

# IOWA Geology

NUMBER 4



## IOWA GEOLOGICAL SURVEY

123 North Capitol St.  
Iowa City, Iowa 52242

Dr. Stanley C. Grant  
Director and State Geologist

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The Honorable Richard Johnson	Auditor of State
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*Front Cover:* Coal specimen from the Lovilia Coal Mine No. 4, Monroe County. The white band contains sphalerite (zinc sulfide). The yellow color is pyrite (iron disulfide). Applying the methods and materials used to make color proofs of maps before printing, and by making several separations from the original black and white photo, color was built layer upon layer until the final print was derived. The results are reminiscent of Gum-Bichromate Prints made by photographers in the early 1900's. (Cover by John Knecht)

*Back Cover: Top Photo* — Early morning and the buses are ready to roll for the Tri-State field trips. (Photo by Michael J. Bounk)

*Bottom Photo* — Gypsum quarry in Fort Dodge (Photo by Raymond R. Anderson)

Charles J. Huelsbeck	Editor
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Charmaine Shreve	Production and Photography

Notice to Librarians: This issue of *Iowa Geology* is a continuation of the Iowa Geological Survey *Newsletter* which included v. 1, Numbers 1-3, 1976-1978. With the new name, the volume number is being discontinued.

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Associate State Geologist Orville Van Eck presents Fred Dorheim the Survey Certificate of Appreciation. (Photo by Timothy J. Kemmis)



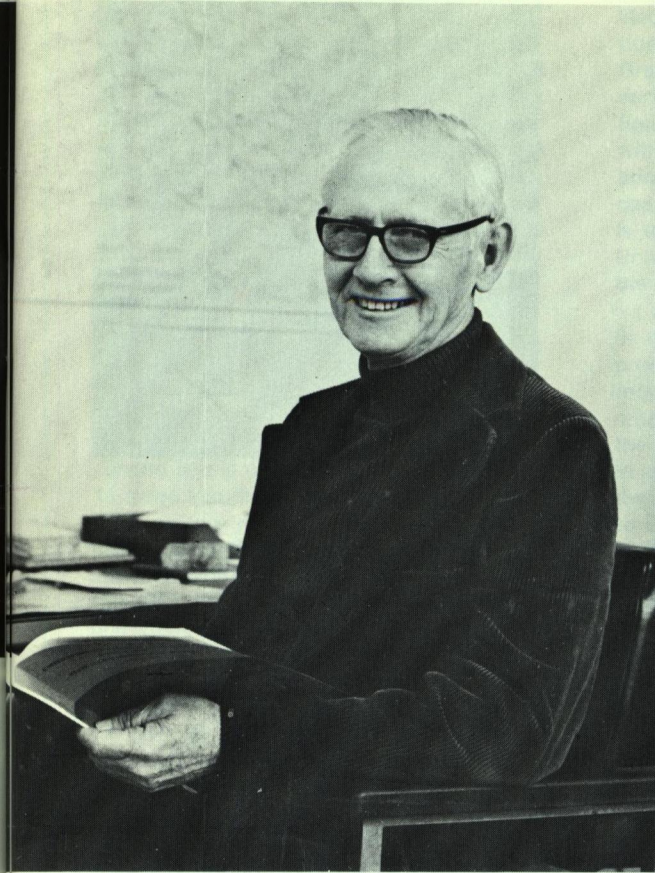
Fred and his wife Eleanor are honored at retirement banquet. (Photo by Timothy J. Kemmis)

This issue is dedicated to

## FRED H. DORHEIM

**Chief Geologist Emeritus  
Iowa Geological Survey**

for thirty years of Dedicated Distinguished Service to the State of Iowa, the Iowa Geological Survey, and the Iowa Department of Transportation through mineral resources research and applications, and through technical education services, while helping to make Iowa a better place to grow for industry, students, teachers, citizens, and colleagues.

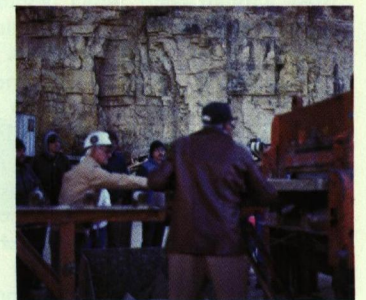
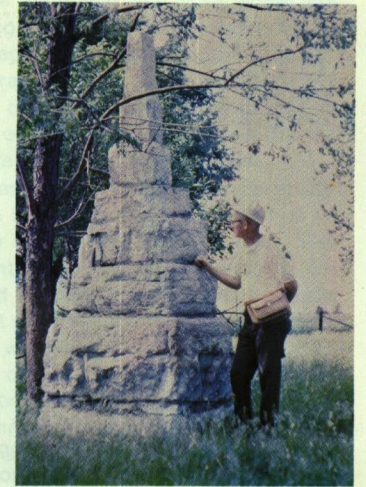


Above: Fred Dorheim, Chief Geologist Emeritus.

Top right: Fred Dorheim at site of Lithograph City Marker, June 1978.

Right center: Fred (right) on Geological Society of America Field Trip, May 1965.

Bottom right: Tri-State, 1978, Stone City.



# ON THE OUTCROP WITH THE DIRECTOR

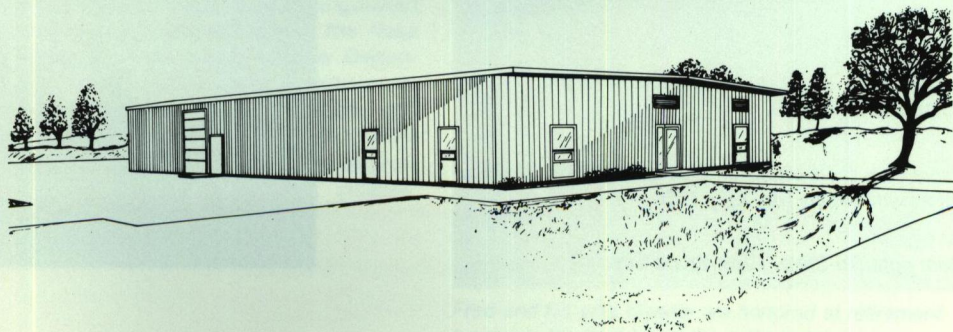


With the fourth issue of this publication, we have changed the name from *Newsletter* to *Iowa Geology*, which more directly reflects what the Iowa Geological Survey (IGS) is all about. We are a scientific and technical service agency to the government and the people of Iowa, with our principal effort being in the field of geological and hydrological services.

We dedicate this issue of *Iowa Geology* to Mr. Fred H. Dorheim, who has been a part of this agency for more than 22 years, and are featuring Iowa economic mineral resources, which he studied. Fred retired at the end of 1978 with 30 years of service to the State of Iowa as a geologist, first for the

Iowa Highway Commission (now a part of the Iowa Department of Transportation), and then for IGS. In recent years, Fred has been Chief of the Economic Geology and Stratigraphy Division and since September 1975, has been Chief Geologist of IGS. On 15 November 1978, he was designated "Chief Geologist Emeritus."

Fred has served Iowans in research, education, and industrial programs, which have enhanced the understanding of our resources and geological environment of Iowa. In retirement Fred will consult part-time with the limestone industry and probably will work on some special projects for IGS. Fred has been a long-time good friend



Artist's sketch of new IGS warehouse under construction on the Oakdale Campus, University of Iowa. (Drawing by Char Shreve)

and colleague to many of us, and we wish him well in his new role.

The year 1978 was very important for IGS. Significant progress was made in each of our major programs; elaboration on the various projects is found later in this issue. We also worked hard to hold down the cost of government by reorganizing for more efficiency and economy of operation. We cut out some projects that were important but low in priority. We eliminated travel that we felt we could not afford and limited new projects to those essential to other agencies of government. We are also doing most of the maintenance on our fleet of state vehicles.

Our long-needed sample and core library, warehouse, and laboratory building was funded and is under construction. We hope to move into the new facility before the end of June this year. The building will house the Coal Division offices and labs, the

Subsurface section of the Economic Geology and Stratigraphy Division, the Support Services Group, and the Contracts and Grants Division. It will have a well-equipped darkroom operated by the Illustrating section of the Technical Services Group and will also contain IGS records and publications storage and a preparation area for coal, mineral, and rock samples. The facility is located on the Oakdale Campus of the University of Iowa, and we are grateful for the cooperation of university officials.

I am pleased with the professional ability of the IGS staff and with the high level of production maintained by this agency. The requirement for services continues to increase, and we pledge that we will maintain the highest possible performance standards in all work we undertake. We want to assure the people of Iowa that the dollars allocated to us will be used wisely and with frugality while meeting the challenging scientific and technical service tasks that lie ahead.

Dr. Stanley C. Grant  
Director and State Geologist

## GEOLOGICAL BOARD MEETS

On December 14, the annual meeting of the Geological Board of Iowa was held at the Capitol Building in Des Moines with the Honorable Robert D. Ray, Governor of Iowa, as Chairman. Other board members included the Honorable Lloyd R. Smith, Auditor of the State; Dean D. C. Spriestersbach, Vice President for Educational Development and Research, University of Iowa (representing University of Iowa President Willard Boyd); Dr. W. Robert Parks, President, Iowa State University; and Dr. Karl Goellner, President of the Iowa Academy of Science. The 49th *Annual Report* of the Survey was presented to the Board with opening comments by Dr. Stanley C. Grant, Director and State Geologist, on the agency's reorganization

and operations. Other presentations were made as follows: Administration by Orville J Van Eck, Associate State Geologist; Administration and Support Services and Personnel Changes by Martha B. Kafer; Technical Services by Bernard E. Hoyer; Operations and Publications by Donald L. Koch, Assistant State Geologist; Coal by Dr. Matthew J. Avcin; Water Resources by Donovan L. Gordon; Stratigraphy and Economic Geology by Raymond R. Anderson, and appropriations request by Dr. Grant.

Progress on the new warehouse at the Oakdale campus was also reported. The report was enthusiastically received by the Board.

# HYPEROPIA: A BENEFIT IN STATE GOVERNMENT

By Orville J Van Eck



A number of years ago (15 to be exact), the Iowa Geological Survey entered into a cooperative program with the U.S. Geological Survey to conduct an aeromagnetic survey of the Mid-continent Gravity Anomaly (MGA) in

Iowa. The MGA is a zone of rather intense gravity and magnetic values, and it extends from Lake Superior down through Minnesota, Iowa, Nebraska, and Kansas. It appears to end in northern Oklahoma. At the time, the study appeared to be rather academic with little practical value to the people of Iowa. However, some of us did recognize an applied value and sought to gain executive and legislative support to complete the aeromagnetic mapping of the state. Fortunately the governors and legislators to whom we addressed requests for funds to complete the mapping were far-sighted enough also to recognize the future applied value and did appropriate the required funding. For that they are to be commended.

With the interpretation of the aeromagnetic maps came a new understanding of the basement rocks upon which the better understood sedimentary rocks were deposited. But beyond that we have come to realize that the structure and tectonics of those basement rocks have played important roles in the distribution and structure of the much younger sedimentary rocks.

Such understanding is important in evaluating and managing the water and mineral resources of Iowa and in recognizing a real possibility of valuable mineral resources that as yet have not been identified.

To date there have been no startling mineral resource finds in the state, but various studies along with the information from the aeromagnetic surveys are pointing to targets worthy of exploration. Probably most of the potential targets are too deep for economical exploitation at this time, but as economics change with more of the shallow mineral deposits of the United States depleted, the probability of utilizing those deeper deposits increases. To this end we are continuing stratigraphic, petrographic, structural, and geophysical studies.

