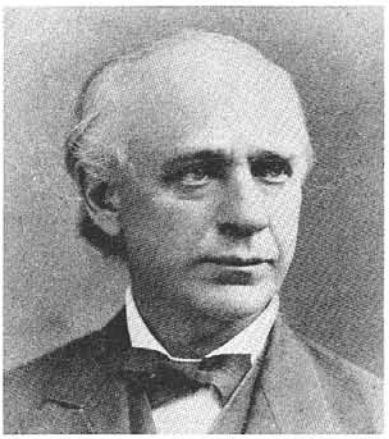
Ohio Geology Newsletter
FALL 1984
Division of Geological Survey

THE DIVISION OF GEOLOGICAL SURVEY— PAST, PRESENT, AND FUTURE

As to what remains to be done in Ohio geology, it is difficult to speak. The science of geology is constantly lengthening its cords and strengthening its stakes. Every line of investigation opens up larger questions than those which it directly undertakes to settle. New methods of research are coming into use, and old problems must be reconsidered by their aid. It is only the generalities of our geology that have been thus far attacked. Deeper and more thorough work will be demanded in every subdivision of every field.

Edward Orton, 1893



Edward Orton, Sr.

Although nearly a century has passed since Orton penned this observation, the truth of his statement has not changed appreciably. Not only have new methods of research become available and new questions arisen, but also new demands for geological information, many of which could not have been envisioned by Orton, have become an integral part of our society. The great intellectual revolution in the geological sciences, brought about by the plate-tectonics theory, has been paralleled by a similarly significant demand by society for geological and mineral resources information and for intelligent decision making in planning and environmental concerns.

In the nearly century and a half since the the Ohio legislature recognized the need for geological information about Ohio, the agency known variously as the "Geological Survey of Ohio," "Ohio Geological Survey," and, currently, "Division of Geological Survey" has been the state organization responsible for gathering geological data and making that information available to the public. The popularity and importance of the Survey's geological information is reflected by the fact that each year the Division receives more than 64,000 public inquiries by letter, telephone, and personal visit and distributes nearly 300,000 maps, publications, and other technical records.

THE BEGINNINGS

The history of the Survey is a distinguished one in which significant geological progress has been made by a long list of able geologists. The progress has never been easy from either the scientific or the administrative viewpoint; however, a remarkable persistence and dedication has always characterized Survey geologists in the pursuit of knowledge for the betterment of the citizens of the State of Ohio.

The beginnings of the Survey date to the founding of the State of Ohio. One of the first acts of the newly formed Ohio Legislature in 1803 was to pass a law governing the extraction of salt at natural discharges of salt water known as salt licks. It was not until 1836, however, with the signs of the coming Industrial Revolution, that the state legislature began to seriously consider the establishment of a geological survey. Prodded both by leading scientists in the state and by a competitive spirit with other states that were establishing geological surveys, the Ohio Legislature, on March 27, 1837, passed legislation authorizing the first Geological Survey of Ohio.

William W. Mather

A young West Point graduate, William W. Mather, who was serving as a geologist with the New York Geological Survey, was lured to Ohio to become the first State Geologist. A distinguished and energetic assemblage of geologists and naturalists took to the field in June 1837 to begin an odyssey of geological

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ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste, Governor • Lt. Gov. Myrl H. Shoemaker, Director

Chief's corner by Horace R. Collins

"What is this geology of which we are so proud and confident? What has it done for the mental or material benefit of the human race? And on what grounds does it justify its claims to respect and support as one of the facts in the advance of humanity?" These penetrating questions, posed in 1900 by Charles Lapworth, an eminent British geologist, are just as worthy of an answer today as they were when originally written. In regard to the Division of Geological Survey, the majority of the programs currently underway are designed to generate and distribute information on the geology and mineral resources of Ohio for the mental and material benefit of the human race—in this case primarily the citizens of Ohio.

