

Minnesota Geological Survey NEWSLETTER



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MINNESOTA GEOLOGICAL SURVEY, UNIVERSITY OF MINNESOTA
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SCIENTIFIC DRILLING, CENTRAL MINNESOTA

The MGS has been engaged in shallow scientific drilling in central Minnesota since 1980, when several holes were drilled to investigate geophysical features along the COCORP seismic profile across the Great Lakes tectonic zone. Subsequently expanded to an investigation of the entire Animikie basin, the 85th hole was drilled in December 1985.

The project has redefined the western margin of the Animikie basin and sharpened our understanding of the broad structure of the Cuyuna district. It has also raised perplexing questions about the Proterozoic tectonics of central Minnesota, particularly in Todd, Morrison, and Aitkin Counties where large thrust blocks may be present, but are almost impossible to prove through the blanket of overburden.

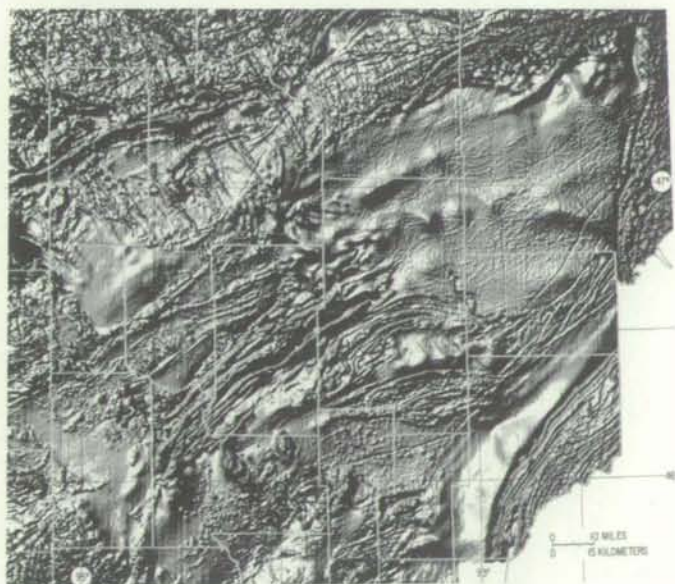
Our procedure has been to select drilling targets on the basis of geophysical data (see maps below), to drill through the unconsolidated overburden by conventional rotary methods, and to take a 10-

foot core run in the first sound rock encountered. We have logged and sampled the overburden at all sites, and have learned at least as much about the stratigraphy of the Quaternary deposits and the characteristics of the saprolitic zone above bedrock, as we have about the bedrock itself.

Some of the results of the overburden studies are summarized in the Minnesota Geological Survey Report of Investigations 34 by Gary Meyer, which will be published in January, 1986. The basic data on all drill holes will be published in Information Circular 23, by Southwick and Meyer, in the spring of 1986. A revised geologic map of the Animikie basin is in preparation; the target date for its publication is September 1986.

All samples, logs, and drill cores from the project may be inspected at the MGS office in St. Paul.

D.L. Southwick



Shaded relief aeromagnetic anomaly map of central Minnesota. Illumination from the northwest at 45° inclination.



Locations of drill holes in same area as at left.

MIDCONTINENT STRATEGIC AND CRITICAL MINERALS

Minnesota and eleven other midwestern and central states are cooperating with the U. S. Geological Survey (USGS) in an ambitious effort to evaluate the mineral potential of the nation's Midcontinent, which includes the southern half of Minnesota.

The first task in this evaluation has been to compile a series of maps portraying the Precambrian bedrock geology, topography of the Precambrian surface, isopachs of Lower Paleozoic strata, known mineral occurrences, and magnetic and Bouguer gravity anomalies over the entire area. These maps were compiled from data supplied by the state geological surveys and will be published at various small scales in 1986 by the USGS. John Mossler, G.B. Morey, and Dave Southwick compiled the geologic data for Minnesota. The second task, now in the planning stage, will be topical investigations of areas or geologic environments deemed to have potential for undiscovered mineral deposits.