Mineral exploration and development is not an activity that can be entered into with the view of turning a quick profit. A far-sighted commitment by industry is required. The Geological Survey believes that it is our role to provide information that will attract those commitments. Again, that is a far-sighted view.

Thus the title of this brief discussion. Hyperopia (far-sightedness) is a tremendous benefit in state government. Without it the basic geologic work upon which the more visible applied geologic work is based could not be conducted. We are convinced that the far-sighted confidence of the governors and the legislators who appropriate the funds that enable us to conduct those basic studies will continue to be rewarded. (Mr. Van Eck is the Survey's Public Service Executive.)

# ECONOMIC GEOLOGY AND THE IGS SINCE WORLD WAR II

By Fred H. Dorheim



My earliest contact with the Iowa Geological Survey was in the first ten years following World War II when I was geologist for the Iowa Highway Commission (now D.O.T.) and later for industry. During those years I could

call on Survey personnel to go in the field with me to evaluate an economic problem, to read a core, or to solve a water problem. Their capability then, as now, is not limited by "state-line faults." Frequently, and always in a rush, I would stop by on my way to an out-of-state project and get helpful information on Missouri, Texas, or West Virginia, to name a few states. During these same years the Survey started a project to study the aggregate availability of southwest Iowa. When the project was completed and published, it became the "bible" for geologists, materials engineers, and materials producers in the area — in fact, a major contribution to a network of good roads in southwest Iowa.

I joined the Iowa Geological Survey in June 1956. We have continued to provide the kind of help that I have described above. Requests for rock and mineral data come, not only from the rock industry itself, but also from individuals who want to know what is on their land and from engineering consultants who want to know what type of foundation problems they may have or what problems they may expect to encounter in placing a water line, sewer line, or similar type of excavation.

In the late fifties when county conservation boards were formed, there was an epidemic of interest in building county recreation lakes. Because those in economic geology were most closely associated with near-surface rock conditions,

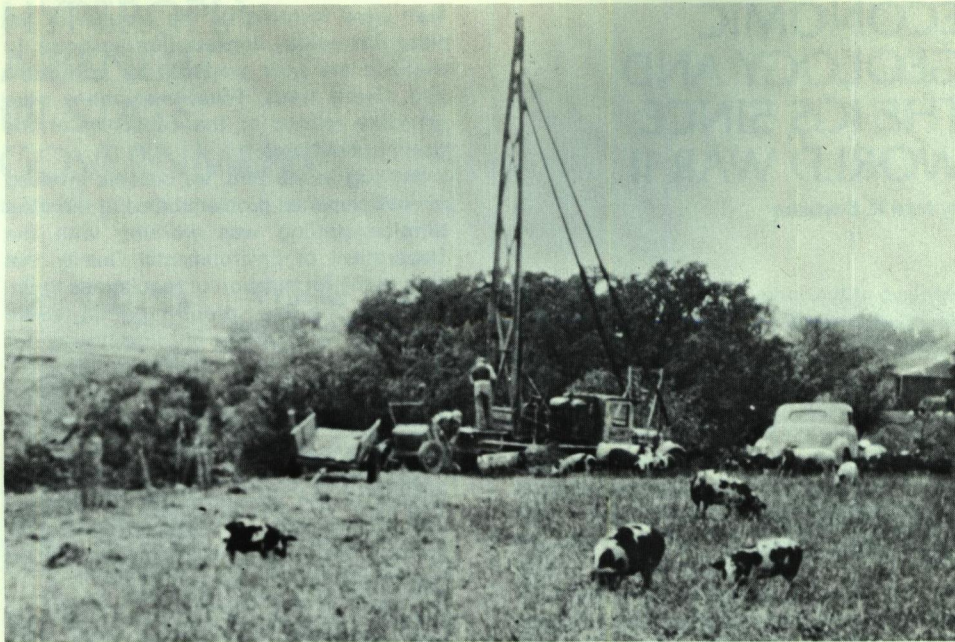
they were involved, at the request of the state and county conservation agencies, to evaluate the sites proposed for both state and county lakes. These evaluations were primarily related to the capability of the basin to hold water.

Starting in the 70's, we became involved in environmental problems. One of the most time-consuming was working with the Department of Environmental Quality, not only in the formulation of regulations to implement the law requiring that waste (garbage) be disposed of in approved disposal sites, but also in working with DEQ, county commissions and engineering consultants in selecting sites that would be safe for disposal of this waste. Our interest and involvement in this is based on our concern relative to the protection of both surface and groundwater resources. In doing this, we provided geophysical data on sites being considered for waste disposal and, on the basis of this information, advised the local commission on which sites were worthy of further exploration. When the plans were formulated and soil testing was done, we studied the soils and the plans to see if all provisions related to protection of the water resources had been adequately provided for.

Another environment/energy-related activity in which we are participating is to provide industry, their consultants, and other agencies with data on high-calcium limestone, which is used by the power companies to reduce the sulphur escaping from the stacks when high sulphur coal is used in the power plant. This will be an important factor in keeping the air clean if Iowa coal is used in the production of electrical power.

In education, personnel from the Economic and Subsurface Division of I.G.S. have, over nearly 20 years, worked as resource persons with the Iowa Conservation Commission, the U.S. Soil Conservation Service, the State Department of Public Instruction, and schools at all levels in trying to show teachers and students how industry converts natural rock and mineral resources into useful products for society. This has been done by lecturing, leading field trips, and working on the preparation of Conservation guidebooks for use in the schools. (Mr. Dorheim, Chief Geologist Emeritus, was Chief of the Stratigraphy and Economic Geology Division.)





This 1947 photograph shows the Gus Pesch drill-rig boring an exploration hole at the site of the Fort Dodge Limestone Company quarry near Le Mars.

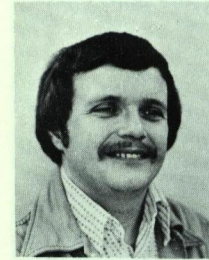


The Le Mars Quarry, owned by Fort Dodge Limestone Company, is shown during its first year of operation in 1948. The shovel and truck are used to excavate and haul the Cretaceous-age limestone to a nearby crusher.

The land in these photographs is now the location of "Camp Quest", an outdoor education facility owned by the Le Mars Community School District. The Iowa Geological Survey drilled deep test holes here this past summer as part of the Northwest Iowa Groundwater Resources Study. Photos provided by Fort Dodge Limestone Co. Division, Welp and McCarten Inc.

## THE FUTURE OF IOWA'S MINERAL INDUSTRY

By Raymond R. Anderson



The mineral industry in Iowa anticipates a continuation of the trend which has produced ten consecutive years of record production value. In 1977 the industry produced over \$231 million in products and employed almost 10,000 people in extraction and secondary production.

The most valuable mineral product in Iowa continues to be cement. It accounted for 45% of the total mineral value of the state in 1977, and most of Iowa's five cement producers are already planning to increase production to meet the skyrocketing demand for their product.

Production of limestone and dolomite for concrete aggregate, road stone, agricultural lime, and other uses is expected to continue to increase slowly, as it has for the previous two decades. The upturn in demand for concrete should produce a parallel demand for concrete aggregate. With the value of Iowa farmland escalating, the economics of underground extraction of stone are becoming more favorable. Already 10 underground stone mines are in operation in Iowa, with more under consideration. High-calcium limestone formations are most attractive for underground mining. This stone is usually of concrete aggregate quality and may soon be very valuable as an absorbent in the large new power plant stack-gas scrubber market. These high-calcium limestone formations include the Gilmore City in north-central Iowa, the Wapsipinicon in the east-central, the Spergin in the southeast, and the Hertha in the southwest part of the state.

Sand and gravel production, presently valued at slightly over 12% of Iowa's total

mineral production, should also continue to increase moderately in the future. As in the past, the areas of greatest production will continue to be concentrated along major rivers near large urban areas and in areas of limited production from other aggregate sources. Remote sensing and other new technologies can be utilized to prospect for new deposits in the aggregate-poor areas of western Iowa, allowing expansion of the sand and gravel industry into these high-need areas.

Gypsum production from rocks of Jurassic Age near Fort Dodge will begin to diminish within the next few decades as this limited resource is depleted. Total production of gypsum for wallboard, plaster, and other products, however, could continue to rise if subsurface gypsum deposits of Devonian and Mississippian age eventually are mined more extensively. (See Figure 1)

With the current renewed emphasis placed on coal as an energy source, the use of coal in the state should nearly double over the next eight years to over 17 million tons annually. The amount of Iowa coal that will be produced to meet this need is difficult to predict, owing to many economic and environmental considerations. Over

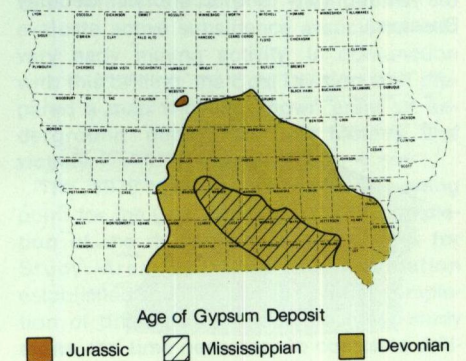


Figure 1. Gypsum Resources of Iowa

41% of Iowa is underlain by potentially coal-bearing rocks, and coal resources in the state are estimated to range between 10 and 20 billion tons. This huge resource hopefully will be utilized more fully, but it is difficult to predict exactly when.

The future of clay production in Iowa is not as bright as that of other non-metallic minerals. Despite an increased demand for building and decorative brick, competition for the pipe market from plastic and concrete pipe producers will continue to put a heavy stress on the few remaining clay producers in the state.

Although economically recoverable deposits of metallic minerals are unproved, and their economics have been unstable, there is potential for future production in Iowa. Valuable deposits of copper, zinc, and lead may be discovered in northeast Iowa. Anomalously high concentrations of zinc in some of the coals in the state hint at the possibility for recovery of this mineral somewhere in southern Iowa.

The study of geophysical data such as aeromagnetic maps of Iowa could lead to the discovery of deeply buried metallic mineral deposits in the state's "basement". Deposits of iron-bearing minerals have already been discovered in northwest Iowa. Further exploration drilling is necessary to determine if they can be recovered economically. Current research on a magnetic anomaly centered in Delaware County suggests a geologic setting similar to a known area of metallic mineralization in Wisconsin.

Future production of these and yet undiscovered mineral resources could add significantly to the economic base of Iowa's mineral industry. (Mr. Anderson is Chief of the Stratigraphy and Economic Geology Division.)

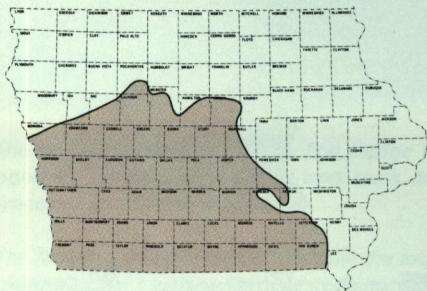


Figure 2. Areas of Potential Coal Production

## HISTORY OF COAL MINING IN IOWA

By Dr. Matthew J. Avcin, Jr.