Take, for example, the geological mapping program. Maps generated by the geologists working on this program will have great value to those who must make decisions affecting the economic, political, social, or civic well-being of society. Maps depicting areas having geological conditions suitable for solid-waste disposal versus unsuitable areas will assist those responsible for the safe disposal of the refuse of modern society. Maps showing the distribution of mineral resources will assist private landowners, mineral developers, and regulatory agencies in reaching personal, corporate, or governmental decisions on the use of mineral resources. Ours is a mineral-driven economy, with the value to society of energy and finished products far exceeding the raw dollar value of the fuel and industrial minerals produced in Ohio. Additional raw materials to feed our society as well as jobs for our citizens will issue from the painstaking, detailed mapping now being carried out county by county. Information needed to more fully protect the environment and valuable ground-water supplies is being generated through top-of-rock and drift-thickness mapping. These maps will assist industry and regulators alike in determining how much casing should be set on a drilling well to insure the protection of ground-water supplies. These same maps inform engineers and architects on general foundation conditions at potential construction sites and what measures must be taken to insure the safety of dams, buildings, and other constructed facilities. Derivative maps will tell us of geologic hazards which may exist in a county and provide insight into methods of avoiding or minimizing such hazards.

Other programs are developing information on the chemical and physical characteristics of our mineral resources. Such information is being used, for example, in designing coal-washing plants to clean our native coals, which in turn helps protect both our environment and the jobs associated with the mining of Ohio coal. Detailed chemical analyses of coals, limestones, and brines will be used to design new techniques for both utilization and environmental protection.

Studies of the shore of Lake Erie which establish the rate of erosion and the effectiveness of structures designed to slow down or control the erosion rate are a great aid to homeowners, potential builders, and local units of government concerned with disappearing land. Similarly, the searching out of sand deposits to nourish receding beaches and the development of wave and current data which can be used to formulate shore-protection plans contribute to the well-being of the thousands who reside along the Lake Erie shore.

As much as we geologists enjoy producing maps and technical reports, that in itself is not the goal. The goal is to make geologic information available to be used for the benefit of society. Accordingly, a major portion of the Survey's efforts is directed toward assisting individuals in geological and mineral-resource matters and in the distribution of maps, reports, and other technical data. A review of the numbers of materials distributed and citizens assisted reported elsewhere in this issue of *Ohio Geology* indicates that the public is aware of the importance of geology to its well-being and is making large use of the Survey. On these grounds, perhaps, we could lay claim to respect and support as one of the facts in the advance of humanity.

OHIO GEOLOGY

A newsletter published quarterly by the Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Columbus, Ohio 43224.

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News items, notices of meetings, etc. should be addressed to the attention of the editor. Change of address and new subscriptions should be addressed to the attention of the secretary.

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investigation that continues in both intent and spirit to the present day. Not only did these scientists survey the geology and mineral resources, but they also gathered information on the living faunas and floras and other natural history and archeological occurrences within the state. In this respect, the First Geological Survey can be regarded as the forerunner of today's Ohio Department of Natural Resources.

By the end of the 1838 field season, financial problems in the state led to the termination of the First Geological Survey of Ohio. During that year, two geological reports, known as the First and Second Annual Reports, were published. Although the First Geological Survey of Ohio was only a brief reconnaissance of the state, it did provide an important data base for the intelligent development of mineral resources.

Despite repeated attempts to reactivate the geological survey, it was not until 1869 that the legislature authorized what was to become the Second Geological Survey of Ohio. Although the concept of a geological survey still remained as a one-time, limited-term investigation of the state, the legislature planned to carry it out on a much grander and more thorough scale than had been the case with Mather's venture 30 years earlier.

John Strong Newberry, a native Ohioan, was selected to become State Geologist and leader of the Second Geological Survey of Ohio. Newberry had been trained as a physician and was a veteran of geological expeditions in the west, director of of the Sanitary Commission for the Union Army during the Civil War, and Professor of Geology at the Columbia School of Mines (now part of Columbia University).

Newberry, along with a cadre of able assistant geologists, began a detailed county-by-county investigation of the state's geology and mineral resources. In addition, Newberry appointed a number of leading paleontologists as special assistants in order to describe the rich fossil faunas and floras of the state. As with the earlier Mather Survey, investigations of the state's agriculture, botany, and zoology were to be carried out.

Once again, financial problems in the state brought an early demise to the Survey, and by 1874 it was no longer a functioning organization. Newberry continued to assemble and publish, in part at his own expense, the information

gathered by the Second Geological Survey of Ohio. Several thick and fact-filled volumes were published under Newberry's direction.