Although southern Minnesota has never been hot territory for mineral exploration, new ideas on the genesis of sedimentary man-

ganese deposits, such as the Nikopol-Chiatura deposits in the Soviet Union, have prompted interest in the Upper Cretaceous rocks of southwestern Minnesota and adjacent states. Therefore, the MGS and the geological surveys of South Dakota, Nebraska, and Iowa have proposed a joint project to study the stratigraphy, paleogeography, and geochemistry of Cretaceous rocks near the Sioux Ridge to determine whether favorable environments for sedimentary manganese deposits do in fact exist in the area. Actual start-up awaits bureaucratic and budgetary decisions in the USGS, but is tentatively scheduled for 1986. In the meantime, the MGS and the South Dakota Geological Survey are moving ahead independently with studies of Cretaceous rocks. Dale Setterholm is carrying the ball for the MGS.

Further information on the Midcontinent Strategic and Critical Minerals Project may be found in USGS Open-File Report 85-0597 by Walden P. Pratt.

D.L. Southwick

DIRECTOR'S COLUMN

MGS on the National and International Scene

Forty years ago almost nothing was known directly about the geology of the deep sea floor, an unsatisfactory state of affairs considering the fact that it comprises two thirds of the solid surface of the earth. Scientific investigation of the deep sea floor began in earnest at the end of World War II, at first with technologies developed for submarine warfare, and later with new technologies for deep sea drilling and sampling. The result has been a revolution in geologic thought, which has plate tectonics as a central theme. Now, paradoxically, we have a better understanding of the dynamics and structure of the oceanic crust than we do of the continental crust.

This is also not a very satisfactory state of affairs, for the continental crust is thicker, more complex, and has more of the earth's geologic history locked up in it than does the oceanic crust. Efforts began about 10 years ago to develop a program to study the continental crust by deep drilling, focused entirely on the need for scientific information, rather than on economic targets. A workshop in 1980 at the Los Alamos National Laboratory in New Mexico was sponsored by the National Academy of Science to brainstorm the development of such a program.

G.B. Morey and I attended the workshop, because the oldest known rocks in North America, the continental nucleus perhaps, are exposed in Minnesota, and in this sense, Minnesota is the "basement" of the continent. Major questions about the origin and structure of the continent ultimately can be answered only by drilling a deep hole, or more likely, a number of deep holes, in the Minnesota basement and very carefully analyzing the drill cores and geophysical data obtained at depth.

As a result of the Los Alamos workshop, the National Academy of Science formed a Continental Scientific Drilling Committee (CSDC) to plan a long-range scientific drilling program. Because of Minnesota's interest, I was appointed to that committee, and MGS has been actively involved in it ever since. Subcommittees were established to study both technology and possible targets, such as active faults and earthquakes, active volcanoes, roots of major ore deposits, interactions of continental and oceanic plates, and the deep structure of the continent.

A site for the first American ultradeep scientific drill hole has now been chosen in the eastern foothills of the Great Smokey Mountains near the northern tip of South Carolina. Here data from surface geology and geophysics, interpreted on the basis of plate tectonics theory, seem to be telling us that the Appalachian mountain chain formed about 300 million years ago when the African plate collided with the North American plate, and a great slab of the African plate was thrust onto the North American plate. Later, the two plates spread apart, but a long strip of what had been part of the African plate was left stranded and now forms part of the Appalachian mountain chain.

If this seems like a wild, implausible tale to some readers, I can only assure them that it seemed equally so to most serious geologists 20 years ago. Although the geology we can see and map in the field seems to demand this dramatic explanation, many problems still need to be investigated. If the first U.S. attempt at an ultradeep scientific drill hole succeeds, we expect that at some point in the depth range of 20,000 to 30,000 feet, it will penetrate the overriding rock and pass down into rock typical of the North American plate, thus testing a major hypothesis of plate tectonics and providing an enormous amount of data on the physics and chemistry of rock subjected to high temperatures and states of stress. A not-for-profit corporation called DOSECC (Deep Observation and Sampling of the Earth's Continental Crust) has been funded by the National Science Foundation to begin preliminary engineering and detailed site investigations. The University of Minnesota is one of 11 universities that formed the corporation, which has now been joined by 12 additional universities. At present I represent the University on the Board of Directors of DOSECC.

