MICHIGAN

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A BRIEF HISTORY OF THE MICHIGAN GEOLOGICAL SURVEY

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HISTORICAL SEQUENCE OF ORGANIZATIONAL NAME AND DIRECTORS:

First Geological Survey
Douglass Houghton, State Geologist, 1837-45
Second Geological Survey
Alexander Winchell, State Geologist 1859-62
Michigan Geological and Biological Survey
Alexander Winchell, State Geologist, 1869-71
Carl Rominger, State Geologist, 1871-85
Charles E. Wright, State Geologist, 1885-88
M. E. Wadsworth, State Geologist, 1888-93
Lucius L. Hubbard, State Geologist, 1893-99
Alfred C. Lane, State Geologist, 1899-1909
Roland C. Allen, State Geologist, 1909-19
Richard A. Smith, State Geologist, 1919-20
Geological Survey Division, Department of Conservation
Richard A. Smith, Division Chief and State Geologist, 1920-46
Gerald E. Eddy, Division Chief and State Geologist, 1946-51
Franklin G. Pardee, Division Chief and State Geologist, 1951-52
William L. Daoust, Acting State Geologist, 1952-54
William L. Daoust, Division Chief and State Geologist, 1954-64
Geological Survey Division, Department of Natural Resources
Gerald E. Eddy, State Geologist, 1964-71
Arthur E. Slaughter, State Geologist, 1971-76
Division of Geology, Department of Natural Resources
Arthur E. Slaughter, State Geologist, 1976-77
Geological Survey Division, Department of Natural Resources
Arthur E. Slaughter, State Geologist, 1977-81
R. Thomas Segall, State Geologist, 1981-96

GENESIS

At 12:00 Noon on January 26, 1837, Michigan achieved statehood and at 2:00 PM that same day, the fledgling legislature introduced and approved a bill which proposed a thorough geological study of the state. Thus this bill, subsequently to become Act 20, created our first Geological Survey and also the first department of the State created by statute.

The bill authorized and directed Governor Stevens T. Mason, with the advice and consent of the Senate, to appoint:

> A competent person whose duty it shall be to make an accurate and complete geological survey of this state, which shall be accompanied with proper maps and diagrams, and furnish a full and scientific description of its rocks, soils and minerals, and of its botanical and geological productions . . . . and provide specimens of the same . . .

An appropriation of some $3,000 was recommended to carry out the above work during the first year, and on February 23, 1837, Governor Mason signed the bill into law.

As a result of this legislation, Dr. Douglass Houghton, who had conceived and planned the survey, and persuaded individual members of the legislature to commit money and time to this undertaking, was appointed Michigan's first State Geologist. The Michigan Geological Survey's early accomplishments are inextricably linked with the work and personality of Dr. Houghton.

At the time of Houghton's appointment in 1837, fewer than 24,000 people of European descent lived in Michigan, most in the region of present-day Detroit or at isolated trading stations along the Great Lakes. The shorelines were only roughly charted, the northern two-thirds of the state was an unsurveyed wilderness, and practically nothing was known of the state's interior. Easterners viewed Michigan as an unhealthy land dominated by bogs and sand hills, its Upper Peninsula too cold and “fit only for savages.” Indeed, the Survey was in part created to dispel those beliefs and to bring more settlers to the state.

THE EARLY YEARS: 1837 to 1900 INVESTIGATION AND DISCOVERY

The First Geological Survey

After his appointment as State Geologist, Douglass Houghton organized the Survey into geological, zoological, botanical and topographical departments. To cut costs and keep the new Survey on schedule, yet maintain high standards for collecting and reporting data, Houghton devised a plan to combine the existing federal linear survey with the Michigan Geological Survey. In 1844, Houghton and the commissioner of the General Land Office signed contracts to conduct a joint linear and geological survey. This was the first instance of such cooperation between the federal government and a state survey.

Under Dr. Houghton's direction the Survey prepared and presented seven annual reports to the Michigan Legislature which would form a basis for the future

understanding of the Michigan Basin. The most noteworthy geological contributions of the Houghton-directed Survey include the determination of the stratigraphy and structural setting of the Michigan Basin, confirming the extent of Michigan's copper deposits, defining Michigan's coal basin, and bringing attention to the importance of deposits of natural brines, gypsum, peat, marl, clay, limestone, iron ore and gold.