In 1882, Edward Orton, Sr., an assistant to Newberry and Professor of Geology and first president of the Ohio State University, was appointed State Geologist with the objective of completing the long-awaited volume on economic geology begun under Newberry's direction. This 1,000-page volume appeared in 1884. Orton, with small appropriations from the legislature, continued limited geologic investigations of the state. Among the significant contributions of Orton during this period was a report in 1888 on the occurrence of petroleum and natural gas in northwest Ohio.

In 1900, after the death of Edward Orton, Sr., Edward Orton, Jr.—trained in geology and the founder of the science of ceramic engineering—became the fourth State Geologist of Ohio. With this appointment the Survey became a permanent organization; the legislature finally realized that the geology of the state could not be worked out during the course of a time-constrained "survey," and that there was a significant need for the citizens of the state to have access to a continuing data base of geologic information. The wisdom of that turn-of-the-century perception has continued to be demonstrated.

The Survey has existed on a continuous basis since 1900. In 1949 the Survey became one of the seven originally chartered divisions of the newly created Ohio Department of Natural Resources and became officially known as the Division of Geological Survey. We continue to be known informally as the Ohio Geological Survey.

CURRENT SURVEY ORGANIZATION AND PROGRAMS

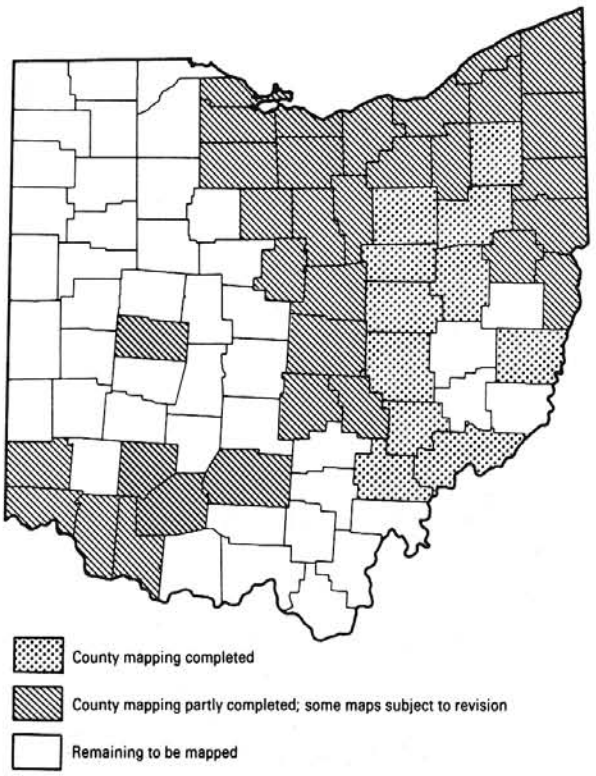
The Survey is currently divided into six sections, each of which deals with an important aspect of geological investigation or with the presentation of geologic information to the public. In the following paragraphs, the functions and responsibilities of each section of the Survey are outlined. Because of the extremely wide range of activities carried out by the Survey, the following accounts are abbreviated summaries of current programs.

REGIONAL GEOLOGY SECTION

The Regional Geology Section of the Survey is the largest section in terms of both numbers of people and breadth of responsibilities. Geologists assigned to this section gather information pertaining to mineral resources; prepare bedrock, glacial, and various other geological maps for counties and other subdivisions of the state; and collect mineral-production statistics.

Mineral resources.—Ohio is a major producer of important mineral commodities, including coal, limestone, dolomite, sand and gravel, salt, oil and gas, sandstone, clay and shale, and, to a lesser degree, gypsum and peat. These commodities have long been of economic importance to the state and historically the Survey has focused attention on them. Through the years the Survey has gathered a massive data base for these mineral commodities that includes the distribution, thickness, and physical and chemical characteristics of each commodity. This information has been presented in numerous published reports, and a considerable amount of additional data is contained in open-file reports and various unpublished files that are available for public inspection. This data base is of immense importance to the exploration and planning for future mineral development in the state and is utilized, either directly or indirectly, by a large segment of the state's population. Primary users of these data include mineral companies, government agencies at federal, state, and local levels, geological researchers, and individuals who desire information concerning potential mineral resources on their properties.