Internationally the U.S. Continental Scientific Drilling Program is only one of several major scientific drilling projects. The most advanced is the Russian program, which has reached a depth of about 46,000 feet in a hole on the Kola Peninsula on the far northwestern tip of the USSR. It was drilled to answer a somewhat different set of geologic questions, but so far what we have learned of the results indicates that major discoveries have been made relating to crustal conditions and processes at great depth. In October I attended the Second International Symposium on Observation of the Continental Crust through Drilling held in the Federal Republic of Germany. The West Germans are undertaking a program like ours, and they plan an ultradeep hole in Bavaria near the Czechoslovakian border. At the symposium I reported on the results of the task group, which I chaired, on core-drilling technology suitable for drilling 50,000 feet.

We are just beginning to learn about the processes and structures in the continental crust that can be investigated through drilling. In a sense we have begun a voyage of discovery into unknown aspects of the earth—a voyage comparable in its intellectual excitement and potential for future development to the voyages of Columbus and other great explorers into then unknown regions of the surface of the earth. We are very pleased that the University of Minnesota and MGS are playing an active role in this adventure, and we look forward to the time that an ultradeep scientific drill hole will probe beneath the known basement of the continent at a site some place in Minnesota. We expect, however, that it will be at least several years before this can happen, depending on the funding available. Ultradeep drilling is somewhat comparable in cost to small experiments in space exploration. The knowledge to be gained is potentially at least as rewarding.

Matt Walton

PROJECT UPDATES

GEOPHYSICS

V. Chandler, P. McSwiggen, S. Mills, and graduate students K. Carlson and R. Ferrerer

The aeromagnetic surveying program is now into its fourth biennium, and acquisition is 90 percent complete on the tract in west-central Minnesota scheduled for 1985-1987 (see figure). Delivery of 7.5-minute maps and digital data should occur during the summer of 1986. At the end of the current biennium, our total acquisition will cover about 45 percent of the state. The U.S. Geological Survey (USGS) is acquiring data over north-central Minnesota as part of CUSMAP (see p. 3 of this newsletter).



Status of aeromagnetic mapping by MGS. The U.S. Geological Survey project will be completed in 1987.

Results of a paleomagnetic study of Keweenaw dikes in extreme northeastern Minnesota were consistent with general Keweenaw magneto-stratigraphy; no paleomagnetic equivalents to the Logan sills were found. Work was completed on the Duluth Complex structural study, and a final report was submitted to the Minnesota Department of Natural Resources. The study defined a major intrusive belt near the roof of the complex and structures near the basal contact that warrant further investigation.

Peter McSwiggen and G.B. Morey have been preparing a gravity and magnetic model study of the St. Croix horst segment of the Keweenaw Midcontinent rift. The central part of the failed rift is occupied by volcanic rocks that are flanked and overlain by thick sequences of sedimentary rocks. The sedimentary rocks have attracted attention recently because some people believe they may contain oil and gas.

Field acquisition of gravity data was completed in the International Falls 2° sheet by standard vehicular access, as well as reconnaissance coverage along the boundary lakes by boat. The MGS plans to publish the International Falls sheet (1:250,000 scale) sometime in the spring of 1986.

Graduate students completed processing and correlation analysis of gravity and magnetic data over a large block of central Minnesota, and the results should have significant bearing on the interrelated structure of the Great Lakes tectonic zone, the Cuyuna iron range, and the Animikie basin. Development and testing are nearly complete on Werner deconvolution, a method that operates directly on aeromagnetic profiles and extracts information regarding the depth, dip, and magnetization of sources. This method will be used to investigate crustal structure in central Minnesota.