In 1845, Houghton, at age 36, drowned in Lake Superior when his boat capsized in a gale. His accomplishments included serving as Mayor of Detroit, Professor of Geology at the University of Michigan; founding member and president of the Association of American Geologists (which later became the American Association for the Advancement of Science). At the time of his death, he had been nominated for Governor of Michigan.

After Houghton's death, the Michigan Geological Survey was suspended. Houghton's assistant, Bela Hubbard, along with William Burt, a surveyor with the General Land Office, continued to survey and explore the mineral region of the south shore of Lake Superior. They described masses of iron ore near Menominee. Their discoveries prompted Charles Jackson, Josiah Whitney and John Foster to begin active reconnaissance of the public mineral lands of Michigan's Upper Peninsula Lake Superior Land District (16,000 square miles). Their efforts were assisted by John Locke, William Mathers, Charles Whittlesey and James Hall. Hall, one of Houghton's students while teaching Natural History at the Rensselaer Scientific School, later became State Geologist of New York. Reports prepared from these expeditions were published in 1851. By 1855, more than 80 percent of the copper produced in the United States came from the Lake Superior Land District. Active mining for iron ore in the Upper Peninsula had begun earlier in 1848.

The Second Geological Survey

In the late 1850's petitions from across the state were received by the Michigan Legislature requesting further investigations into salt resources. On February 15, 1859, Act 206 established the formation of a second Geological Survey to complete the survey suspended in 1845. Dr. Alexander Winchell, then Professor of Geology at the University of Michigan, was appointed as State Geologist.

Winchell conducted extensive field work from 1859-62, but published only one report. The publication includes a massive accumulation of geological facts including: a general account of the geology of the state (the first orderly overall description of the geology of the Michigan Basin), thorough descriptions of the coal, gypsum and salt deposits of the Lower Peninsula and the iron deposits of the Upper Peninsula, Many of the geological observations were based on the earlier work of Douglass Houghton. The report also summarized the economic progress of the non-metallic mineral industry in Michigan.

Winchell was responsible for the accumulation of a massive fossil collection. Based on observations related to these fossils and correlations with oil-bearing strata in Canada and Ohio, he believed oil could be found in Michigan.

The work of the second Survey was suspended in 1863 when the legislature failed to appropriate funds for its continuation. The state treasury was under severe strains due to the military expenses of the Civil War.

The Third Geological Survey to 1900

By the year 1869 a strong public demand had arisen for a resumption of the Geological Survey. Legislation was passed in March 1869 to establish a third Geological Survey, but the Act made no provision for zoological or botanical investigations as did those of 1837 and 1859. In April of that year Dr. Winchell was for the second time appointed as State Geologist under the direct supervision of a Board of Geological Survey. The Board was an ex officio body consisting of the Governor, the Superintendent of Public Instruction, and President of the State Board of Education.

Dr. Winehell's second administration of the Geological Survey was destined to be, like the first, short-lived. Dr. Winchell wished the Survey's investigations to concentrate on the Lower Peninsula and to progress in a scholarly direction. It was the wish of the Board of Geological Survey that the thrust of the Survey's duties should be in the development of the iron and copper deposits of the Upper Peninsula.

The Board signed independent contracts with Major T. B. Brooks to survey the Marquette Iron District, and Professor R. J. Pumpelly to survey the Copper Region.

Frequent heated debates and political friction between Dr. Winchell and the Board resulted in his resignation as State Geologist in 1871. The Board appointed Dr. Carl Rominger to continue the survey of that part of the state not included in the investigations of Major Brooks and Professor Pumpelly.

During the years 1872-76 Dr. Rominger was engaged practically alone in the work of the Survey. The results of his researches are embodied in Volume III of the Survey's reports. Most important is his discussion of the geological structure of the Lower Peninsula, confirming and carrying further the views and work of Houghton and Winchell, as to the “basin structure” of the Michigan Region. His work also includes a careful and elaborate monograph on the fossil corals of Michigan. This work remains today the classic treatise of fossil corals of the Michigan Basin.

