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Saluja
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Perkins - Radon
Halvorson - Integrated Studies Program
CHAIRMAN'S REPORT

I'm enthusiastic about starting this academic year at UND where after 23 years of teaching I'll also be involved in departmental administration. When Don Halvorson resigned as chairman and State Geologist to return to teaching, I was asked to become Department Chairman and also participate in the national search for a State Geologist. Although the State Geologist and Department Chairman positions have now been separated, the unity between the North Dakota Geological Survey and the Department of Geology is still strong. We are currently searching for a new State Geologist and we're expecting an even stronger relationship when the new State Geologist is appointed both as Director of the Survey and Professor in the Department. Sid Anderson, who has been appointed acting State Geologist, is Chairman of the Search Committee.

With an enrollment of 11,106 students in the Fall semester of 1985-86, UND is topping off a period of slow but steady growth. So is the Department of Geology and Geological Engineering, our new name, reflecting better the development of our Geological Engineering program. We have 12 full-time faculty, 6 part-time or adjunct faculty, 9 doctoral students, 39 master's students, 36 undergraduate geology majors and 39 geological engineering majors. The faculty is strong with diverse interests and skills; our teaching has frequently been commended and our research record was finally recognized when Geology won the UND Departmental Research award last spring. Our students are better than ever and are seriously pursuing degrees to prepare them for professional work in the petroleum/energy industries, hydrology, mining, as well as government research and teaching careers. The facilities of Leonard Hall are outstanding but we are filling every space available. New labs have been constructed in the basement and other rooms have been modified. The Mining and Mineral Resources Research Institute, under Gerry Groenewold, is located in Leonard Hall and is a great asset to our research and our teaching activities.

In September, the department was evaluated by ABET (Accreditation Board of Engineering and Technology) for possible accreditation for the geological engineering degree program. The visit consisted of a detailed examination of the department's facilities, equipment, faculty qualifications, course content, and curriculum. In preparation for the visit, the department was asked to prepare a lengthy summary including all aspects of our teaching and research activities. In addition, each faculty member provided recent examples of good, fair, and poor student work for each course in the engineering curriculum. The results of the accreditation visit have not yet been received from ABET. We believe that our geological engineering program meets the criteria specified by ABET, but we also realize that it is difficult to receive full accreditation on the first attempt.

You may be interested in the tasks, opportunities, and needs that we are emphasizing for the 1985-86 academic year.

1. Transfer of leadership in the department and general reorganization of areas of responsibility into the following areas: Teaching under Alan Cvancara; Research under Alan Kehe; Service under John Reid; and Administrative Support under Rich LeFever. Rich also continues to serve as Assistant Chairman.
2. Implementation of a revised Geological Engineering Degree Program still under consideration by the State Board of Higher Education.

3. Review of our undergraduate degree program in geology and the potential for a graduate program in geological engineering.

4. Meeting new needs for utilization of space in Leonard Hall will require funds for remodeling in addition to difficult decisions on modification of current space usage. Our major needs include:
   a. A computer room for graduate and undergraduate students to house our growing student computer facilities.
   b. Rock, fossil, and general storage development in several parts of the basement or other areas to free up currently used space.
   c. A microscopy laboratory for graduate and undergraduate student research using our limited number of student research microscopes.
   d. At least one additional permanent faculty office.
   e. An undergraduate student study area.

5. Financial support for: geophysical equipment for teaching and research, building modifications, and general departmental travel support for field trips and travel to professional meetings.

6. Special attention to the continued development of cooperative work with the North Dakota Geological Survey and the Mining and Mineral Resources Research Institute.

7. Increased contact with Alumni and encouragement of their participation in determining Department direction. Our Alumni have regularly given strong responses to our requests for financial support for special needs.

Best of luck to each of you.

[Signature]
Frank R. Karner
CONTRIBUTIONS NEEDED NOW, MORE THAN EVER

Donations to the Geology Department are now our major source of funds for day-to-day operating expenses and equipment. Appropriated funds fall far short of our expenses and we must rely upon funds coming from private individuals and companies. For the past several years we have not been able to break even with the funds provided us by the university and have had to spend some of our savings just to keep things operating as they are. We have not, therefore, been able to purchase some of the replacement and new equipment we need.