PRECAMBRIAN GEOLOGY

M. Jirsa, P. McSwiggen, J. Miller, S. Mills, G. Morey, D. Southwick

COGEOMAP Program in Northeastern Minnesota

Geologic mapping along the North Shore of Lake Superior near Silver Bay was conducted by the MGS this past summer. The project is partly funded by the U.S. Geological Survey COGEOMAP (cooperative geologic mapping) program which was initiated to re-establish quadrangle-scale mapping.

Split Rock Point NE quadrangle and part of Silver Bay quadrangle were mapped. The area is underlain by a 1.1-billion-year-old terrane of volcanic rocks and hypabyssal intrusions. It is perhaps best known for the large anorthosite inclusions in diabase dikes and sills. Studies of the distribution of these anomalous rock types, and the geologic and structural relationships of the extrusive and intrusive rocks will provide insights into the interaction between magmatism and tectonism during the formation of the Keweenaw Midcontinent rift system.

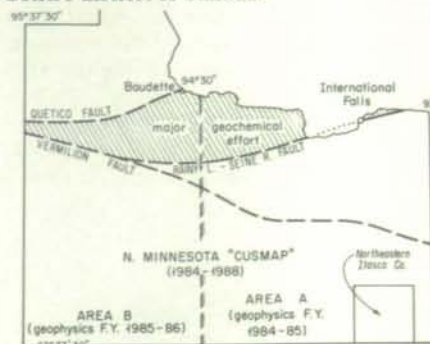
U of M graduate students Colin Reichhoff, Jayne Reichhoff, Bernie Saini-Eidukat, and Steve Shank performed the field mapping under the direction of Jim Miller, and Professors Paul Weiblen and John Green assisted with part of the project. Map compilation and petrographic and analytical studies of samples will be conducted this winter and spring. A similar project is planned for next season for the uncompleted part of the Silver Bay quadrangle and adjacent areas to the east and northeast. The product, pending funding allocation, is a series of three adjacent quadrangle-scale maps to be published about 1987.

Northern Minnesota CUSMAP

The MGS is cooperating with the U.S. Geological Survey (USGS) on a project called CUSMAP in the International Falls area. CUSMAP is the acronym for Conterminous United States Mineral Appraisal Program, a long-standing USGS program to summarize and upgrade the regional geology of known and potential mineral-producing regions of the country. CUSMAP results are summarized in folio format (scale 1:250,000), and heretofore have covered a standard 1° x 2° NTMS quadrangle. Other CUSMAP projects, either completed or well along, in-

clude the Rolla (Missouri), Dillon (Montana), and Wallace (Idaho) quadrangles.

The Northern Minnesota CUSMAP differs from the norm in that the area to be evaluated is not a standard quadrangle (see map), and the bedrock geology is very poorly exposed. Evaluation of its mineral potential will depend far more on geophysical and geochemical methods than has been the case for other CUSMAP studies. The interest comes from the long-known fact that significant deposits of precious and base metals occur directly along strike in the Rainy Lake-Mine Centre district of Canada.



The USGS began to acquire detailed aeromagnetic and airborne electromagnetic data over the project area in the late summer of 1984, and continued the flying in the summer of 1985. A series of mishaps has slowed progress, but the geophysical data for about half the area should be available to the public by spring 1986. The aeromagnetic maps will be sold through the Minnesota Geological Survey map sales office in St. Paul.

Besides geophysical mapping, the USGS will be doing geochemical sampling and mapping in the Birchdale-Indus and Ranier areas (Bob Clark of Denver is in charge) and some conventional geologic mapping (Klaus Schulz of Reston is in charge). The MGS will contribute a shallow drilling program, which will focus on the verification of suspected faults and shear zones as interpreted from geophysics, and will map the bedrock geology of six 7.5-minute quadrangles in northeastern Itasca County, in the southeastern part of the project area. We also will assist the geochemical assessment by mapping Quaternary deposits north of the Rainy Lake-Seine River fault.