Dr. Rominger accompanied both Major Brooks and Professor Pumpelly during stages of their surveys. Results of these investigations were delayed for political reasons by the Board of Geological Survey and not published until 1895. This delay is felt to have slowed the development of Michigan's early mineral industry.

Dr. Rominger continued as State Geologist until May 1885, when he was succeeded by Charles E. Wright, who had been Commissioner of Mineral Statistics. Wright remained State Geologist until his death in March 1888. During Wright's tenure he engaged the Survey in making sketches and maps of the topography to illustrate geologic phenomena of the Upper Peninsula. Wright also collected and identified some 3,300 rock specimens.

Following Wright's death, Dr. M. E. Wadsworth, Director of the State Mining School was appointed as State Geologist. Under Dr. Wadsworth's direction, the Survey at last secured offices of its own. Up to that time the Survey had had no offices other than the private offices or homes of the various geologists. With Wadsworth's leadership the Survey became an organized and more efficient branch of state government. Wadsworth made arrangements with the USGS that enabled the State Survey to devote most of its time and resources to economic geology, while leaving the more purely scientific studies, particularly paleontology, to the USGS.

After Dr. Wadsworth's resignation in 1893, the Board appointed Dr. Lucius L. Hubbard as State Geologist and Dr. A. C. Lane as Assistant State Geologist. Under Dr. Hubbard the Survey was thoroughly reorganized and all ties to the College of Mines and the University of Michigan were severed. The Board felt that while the Survey's connections to these institutions were beneficial to the schools, it was detrimental to the Survey.

Up to this time the achievements of the third Survey were mainly of exploration and progress in the Upper Peninsula, aside from the lonely work of Dr. Rominger. To eliminate duplication of studies being done by the USGS, Dr. Hubbard stopped work in the Iron District by the Michigan Survey. He continued work in the Copper District and Isle Royale and directed Dr. Lane to begin extensive research in the Lower Peninsula. Resulting publications prepared by these men on the geology of the Keweenaw Peninsula and Isle Royale, salt and gypsum, petroleum prospects, deep paleozoic borings in the Southern Peninsula, and copper deposits of the Upper Peninsula are still used as references and are considered to embody the highest characteristics and quality of geological work.

In 1899 Dr. Hubbard resigned and the Board elected Dr. Lane as his replacement. Under Dr. Lane's direction the Survey headquarters were moved from Houghton in the Upper Peninsula to the capitol in Lansing in the Lower Peninsula. Survey publications began to take a more diverse nature as interest in the geology of the Lower Peninsula increased, and the legislature again attached provisions for zoological and biological responsibilities to the duties of the Geological Survey. During Dr. Lane's service as State Geologist, the first thorough topographic survey of Michigan was initiated.

THE MIDDLE YEARS: 1900 to 1950 PRODUCTION AND CONSOLIDATION

The Third Geological Survey

If the years prior to 1900 can be thought of as the years of Investigation and Discovery, then the interval from 1900 to 1950 must surely be viewed as the years of Production and Consolidation. Dr. A. C. Lane continued his work commenced prior to the turn of the century, but resigned as State Geologist in 1909 to accept a professional position at Tufts College.

R. C. Allen succeeded Dr. Lane as State Geologist and under his leadership, numerous papers were published detailing the geological investigations taking place at the time. Much of this work was on the Paleozoics of Michigan, individual county geologic reports, and the surface geology of Michigan, including a new [m]ap of surface geologic formations. A study of the Monroe Formation, which led to the discovery of significant glass sand deposits, was also completed. This information later proved to be of extreme value during World War I when the United States was cut off from supplies of German optical glass.

At about this time the Survey inherited the duties of the Commissioner of Mineral Statistics and began issuing reports on metallic and non-metallic minerals. An annual appraisal of iron mines was established in cooperation with the Board of State Tax Commissioners. From these two information sources Michigan was able to provide adequate source data on strategic minerals available in the state to the National Defense War Minerals Council, both before and during World War I.

The onset of World War I saw a great curtailment of the Survey's activities, mainly due to lack of funds and manpower. However, the topographic branch of the Survey continued to work on the topographic survey of the state and at this time (1915) they finally completed the relocation and marking of the permanent boundary line between Ohio and Michigan.

