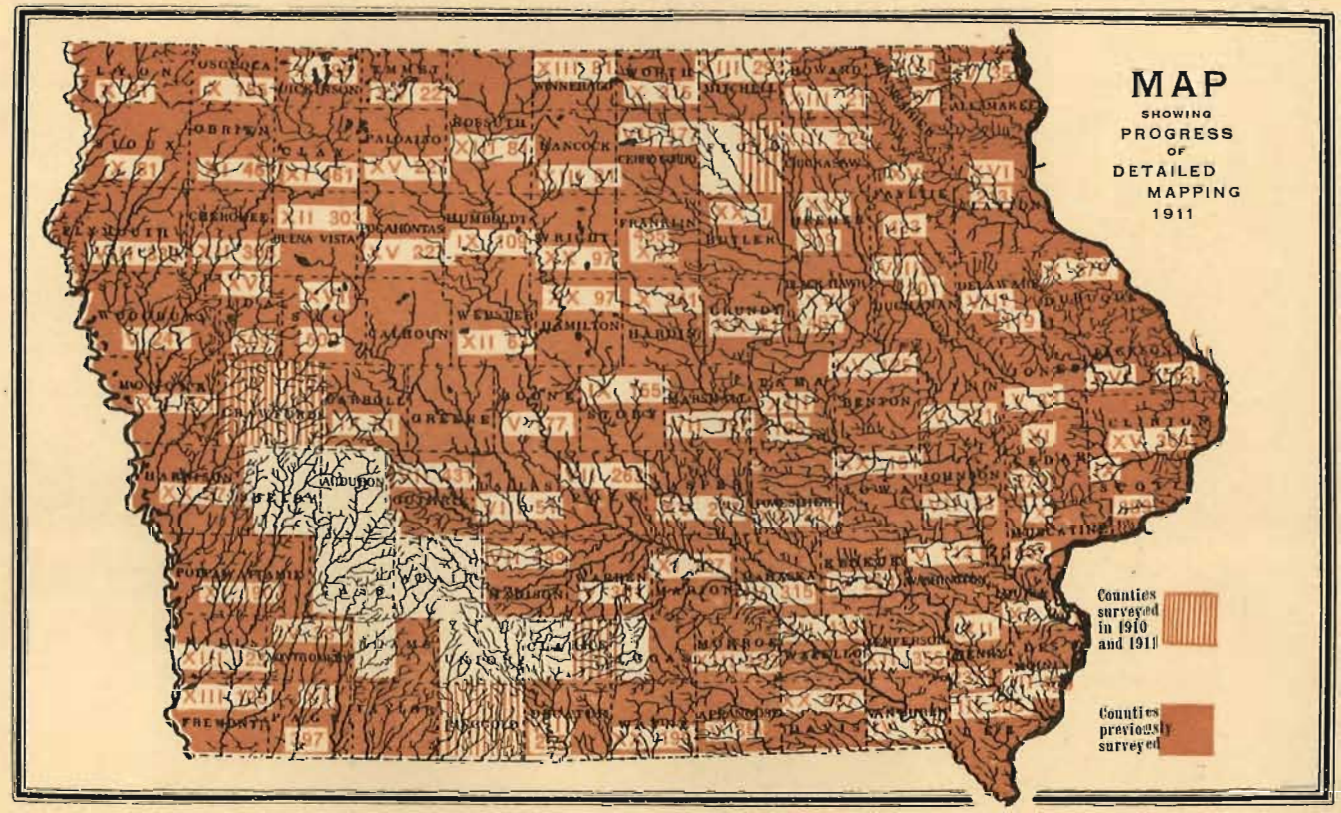
ADMINISTRATIVE REPORT

IOWA GEOLOGICAL SURVEY



NINETEENTH AND TWENTIETH ANNUAL

Reports of the State Geologist

DES MOINES, DECEMBER 31, 1911.

To Governor B. F. Carroll and Members of the Geological Board:

GENTLEMEN:—Since the publication of the Eighteenth Annual Report the Iowa Geological Survey has suffered a great loss in the death of my predecessor, Professor Samuel Calvin, who, from the beginning of the present Survey in 1892 until his death in April, 1911, devoted much time and energy to the service of Iowa. The name of Professor Calvin will go down in history in connection with the scientific and economic development of Iowa. Under his directorship the Iowa Geological Survey published nearly twenty volumes of reports dealing with the geology and mineral resources of the state. These publications will ever stand as a monument to the thoroughness with which he pursued his scientific work and to his broad conception of the functions of a State Geological Survey. That which he ever had in mind was well expressed by himself in his presidential address delivered before the members of the Iowa Academy of Science, in April, 1908. He said,

"It has been the aim of the Survey to collect and furnish trustworthy information, the fullest possible, relative to the geologic structure and geologic resources of Iowa; but while the purely economic side of the subject has necessarily been emphasized more or less in all the work so far done, any facts that could make knowledge clearer, broader, more definite, have not been neglected. Facts that seem at first to be in no way related to commercial or industrial activities, may be the germs from which will spring some great body of knowledge of the utmost importance to the well being of mankind. The

oft quoted example of the twitching of the muscles in the legs of a frog under an electrical stimulus seemed as far removed as possible from anything that might contribute to the accumulation of wealth or the promotion of human comfort, and yet that simple fact was the starting point from which have developed the marvelous uses and applications of electricity which are of such stupendous and daily growing importance in modern human life. The pure science of today becomes the basis of the applied science of tomorrow, and enlightened states, the world over, realize that money expended for the prosecution and encouragement of scientific research, is money well invested. By the substitution of definite knowledge for vague uncertainty relative to water supplies, coal, lead and zinc ores, oil, gas, Portland cement materials, clays and all other natural products, the Survey has saved to the citizens of Iowa, many times over, all that the Survey has cost.