The shallow drilling is expected to begin in May of 1986 under the direction of Dave Southwick and Sarah Mills. The northeastern Itasca County geologic mapping in the Sherry Lake 7.5-minute quadrangle commenced in August 1985, and will continue for several seasons under the direction of Mark Jirsa. All investigations will be conducted so as not to interfere with the exploration activities of companies who hold mineral leases in the area.

East-Central Minnesota

G.B. Morey has compiled a new geologic map of the Cuyuna range, mainly from data acquired by mining companies in the early 1900s and now in the files of MGS. The map, which includes the North range and much of the South range, covers seven 7.5-minute quadrangles and is based on approximately 7000 drill holes. It will be published in mid-1986.

ENGINEERING AND ENVIRONMENTAL GEOLOGY

District Cooling Project

M. Hoyer, R. Kanivetsky

The MGS is involved with the St. Paul District Heating Development Company in a study of the feasibility of chilled water aquifer thermal energy storage (ATES) to supply a district cooling system in the downtown St. Paul area. The MGS role is to examine the geologic and hydrogeologic conditions, identify environmental and regulatory issues, examine ground-water use in downtown St. Paul, and assist in well-field design, planning, and aquifer selection. The seasonal storage of some of Minnesota's abundant winter could provide an advantage in efficiencies of cooling during the summer season.

COMPUTER OPERATIONS

T. Wahl

The most notable computer activity for the past 6 months has been the acquisition of additional hardware. Equipment added includes three microcomputers with graphics and data-acquisition capabilities, a wide media pen plotter (Calcomp 1044), and improved data communications hardware. We are moving existing main-frame applications software to the micros and developing and installing additional software to exploit the capabilities of all the new equipment.

STRATIGRAPHIC GEOLOGY

B. Bloomgren, M. Jirsa, J. Mossler, B. Olsen, D. Setterholm

The 1:125,000-scale bedrock geologic and bedrock topographic maps of the Twin Cities seven-county metropolitan area (Map M-55) are still in preparation. They will include recently acquired data for the parts of the area where data were lacking for Jirsa's 1980 compilation. The current compilation by Mark Jirsa, Bruce Bloomgren, and Bruce Olsen should be ready for publication in spring 1986.

The sedimentology of Cambrian rocks of Dresbachian age in Minnesota is being studied by John Mossler. These rocks are the basal Mt. Simon Sandstone, the medial Eau Claire Formation, and the overlying Galesville Sandstone. The study is based mostly on long rock cores which became available as a result of subsurface investigation by private firms for possible underground gas-storage sites and for mineral deposits in southern Minnesota.

Dale Setterholm is investigating the Cretaceous rocks of Minnesota, particularly those on the Mesabi range and in southwestern Minnesota. The current study is intended to find, sample, and describe all Cretaceous outcrops on the Mesabi range. Mapping and evaluation of the marine Cretaceous rocks of southwestern Minnesota is continuing as part of the Midcontinent Strategic and Critical Minerals Project described on p. 2 of this newsletter.

QUATERNARY GEOLOGY

H. Hobbs, R. Lively

Mississippi Valley Conference

An MGS-sponsored working conference on the Pleistocene geology and evolution of the Upper Mississippi valley was held August 13-16, 1985, at Winona State University. More than 40 geologists, soil scientists and geomorphologists from Minnesota and surrounding states, as well as some interested Winona residents, attended. Because this was a working conference, the abstracts and field guide volume was not published as part of our guidebook series. However, copies of it can be read in the MGS library.

Paleosols Discovered

A recent road cut near the town of Hokah in Houston County exposed buried paleosol that has a very thick and well-developed B soil horizon. A sample of the loess-covered A horizon was collected for carbon-14 analysis. The resulting $25,690 \pm 780$ BP date indicates that burial by loess occurred about that time. This is the first known pre-late Wisconsin paleosol identified in Minnesota. The soil is Sangamon by definition in that it has been buried by material of Wisconsin age, but it may in fact have started forming long before the Sangamon interglacial. Two additional paleosol locations were subsequently discovered in Olmsted County, but they are less complete than the one at Hokah.