At the conclusion of the war the Survey enjoyed a modest expansion. More precise geological investigations were instituted and appraisals of copper mines as well as iron mines were planned and executed. The reconstruction of industry after the war led to the demand for geologists and in 1919 R. C. Allen resigned to become Vice-President of the Lake Superior Iron Ore Association.

Richard A. Smith, Assistant State Geologist under R. C. Allen, was appointed State Geologist and Director of the Geological Survey. He continued many of the projects initiated by his predecessor including: exploration of the iron formations of the Upper Peninsula, studies of the Ordovician shale group, and completion of the inland lakes survey. A soil and land economic study was undertaken in cooperation with the Department of

Agriculture, as was an economic survey of the clays and shales of Michigan.

In 1921 the Michigan Department of Conservation was created and the powers and duties of the Survey were transferred to this new department. The new department did not include topographic or land surveys which had been transferred to other divisions of state government.

The Oil and Gas Industry in Michigan

Although the first oil well in Michigan was drilled near Port Huron in 1886, it was not until the middle 1920's that serious oil exploration got underway. While it is true that many "local use" oil and gas wells dotted southeast Michigan, both before and after the initial discovery, it was not until the discovery of the Saginaw Field in 1925 that Michigan became a commercially producing oil state. From this point forward, through the late 1920's and into the early 1950's, the Southern Peninsula saw a proliferation of relatively shallow oil and gas fields.

The burgeoning oil industry placed a severe strain on the limited resources of the Survey and the need for regulation was met by Act 65 of the Public Acts of 1927 which mandated the issuance of drilling permits and provided for regulations governing petroleum exploration, operation and development, and penalties for violations of the act. Under this act, Michigan's first permit was issued to the Logan Oil Company for the Logan No. 1 well in Logan Township, Mason County.

The work of the Survey continued to increase as the search for oil grew. In 1927 and 1928, the Survey established its first field offices to administer Act 65. At this time the Petroleum Section of the Survey was created. In 1929 the duties of the Supervisor of Wells were extended to include operation of producing wells and the collection of statistics of oil and gas production. Michigan had become an oil producing state of the first order east of the Mississippi.

In 1929, with the onset of the "Great Depression", Michigan, with its new found oil industry, was ranked first in the production of salt, bromine, calcium chloride, and magnesium sulphate, and second in iron ore, portland cement, gypsum and amorphous graphite. A law passed in 1929, for the joint cooperation of the Department of Conservation and the USGS to take and utilize aerial photographs for the production of base maps and surveys, put Michigan on the leading edge of a technique which is still in use today. Satellite mapping is simply an extension of this early development.

The depression took its toll with the Survey as it did with all facets of industry and government, but never-the-less the oil industry continued to grow and with it, the responsibilities of the Survey. More new field offices were established and new services were provided on the geologic, technical and advisory problems of the industry. Oil and gas field reports, maps and well records were made available to the public, as office technical and clerical personnel increased. By 1935 exhaustive reports on the geology of several of the larger oil fields had been printed and published. From 1935 through 1938 Survey work continued to increase, aided somewhat by the various depression-spawned projects such as PWA, WPA, and, CCC. New field offices continued to be established, or old offices shifted to new locations, as developments necessitated.

In 1939 two developments of significance to the growing oil and gas industry occurred: (1) the state of Michigan was admitted into membership in the Interstate Oil Compact Commission, and (2) the old oil and gas act, Act 65 of the Public Acts of 1929, was superseded by Act 61 of the Public Acts of 1939. This is the authority under which oil and gas is presently regulated, though it has been amended and revised a number of times in the intervening years. This new law repealed all existing oil and gas legislation and introduced many new features to prevent surface and subsurface waste. It also provided for an advisory board of six persons knowledgeable in oil and gas matters to aid and advise the Supervisor of Wells in his deliberations.

By 1940 the Survey had accumulated a large library of well cuttings which were washed, cleaned, and stored. These were available to outside interests as well as Geological Survey personnel, and each month all new well logs were typed, mimeographed, and made available to the public at a nominal price.