For example, we have not been able to purchase any new microscopes for our petrology students during the past 10 years -- the ones they are using are rather old and difficult to keep operational. On the research side, things are just as bleak. During a recent polling, our faculty came up with a list of 17 major pieces of equipment that are needed for their research. The total cost was equivalent to over 25 years of our appropriated equipment funds! Travel funds, too, are nowhere near sufficient for our needs. The departments allocation amounts to $80 per faculty member for travel each year -- enough to get to Minneapolis. There are no appropriated funds available to support student travel for field research or to present papers.

In summary, for the past few years the Department of Geology has been able to maintain its excellence to a large extent because of generous contributions from our former students and because we had some small savings. All our funds are almost depleted now, and we have a lot of catch-up expenses that need attention. We have several specific funds, and you can earmark your dollars for specific purposes. General, non-specified, funds are much appreciated too, because they permit us to respond to emergency situations. Whatever your preference, your contributions to the Geology Department are needed now more than ever. Checks should be out (and mailed) to the UND Foundation. You must, however, clearly specify the Geology Department or one of our specific funds on the check or the money will just go into a UND general fund.

MATCHING FUNDS

If you are employed in industry and wish to contribute to the future of the Geology Department, check with the personnel department to see if your company is one of the many that matches (or double matches) employee's contributions. If you can't find out, write us. We'll find out for you.
GEOLGY LIBRARY FUND

The Department has recently established a Geology Library Endowment Fund. Income from money contributed to this fund is used for collection enhancement in the Geology Library. You may contribute to this fund either through the Geology Department or the Alumni Association by ear-marking your check for the Geology Library Endowment Fund.

C. B. FOLSOM FUND IN PETROLEUM ENGINEERING

Note (elsewhere, herein) the establishment of the C.B. Folsom Fund in petroleum engineering. You may contribute to this memorial to Burt either through the Department or the Alumni Association by specifying on your check, the C.F. Folsom Fund.

REBA A. LAIRD FUND

The Reba A. Laird fund was established by Dr. Laird in honor of his wife, Reba. Income from this fund provides scholarships to aid young women with their geological education. If you wish to add to this fund either through the Department or the Alumni Association, specify on your check, The Reba A. Laird Fund.

THANKS FOR YOUR HELP!

The following have made generous donations to our Department this year. We are deeply appreciative of their gifts.

Atlantic Richfield Foundation
Bailey, Terrence P.
Ballard, Fred

Halvorson, Don L.
Hamilton, Thomas
Hanson, Bruno
Caramanica, Frank  
Carlson, Clarence (Kelly)  
Carter, John  
Catt, Diane  
Christensen, Odie  
Ensearch Exploration  
Frickson, Mark  
Exxon Foundation  
Gas Resources Group  
Gerhard, Lee  
Holland, Dr. and Mrs. F.D., Jr.  
Iverson, Wayne  
Gray, Lockhart  
Mickelson, Kermont  
Newmont Mining Corp.  
Sabo, Joseph  
Saluja, Dr. and Mrs. Sundar  
Tenneco Oil Co.  
Utgaard, John  
Waldren, Charles  
Wilson, Everett

(other gifts are still being processed by the Alumni Association)

SCHOLARSHIPS AND AWARDS

The following people received scholarships and awards from our Department for the 1985/86 year:

Bernold M. Hanson Geology Scholarship  
Joseph F. Gibbens  
Eric J. Simonson  
Mark R. McDonald  

Hugh and Ruth Palmer Scholarship  
Gregory W. Smith  
Michael Koch  
Ronald D. Johnson  
Brad L. Burkholder  
David K. Fastwood  
David F. Schwenn  
Lorena L. Goerger  
Eric T. Graney  

Henry Hinda Scholarship  
Kevin J. Sevigny

Reba A. Laird Fund  
LaRae J.H. Schwenn

Ernest Tisdale Geology Scholarship  
Daryl L. Uran

Tom and Frances Leach Foundation Scholarship  
Kimberley M. Moe  
Michael J. Skibicki  
Daryl L. Uran
EQUIPMENT NEEDS