MGS STAFF

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David L. Southwick, *Associate Chief Geologist*

Douglas J. Bergstrom, *Geologist*
Bruce A. Bloomgren, *Geologist*
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Howard C. Hobbs, *Geologist*
Marcus C. Hoyer, *Geologist*
Mark A. Jirsa, *Geologist*
Roman Kanivetsky, *Hydrogeologist*
Mary Jo P. Kuhns, *Geologist*
Richard S. Lively, *Geochronologist*
Peter L. McSwiggen, *Geologist*
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Sarah J. Mills, *Geologist**
John H. Mossler, *Geologist*
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*Staff Additions

Lori Martin is a new addition to our secretarial staff. Lori came to us with a variety of experience in the three years since she was graduated from the University of Minnesota with a Spanish major. She lived in Spain with a family for a year and has returned since to

renew the acquaintance. Spanish is not her only language; one day she responded in Portuguese to a letter to MGS from Portugal. She has already taken steps to broaden her knowledge by sending in her first request for a Regent's Scholarship. Her inquisitive mind never rests. We welcome her aboard with great enthusiasm.

Jim Miller has worked as a "temporary" for MGS for some time but became a permanent staffer in July. Jim hails from Chicago (although he doesn't readily admit it). His undergraduate work was done at the Illinois Institute of Technology and later at the University of Illinois at Urbana, where he received a B.S. in 1977. He has been progressing toward a Ph.D. at the University of Minnesota, Minneapolis, and expects to defend his dissertation in February. Jim's professional emphasis is the intrusive rocks of the Keweenaw Duluth Complex (see COGEOMAP, this newsletter).

Sarah Mills recently joined us as a staff geologist and has been working on the gravity survey (International Falls sheet) and the scientific drilling program. Sarah was graduated in 1978 from Carleton College (Northfield) with a B.S. in geology. She then attended the University of Minnesota, Duluth, for graduate work and is nearing completion of her thesis on copper-nickel sulfides in the MINNAMAX deposit (Duluth Complex) in northeastern Minnesota. Sarah brings to MGS a strong background in precious and base metals exploration. She will continue working on the scientific drilling program in the International Falls area next year, and she will develop a research program in the Duluth Complex.

STAFF NEWS

Roman Kanivetsky participated as a panelist at the meeting "Educational and Professional Development in Hydrogeology: Needs and Opportunities," sponsored by the American Institute of Hydrology, November 14-15, 1985 in Las Vegas. Roman presented a paper entitled "Professional training in hydrogeology—what kind of preparation is needed?" Roman is scheduled on January 23, 1986 to conduct a seminar called "Minnesota: Ground-water connection," at the University of Minnesota Department of Civil and Mineral Engineering.

Val Chandler, G.B. Morey, Dave Southwick, and Matt Walton participated November 20 and 21 in an organizational meeting of the Great Lakes International Multidisciplinary Program on Crustal Evolution (GLIMPCE), coordinated by the U.S. and Canadian geological surveys. The group will direct funding for crustal studies in the Great Lakes region. Morey also was an invited lecturer at the American Institute of Professional Geologists regional meeting in September speaking on petroleum resources in the Midcontinent rift system.

G.B. Morey, Dave Southwick, Peter McSwiggen and Gary Meyer assisted a film crew from the British Broadcasting Company in preparation of a film on the evolution of a continent.

Val Chandler and Jim Miller recently participated in the International Magmatic Sulfides Field Conference which was held at several stops in the Duluth Complex. Val also has served as principal advisor to graduate students Robert Ferderer and Kelley Carlson.

Dave Southwick, Dale Setterholm, and John Mossler attended a conference on manganese potential of the Zuni strandline and precious metals/uranium potential of the Sioux Quartzite in Sioux Falls, South Dakota, from August 7 to 9, 1985. Dave will be teaching Introductory Geology and a graduate seminar on shear in rocks this winter quarter at the University of Minnesota.

Jim Miller presented a paper (jointly written with P.W. Weiblen) at the Geological Society of America Meeting (Orlando, Florida, Oct. 28-31) entitled "Comparative petrogenesis of anorthositic and troctolitic series rocks of the Duluth Complex."