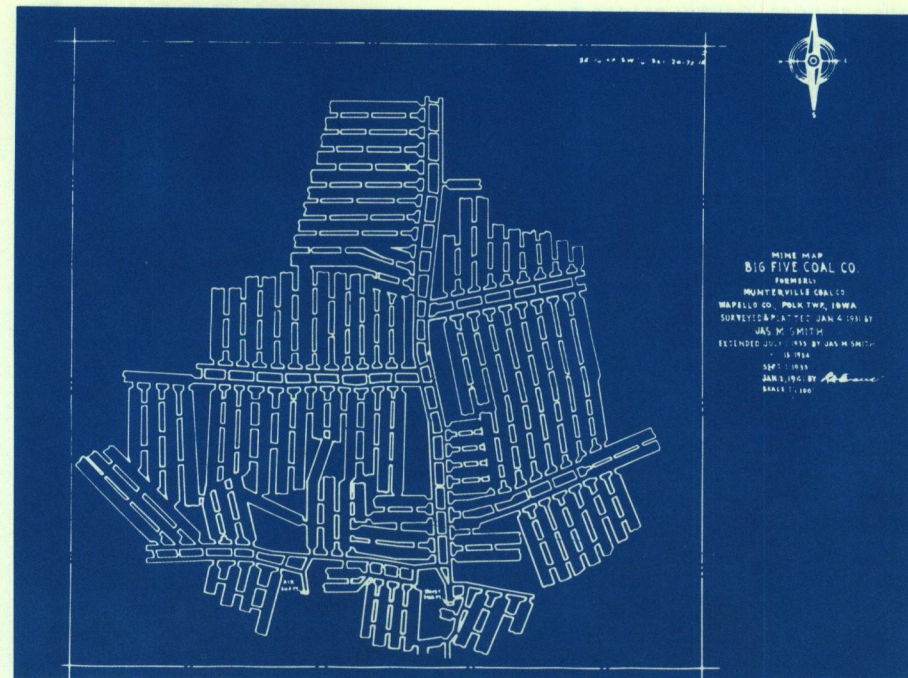


Coal mining in Iowa started in several areas of the state in the early 1840's. The coal was used locally for home heating and for smithing operations. Production increased gradually as coal replaced wood as fuel for both home

use and boat traffic on the Des Moines River, but did not top 100,000 tons/yr. until the late 1860's. About this time the coming of the railroads resulted in the acceleration of the coal industry in Iowa, and the industry continued to expand until its peak period in the early 1900's.

Although the industry had its best year in 1917 in response to war conditions, the die had been cast. In 1900 the population of the state had reached 2,232,000 and since then has grown only moderately to the present level of approximately 2,870,000. Agriculture has been the dominant economic endeavor; industrial development slowed when it became obvious that the state was blessed with natural resources more suited to growing crops than for the support of large industry, removed as it was from the main markets to the east. These trends effected a ceiling on the development of Iowa coal, and a long-term decline was assured by events outside the state.

The principal pressure on the coal industry in Iowa was competition for its traditional markets from out-of-state sources, which were cheaper, either because of easier mining conditions or better technology combined with economies of scale. In addition, the availability of other fuels such as oil and gas began to compete with coal. Without a large industrial base to serve as a safe market, the industry slowly slid back to production levels comparable to the 1860's and early 1870's. The industry today supplies small amounts of coal on



Mine map of Big Five Coal Company, located in Wapello Co., surveyed in 1931.

short-term contracts and the spot market to local utilities. The IGS coal exploration program is designed to provide data that will enable the coal industry to locate the

thickest deposits of highest quality coal in the state to encourage growth of the industry. (Dr. Avcin is Chief of the Coal Division.)

## THE COAL DIVISION IN '78

By Dr. Matthew J. Avcin, Jr.

The year 1978 marked the conclusion of a series of intermediate-range projects by the research staff of the Coal Division. The results of several of these projects will be published in 1979, including two papers on palynology, a summary paper on general stratigraphy prepared for the International Congress of Carboniferous Stratigraphy and Geology, a paper on coal chemistry, and a summary report on Study Area #1 (Wapello, Davis, Jefferson and Van Buren Counties).

In Study Area #1, drilling was completed in November 1978, and the last of the logs

were released in December. The backlog of undescribed core was greatly reduced, and the remaining backlog should be taken care of before the 1979 drilling season is very far advanced. Other drilling completed in the past year included a series of stratigraphic tests within the city of Des Moines to evaluate active subsidence associated with very early mining activity. In conjunction with this drilling, the Coal Division staff prepared a map showing known areas of underground mining in Des Moines and vicinity.

The 1978-1979 period marks a turning point for the Coal Division with the completion of the drilling and report phases for Study Area #1. With the foundation established thus far and the partial completion of drilling in some of the other study areas, the time necessary to complete drilling and prepare summary reports should be reduced appreciably.

## VAN ECK AND HORICK HONORED

On July 26, University of Iowa President Dr. Willard L. Boyd, representing Gov. Robert D. Ray for the Geological Board of Iowa, presented certificates to Orville J Van Eck, Associate State Geologist, and Paul J. Horick, Senior Ground Water Geologist, for 25 and 30 years of service respectively. In his congratulations, Dr. Stanley C. Grant, Director and State Geologist, emphasized several of their many accomplishments. Attending were the families of the recipients, the Survey staff, Board Member Dr. Karl Goellner, and Ms. Wilma V. Gould, former Administrative Assistant at the Survey.

Mr. Van Eck, a native of Grand Rapids, Michigan, joined the Survey in 1953. He was a meteorologist for the Army Coast Artillery from 1942 to 1946. He earned the B.S. and M.S. degrees in Geology from the University

of Michigan, where he studied for an additional year. Of his several publications significant to the geology of Iowa, the most widely circulated is *Coal Resources of Iowa* (IGS Technical Paper No. 4, 1965). His most recent publication is *Plugging Procedures for Domestic Wells* (Public Information Circular No. 11, 1978). He and his wife, Pat, have two daughters and one grandson.

Mr. Horick was born in La Grange, Illinois and has the B.A. degree in Economics from Augustana College in Rock Island and the M.S. in Geology from the University of Iowa. He has been with the Survey since 1948. From 1970 to 1978 he was Chief of Ground Water Geology and in 1978 was appointed Senior Ground Water Geologist. Of the seven publications that he has written or co-authored, the major ones are *The Minerals of Iowa* (Iowa Geological Survey, 1974), *The Mississippian Aquifer of Iowa* (IGS Misc. Map Series 3, 1973), and *The Jordan Aquifer of Iowa* (IGS Misc. Map Series 6, 1978). He also planned and edited the popular Iowa Academy of Science collection, *Water Resources of Iowa* (University of Iowa Printing Service, 1970). He and his wife, Claudia, have a daughter and a son.



Paul Horick and Orville Van Eck receive awards. Left to right: Dr. Karl Goellner, Paul J. Horick, Orville J Van Eck, and Dr. Willard Boyd

## THE JORDAN AQUIFER

By Paul J. Horick



A water-bearing stratum that supplies about 18 to 19 billion gallons of water annually to Iowa municipalities and industries and as much as 1,000 to 2,000 gallons a minute or more to individual wells is the subject of a new report recently published by the Iowa Geological Survey (Miscellaneous Map Series 6, 3 sheets, 1978). Named for outcroppings of the Jordan Sandstone along the Mississippi and Upper Iowa River valleys in Allamakee and Clayton Counties, the formation extends beneath the entire state except the northwest corner. About two-thirds of the total withdrawal from the Jordan aquifer is by municipal wells, and the remaining one-third is by industrial wells. Major pumping centers are found at Mason City, Cedar Rapids-Marion, the greater Des Moines area, and Fort Dodge. The bulk of the withdrawal is concentrated in the eastern two-thirds of the state, where the aquifer is more permeable and the water is of better quality. Approximately 200 wells pumping significant quantities of water tap this source.

Historical data on water levels indicate that the static head of the aquifer has lowered by as much as 175-200 feet in the principal pumping centers and 50 to 150 feet regionally since the first wells were drilled 75-85 years ago. The drop in the pressure surface is expected to continue as ground-water use increases. Recently the state imposed restrictions on the use of the Jordan aquifer for irrigation or by power

companies which require enormous amounts of water for their operations and would drastically lower the pressure surface of the aquifer. Although there is a current imbalance between recharge in the northern part of the state and withdrawal by wells and natural discharge to the southeast, the authors of the report do not foresee any danger of restricting use of the aquifer except locally at the pumping centers. In these places the problem can be mitigated by proper spacing of the wells.

Chemical and temperature studies show the water from the Jordan to range from good to poor quality, with the best quality occurring in the northeast part of the state and the poorest in the western part. This is attributed to the character and thickness of the rocks through which the water passes and the rate at which the aquifer is flushed. The main recharge area for the Jordan aquifer is in north-central Iowa and southern Minnesota, whence the water flows laterally southeastward. However, an estimated 38 percent of the water in the Jordan is received by vertical leakage through overlying sediments in central and western Iowa.

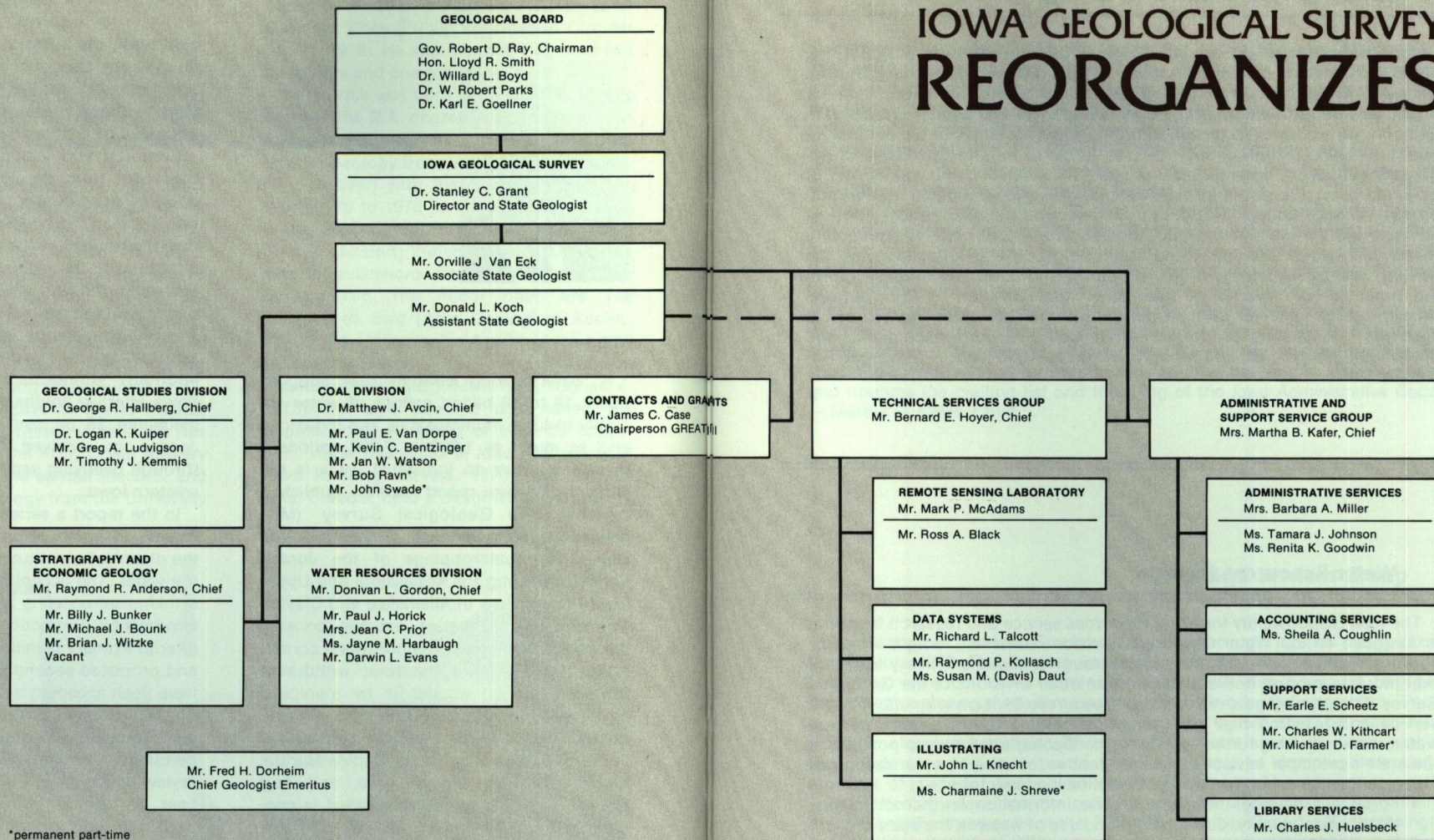
In the report a series of charts and maps outline in some detail the significance of the chemical constituents and properties of the water. The acceptability of the water for drinking purposes is based on the U.S. Environmental Protection Agency's National Interim Primary Drinking Water Regulations and proposed secondary regulations, which have been accepted by the Iowa Department of Environmental Quality. Standards of water quality for industry are different, depending on how the water is to be used. A review of the maps will enable an industrial user to decide if the water meets his particular requirements.