"As an aid to public education, helping the people to see and appreciate and correctly interpret the geological phenomena which lie all about them, helping them to view the world in which they live understandingly, instead of looking at it with the vague, dull, comprehensionless mental attitude of the unlearned savage, the Iowa Geological Survey has earned its place as an important factor in contributing to the general intelligence of this most beautiful, most prosperous, most intelligent state."

After having been appointed in May, 1911, by the Geological Survey Board to succeed Doctor Calvin as director of the Iowa Geological Survey, I endeavored to carry forward to completion all the lines of work which had been approved by the Board and which had been commenced under the direction of my predecessor. Some of these investigations had been scarcely begun, whereas others, upon which work had been done during several years, were nearing completion, and the manuscripts were being prepared for publication. The report nearest to completion was a cooperative report between the Iowa Geological Survey and the United States Geological Survey on the important subject of the Underground Waters of Iowa. Doctor Calvin had hoped

that this report might have been issued during the fall of 1910 or early in 1911, but unavoidable delays in connection with the incorporation of the work of several authors into one report, the vast amount of material to be published, the making of maps, charts, etc., caused the manuscript to be still incomplete at the time of his death. It was evident that the Nineteenth Annual Report would of necessity be late in publication, and hence I decided that it would be well to combine the Nineteenth and Twentieth reports into one volume, which constitutes the Twenty-first volume of the Survey.

The volume is devoted principally to the Underground Waters of Iowa. The manuscript was prepared by Professor W. H. Norton and several collaborators. The discussion of the chemical analyses and related features of the waters was prepared by Professor Hendrixson. Professor Norton for many years has been keeping the records of the deep wells and the data relating to the underground waters of the state, and has been giving expert advice to officials and municipalities and others interested in problems of artesian supplies. Since 1903 the investigations have been carried on in cooperation with the United States Geological Survey. Both the National and the Iowa Surveys will publish the monograph on the underground waters of Iowa. This great work will constitute a most valuable contribution to our knowledge of the resources of the state.

In this volume are also included the statistics of the mineral production of Iowa for the years 1909 and 1910. Several months ago separates of this part of the volume were sent to all the mineral producers of the state. It is gratifying to note that the mineral production in Iowa in 1910 exceeded that of any previous year, the total value being $22,744,572. Of this amount coal at the mine contributed $13,903,913, which has never been exceeded in the history of coal mining within the state. Another interesting part of the report dealing with the mineral production of 1910 is that which describes a new gypsum field which was discovered in Appanoose county by the Scandinavian Coal Company while it was prospecting for coal.

The evidence suggests that these new deposits may be of great economic importance. In 1909 two well equipped Portland cement plants produced cement in Iowa; a third plant was added in 1911. Two of these plants are located at Mason City, the third is in Des Moines.

I have the honor to report that during the years 1910 and 1911 the Iowa Geological Survey carried forward a number of lines of investigation in the field, and has served the state as a bureau of information in the office. Citizens of Iowa, as well as many persons living outside the state, are constantly applying to the offices of the Survey for information concerning the character, extent and geographic distribution of our geological resources; and to answer fully all the questions asked, a large amount of time must necessarily be spent in compiling and verifying data, and in setting out the facts in more or less voluminous correspondence.

The work of the Survey for 1910 and 1911 may be summarized as follows:

First. Dr. S. W. Beyer and his assistants continued the study of the quality and distribution of road materials, and the results of this work will soon be ready for publication. Pleistocene gravels are very generally distributed, especially in the northern half of the state, and they constitute ideal dressing for a properly constructed and well drained road bed. In many counties there are inexhaustible beds of limestone that some day may be crushed with cheap water power and so made available for road purposes. Professor Beyer has also given attention to the availability of the Pleistocene sands and gravels for the manufacture of concrete.

Second. Professor Norton has acted, and will continue to act, as the expert of the Survey in connection with all problems related to the artesian waters of the state. The knowledge Professor Norton has gained, as a result of his many years of study of underground waters, enables him to give expert advice to all towns and cities which are desirous of knowing, before going to the expense of a deep water system, whether or not it would be advisable to do so, the depths to which wells have

to be sunk in different parts of the state, the probable cost of wells, the probable supply which may be expected, etc.