Although this data base is large, much additional work is needed to meet the requirements of a modern society. The constantly shifting concerns of society, new technology, changing economic conditions, and intellectual and scientific advances all combine to require new or updated approaches to the acquisition of additional data on the geology and mineral resources of Ohio.



Status of geological mapping.

Geological mapping.—Geologic maps are fundamental tools in nearly any application of geology, whether it be mineral-resource exploration and development, local zoning regulations, construction engineering, or scientific investigations. Early in its history, the Survey experimented with the concept of county geologic maps. John Locke, a remarkable geologist with the First Geological Survey of Ohio in 1838, prepared a bedrock-geology map of Adams County that was the first county geologic map in the United States.

During the Newberry Survey (1869-1882), very generalized, page-sized geologic maps were prepared for many counties in the state. Since that time, geologic maps, most with some explanatory text, have been published for a number of counties. But the Survey staff has traditionally been of small size and the progress until now has been accordingly slow.

Production of detailed, full-color county maps commonly requires several years of field investigation, during which time each outcrop of rock in roadcuts, quarries, and stream beds is measured and examined in detail. The work map compiled from these field investigations then must go through a review and editorial process before being drafted and prepared for printing—in itself a highly technical and time-consuming

process. From beginning of field work to publication, a geologic map commonly requires from 3 to 5 years of effort from several skilled geologists and cartographers.

In 1981, however, the dream of many Ohio geologists neared reality with the passage of Amended Ohio House Bill 385, which authorized the funding and implementation of an accelerated 10-year geologic mapping program for the state of Ohio. This legislation received widespread support from elected officials, mineral industries, and the geological community because of its obvious importance to the state and because it was funded through diversion of a small portion of the already existing mineral severance tax.

The geological mapping program is now underway, with teams of geologists mapping bedrock in southwestern and eastern Ohio and glacial geologists mapping in the north-central portion of the state. In addition, other geologists are preparing top-of-rock and drift-thickness maps in advance of the bedrock and glacial mappers.

Survey geologist Greg Schumacher mapping Ordovician rocks in Clermont County.

The mapping of Ohio's bedrock and glacial sediments presents many challenges, including development of accurate and meaningful subdivisions of the strata and determination of their lateral extent, how best to portray the units on a map, and the ever-present problem of cumbersome historical terminology. Many years and considerable labor lie between now and the completion of geologic maps for each of Ohio's 88 counties, but the potential benefits to the state are so great that the effort promises to be repaid many times over. Not only will new mineral resources be located and known deposits be better defined, but a comprehensive data base will be generated that will become essential in the decision-making process for planning agencies and other governmental units. These geologic maps also will be an effective tool with which to lure new industry and business to the state.

Core drilling.—In May 1981, another long-term aspiration of the Survey was achieved with the acquisition of a Mobile

Survey core rig exploring for coal in Gallia County.

B-61 core-drilling rig with a capacity to extract a continuous rock core to a depth of about 3,000 feet. At last the Survey has the capability to investigate the distribution and chemical and physical characteristics of rocks and mineral deposits at depths and in areas of the state where little or no available mineral exploration has been done. The goal of the Survey's drilling programs is not to do the detailed work of private industry but to develop a framework of geologic information that will encourage exploration by industry. This concept seems to be working, as at least two major energy companies are already known to have investigated and leased large areas based on drilling reports issued by the Survey.

The core rig has proved to be a highly reliable piece of equipment and has averaged 13 core holes per year, with an average depth of 609 feet per hole. Most of the drilling targets have been the deep and unexplored coal deposits in eastern Ohio, but projects also have included investigation of high-calcium limestone in southwestern Ohio and limestone resources and potential sulfide mineralization in the northwestern part of the state. Each core has provided important information about the nature and distribution of rock units within the state—data that are of vital importance in understanding the geologic framework of Ohio and in the search for mineral resources.