Low concentrations of radium have been found in Jordan aquifer water supplies. The effects on human health are not fully known. The concentrations exceed the recommended EPA primary regulations in all but the northeast parts of the state. Fortunately, the radioactivity can be removed easily by softening processes.

Pertinent data are also supplied to calculate the depth of a well needed to penetrate the aquifer, the potential yield, static head, and drawdown. (Mr. Horick is Senior Ground Water Geologist in the Water Resources Division.)



# IOWA GEOLOGICAL SURVEY REORGANIZES



\*permanent part-time

The year 1978 saw a major internal reorganization of IGS. First organized into operating divisions in 1975, the structure was changed in July last year to provide more functional and efficient management, personnel assignment, and program accountability.

Under the Director and State Geologist, the administrative and service functions were assigned to Associate State Geologist Orville J Van Eck, along with contracts and

grants. Mrs. Martha Kafer was appointed Administrative Officer and Chief of the Administrative and Support Services Group. Mrs. Kafer supervises the office and accounting staff, the librarian, and the support services staff. Mr. Bernard Hoyer was appointed Chief of the Technical Services Group, which includes the Remote Sensing Laboratory, Data Systems, and Illustrating sections.

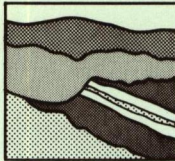
Operational functions were assigned to

Assistant State Geologist, Donald L. Koch, under whom four operating divisions were established. These include the Geological Studies Division, Dr. George Hallberg, Chief; Coal Division, Dr. Matthew Avcin, Chief; Water Resources Division; Mr. Donovan Gordon, Chief; and Economic Geology and Stratigraphy Division, Mr. Raymond Anderson, Chief.

Staff assigned to the operating divisions perform functions related to the major pro-

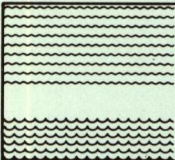
grams of the division. They may also work on projects with other divisions as the need may dictate.

The Administrative and Service Groups serve the agency as a whole and carry out projects for other state agencies as well. — Dr. Stanley C. Grant, Director and State Geologist



## Stratigraphy and Economic Geology Division

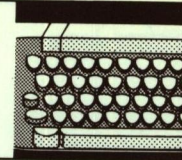
The Stratigraphy and Economic Geology Division has been assigned the combined duties of the previous Mineral Resources and Subsurface Studies Divisions. These include answering requests of a geologic nature from the public as well as those from well drillers and mine and quarry operators. In addition, we endeavor to remain informed about all facets of the mineral industry in Iowa, including such diverse fields as new technologies in aggregate extraction, potential new markets for products, and monitoring of oil exploration. We also log rock stratigraphies and lithologies from selected well cuttings collected by well drillers around the state, adding this information to our file of over 26,000 logs. In addition, our staff is conducting research in water availability and quality in northwest Iowa, studying the geology and geohydrology of Floyd County, and collecting information on the potential for deep-lying "basement" mineralization in Iowa, among other projects. Other division responsibilities include providing geological assistance in locating sanitary landfills, aiding in dam inspections, and coordinating geological and topographic mapping in Iowa. — Raymond Anderson, Chief



## Water Resources Division

The lead responsibility for water resources service and research functions is assigned to the Water Resources Division. However, today's water resources problems must be addressed through a multidisciplinary approach that requires support and assistance from other divisions of the Geological Survey. The primary goal of the Water Resources Division is to effect public service and research that will promote a better understanding of Iowa's water resources and further enhance the Geological Survey's position as the state's principal advisor and consultant in the area of water resources. This goal can be achieved through the following objectives:

- To collect, catalog, index and archive information on the occurrence, distribution, quality, development and use of water in the state;
- To provide advisory services to the public, private industry, agriculture and the state in relation to the development, use, management, protection and conservation of the state's water resources;
- To research and report findings concerning the occurrence, distribution, quality, development potential and status of the state's water resources;
- To identify and research water problems, as a division or in cooperation with other divisions or agencies, related to the development, use, protection, conservation and management of the state's water resources;
- To provide technical support to the agency, the state, or other state and federal agencies in the areas of data acquisition, research drilling and testing;
- To keep current with developments in research and applied technology in the fields of surface and ground water hydrology and water resources planning and management. — Donovan L. Gordon, Chief



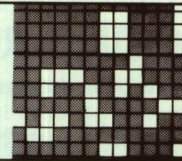
## Administrative and Support Services Group

*Administrative Services:* Mrs. Barbara Miller, Office Manager; Ms. Tamara Johnson, Secretary; and Ms. Renita Goodwin, Secretary, provide secretarial, communications, and reception services to all programs. They are also responsible for mail distribution, publications sales, and maintenance of the map and publications inventory.

*Accounting:* Ms. Sheila A. Coughlin, Accountant, provides accounting record-keeping, payroll, and purchasing services. She also provides the management with detailed quarterly budget reviews.

*Support Services:* Earle E. Scheetz, Administrative Assistant; Charles Kithcart, Geologic Aide; and Michael Farmer, Geologic Technician, collect the drill cuttings received regularly from drilling contractors and process them for microscopic study. They catalog and shelve additions to the cuttings and core library as well as maintain the Survey vehicle fleet.

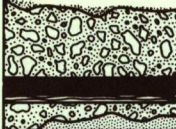
*Library Services:* Charles J. Huelsbeck, Technical Librarian, has developed a cataloging system uniquely suited to the collection of publications shelved in the several offices of the Survey. He also researches for special projects, edits serial publications such as the annual *Iowa Geology*, and updates the mailing list and the filing of the *Iowa Administrative Code*. — Martha B. Kafer, Chief



## Technical Services Group

The Technical Services Group was formed through internal reorganization in July 1978. The Remote Sensing Laboratory, Data Systems, and Illustrating were combined administratively under this group to improve coordination among these three primarily service-oriented operations. Each is responsible for providing services internally to IGS staff, but each also works in close cooperation with other government agencies. Their goal is to provide information in useful formats. All require comparatively large amounts of space for mechanical, electronic, or optical equipment.

As technology develops, the capabilities of the Geological Survey will increase, and the three units of the Technical Services Group will increasingly be utilizing new capabilities in common. The interrelationships between data handling techniques and the programs of the units are apparent. Data Systems is developing increased computer capabilities for analyzing geographically distributed data. At the same time, the Remote Sensing Laboratory is cooperating with NASA and several state agencies to investigate the development of a computer information system which could utilize satellite data. Both can utilize much of the same processing hardware. Further, both need to produce map products which are usable either as interim or final products. This leads directly to equipment and techniques that can be employed by the Illustrating Section. Overall, the Technical Services Group as organized will effect an efficient, well coordinated division to serve better the needs of its component units and the needs of the Geological Survey. — Bernard E. Hoyer, Chief



## Coal Division

The activities of the Coal Division are subdivided into data acquisition and research. The data acquisition group is field-based in southern Iowa and is composed of a drilling crew and two geologists. Mr. Kevin Bentzinger is the research driller, and he is assisted by Mr. Jan Watson. Field logging of drilling samples and cores is accomplished by Mr. Paul Van Dorpe, Geologist, who also acts as liaison between IGS and the general public. Ms. Mary Howes is the second geologist assigned to southern Iowa and has primary responsibility for the description and sampling of surficial exposures.

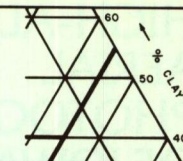
The research group is based in Iowa City and is composed of three people. Dr. Matthew Avcin is head of the Coal Division and is specifically responsible for coal chemistry, while Mr. Robert Ravn is working on palynology, and Mr. John Swade is studying conodonts. All three researchers share responsibility for synthesis of the data generated. — Dr. Matthew Avcin, Chief

## TRI-STATE FIELD CONFERENCE

By Raymond Anderson



Dr. George Hallberg leading Tri-State Field Trip on the Iowan Erosion Surface, south of Le Grand.



## Geological Studies Division

The primary task of the Geological Studies Division is to conduct and coordinate applied studies that are fundamental to the understanding of Iowa's physical resources. Such studies may be independent of other Survey divisions or may be performed in support of other division projects. In addition, many of the studies are done in cooperation with other agencies, especially soils and water-related investigations. Currently under way are a wide variety of projects, which include the Dakota sandstone aquifer study in northwest Iowa, analysis of hydrologic situations for waste disposal, investigation of engineering properties and hazards of Iowa soils, the nature of economic mineralization in northeast Iowa, and the history of the Missouri River alluvial plain. — Dr. George Hallberg, Chief

On October 13-15, 1978, the Iowa Geological Survey sponsored the 42nd Annual Tri-State Geological Field Conference, which provides an opportunity for professional geologists, students, and the interested public from the tri-state region of Iowa, Illinois, and Wisconsin to examine and discuss specific geological problems. The locations of the meetings rotate among the three states, under the sponsorship of colleges or state geological surveys. This year's conference was headquartered at Kirkwood Community College in Cedar Rapids and was attended by 150 people.

Four field trips were conducted during the conference. Two trips on the 14th included a tour and description of the Plum River fault zone in eastern Iowa and an examination of the Pleistocene history, stratigraphy, and geomorphology of the Iowan Erosion Surface of east-central Iowa. The conference was successfully concluded on the 15th with a trip to examine the geomorphology and basal Maquoketa stratigraphy of the Dubuque area and a trip to the Stone City quarries near Anamosa, with review of the local geology and history. A banquet on the evening of October 14th featured a presentation by Dr. Carl Vondra of Iowa State University on "Ancient En-

vironments and Early Man at Lake Turkana, Kenya."

Copies of the Guidebook to the 42nd Annual Tri-State Geological Field Conference, including detailed descriptions of the four field trips, as well as a fifth trip which was to examine applied engineering geology in the Cedar Rapids area (subsequently cancelled), are available from the Iowa Geological Survey for \$4.20, postage and handling included.

### Geopoetry

The IGS received many compliments on the Tri-State Field Conference, but to my knowledge only one participant was moved to poetry. An unnamed U.N.I. geology student was so inspired by the Pleistocene field trip that he penned the following song (with apologies to Karen and Richard Carpenter).

*"We're on the Top of the World looking down from a paha at the gently-stepped slopes all around. And the reasons were found because Ruhe came around — Paha's put us on the Top of the World!"*

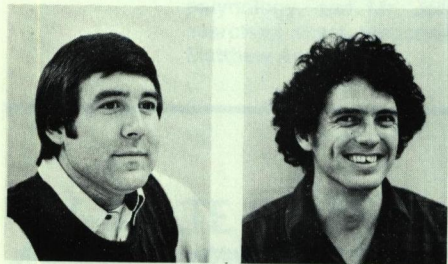
(Mr. Anderson is Chief of the Stratigraphy and Economic Geology Division.)

