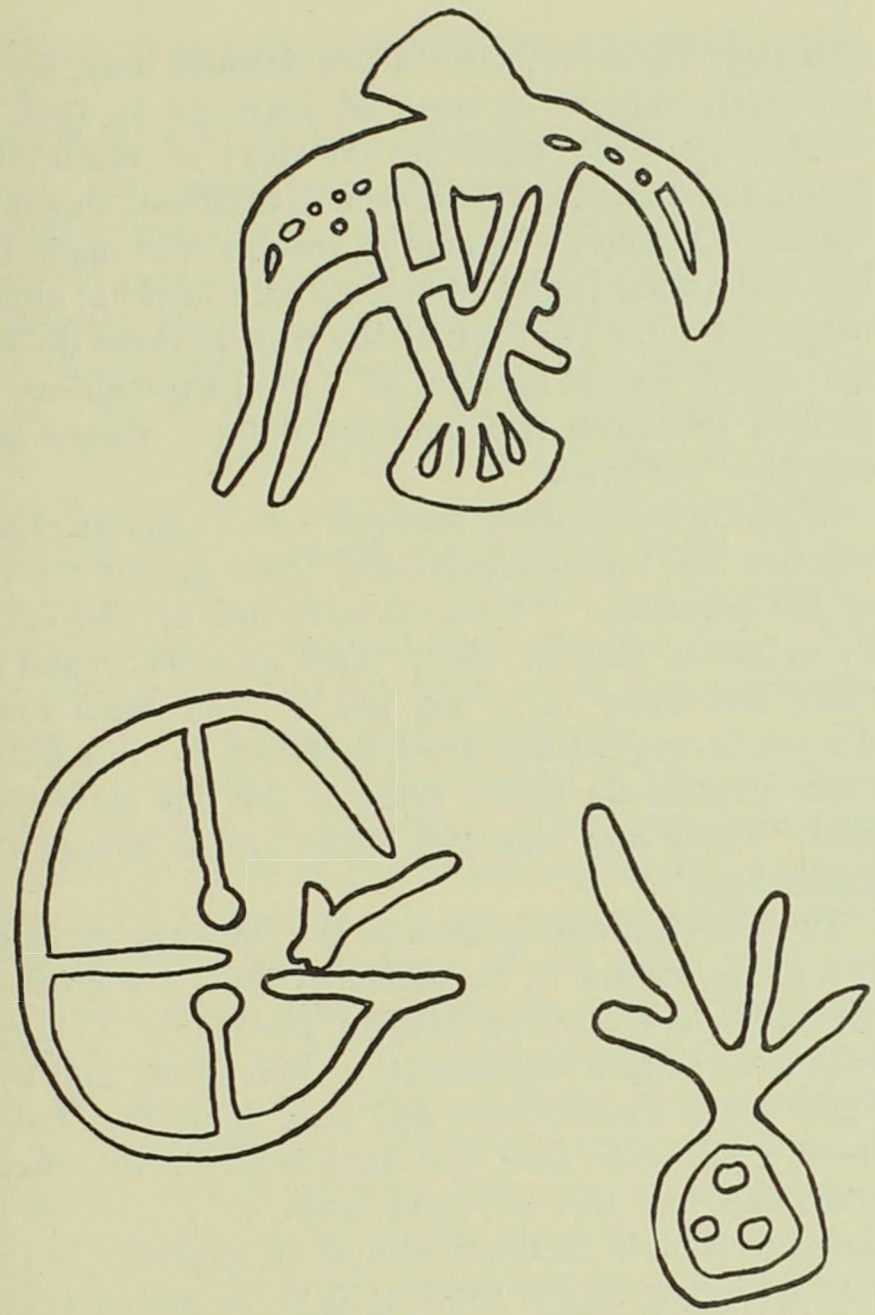
EFFIGY AND LINEAR MOUNDS ON A MISSISSIPPI RIVER BLUFF TWO AND A HALF MILES NORTH OF McGREGOR, FROM THE LEWIS-HILL SURVEY

deprived of their covering of vegetation and put under cultivation, the mounds disappear in a few years.

The rock carvings too on the cliffs facing the Mississippi have fared badly during the last half century, and it is fortunate that many of these were transferred to tissue-paper rubbings while they were still undefaced. For the most part the originals are now nearly obliterated by the large painted or carved initials placed over them by the joy-seekers of a later race.

Thus one has reason to be thankful that some decades ago a vigorous young Virginian and a well-to-do and competent engineer from England were willing to devote the best of life to a pioneer archeological survey. Some fine groups of mounds still stand on the Mississippi bluffs, and the student of these discovers that the groups surveyed by Lewis yield to-day the same measurements that went into the field books of the eighties and nineties. This fact creates confidence in the surveys of those other mounds that long ago were torn and leveled by the processes of agriculture.