Core drilling is, by nature of the process and equipment, a slow procedure. It is readily apparent that any county being mapped under the Survey's mapping program would greatly benefit from several strategically placed cores. This is particularly true in the glaciated two-thirds of the state, where exposures of bedrock are sparse owing to the generally thick blanket of glacial sediment. In addition, it is highly desirable to have, during the process of glacial mapping, a drilling capability for unconsolidated glacial sediments. In order to meet the scientific and technical demands of the mapping program and continue the important task of exploration for deep coal and other valuable mineral resources, additional drilling equipment will be required.

Mineral statistics.—How much of a mineral commodity is produced, who produces it, and where it is produced are all important questions frequently asked by many segments of the population for many different reasons. These data must be gathered from hundreds of mineral producers across the state and assembled into a coherent and usable summary in a timely fashion.

This task, which was formerly carried out by another state agency, became part of the Survey's responsibilities in 1981

under the provisions of the geological mapping legislation. The *1983 Report on Ohio mineral industries,* released in mid-1984, was the first report in this annual series wholly gathered and assembled under the Survey's direction. Mineral producers, government officials, and businesses across the state have all commented favorably on the accuracy, value, and timeliness of this report.

PUBLIC SERVICE AND SALES SECTION

The Survey is an information-distribution agency as well as a research organization, and it is the responsibility of the Public Service and Sales Section to distribute the numerous Survey publications to the public and to answer, or refer to the appropriate staff geologist, the more than 500 monthly telephone inquiries received at the Survey's general number. In addition, the staff of this section handles nearly 800 walk-in customers per month who wish to purchase maps or other publications, have questions answered, or have rock, mineral, or fossil specimens identified. The Sales Office staff also responds to an average of 450 mail requests or inquiries per month.

Publication Sales office.

The Public Service and Sales Section annually distributes 26,000 topographic maps and approximately 41,000 Survey publications. In addition, this section manages the Publications Center for the entire Department of Natural Resources, a responsibility that includes the annual distribution of approximately 150,000 publications spanning nearly 1,000 titles. The magnitude of these figures, coupled with more than 152,000 records distributed by the Subsurface Geology Section, reinforces our belief that the Survey is an important and critical source of information for the citizens of the state. A complete listing of the publications, maps, technical records, and other materials of the Division of Geological Survey is available upon request from the Public Service and Sales Section.

LAKE ERIE SECTION

The Lake Erie Section of the Survey began in 1949 as the Lake Erie Geological Research Group within the Division of Beach Erosion (renamed the Division of Shore Erosion in 1950) and in 1961 became a part of the Survey. The principal responsibilities of the Lake Erie Section are the analysis and prediction of erosion rates along the Ohio shore of Lake Erie and mapping of the distribution and characteristics of bottom sediments in the lake.

The Survey maintains a small waterfront office in Sandusky from which Lake Erie studies are performed. Central to the completion of these studies is the Survey's 48-foot research

Survey research vessel, GS-1.

vessel, the *GS-1.* This steel-hulled boat was built in 1953 and still has the original diesel engine. The *GS-1* is used principally for studies of bottom sediments, seismic-reflection profiling, water-current studies, and as a base for studies of shoreline erosion. LORAN-C and radar are used for navigation and precise positioning of the vessel during data-gathering activities.

One of the principal functions of the Lake Erie Section has been to evaluate the significant problem of erosion of the Ohio shore of the lake. Valuable lakefront property is annually consumed by the waves along many sections of the shore, a circumstance that is of great concern to lakeshore residents and local government officials. A series of county shore-erosion studies produced by the section have characterized the susceptibility of the shore materials to erosion and, through analyses of older maps and aerial photographs, attempted to predict future shoreline positions.

Another principal focus of the Lake Erie Section is the characterization of the subbottom sediment in the central basin of the lake. These data are gathered by a specially designed coring device operated from the *GS-1.* Such information will enable the Survey to locate new deposits of sand resources and may provide important data on the geologic history of Lake Erie.

Instrumental to the understanding of the dynamic interactions in the shoreline zone of Lake Erie is a detailed knowledge of wave activity and sand transport. Such data can be used to design more efficient shore-protection structures and to develop beach-nourishment projects in order to preserve or rebuild Lake Erie beaches.

Over the years, the Lake Erie Section has taken some dramatic steps towards a better understanding and characterization of the Lake Erie shoreline. However, a number of important projects remain to be completed, particularly a coring project in the central basin of the lake and wave and sand-transport studies.