# HIGH-ALTITUDE AERIAL PHOTOGRAPHY OF IOWA

By Timothy J. Kemmis  
and Patrick McAdams

*"The wealth of Iowa is in her soils, and her strength lies in their intelligent development."*

— Anonymous



Timothy J. Kemmis

M. Patrick McAdams

In May 1978 high-altitude color-infrared photographs were obtained for the Des Moines Glacial Lobe and Louisa, Lee, Henry, and Des Moines Counties — about 23,000 square miles. (Figure 1). The imagery was acquired through the cooperative efforts of the Iowa Department of Soil Conservation, the U.S. Soil Conservation Service (SCS), the U.S. Army Corps of Engineers, and the Iowa Geological Survey Remote Sensing Laboratory.

Color-infrared imagery (CIR) was used because experience has shown it to be superior for imaging land use as well as soils and surficial geology. Thus it would be of maximum value to the cooperating agencies. The scale of the imagery is 1:80,000 (slightly less than one inch to the mile). This scale provides a good balance between resolution and areal coverage. It depicts small landforms with great detail, and yet gross landform differences often can be viewed on one photograph (see the accompanying photographs).

The CIR photography will be used by the different agencies for various research projects. The imagery will provide the Iowa

Department of Soil Conservation with information on land-use and conservation practices. The SCS plans to use the photography for river basin planning, resource and conservation inventories, soils mapping, and land-use studies. The Corps of Engineers will use the imagery to study surface-water resources in the Des Moines River basin.

Geologists at the Iowa Geological Survey will study the CIR photography for information on surficial geologic materials and soils. The clarity and detail of the photography will permit precise mapping of the distribution of different landform-material associations. This mapping will be integrated with detailed field studies to document the association between individual landform types and the kind and character of soil materials which comprise them.

The results of this program will produce a better understanding of the surficial deposits for those portions of the state under study. This will aid applied programs such as soil mapping, engineering studies, and land-use planning and management.

This photography complements similar imagery obtained over southern and southwestern Iowa in May 1975. Together they form a useful record of Iowa land use and a valuable record for assessing resource problems over about 30,000 square miles. IGS is hopeful that this record can be completed for the entire 56,000 square miles of Iowa in the near future. (Mr. Kemmis is a research geologist in the Geological Studies Division and Mr. McAdams is Supervisor of the Remote Sensing Laboratory.)

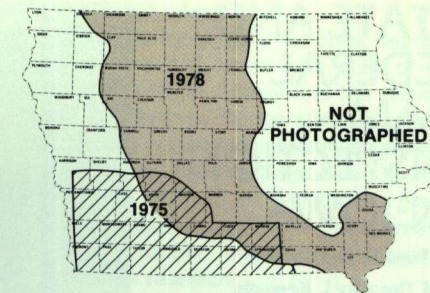
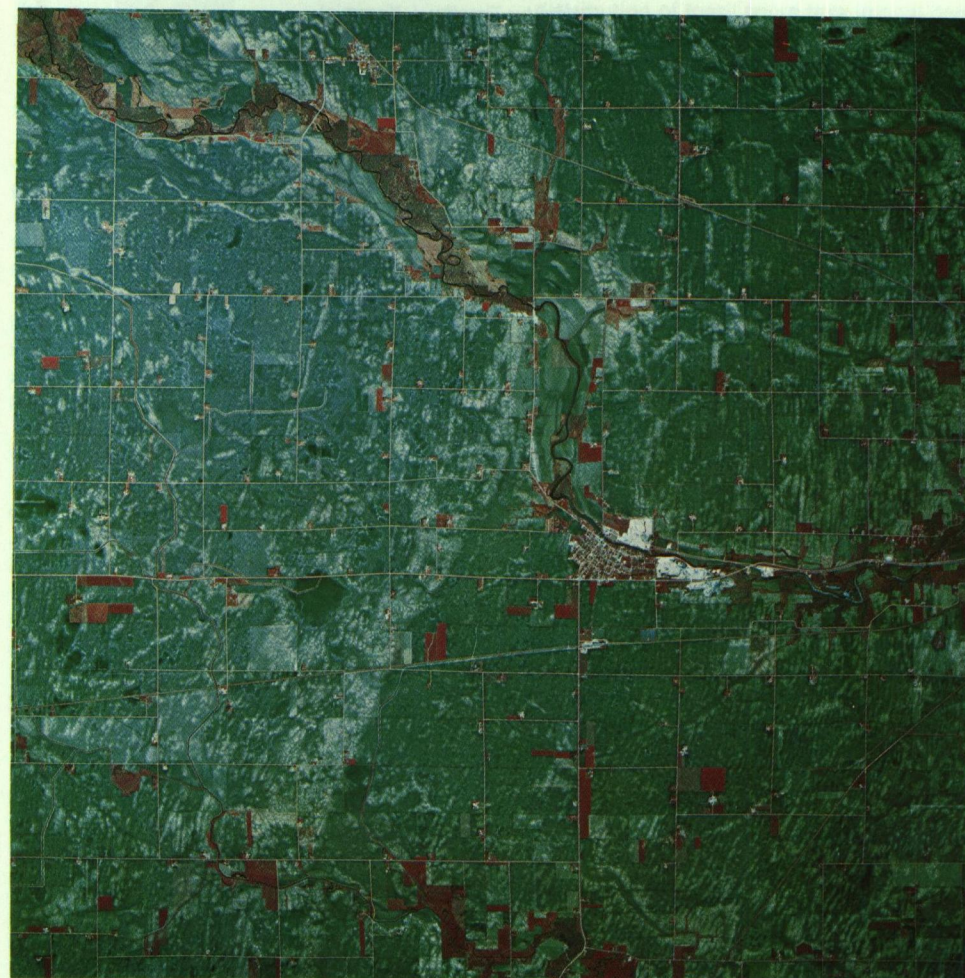


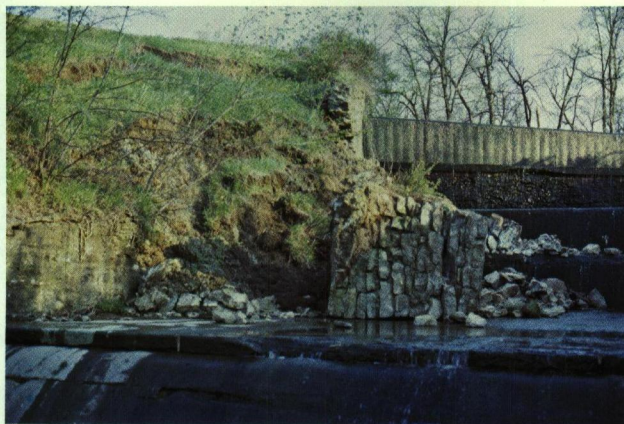
Figure 1. High Altitude Color Infrared Photography.



Color infrared photograph of the Alden area. Linear "minor moraine" landforms are shown on the left. The town of Alden, the Iowa River, and a high N-S trending ridge directly west of Alden are shown. (Photo by Timothy J. Kemmis)

# STATE AND FEDERAL DAM INSPECTION IN IOWA

By Fred H. Dorheim  
and Timothy J. Kemmis



*Collapsed lower spillway observed on a dam inspection.  
(Photo by Timothy J. Kemmis)*

As of January 1, 1978, the State of Iowa joined in a federally funded program to inspect "hazardous" dams in Iowa. The term "hazardous" has nothing to do with the condition of the dam but is defined in terms of the size of the impoundment, the head of water impounded, and the proximity of residences, schools, hospitals, or other occupied buildings downstream from the dam. Federal structures, such as the Coralville, Red Rock, or Rathbun dams are not in this program. They are totally the responsibility of the Federal government.

The purpose of the inspection is to review the condition of the dam and the impoundment, to point out any condition that needs correction, and to advise on maintenance practices.

Input from the Iowa Geological Survey has been to identify bedrock and soils conditions at the dams, to look for seepage areas, and to note those conditions that would tend to promote erosion or settlement of the fill materials.

The inspection team is made up of five persons from the U.S. Army Corps of Engineers, two from the Iowa Geological Survey, and two from the Iowa Natural Resources Council. The make-up of the inspection team includes civil engineers, geologists, hydrologists, and, when required, an electrical engineer and a mechanical engineer.

The ownership of the impoundments varies. Some, such as lakes in state parks, belong to the State of Iowa; others, such as

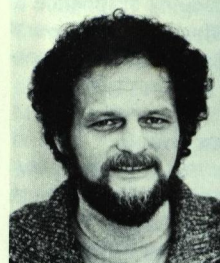
reservoirs for water supply, belong to municipalities; and yet others, such as impoundments belonging to housing developments or power companies, are privately owned.

Between January 1, 1978 and November 1, 1978 the team has inspected 18 impoundments. The conditions of the dams vary. Because Iowa has had a dam safety program for quite a long time, most of the dams have been in satisfactory to good condition. However, as the accompanying photograph shows, some dams have been found to require maintenance to prevent serious problems from developing. For those few that have had more serious problems, the owners have taken steps to have the condition corrected. Thus, an important role of the inspection program has been to inform dam operators of existing problem areas and to indicate which parts of the dam structure owners should inspect routinely for potential problems.

After the dams have been inspected, a report goes to the governor of Iowa, to the owner of the dam, to the Natural Resource Council, and to the Iowa Geological Survey. It is the responsibility of the State of Iowa, through the Natural Resources Council, to see that the corrective recommendations are followed. (Mr. Dorheim, Chief Geologist Emeritus, was Chief of the Stratigraphy and Economic Geology Division; Mr. Kemmis is a research geologist in the Geological Studies Division.)

# EXCURSIONS AND MEETINGS IN '78

By Donald L. Koch



## Lawrence of Kansas

Orv Van Eck returned to Lawrence on January 3 to finalize plans for a contract proposal to the Nuclear Regulatory Commission (NRC) for supporting studies in structural geology and seismicity in southwestern Iowa. A network of five seismic recorder stations will be established in 1979 to obtain background data in advance of any future proposals for siting nuclear power plants within or near this area of the midcontinent.

## Winter Cloudburst?

Dr. Grant, Director of IGS, presented talks on water availability during the week of January 16 at Estherville, Swea City, Storm Lake, and Spencer, Iowa. The meetings were sponsored by the Agricultural Extension Service (Iowa State University, Ames) to provide area farmers with information on water resources and to discuss problems that might result from extensive use of groundwater to irrigate crops.

## Keeping Cool

The Little Amana Holiday Inn was the setting on February 3 for the Geological Society of Iowa's Annual Meeting. Highlights of the adventures of Dr. Keene Swett and David Johnson (U. of Iowa Geology Department) during their 1977 summer field research in Arctic Spitzbergen were presented in a program entitled "Eighty Degrees North and Other Ways to Keep Cool in the Summer."

## Another Glacier?

George Hallberg was in Lincoln, Nebraska on February 7 to meet with staff of that state's Geological Survey and the National Soils Laboratory. Cooperative studies of Pleistocene sediments in southwestern Iowa are providing data that significantly affect the classic concept of Pleistocene glaciation. New data on engineering properties of soils is another important product of cooperative research.

## Seams Like Coal Times

Matt Avcin and Bob Ravn visited the Illinois Geological Survey on February 9 to compare spore specimens from Iowa coal beds with spore taxa from Illinois coals. The distribution of fossil spore taxa in coal beds permits assignment of relative ages to the several coal seams in Iowa as an aid in correlation of equivalent seams from one location to another.

## Alice In Adventureland

Orv Van Eck and Mike Bounk attended the March 15-16 Annual Convention, Iowa Water Well Association, at Adventureland near Des Moines. Contact with Iowa well drillers at this annual event is mutually beneficial.