Mary Jo Kuhns is on leave—and for good reason: she's tending her new baby girl, Madeleine Mary. She has help though, from her 2-year-old son!

RECENT THESES ON MINNESOTA GEOLOGY

Clark, R.C., 1985, THE STRUCTURAL GEOLOGY OF THE THOMSON FORMATION: CLOQUET AND ESKO QUADRANGLES, EAST-CENTRAL MINNESOTA. M.S., University of Minnesota, Duluth, 114 p.

Dosso, Laure, 1984, THE NATURE OF THE PRECAMBRIAN SUBCONTINENTAL MANTLE: ISOTOPIC STUDY (Sr, Pb, Nd) OF THE KEWEENAWAN VOLCANISM OF THE NORTH SHORE OF LAKE SUPERIOR. Ph.D., University of Minnesota, Minneapolis, 221 p.

EldougDoug, A.A., 1984, PETROLOGY AND GEOCHEMISTRY OF THE VOLCANO-SEDIMENTARY GLEN TOWNSHIP FORMATION, AITKIN COUNTY, EAST-CENTRAL MINNESOTA: IMPLICATIONS FOR GOLD EXPLORATION. Ph.D., University of Minnesota, Minneapolis, 199 p.

Keen, K.L., 1985, SAND DUNES ON THE ANOKA SAND PLAIN. M.S., University of Minnesota, Minneapolis, 191 p.

Lundy, J.R., 1985, CLUES TO STRUCTURAL HISTORY IN THE MINOR FOLDS OF THE SOUDAN IRON FORMATION, NORTHEASTERN MINNESOTA: M.S., University of Minnesota, Minneapolis, 144 p.

Motamedi, Shoallah, 1984, THE KEWEENAWAN LAVAS IN THE CITY OF DULUTH. M.S., University of Minnesota, Duluth, 140 p.

Neuman, S.N., 1985, LOWER AND MIDDLE PRECAMBRIAN GEOLOGY OF THE DENHAM AREA, NORTHERN PINE COUNTY, EAST-CENTRAL MINNESOTA. M.S., University of Minnesota, Duluth, 180 p.

Pierson, W.R., 1984, A GEOPHYSICAL STUDY OF THE CONTACT BETWEEN THE GREENSTONE-GRANITE TERRAIN AND THE GNEISS TERRAIN IN CENTRAL MINNESOTA. M.S., University of Wyoming, Laramie, 84 p.

Ross, B.A., 1985, A PETROLOGIC STUDY OF THE BARDON PEAK PERIDOTITE, DULUTH COMPLEX. M.S., University of Minnesota, Minneapolis, 140 p.

Vander Horck, M.P., 1984, DIAGENESIS IN THE SIOUX QUARTZITE. M.S., University of Minnesota, Minneapolis, 101 p.

NEWS NOTES

MGS-DNR Research Forum

The second annual MGS-Minnesota Department of Natural Resources Current Research Forum was held October 22, 1985 in Hibbing. The forum is a poster presentation and discussion that focuses on ongoing and recently completed research related to mineral resources. Researchers from the MGS, the Department of Natural Resources (Minerals Division), University of Minnesota geology departments (Twin Cities and Duluth), and the Mineral Resources Research Center (U of M) presented their results. Eleven displays were prepared by MGS staffers. Of the 80 people in attendance, the majority were involved in private minerals exploration and evaluation. For more information about this and future research forums, contact Lee Warren, Department of Natural Resources, Minerals Division, 1525-3rd Avenue East, Hibbing, MN 55746.

Mineral Collection

In March of 1985, the Minneapolis Public Library donated its rock and mineral collection to the MGS. The collection contains over 2000 specimens and has been valued at approximately \$10,000. The specimens include a large sample of very fine quality malachite weighing over 9 pounds; a stibnite crystal over 14 inches long; many fine, polished slabs of petrified wood, and an 8-foot-long mastodon tusk. Many of the better specimens are now on display in the front entryway of the Minnesota Geological Survey and may be viewed by the public during regular working hours.