GEOCHEMISTRY SECTION

The Survey's Geochemistry Section has well-equipped laboratories for both chemical and physical analyses of rocks, sediments, and fluids such as brines. These analyses are carried out on samples originating from Geochemistry Section projects and on samples from projects in other sections of the Survey or other divisions of the Ohio Department of Natural Resources.

Ohio coal has traditionally been a principal focus of geochemical analyses at the Survey, and since 1975 the Survey has had an ongoing program, in cooperation with the U.S. Geological Survey, to provide proximate, ultimate, and de-

tailed chemical analyses of Ohio coals. This detailed testing involves 70 different major and minor trace elements as well as the more traditional chemical and physical tests of coal quality. The total number of determinations for any series of samples may exceed 100.

Coal samples for this ongoing project have been collected from surface and underground mines and from core samples obtained by the Survey's core-drilling rig. A total of 740 samples have been collected to date from major coal seams throughout the state. These and other samples to be collected will provide an extensive and comprehensive body of chemical and physical data for a detailed characterization of Ohio's coals. Such information is of enormous value in coal exploration and research into better and cleaner ways to utilize Ohio's enormous coal reserves.

The Geochemistry Section also has had a strong involvement in studies of limestone and dolomite in Ohio. These investigations have centered on chemical analyses and on physical properties of carbonate aggregates. Such information is of particular importance to the construction industry in the state and for the expanded development of Ohio's major resources of limestone and dolomite. The use of native limestone and dolomite to absorb sulfur dioxide in fluidized-bed combustors or in stack-gas scrubbers is also an important area of concern for the Geochemistry Section. Other areas of investigation are the exploration for and chemical and physical characterization of subsurface deposits of carbonate rocks using the Survey's core-drilling rig. Two projects have been completed and a third one is underway in western Ohio.

Natural brines produced as a by-product of oil- and gas-well drilling are currently a topic of considerable interest in the state in regard to the proper environmental disposal of these fluids. The Geochemistry Section is developing a proposal to investigate trace-element concentrations in natural brines. Data generated through such a project could provide potential "fingerprints" or "signatures" useful in determining sources of brine contamination.

SUBSURFACE GEOLOGY SECTION

The Subsurface Geology Section is responsible for all aspects of the geology of the rocks that lie deep beneath the surface of the state—such rocks as are commonly encountered in the search for oil and gas. As part of this responsibility, the section maintains a large file of records pertaining to the oil and gas wells in the state.

This important geologic data base consists of more than 165,000 records of individual oil and gas wells that have been drilled in Ohio. These records are in the form of cards that contain information on the owner, producer, location, elevation, and geologic formations encountered during drilling of each well. In addition, the Subsurface Geology Section has geophysical logs for nearly 38,000 wells.

The section also maintains a sample library of rock cuttings and cores from nearly 4,000 oil and gas wells. These samples are provided to the Survey by the oil and gas industry. Rock chips cut by the drill are placed in sample bags at intervals during the drilling of a well and are then transferred to the Survey, where they are washed, dried, and then placed in labeled envelopes for storage. These samples are used extensively by Survey staff, by members of industry, and by other geologists in their investigations of the subsurface geology of the state.

Of considerable interest to the state's oil and gas industry, as well as the general public, are the numerous maps prepared

Subsurface Geology Section.

and maintained by the Subsurface Geology Section. County and township maps, available for most areas of the state, show the locations of and other information pertaining to oil and gas wells. New wells are plotted on the maps on a weekly basis. Also available are numerous maps that depict the locations, elevations, structure, and other information for various subsurface geologic formations in the state.

As the principal repository of subsurface geologic information for Ohio, the Subsurface Geology Section is a busy place. During 1983, the section sold 94,000 copies of well cards, 34,000 copies of geophysical logs, and 24,000 maps. More than 3,600 representatives of the oil and gas industry visited the section and 5,000 telephone inquiries were received.

In addition to fulfilling this heavy commitment to public service, the Subsurface Geology Section is involved in several research projects on the oil- and gas-bearing rocks of Ohio. A major effort in recent years was the Eastern Gas Shales Project, begun in 1976 under auspices of the U.S. Department of Energy. The report for the Ohio portion of the project was completed in 1982 and represents a significant contribution to our understanding of the geology of the Devonian-age gas-bearing black shales that underlie eastern Ohio.