## The Next Generation

About 40 high school students from Burlington, Iowa toured the Geology Department and Survey facilities on March 4. Ray Anderson explained work programs of the Survey to illustrate the variety of applications of geology in the areas of land use and the development of natural resources.

## In The News

The week of March 27 was a busy period for Jean Prior when she led a series of field trips, sponsored by Area Education Agency 12, to examine landform features in several western Iowa counties. She also was interviewed for a Channel 4 (Sioux City) program on landforms of Iowa. Another part of the week's activity involved a search with Carolyn Milligan (University of Iowa, Dept. of Art/Art History) to locate sites from which Orestes H. St. John made his landscape sketches in 1868. Carolyn is re-sketching these landscapes from the same vantage point of St. John as part of a project to demonstrate the role of geology in art and

to make comparisons of natural and man-made changes since the earlier sketches were done. (Lithographs of St. John's sketches were included in the 1870 *Report on the Geological Survey of the State of Iowa* by Charles White.)

### **Geologists Made Milwaukee Famous**

The U.S. Geological Survey conducted a meeting for states within their Eastern Division at Milwaukee, Wisconsin on April 4-5. Dr. Grant, Orv Van Eck, and Matt Avcin were there to discuss on-going and planned programs of the USGS for states within this region and to outline topics of mutual concern to the several states within the region. Good ole Milwaukee.

### **Rocky Mountain High**

Bernie Hoyer was Governor Ray's representative in Denver at the April 6 meeting of the Intergovernmental Science, Engineering, and Technology Advisory Panel, which was established to aid in the development of recommendations to President Carter for Landsat (remote sensing) policy planning.



*Annual barge trip, sponsored by GREAT II, gives state and federal agency representatives a first-hand view of economic and environmental problems on the Mississippi River. (Photo by John L. Knecht)*

### **Hard Duty**

Logan Kuiper presented a paper entitled "Accuracy Testing of Numerical Solutions to the Infiltration Equation" at the mid-April meeting of the American Geophysical Union in Miami Beach, Florida.

### **They Went That-A-Way**

The troops headed for the April 21-22 meeting of the Iowa Academy of Science at the University of Northern Iowa. Several papers were presented at the Geology sectional meeting.

### **Return to the Pleistocene**

An invited paper on "Quaternary Time-Stratigraphy in Iowa, Nebraska and South Dakota" was presented by George Hallberg at the May 2 north-central states sectional meeting of the Geological Society of America in Ann Arbor, Michigan.

### **Everyone Needs a Friend**

George Hallberg, Tim Kemmis, and Jayne Harbaugh attended the May 20-21 Midwest Friends of the Pleistocene Field Conference at Vincennes, Indiana. This usually is a lively meeting for friends — and enemies.

### **More Hard Duty**

Don Koch willingly accepted the assignment to substitute for Dr. Grant at the June 11-15 meeting of the Association of American State Geologists in Jackson Hole, Wyoming. Talk about landscapes!

### **Tote That Barge**

The U.S. Army Corps of Engineers hosted a July 10-11 barge trip from Guttenburg to Clinton for discussion and observation of environmental problems associated with disposal of dredged materials. Jim Case and his staff participated to review problems related to historical disposal sites and to discuss new sites that might be environmentally acceptable. Jim is chairman of the Dredged Material Uses Work Group, Great River Environmental Action Team (GREAT II).

### **Slip Sliding Away**

Symposia on "Glacier Beds" and "Dynamics of Large Ice Masses" were held in late August at Carleton University, Ottawa, Canada. Glaciologists from Canada and foreign countries presented the results of their research. Tim Kemmis brought home several new ideas that will assist in studying the glacial deposits in Iowa, especially those of the Des Moines Lobe. More refined interpretations for environments of deposition of soils materials will aid in explaining inherent qualities of different soil types, particularly with respect to soils engineering problems.

### **I Know What He Said**

#### **— What Does He Mean?**

It can be a difficult task to maintain technical accuracy in writing and still communicate effectively with the public sector that needs basic, understandable information. Don Gordon concentrated on his writing skills during a September 14-15 training session hosted by the U.S. Geological Survey in Rolla, Missouri.

### **Too Early For Skiing**

Orv Van Eck was briefed on programs of the U.S. Geological Survey within the Central States Region at Denver on September 18-20. Presentations were made by staff of the Water Resources Division, Geologic Division, Conservation Division, and the Office of Surface Mining. These meetings pro-

vide the opportunity for direct input in the planning phase for USGS programs that can better meet individual states' needs.

### **Rolla Re-visited**

Dr. Grant attended the October 2-3 Regional Topographic Conference at the USGS Mid-continent Mapping Center in Rolla, Missouri. Later, Paul Horick traveled to Rolla for the October 19-20 Midwest Ground-Water Conference.

### **Tri-State**

The 1978 Annual Tri-State Field Conference for geologists and students of geology was hosted by the Iowa Geological Survey on October 13-15. Topics covered on the field trips included Pleistocene-soils geology, structural geology, geomorphology (landforms) and quarrying-mining for dimension stone. (See article on p. 20)

### **What a Crop**

Bernie Hoyer was in Houston, Texas for the October 23-26 Large Area Crop Inventory Experiment (LACIE) Symposium at NASA's Johnson Space Flight Center, where new techniques are being developed to utilize Landsat data for predicting crop yields.

### **Over The Border**

Toronto. That's where Ray Anderson went for the October 23-29 Annual Meeting of the Geological Society of America. Ray made several important contacts with people who provided information and/or offered technical assistance that will be valuable in several Survey programs.

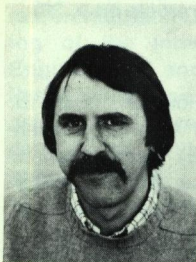
### **Keeping Warm**

The Earth Resources Laboratory (ERL) in Slidell, Louisiana is responsible for implementing NASA's Regional Applications Program for applying Landsat satellite data to resources management problems in Iowa. A Landsat demonstration project is under way to show the utility of Landsat data for assessment of soil erosion hazards and for monitoring changes in land use. Pat McAdams and Ross Black went to Slidell December 2-10 to begin processing Landsat and digitized soils data for the demonstration project. (Mr. Koch is Assistant State Geologist.)

# IOWA WATER RESOURCES DATA SYSTEM

## Progress Report

By Richard Talcott



The Iowa Water Resources Data System (IWARDS) has the goal of making water resource-related data more easily accessible for management, planning, and research. This project was initiated in conjunction

with the interagency effort on the state water plan framework study and represents part of the Iowa Geological Survey's contribution to that study. IWARDS operations are guided by an advisory committee whose membership includes representatives of state agencies and university research groups.

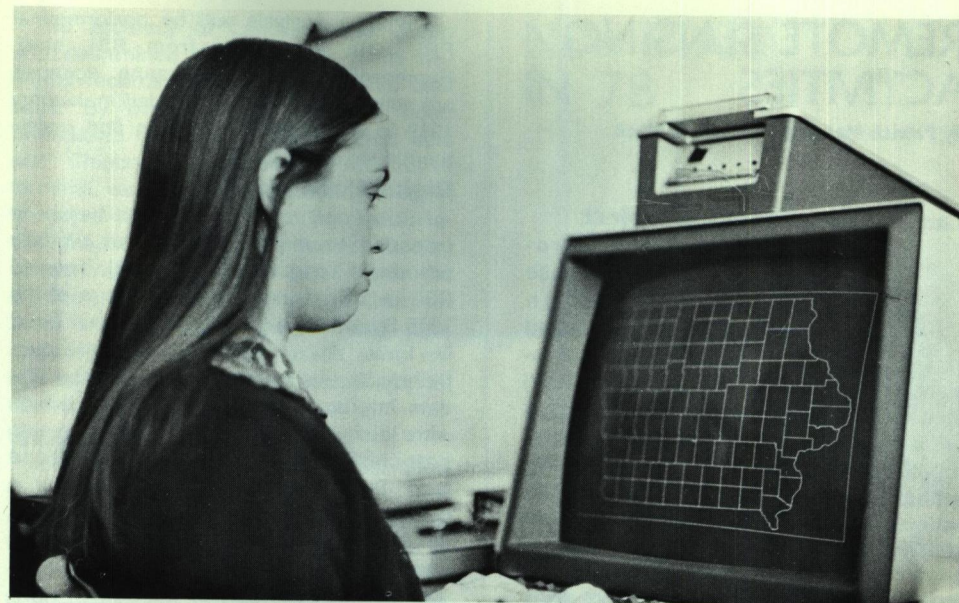
IWARDS services fall into four categories: Data Base Management, Clearinghouse, System Analysis, and Research. The following information describes IWARDS activities in each of these service categories and reports on the progress made toward full implementation.

The design and development of a Data Base Management software package has dominated IGS programming staff time for the past year. This package is now operational at the University of Iowa Weeg Computer Center, and several agencies are preparing to use it for managing some of their computerized files. The software enables selective retrieval, flexibility in formatting of output, simplified updating procedures, and

a facility for bringing data from separate sources into a common file. These advantages are achieved without writing numerous special programs. A simple command language is used to process the pre-defined data files. In most situations, this may be done by persons without computer programming experience. The package, including enhancements (e.g., for processing parameterized input files), is being installed on the Comptroller Data Processing computer in Des Moines and will be maintained via telephone link by IWARDS staff. User manuals and training sessions are planned for the first few months of 1979.

The IWARDS Clearinghouse is a service to those seeking references to water-related data that is being collected on a regular basis by federal and state agencies as well as by various research organizations. IWARDS is a Local Assistance Center for the National Water Data Exchange (NAWDEx). This program of the U.S. Geological Survey maintains an index to data collected by the U.S.G.S., the Environmental Protection Agency, Corps of Engineers, National Weather Service, and numerous other state and federal organizations. IWARDS staff and the cooperating U.S.G.S. District office staff work together on coding, entering, and retrieving water data and data-index entries using the NAWDEX and U.S.G.S. WATSTORE systems. To complement the nationally-based index, the *IWARDS Data Catalog* contains a bibliography and a report on data collection in Iowa, and a computerized data index (The IWARDS Data Directory) is now being compiled. The Data Catalog, Vol. 1, was distributed last year. The reports, "Iowa Water Resources Data Collection Programs and Sources," and "IWARDS Design Report" were completed this year and distributed to holders of the *Data Catalog*.

The Systems Analysis services performed by IWARDS staff include a study of future data processing and hardware needs at the Iowa Geological Survey. In this connection a formal report was prepared wherein the acquisition of data entry and computer cartography equipment was recommended. Work is continuing on the evaluation of digital image enhancement and production activity utilizing LANDSAT satellite products. (The latter work is being performed in close cooperation with the IGS Remote Sensing Laboratory which is also a part of



Sue (Davis) Daut with digitizer used for computer cartography work.

the IGS Technical Services Division.) IGS has acquired two computer terminals, a digitizer and cassette tape unit for IWARDS, and for computer cartography work. In another project, IWARDS has assisted the planning staff at the Conservation Commission in preparing for use of the IWARDS data base management package to handle the Facilities Inventory and to produce summary tables of facility-use data. Also, a pilot project to implement the data base management package for use by the Office of the State Archaeologist has been developed.

IWARDS research services in the past year have been highlighted by three projects. The IWARDS manager assisted in preparation of a proposal for funding from EPA in the amount of \$9990 to accelerate the coding of water-quality data from Iowa. EPA funded the project and is now considering a second proposal for support to the data coding project along with additional funds to support IGS participation in a study of the relationship between cancer incidence rates and the quality of drinking water in Iowa. These projects were initiated by the University of Iowa Department of Preventive Medicine. IWARDS staff also supported a research project in which the IGS Water Resources Division cooperated with the State Climatologist to summarize graphically the drought risk around the state.