Geologic Sample Program

The Minnesota Department of Natural Resources has continued funding the MGS Public Geologic Sample Program, which is designed to aid both rock hounds and amateur prospectors. If a sample is determined to have economic or scientific value, it can also be chemically assayed. Samples can be brought to our office in St. Paul or mailed, care of Public Geologic Sample Program, Peter McSwiggen. There is no charge for the identification services. Results of the program during 1983-85, published as Information Circular 22, include more than 230 multiple-element analyses from localities throughout Minnesota.

LIBRARY AND PUBLICATION NEWS

MGS Library

The library was established in 1974 to provide MGS staff with easily accessible reference materials. The focus of the collection is on Minnesota geology, but it also includes many basic works on geology, and on North American geology in particular. Sizeable holdings have accumulated in areas such as seasonal thermal energy storage, engineering geology, hazardous and nuclear waste disposal, oil and gas exploration, and uranium resource evaluation. Holdings include 1,600 books and public documents, 7000 serial and journal volumes, 300 theses, 3000 maps (topographic and geologic), a reprint collection, a pamphlet/newsclipping file, blue-line air photos for the entire state, open-file reports and maps, and over 450 field notebooks.

Although circulation of library materials is limited to Survey staff and to the premises, the library is open to the public and photocopying service of most materials is available.

Recent MGS Publications

AEROMAGNETIC MAP OF MINNESOTA, CENTRAL REGION, by Val W. Chandler. 1985. 2 sheets, scales 1:250,000 and 1:100,000,000. (Aeromagnetic Map Series A-5)

PUBLICATIONS OF THE MINNESOTA GEOLOGICAL SURVEY AND ITS PREDECESSOR, THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF MINNESOTA, by Lynn Swanson. 1985. 48 p. (Information Circular 21)

ANALYTICAL RESULTS OF THE PUBLIC GEOLOGIC SAMPLE PROGRAM, 1983-1985 BIENNIUM, by G.B. Morey, Peter L. McSwiggen, Mary Jo P. Kuhns, and Mark A. Jirsa. 1985. 56 p. (Information Circular 22)

GROUND-WATER GEOCHEMICAL ATLAS FOR PARTS OF EAST-CENTRAL MINNESOTA, by R.S. Lively and G.B. Morey. 1985. 5 sheets (Miscellaneous Map Series M-58)

GEOLOGIC MAP OF NORWEGIAN BAY QUADRANGLE, ST. LOUIS COUNTY, MINNESOTA, by R.L. Bauer. 1985. Scale 1:24,000. (Miscellaneous Map Series M-59)

SEDIMENTOLOGY OF THE MIDDLE ORDOVICIAN PLATTEVILLE FORMATION, SOUTHEASTERN MINNESOTA, by John H. Mossler. 1985. 27 p. (Report of Investigations 33)

SUBSURFACE TILL STRATIGRAPHY OF THE TODD COUNTY AREA, CENTRAL MINNESOTA, by Gary N. Meyer. 1986. 40 p. (Report of Investigations 34)

GOLD IN MINNESOTA, by John Spletstoesser. 1985. (Folder)

Inquiries to Map and Publications Sales: (612) 373-0223.

FROM THE EDITORS

The first (in a long time) MGS Newsletter (vol. 1, no. 1, summer 1985), which was edited by Mary Jo Kuhns, is now out of print. This newsletter (vol. 1, no. 2) was compiled and edited by Mark Jirsa and Nancy Balaban.

Future MGS newsletters will appear twice each year. The *Spring* newsletter will summarize efforts of the winter and spring, will include a section on funding and will be available in early sum-

mer. The *Fall* newsletter will summarize summer and fall activities, will include a list of recent MGS publications, and will be available in early winter. Confused?

Any comments, however rude, regarding the content of this and future newsletters are welcome. Also, if anyone would like to be included on our newsletter mailing list, please send us your name and address, attention Newsletter editor.

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