A major project that is nearing completion is an investigation of the geology of the Trenton Limestone of northwestern Ohio. During the period 1884-1916, wells in this part of the state constituted the largest oil field in the United States. Many thousands of wells were drilled in this area, but very poor production techniques resulted in the eventual abandonment of the field. There are estimates that perhaps as much as 90 percent of the oil in this field still remains in the rock. Commercial interest has been expressed in applying secondary-recovery techniques or even "oil mining" in order to recover this oil. The Survey report on the Trenton Limestone will be a major source of information on this petroleum reservoir.

The huge volume of data in the files of the Subsurface Geology Section and the large number of annual additions to that data base are well suited to computerization, and initial steps have been taken to link the Subsurface Geology Section with computers in the Division of Oil and Gas so that newly permitted wells will be automatically added to the Survey's files. It should be stated that the Division of Geological Survey and the Division of Oil and Gas share, in part, a common data base; however, the functions of the two divisions are very different. The Division of Geological Survey is principally a research organization, whereas the Division of Oil and Gas is primarily a regulatory agency.

TECHNICAL PUBLICATIONS SECTION

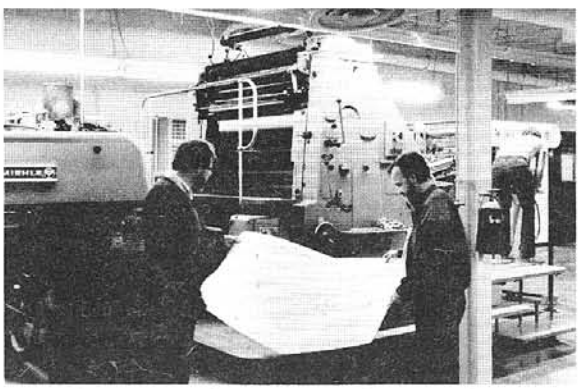
A primary objective of Survey projects is to present the

results of these investigations to the public in the form of reports and maps. The transformation of the geologist's work maps and manuscript into an accurate, readable, and usable document is the principal function of the Technical Publications Section. Such transformations take place in many stages and require the expertise of highly skilled people at each step. All phases of report preparation, except final printing, are done within the Survey.

In order to depict this process more fully, a full-color geologic map and descriptive written report, such as are being prepared in the mapping program, will be traced through this multistage process. The involvement of the Technical Publications Section begins early in the research phase of the mapping project with the preparation of a county base map at a scale of 1:62,500. The base map is prepared by reducing the negatives of 1:24,000-scale U.S. Geological Survey 7½-minute quadrangle topographic maps and compositing them into a county base map. Commonly, between 15 and 20 quadrangles are needed for coverage of an entire county. This method provides the detail and accuracy of a 1:24,000 map (field mapping is done at this scale) but provides the compactness and manageability of a 1:62,500 map. The map at this latter scale gives a county overview on a single sheet of paper and is considerably quicker and more cost effective to produce than individual quadrangle maps for an entire county.

After the geologist's field map and manuscript, which generally includes figures and tables, have been completed and subjected to peer review, these documents are scrutinized by the Survey's editor, who corrects any remaining grammatical and scientific problems and insures clarity and consistency of the manuscript and the map.

The next stage in the production process for the maps is preparation of the scribecoat—a dimensionally stable, plasticized material that is coated with a substance that can be cut away with a special tool in order to make lines of constant thickness. These scribelines delineate all of the geologic units and other lines to be portrayed on the map. Using the scribecoat, the cartographer makes a series of peelcoats—one for each color and pattern that is to be portrayed on the map. The peelcoat is a plasticized material that can be "peeled off" the areas on the map on which a particular color or pattern will be displayed. One map may require as many as 12 peelcoats.



Initial press run of a county geologic map being inspected by Technical Publications Section staff.

Photographic negatives are prepared from each peelcoat and, along with negatives showing topography, cultural features, and lettering, are sent to the printer for production of the finished map. Technical Publications Section personnel check the map at each stage of production, including inspection of the printer's preliminary press run to insure that colors conform to preset standards and that the negatives are in registration so that lines are sharp and crisp.