Precipitation data was compiled for selected stations, and expected deficiency amounts for various drought periods were calculated. These were then displayed on computer-generated maps.

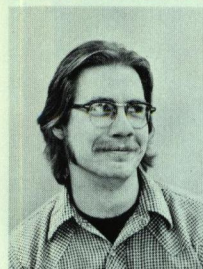
IWARDS services are provided by the Data Processing section, Technical Services Division, Iowa Geological Survey. The staff includes Dick Talcott, Manager; Pete Kollasch, Lead Programmer; and Sue (Davis) Daut, Computer Programmer. The activities of this section mesh with those of the IGS/USGS cooperative data encoding project, with Dan Gockel as supervisor.

IWARDS goals for the next year include documentation and implementation of the data base management software package, "routinization" of clearinghouse services, and implementation and publicizing of the IWARDS Data Directory, development of computer graphics software, and production of tabular and graphic data files for analysis of water quality. Special emphasis will be placed on providing information services to organizations using water-related data in management, planning and research. (Mr. Talcott is Manager of IWARDS.)

# REMOTE SENSING ACTIVITIES

By Patrick McAdams and Ross Black

## Landsat Demonstration Project



Ross Black Earth Resources Laboratory (ERL) in Slidell, Louisiana is responsible for implementing RAP in Iowa. The Remote Sensing Laboratory (RSL) and ERL have initiated a Landsat demonstration project for Iowa. RSL drafted a preliminary proposal which was presented to interested state and federal agencies charged with managing the natural resources of Iowa. Suggestions from these agencies and ERL were incorporated, and a final proposal was prepared.

The major emphasis of the project will be on the assessment of potential soil erosion hazards in the North Branch Basin in Madison County. The "Modern Soil Survey" maps of the basin will be digitized and entered into a data base at ERL. This information will be merged with the data base with Landsat derived land-cover data. This composite data base will then be used to compute potential soil erosion using the universal soil loss equation. This procedure will illustrate the feasibility of using digital soils data and Landsat landcover data to manage Iowa soil resources.

The project also addresses other types of resource management problems. Multidate Landsat land-cover data and digital soils data will be merged to monitor the conversion of prime agricultural land to non-agricultural uses. The data base will be used to extract land use within a proposed arterial highway corridor. In addition, digital Landsat data will be used to assess wildlife habitat and to monitor the conversion of forest and pasture lands to row cropland during the period 1973 to 1978.

The data analysis will be performed at ERL with assistance from RSL staff. Representatives of cooperating agencies are scheduled to meet in Slidell in January 1979 to complete the analysis and review the results of the project.

## Digital Flood Mapping

RSL's flood mapping research has been extended to include the use of digitally processed Landsat data. The ERL assisted RSL in processing a Landsat image of the 1975 Squaw Creek/South Skunk River flood in Iowa. An unsupervised classification technique was used to group the Landsat data into spectrally similar classes, which were labeled as flooded or unflooded, using post-crest aerial photography as ground data. This classified data was entered in a geographic data base. Also, 1:24,000 scale, photo interpreted, flood boundary maps were digitized and entered in this data base.

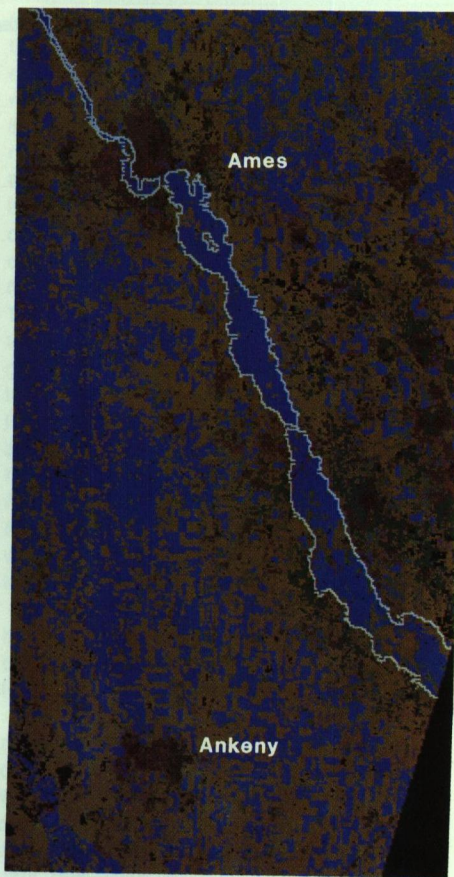


Figure 1. Computer processed Landsat image of Squaw Creek/South Skunk River Flood.

The accuracy of Landsat classification was determined by comparing these two digital records using the geographic data base. By overlaying the digitized flood boundaries on the classified Landsat data and displaying this on an interactive terminal, we were able to assess qualitatively the reliability of the Landsat classification. A quantitative analysis was provided by comparing the number of acres inside the digitized boundaries with the number of acres on the Landsat scene that were classed as flooded. The results were encouraging, indicating that Landsat can be used to map areas of recent flooding.

## Wildlife Habitat Assessment

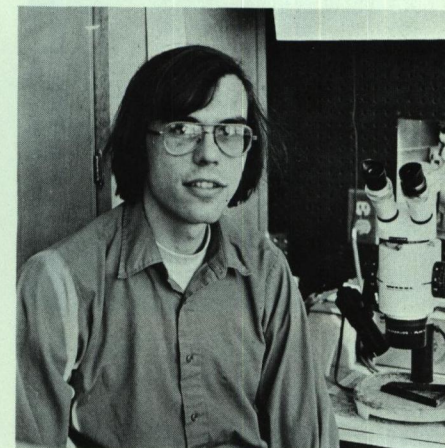
John Beamer of the Iowa Conservation Commission has been using maps produced from aerial photography to quantify the areal and boundary interrelationships of various cover types in wildlife management areas. This data is used to calculate the Diversity Index, a measure of the habitat suitability of an area for a given organism. Until recently the calculations had been performed manually. At John's request, Ross Black wrote a computer program which performs the calculations. The program can also compare several management areas and quantitatively document change in habitat suitability with time. ICC field officers thus, for the first time, have a *standardized* method of assessing and attacking problems of human encroachment, water level, floral zonation changes, and other matters on ICC managed lands.

## Coal Strip Mine Monitoring

In May and August of 1978, RSL acquired low-altitude color-infrared photography of all the active coal strip mines in Iowa. This information was used by the Iowa Department of Soil Conservation, Division of Mines and Minerals to monitor mining and reclamation activities. Technical assistance from RSL and financial support from the Office of Surface Mining will allow Mines and Minerals to implement their own aerial monitoring system. All active mines will be flown quarterly during 1979. Photo interpretation will be handled by Mines and Minerals personnel using a newly acquired Richards MIM 3 light table equipped with a stereo microscope. (Mr. McAdams is Supervisor and Mr. Black is Analyst in the Remote Sensing Laboratory.)

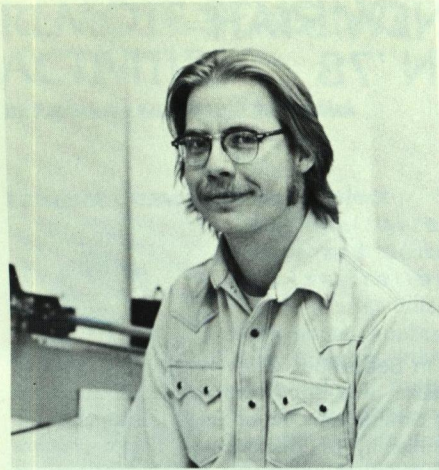
# NEW STAFF IN '78

In September, *Brian Witzke*, a Milwaukee native, was appointed Research Geologist in Stratigraphy. As an undergraduate at the University of Wisconsin-Milwaukee, where he received an honors B.S. in geology, he edited and proofread mathematics texts for Addison-Wesley Publishers and was an aide at the Milwaukee Public Museum. As a graduate student at the University of Iowa, where he received his M.S. in geology in

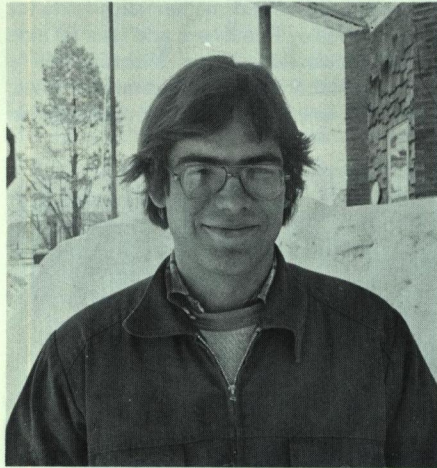


1976, he was a teaching-research fellow. He has completed his Ph.D. comprehensive examinations. His geologic training and interests are primarily in sedimentary rocks, their stratigraphy, environments of deposition, and paleontology. His stratigraphic studies have concentrated on deposits of Cambrian through Devonian age, and the fossil groups he has worked with include echinoderms, brachiopods, diminutive faunas and Tertiary mammals. Recent publications have included syntheses of biogeography, paleoclimatology, paleogeography and plate tectonics.





*Ross Black* of Mason City, Iowa, joined the Survey in May 1978 as a Remote Sensing analyst. With a B.S. degree in Geology (University of Iowa, 1977), he is now completing his M.S. at Iowa. He attended the Rosenstiel Marine Institute (University of Miami) in 1975, studying carbonate sediments and marine geology. He was previously employed as an engineering technician with Wallace, Holland, Kastler, and Schmidt in Iowa and as a geophysics technician with both Woodward-Clyde Consultants in California and Washington and the Mineral Exploration Company of Union Oil in Arizona and Nevada. He has served as a teaching assistant in Geology and Geophysics at the University of Iowa. His specialties are Remote Sensing, Geophysics, and Data Processing.

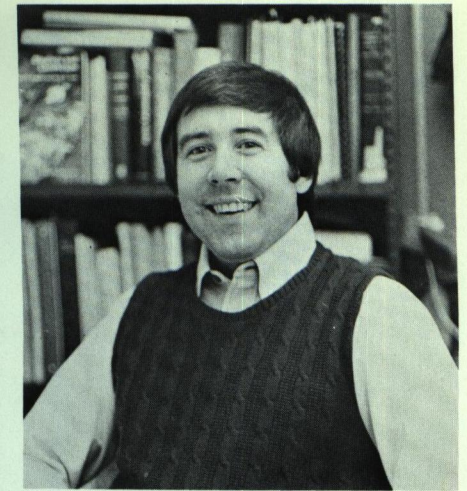


*Jan W. Watson* of Stockport, Iowa and a Keosauqua, Iowa native, became a Geologic Aide as a Drilling Assistant with the Coal Division in July. He has 24 semester credits from Northeast Missouri State University. He was previously employed by City Supply Corporation of Fairfield and Boley Fertilizer and Chemical Co. of Keosauqua.



*Michael Farmer*, after an absence of seven years, returned to the Survey as a Geologic Technician. An Omaha native, Mike did undergraduate work in geology at the University of Iowa. He was also employed as a department manager for Montgomery Ward. He prefers general geology over a specialty and believes in Comprehensive Anticipatory Design. His recent tasks include organizing the cores and publications for the new warehouse on the Oakdale campus.