World War II

During the years encompassing World War II, work went on at the Geological Survey, influenced and directed in considerable degree by the war. Decreased personnel carried an ever-increasing work load. In some respects, the oil and gas industry declined because of war-time restrictions and shortages of materials, especially steel, hampering expansion of exploration and of producing and refining facilities. In the mid-1940's, the western Michigan area reopened as a producing district after having remained dormant since 1930. By the late 1940's, oil and gas operations increased slightly although new discoveries did not add materially to new reserves.

In 1946, R. A. Smith, after seeing the Survey through the aftermath of World War I, the depression years, and World War II, took his well-earned retirement after 26 years, the Geological Survey's longest tenured State Geologist. Though retired, R. A. Smith continued to maintain a presence at the Survey and to give sound advice and counsel to his successor, Dr. Gerald E. Eddy.

Dr. Eddy took over a Survey that had been hard hit by the war just ended, and his first order of business was to see to the regrouping of the Survey as a functional instrument of state resources policy. This he did while continuing to foster the development of the shallow oil "play" in the Southern Peninsula. He was also instrumental in pioneering the new aerial geomagnetic

surveys and geochemical and radioactivity surveys which were just entering into the geologist's lexicon at this time.

Helen Martin - A Vignette

As is so often the case when narrative treatment of a subject is arbitrarily broken into segments, some matters or individuals of uncommon status, bridge those breaks and must therefore, be treated outside the chosen framework. This is surely the case with women in the Geological Survey in general, and Helen Martin in particular.

Helen Martin (1889-1973), with the Survey for nearly 30 years between the years 1917 and 1958 (with an 11 year break), was one of our most productive colleagues. Geologist, geologic researcher, compiler of geologic maps, historian, writer, editor, lecturer, conservationist, and teacher. She authored five books, was responsible for the compilation of six geologic maps, and published numerous papers and short articles.

Well informed on Michigan's natural resources, and greatly interested in conservation, Ms. Martin often included these subjects in her lectures and writings. One of the few women geologists of her time, she helped to pave the way for those women geologists who have followed. Her work has been an inspiration to many, and her lifelong devotion to geology and conservation has contributed greatly to the Survey and to the people of Michigan.

MATURITY: 1950 TO PRESENT RESOURCE REGULATION AND MANAGEMENT

The Third Geological Survey

During the 1950's the Survey would be under the direction of State Geologists Franklin G. Pardee (1951-52) and William L. Daoust (1952-64). This time period saw a gradual decline in oil and gas activity in the Michigan Basin. This decline was to turn around dramatically in 1957. During this year the Albion-Scipio Field was discovered. To date this field has produced over 125 million barrels of oil and qualifies as a major world oil field. The rapid expansion of this field, and further discoveries in the Trenton-Black River Groups statewide, placed heavy demands on the services of the Survey. Information and regulatory requests reached an all-time high during 1959.

In 1964, Gerald E. Eddy returned as State Geologist after having served 12 years as Director of the Department of Conservation. In 1965 the Survey's annual budget exceeded $600,000, which ranked it 17th among the State Surveys in the United States. Over half of this budget was committed to carrying out oil and gas conservation statutes. Regulatory activities engaged in by the Survey became a point of controversy, and a somewhat adversarial relationship developed with the oil and gas industry. Despite some difficulties, the Michigan Survey remained in the forefront of oil and gas regulatory and conservation endeavors, and it was looked to by many other State Surveys as an example of forceful, yet progressive regulatory practices.

During the 1960's, the Survey would complete a cooperative mapping project with the USGS. This project, begun in the 1940's, remapped the iron ore ranges and provided an extensive geomagnetic survey of the Upper Peninsula.

On November 15, 1968, Act 353 placed the Michigan Geological Survey under the direction of the newly created Department of Natural Resources. The next several years would see a number of laws enacted whose aim was conservation, responsible management, and protection of the state's natural resources. Acts covering mine reclamation, sand dune mining, mineral wells, and coal mining would all be in place within 10 years.

Arthur E. Slaughter, State Geologist (1971-81), supervised Survey activities through a time of its greatest expansion. The 1970's would see the rapid development of the Silurian Reef play in the Michigan Basin. Michigan's oil production would increase 300 percent, while it's gas production would leap 600 percent. Controversy over drilling in the Pigeon River State Forest and the potentially tragic gas blow-out in Williamsburg, Michigan brought a great deal of publicity and notice to the oil and gas industry in the state. Public demands for changes in procedure and regulatory methodology brought about changes in the Survey. In 1973, regional geologists were appointed to act as the State Geologist's voice in regional field offices. At this time environmental impact statements and field reviews on drill sites were initiated.