All text, tables, and lettering for the map and accompanying report are produced at the Survey with a computerized phototypesetting system that allows considerable flexibility in type styles and sizes and in formatting of text. This system interfaces with the Survey's word-processing system, thereby reducing the amount of keystroking necessary for documents.

Geologic maps and reports are labor-intensive products that require not only considerable time to produce, but also the skills of uniquely trained and experienced people. Few users of these maps and reports are aware of the complexity of the editorial, cartographic, and phototypesetting processes, although many are appreciative of the efforts.

THE FUTURE

It is quite obvious from this sketch of the Survey's history, activities, and responsibilities that our organization traditionally has been an important one to the state of Ohio. In the nearly century and a half since the Survey was founded, tremendous strides have been taken in the acquisition of knowledge and understanding of the geology of the state. In addition, a large data base of geologic information has been accumulated despite the fact that the Survey has always had a comparatively small staff. Many thousands of Ohioans, throughout several generations, have benefitted directly from Survey reports and knowledge, and all citizens have benefitted indirectly as residents of a state with a mineral-based economy.

Edward Orton's statement quoted at the beginning of this article remains as valid today as it was in 1893. We will never have complete knowledge of the geology of the state, but the closer we come to that altruistic goal, the greater will be the benefit to all.

—Michael C. Hansen

FURTHER READING

Hansen, M. C., and Collins, H. R., 1979, A brief history of the Ohio Geological Survey: Ohio Journal of Science, v. 79, p. 3-14.

NEW PUBLICATIONS LIST

The *List of publications* of the Division of Geological Survey has been revised and updated. The 19-page booklet lists all Survey publications, including those now out of print, and numerous open-file maps and other data in the Survey's files. An index and a list of Ohio libraries that are depositories for Survey publications are provided. Because of rising overhead and publication costs, the prices of many maps and reports have been increased. The new handling charges also are listed. *(Note: there was an error in the schedule of handling charges reported in the Summer 1984 issue of* Ohio Geology. *The handling charge for orders totalling $30.01-$50.00 is $4.00, not $5.00.)*

Survey customers should request a copy of the 1985 *List of publications* in order to have the revised prices. Copies of the *List of publications* are free of charge from the Survey offices.

1983 MINERAL INDUSTRIES REPORT

The Survey has released the *1983 Report on Ohio mineral industries,* compiled by Survey geologist and mineral statistician Margaret R. Sneeringer. The 1983 report represents the first year that the Survey has had full responsibility for gathering and reporting mineral statistics for Ohio. This function was formerly carried out by another state agency.

The report provides production and employment statistics for all of Ohio's mineral industries, which include coal, clay, gypsum, limestone and dolomite, oil and gas, peat, salt, sand and gravel, sandstone, and shale. A directory of mineral producers in the state and statistics on mineral value and wages within each mineral-commodity group also are included in the report. Single copies of the 1983 report are available from the Survey at no charge.

QUARTERLY MINERAL SALES, APRIL-MAY-JUNE 1984

Compiled by Margaret R. Sneeringer

Commodity	Tonnage sold this quarter[1] (tons)	Number of mines reporting sales[1]	Value of tonnage sold[1] (dollars)
Coal	10,069,020	261	339,324,321
Limestone/dolomite[2]	9,301,904	112[3]	31,604,377
Sand and gravel[2]	7,280,519	220[3]	21,287,758
Salt[2]	780,325	5[4]	5,187,861
Sandstone/conglomerate[2]	521,148	22	6,524,643
Clay[2]	194,401	30[3]	1,296,892
Shale[2]	265,985	21[3]	558,529
Gypsum[2]	52,504	1	498,788
Peat	7,472	5	44,252

[1]These figures are preliminary and subject to change.
[2]*Tonnage sold* and *Value of tonnage sold* include material used for captive purposes. *Number of mines reporting sales* includes mines producing material for captive use only.
[3]Includes some mines which are producing multiple commodities.
[4]Includes solution mining.

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U.S. POSTAGE PAID
Columbus, OH
Permit No. 537

Total copies printed: 5,200
Unit cost: $ .3150
Publication date: 2/85
(Includes paper costs)