Third. To Professor B. Shimek was assigned the work of making a thorough study of the Aftonian gravels along the western border of Iowa. The Aftonian deposits are especially well adapted for use in all cases where concrete construction may be used. The demand for such material is good and annually increasing; and, since in the western part of the state the Aftonian beds are practically the only source from which sand and gravel for any purposes may be obtained, they possess a commercial importance difficult to estimate. The scientific interest of Aftonian gravels is scarcely less than their economic interest. In the report on the geology of Harrison and Monona counties published in Volume XX, the ancient life of Iowa as it is revealed by the organic remains found in Aftonian beds is discussed at some length. Since that report was written more bones and teeth of fossil horses, camels, elephants, mastodons and clumsy ground sloths have been found. One of the most interesting of the Aftonian fauna is the right half of the lower jaw of a large bear, the first and so far the only representative of the flesh eating mammals from these deposits. Notable among the additions since Professor Shimek's report was published is the lower jaw of a very large male mastodon. The length of the jaw measured horizontally between the extreme anterior and posterior points is slightly more than thirty-two inches. Altogether the specimen indicates an animal of unusual size and weight even for this bulky species. The extent to which the teeth are worn shows that the individual attained extreme old age. Another interesting addition has been the right radius, a forearm bone of the old fashioned ground sloth, Megalonyx. Professor Shimek finds in the Aftonian gravels large numbers of mollusk shells belonging to the same species as those found in the modern rivers of the state, and these suggest a climate in Aftonian times not greatly different from that of the present. Geographically, the gravels are found to occur at short intervals on both sides of the boundary line all the way from Sioux

Falls to points in Missouri some miles south of Hamburg; and the western Iowa field is certainly only a small part of the area occupied by these interglacial gravels.

Full descriptions of the mammalian remains that have come from the Aftonian gravels have been published by Professor Calvin. The papers are entitled "Aftonian Mammalian Fauna" and "Aftonian Mammalian Fauna II." The former was published in volume twenty and the latter in volume twenty-two of the Bulletin of the Geological Society of America.

Fourth. The study of the margin of the Wisconsin drift lobe in the northwestern part of the state was continued by Prof. J. Ernest Carman during the summer of 1910 and completed in 1911. The object of the work was to furnish data from which a correct map of the drift sheets of that region can be made. While engaged in these studies Professor Carman found a number of other problems relating to structure, genesis and age. These will be discussed in his paper which is now being prepared.

Fifth. The Survey has continued its study of the streams of the state. Gaging stations have been established on the Des Moines, the Cedar, the Wapsipinicon and the Iowa rivers, and some discharge measurements have been made. It is necessary that gaging stations be maintained for several years and that many discharge measurements be made before accurate statements can be made with reference to the water power possibilities of streams. It is the intention of the Survey to continue the gaging stations and the taking of discharge measurements until sufficiently accurate information has been obtained to permit a publication which will be of great value in connection with the development of power within the state.

Sixth. Excellent work has been done in the past few years in connection with the cooperative topographic mapping within the state. Our Survey pays one-half the field expenses whereas the United States Geological Survey pays one-half the expenses of the field and all other costs connected with drawing, engraving and publishing the maps. The maps already issued are proving of great value in the locating of roads,

steam and interurban railways, drainage ditches, and in other ways. It is to be regretted that the funds available for this important work are so small. It is very desirable that this work be continued until an accurate topographic map of the whole state has been completed.

Seventh. Detailed areal work and geological mapping was carried on in Ringgold, Taylor, Calhoun, Greene, Floyd, Crawford and Clarke counties. During the summer of 1910 Professor Calvin completed the field work in Taylor county but at the time of his death he had not written his report. Professor Arey, who had made a survey of Ringgold county, which is adjacent to Taylor county, spent some time in Taylor county in 1911 in order that he might properly interpret the notes of Professor Calvin and write the report. Professor Macbride has almost completed the survey of Calhoun and Greene counties. Mr. A. O. Thomas spent some weeks in 1910 with Professor Calvin in Floyd county and continued his studies of the county during a few weeks in the summer of 1911. Prof. John L. Tilton began in 1911 a survey of Clarke county. Mr. Lees, Assistant State Geologist, has completed the field work in Crawford county and has commenced the writing of his report.

Eighth. As an aid to the schools of the state and to the many persons who are interested in the physical geography of Iowa, the Survey has commenced the study of the most interesting physiographic features of the state. During the summer of 1911, Mr. James H. Lees completed his studies on the physical features of the Des Moines river valley. During the field season of 1910, some work was done on the physiography of the Missouri Valley slope.

Ninth. Dr. O. P. Hay of the National Museum, Washington, an authority on Pleistocene mammals, has almost completed his report on the many interesting mammalian fossils of Iowa.

The Des Moines office has been in charge of Mr. J. H. Lees, Assistant State Geologist, and Miss Nellie E. Newman, the Secretary. From this office much valuable information has been furnished to the people of the state and to many outside of

the state. Much work fell upon the Des Moines office in connection with the preparation of the Twenty-first Volume of the Survey reports, which is herewith submitted for publication.

Yours respectfully,

GEORGE F. KAY.