And the archeological values were not the only ones created by the work of Lewis and Hill. Human interests are certain to gather about any such long-continued effort, and especially the letters of Lewis to Hill do preserve a great story of adventure, as of exploration, in many of the broad reaches of the Mississippi Valley. And moreover it is the story



PETROGLYPHS ON A CLIFF FACING THE MISSISSIPPI RIVER NEAR LANSING, FROM THE LEWIS-HILL SURVEY

of an age that now, after a few decades only, seems extremely remote—a story of journeys on foot, or in "livery rigs" hired by the day; of small-town hotels and boarding houses where existence was fully bereft of luxury; of gangs of tramps who made living in the open inadvisable for a man working alone; of expert work paid for at the rate of three dollars per day of actual service; of a total expenditure of sixteen thousand two hundred dollars, wages and expenses included.

With unembellished rhetoric Lewis characterizes some of the "accommodations" that arouse the ire of the traveller. "There is only one at Clayton", he writes on May 27, 1885, "kept by a Swiss and as dirty and filthy as a hog pen". The small town did not furnish all the grief, however, for in a letter from Prairie du Chien there is the flat statement that "These men who run hotels and B houses are damb hogs".

The political animosities of the time are revealed in a letter written in December of 1887, a non-presidential year, from New Madrid, Missouri: "Things here are red hot—Democratic. Have only had two fights since I came here and paid $5.00 fine, but I think I am solid now, for they would rather fight some one who will not fight back. . . . If it is going to remain frozen I cannot do anything in the way of diging, and if there is as much hell in every town as there is in SE Mo I want to get back north as soon as possible." As Lewis was himself a

Southerner, he was presumably an unprejudiced witness.

The letters of the early nineties reveal the atmosphere and conditions out of which free silver emerged and Coxey's army was recruited. In an effort to reduce expenses on account of the financial stringency beginning in 1893, an attempt was made to work by boat the Mississippi shores of Iowa, Missouri, lower Illinois, Kentucky, and Tennessee. This proved unprofitable as well as dangerous, for what was saved in transportation was spent in hiring some one to guard the boat at night. From his camp in his little four by seven tent at Ottawa, Illinois, Lewis writes that he is still a sufferer from the effects of being hit by a stone in a midnight fracas over the boat near Burlington.

A final quotation from a letter written on November 11, 1894, at Columbus, Kentucky, is representative of much of the correspondence of the last years of the survey: "At the present time in free America there are sections of the route that are more dangerous now to pass over than they were in Soto's time, and it will take some one with tact and skill as well as courage to tackle these sections. Along the Mississippi the 'river rats' and tramps make the route dangerous. Along the upper Tennessee the 'moon-shiners' are the curse to the country." To dangers from rough characters there were added before the month closed some trying experiences in two gales on the Mississippi. In his small boat

Lewis barely managed to weather them out, being closer, as he says, "to the 'kingdom to come'" than he ever cared to risk again.

On the whole, however, the records of this notable survey tell a story of hard and serious work, begun early in the spring of each year and continued until the snow and cold of winter forced the surveyor to seek shelter within doors or in the gentler climate of his sunny South. But with the coming of another working season he shouldered his level and once more began to read accurately his compass indications and to record the results of measurements in his leather-bound notebooks. The great fifteen-year effort, initiated and sustained by two serious-minded bachelors who lived in St. Paul, remains unique in the history of North American archeology. Its results, when fully known, will help to prove that not all the worth-while and interesting antiquities of the world center about the valleys of the Nile and the Euphrates.

Charles Reuben Keyes

Comment by the Editor

AS A GEOLOGICAL LABORATORY

Once upon a time, eternities ago, Iowa was under the sea. Slowly, ever so slowly, sediment was deposited on the floor of the ocean until, after incomprehensible eons of time, the mighty forces of the earth pushed back the water and the land emerged. But the wind and rain and other agents of destruction played havoc with the barren region. Gradually the surface of Iowa was reduced to the sea level and again submerged.

And so the rock-forming process was repeated, age after age, while the numerous strata, each distinctive in composition, were superimposed one upon another. No great diastrophic movement intervened to disturb the normal order of the layers, though the whole rock structure tilted toward the southwest. The edge of each broad stratum is thus exposed in proper sequence to the view of any one who travels from Red Oak to McGregor. Of course the solid rock, except in river valleys and artificial excavations, is obscured by the mantle of soil that was left by the glaciers.

To the geologist, Iowa is a paradise. It is as though all nature had conspired throughout the ages to build a gigantic laboratory wherein the history

of the earth would be revealed to men who could decipher the pages of that rocky palimpsest. The eternal conflict between the sea and the land is fully recorded in the stratified form of the bedrock; the amazing transition from a tropical climate to ages of ice is portrayed in measures of coal and in granite boulders; the story of life is written clear and deep in the limestone cliffs.

Into this geological garden of Eden came Thomas Nuttall in the memorable summer of 1809. It was he who observed that the rocks of Iowa contained the same kinds of fossils as the limestone hills of Derbyshire, England, and thus supplied the key for the correlation of time and place. Since then other scientists — Nicollet, Owen, Agassiz, Wachsmuth, Calvin, Shimek, and Kay — have followed the trail he blazed, reading the signs of the past and reconstructing in vivid detail from the evidence displayed many of the world-wide episodes in the evolution of the earth. The story of Iowa as a geological laboratory is filled with famous names and most significant discoveries.

J. E. B.

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