*Timothy J. Kemmis* of Geneseo, Illinois, joined the Survey in January 1978 as a Research Geologist in the Geological Studies Division. From the University of Illinois he received a B.S. degree in Soil Science and an M.S. in Geology. While a student, he worked part-time on several geological projects in Pleistocene stratigraphy, and he has experience analyzing soils, concrete, and asphalt for the U.S. Army Corps of Engineers. In 1976-77 he worked with the Chicago engineering firm of Sargent and Lundy on geotechnical aspects of power-plant siting, design, and construction. His specialties are glacial geology, Pleistocene stratigraphy, engineering geology, and soil science.



*Mary Howes*, born in Downs, Illinois, joined the Coal Division in July and has spent most of her time on core and outcrop description. She has her B.S. degree in Geology from Illinois State University and entered the University of Iowa in 1975. Currently she is spending her "free time" developing a Master's thesis proposal.



*Sheila Coughlin*, a native of Atlantic City, New Jersey, became the Survey's Accountant in January 1978. She has a B.A. degree in Art History and English from Boston University, a B.A. in Elementary Education from the University of Iowa, and graduate credits in Botany and Theater from the University of Iowa. She has four years experience teaching junior high and high school English, Drama, and Science at Lisbon and Lone Tree, Iowa. She is also a gourmet cook.

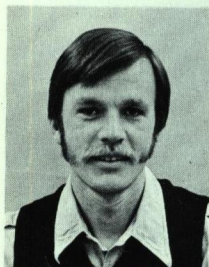


# WHAT? WHERE? WHY? HOW? ...

By Bernard E. Hoyer



Char Shreve preparing an illustration on the light table.



(With this issue of *Iowa Geology*, we begin featuring the professional skills of staff members with respect to their value both to the Survey and to other agencies cooperating with us on joint projects. — Editor's note)

Glacial drift, Cambro-Ordovician aquifer, sedimentary basin, Des Moines Lobe, fault, fractured limestone — these are all examples of jargon IGS geologists use among themselves to describe resource questions such as What? Where? Why? and How? Translating the geologic data and interpretations into public information that

answers these questions is a nearly impossible task without crisp illustrations. John Knecht and Charmaine Shreve, both graphic artists, translate locations into maps, data into diagrams, manuscripts into publications, lectures into fully illustrated presentations, and, in general, complicated concepts into usable information.

John Knecht is a manager, craftsman, and — foremost — an artist. Under his direction the graphic capabilities of the Survey have grown along with the quality of the art work. Charmaine Shreve is a craftsman and artist — capable and productive.

Together they have the skills to use many techniques and materials effectively. Armed with the materials, skills, and creative ideas, they can tailor their graphics to communicate specific ideas in an attractive, ap-

# AND WHO?



John Knecht working on the cover illustration for *Iowa Geology*.

propriate medium and format.

Few people recognize the wide range of services provided by the Illustrating Section. For oral presentation, John and Char produce illustrations such as colored slides and posters. Maps, graphs, and sketches are prepared for publications. Color separations are prepared for publishing full color illustrations, thus reducing the cost of printing. Furthermore, layout designs as well as other miscellaneous projects demanding the "eyes and hands" of an artist are prepared by Illustrating personnel.

John and Char's skills are not limited to serving IGS; both have performed valuable service for others in the state. John perfected techniques to simulate USGS 7½ minute quadrangle maps where none previously existed, using aerial photo base maps. He did

this to prepare a scoring map for the National Hot Air Balloon Races held annually at Indianola, Iowa. He and Char prepared three dimensional models as well as other graphic products for the film, "Iowa's Precious Water." Char prepared all of the illustrative material, as well as providing consultative services for the task force reports, the executive summaries, and the Iowa Water Resources Framework Study Report. All are a part of the State Water Plan and were produced in cooperation with the Iowa Natural Resources Council.

When the question "Who?" is asked, part of the answer probably includes John, Charmaine, or both. (Mr. Hoyer is Chief of the Technical Services Group.)

## PERSONNEL CHANGES IN '78

Orville J Van Eck was reallocated to the position of Public Service Executive.

Raymond R. Anderson, Senior Research Geologist, after 4½ years in the Remote Sensing Lab., moved to the Stratigraphy and Economic Geology Division, to which he was appointed Chief upon the retirement of Fred Dorheim, now Chief Geologist Emeritus. Mr. Dorheim headed the division since 1975.

Paul J. Horick, Senior Ground Water Geologist, was reassigned to the Water Resources Division.

M. Patrick McAdams was appointed Supervisor of the Remote Sensing Lab., with the rank of Senior Remote Sensing Analyst.

Jean C. Prior, Senior Research Geologist, was reassigned to the Water Resources Division.

Mrs. Martha B. Kafer was reallocated to Administrative Officer II.

Richard Talcott was reallocated to Systems Analyst.

John Knecht was reallocated to Graphic Artist.

Greg A. Ludvigson was reassigned to the Geological Studies Division with the rank of Geologist II.

Barbara Miller was reallocated to Confidential Secretary II.

Charmaine Shreve was reallocated to Graphic Artist.

Earle E. Scheetz was reallocated to Administrative Assistant II under the title of Supervisor of Support Services.

Susan M. (Davis) Daut, Computer Programmer, was appointed full-time.

Randy Bentzinger resigned from the Coal Division to join the Iowa Department of Transportation.

Kevin Bentzinger moved from Dilling Assistant to Research Driller in the Coal Division.

## IGS BRIEFS

### Hallberg Honored

Last fall Dr. George Hallberg was named Associate Professor of Geology (Collaborator) at Iowa State University Department of Earth Science. He was also appointed Liaison Representative between the Soil Science Society of America and the Geological Society of America for a four-year term and was elected to the Management Board of the North-Central section of the Geological Society of America for a three-year term.

### Water Film Shown

The color film, "Iowa's Precious Water," sponsored by the Iowa Natural Resources Council with Title III funds and filmed by the Iowa State University Film Production Unit, was shown on the Iowa Public Broadcasting Network on Thanksgiving evening and on

the Sunday evening following. The Iowa Geological Survey had an important role in this film. Several scenes were shot in Survey offices, and State Geologist, Dr. Stanley C. Grant, appeared in a brief segment wherein he explained the problems of locating enough quality water in various regions of the state in relation to demand. John Knecht prepared a 3-dimension model of Iowa, and Charmaine Shreve did charts and maps used in sequences showing Paul Waite and Dr. Grant. Several other Survey staff members appeared briefly.

Persons or organizations interested in showing this film should contact the Information Specialist at Iowa Natural Resources Council, Wallace State Office Building, East 9th and Grand Avenue, Des Moines, Ia. 50319 or phone 515/281-5913.

## IGS PUBLICATIONS IN '78

Compiled by Donald L. Koch and Charles J. Huelsbeck



Charles J. Huelsbeck

- Anderson, R. R. ed., 1978, *Geology of east-central Iowa: 42nd Annual Tri-State Geological Field Conference Guidebook*, 221 p. \$3.00 plus \$1.15 p/h.
- Cagle, J. W. and Heintz, A. J., 1978, *Water resources of south-central Iowa: IGS Water Supply Atlas No. 5*, 97 p. \$2.25 plus 50¢ p/h.
- Dorheim, Fred H., 1978, *Gypsum resources of the Fort Dodge area: Public Information Circular No. 9*, limited edition.
- Hallberg, G. R., 1978, *Problems in water resources related to agriculture, in Proc. 2nd Annual Midwestern Conf. on Food and Social Policy*. Ames: Iowa State Univ. Press, p. 3-28 — 3-34.
- Hallberg, G. R. ed., 1978, *Standard procedures for evaluation of Quaternary materials in Iowa: Technical Information Series No. 8*, 109 p.
- Horick, P. J. and Steinhilber, W. L., 1978, *Jordan aquifer of Iowa: Miscellaneous Map Series 6*.
- Huelsbeck, C. J., et al., 1978, *IGS Newsletter*, Vol. 1, No. 3. Free.



Available before 1978 Published in 1978

Available 7½' Topographic Quadrangles

8. Ludvigson, G. A. and McAdams, M. P., 1978, *New evidence of Early Ordovician tectonism in the Upper Mississippi Valley*: Technical Information Series No. 10.
9. Miller, G. A., Highland, J. D., and Hallberg, G. R., 1978, *Highway soil engineering data for major soils of Iowa*: Technical Information Series No. 7, 109 p.
10. Van Eck, O. J., 1978, *Plugging procedures for domestic wells*: Public Information Circular No. 11.
11. Wahl, K. D., Ludvigson, G. A., et al., 1978, *Water resources of east-central Iowa*: IGS Water Atlas No. 6, 91 p. \$3.50 plus 70¢ p/h.

New Maps: In 1978, IGS received thirty new 7½' topographic quadrangles of previously unmapped areas in Iowa from the U.S. Geological Survey. Readers are invited to phone (319/338-1173) or write the Iowa Geological Survey, 123 North Capitol Street, Iowa City, IA 52242 for an index to the topographic maps of Iowa.

Stewart, S. M., 1978, *State and federal restrictions of dredge spoil placement in the Upper Mississippi River area*, 93 p. A report developed under GREAT II Project funds. (Contract to IGS)

## IGS PUBLICATIONS TO APPEAR IN '79

Compiled by Donald L. Koch

1. Avcin, M. J., and Hatch, J. R., *Chemical analyses of selected Iowa coals, including trace element data*: IGS Technical Paper No. 5.
2. Bunker, B. J., and Ludvigson, G. A., *The Plum River fault zone in east-central Iowa*: IGS Report of Investigations No. 12.
3. Bunker, B. J., and Ludvigson, G. A., *Status of hydrogeologic studies in northwest Iowa*: IGS Technical Information Series No. 11.
4. Dorheim, F. H., *Underground mining in Iowa, exclusive of coal*: IGS Public Information Circular No. 10.
5. Hoyer, B. E., *Development and testing of operational flood mapping techniques*: IGS Public Information Circular No. 6.
6. Huelsbeck, C. J., et al., *Iowa Geology*, No. 4. This series is a continuation of the Iowa Geological Survey Newsletter.
7. Prior, J. C., et al., *Environmental geology atlas of Linn County*: IGS Miscellaneous Map Series No. 7.
8. Ravn, R. L., *An introduction to the stratigraphic palynology of the Cherokee Group (Pennsylvanian) coals of Iowa*: IGS Technical Paper No. 6.
9. Ravn, R. L., *Stratigraphic ranges of miospores in coals of the Des Moines Series of southern Iowa*: IGS Technical Paper No. 7.
10. Wahl, K. D., et al., *Alluvial ground-water resources of the Floyd River Basin*: IGS Water Supply Bulletin No. 12.
11. Wahl, K. D., and Bunker, B. J., *Geohydrology of the Silurian-Devonian carbonate units in the Cedar Rapids area*: IGS Water Supply Bulletin No. 13.

## IN MEMORIAM



The death of Geological Board member Lloyd R. Smith, Auditor of State, in December, marks the passing of a milestone in service to the citizens of Iowa. Born November 3, 1911 in Forest City, he earned the AA degree from Waldorf College and attended the Chillicothe (Mo.) Business College, Drake University, and Grand View College. He married Elaine S. Solyst in 1938, served in the U.S. Navy in World War II, and was an American Legionnaire. He held membership in the National Association of Accountants and was a certified Internal Auditor. Mr. Smith was first elected Auditor of State in 1966. Prior to his elec-

tion as Auditor, he served for sixteen years in the State Treasurer's Office, was Superintendent of the Gas Tax Refund Division, and for nine years was an auditor in the State Auditor's Office.

Mr. Smith recognized the Iowa Geological Survey staff as dedicated professionals serving the citizens of Iowa. He was always ready to question our actions to satisfy himself that we were performing with efficiency, economy, and integrity. He was also ready with praise for our achievements. Mr. Smith contributed much to the Geological Board and to the philosophy of this agency.