As exploration of the "Niagaran Trend" expanded, so did the requests for information and services of the Survey's Oil and Gas Section. Also, the Survey saw many of its skilled and knowledgeable employees leave public service for positions in the booming oil and gas industry.

In 1981, R. Thomas Segall was appointed State Geologist. That same year over 500 mineral producers were operating in Michigan at over 750 sites, with an annual production value of $980 million. Also, over 125 oil and gas operators were active in the state, drilling over 966 wells. Of these wells, 427 were producers. In 1982, oil and gas production for Michigan was valued at $1.5 billion. By 1987, 47 percent of Michigan's total mineral production would be from oil and gas (crude oil, 28 percent and natural gas, 19 percent). The beginning of 1988 saw Michigan's total number of issued permits to drill for oil and gas exceed 40,000. Of this total, 36,000 have been drilled, resulting in 14,105 oil wells and nearly 2,904 gas wells. Over 1,046 billion barrels of oil and 2.8 billion cubic feet of natural gas have been extracted from

Michigan wells. It is calculated that 20,000 jobs are directly related to Michigan's oil and gas industry.

The late 1980's have seen a downward trend in the price of crude oil and natural gas. This price downturn has slowed petroleum exploration and production in Michigan, as well as throughout the nation. While slightly less affected than other oil-producing states, growth of the hydrocarbon industry in Michigan has been stunted by the uncertainty of future price economics. Despite this, the productive capacity of the state has been expanded with the discovery of the deep gas pay zones of the Ordovician Prairie du Chien Group.

At present, work at the Survey is mostly concerned with oil and gas related matters, compliance action, and industry monitoring. In addition to these activities the Survey continues its work in mineral management, groundwater studies, mapping, publications and geological research. Most recently, the Sesquicentennial Bedrock Geology Map of Michigan was released, the first updating of this map in 50 years.

One of the biggest tasks of the 1980's has been the modernization of the Survey. In the early 1980's, the Survey began a new era of information management with the acquisition of computers and microfilm equipment. In 1981, the Survey began a statewide oil and gas database on a mainframe system, storing information on production, subsurface data, and permits. That same year, a comprehensive project of microfilming was started on well logs, drillers logs, permit files, production reports, and old publications. These new information systems allow more space for files, better security, and faster turnaround time on filling requests for information and copies.

In the mid-1980's, electronic data management was expanded to include a dedicated word processing system, acquisition of numerous microcomputers, and use of an integrated software program. An annual well status report and the *GeoPulse* publication are two of the many products generated from microcomputer, and recently, a statewide ground-water database has been implemented.

The Survey also began a geographic information system on computer, and digitized base maps of Michigan are produced in cooperation with Land and Water Management Division of the DNR. Geologic maps are presently being produced by computer, including the new bedrock geology map. Currently, there are plans to improve and expand the electronic information systems and microfilming of files.

EPILOGUE

The Michigan Geological Survey has existed for more than 150 years. During that time, the majority of the state's geology and mineral resources have been explored and documented.

The Geological Survey has been directly involved with the discovery of iron ores, copper lodes, salt, gypsum, coal, potash, limestone, sand and gravel deposits, water supplies, brines, and petroleum. The Survey has added wealth to the State, both monetarily and scientifically. It has encouraged responsible exploration for, and extraction of, minerals and other geologic resources through regulation and management programs, and it has endeavored to conserve hydrocarbons, soils, natural areas, and supplies of potable groundwater. Information generated by the Survey is released in the form of publications, maps, and reports. This information is shared for its interest and scientific value, and is used by the citizens and industries of Michigan.

Those who have worked for the Survey have given Michigan a valuable legacy, and future generations will continue to benefit from their work. New methods of exploration, expanded demands for mineral resources, and the ever changing market for their uses, keeps the Michigan Geological Survey actively involved in prudent development and insightful management of Michigan's minerals and ground-water resources.