(The following is a partial list of equipment that has been requested by faculty and students. We have not been able to purchase any of it!)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 student microscopes</td>
<td>$60,000</td>
</tr>
<tr>
<td>4 research microscopes</td>
<td>44,400</td>
</tr>
<tr>
<td>gravity meter*</td>
<td>31,500</td>
</tr>
<tr>
<td>ultra-high temperature furnace</td>
<td>16,500</td>
</tr>
<tr>
<td>gamma-ray spectrometer</td>
<td>14,900</td>
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<tr>
<td>Ruska capillary pressure apparatus</td>
<td>12,980</td>
</tr>
<tr>
<td>Nikon research microscope</td>
<td>11,720</td>
</tr>
<tr>
<td>Technosyn cold cathode luminescope</td>
<td>10,660</td>
</tr>
<tr>
<td>grinding/polishing equipment</td>
<td>9,900</td>
</tr>
<tr>
<td>digital theodolite</td>
<td>9,900</td>
</tr>
<tr>
<td>boat, motor, trailer</td>
<td>9,700</td>
</tr>
<tr>
<td>2 IBM PC's w/graphics</td>
<td>6,200</td>
</tr>
<tr>
<td>4 fossil storage cabinets</td>
<td>3,200</td>
</tr>
<tr>
<td>2 surveying altimeters</td>
<td>2,470</td>
</tr>
<tr>
<td>3 hard disc drives for IBM PC</td>
<td>2,375</td>
</tr>
<tr>
<td>fluid content stills and stand</td>
<td>1,640</td>
</tr>
<tr>
<td>10 Brunton compasses</td>
<td>1,200</td>
</tr>
<tr>
<td>3 typewriters</td>
<td>930</td>
</tr>
<tr>
<td>rock drill for sampling flat outcrop</td>
<td>890</td>
</tr>
<tr>
<td>medium format camera/accessories</td>
<td>840</td>
</tr>
<tr>
<td>microscope drawing tube</td>
<td>800</td>
</tr>
<tr>
<td>Leitz phase-contrast objective</td>
<td>680</td>
</tr>
<tr>
<td>strip chart recorder</td>
<td>566</td>
</tr>
<tr>
<td>4 new rock suites</td>
<td>540</td>
</tr>
<tr>
<td>film: Bushveld Complex</td>
<td>500</td>
</tr>
<tr>
<td>map storage drawer set</td>
<td>499</td>
</tr>
<tr>
<td>IBM PC memory extension and math chip</td>
<td>485</td>
</tr>
<tr>
<td>Nikon repro-copy outfit</td>
<td>450</td>
</tr>
<tr>
<td>rock trimmer</td>
<td>450</td>
</tr>
<tr>
<td>2 instructional videotapes (AAPG)</td>
<td>445</td>
</tr>
<tr>
<td>soil moisture apparatus</td>
<td>400</td>
</tr>
<tr>
<td>studio focussing photo lights</td>
<td>300</td>
</tr>
<tr>
<td>low power, long working distance lens</td>
<td>250</td>
</tr>
<tr>
<td>5 hand levels</td>
<td>250</td>
</tr>
<tr>
<td>digital lab timer</td>
<td>110</td>
</tr>
<tr>
<td>redox probe for pH meter</td>
<td>60</td>
</tr>
</tbody>
</table>

**TOTAL**                                                              $258,690

* Presently being purchased through a lease-purchase agreement with a bank in Denver. $31,500 is the balance due.
UND ALUMNI PARTY

On June 3, 1985, Fern and Andy Alpha hosted a UND party, sponsored by Andy and by Lee Gerhard, in honor of Bruno Hanson to celebrate Bruno's election as President-elect of the AAPG (cover photo), at the Alpha home in Denver. Alums present:

Fern and Andy Alpha                                          Bruno Hanson
Sid and Mary Anderson                                          Bob Aaker
John and Mary Bluemle                                         Randy Burke
Erling and Pearl Brostuen                                       Charley Cook
Jay and Mary Garske                                            Dave Fischer
Lee and Darcy Gerhard                                          Tom Heck
Peter and Ginny Loeffler                                        Kent Johnson
John and Kathy Oty                                              Joanne Lerud
Dick Pilatzke                                                    Dennis Storhaug

BRUNO HANSON AND ANDY ALPHA HONORED AT GEOLOGY RECEPTION

Andy Alpha, in Grand Forks to receive a Sioux Award (see cover photo), joined with Bruno Hanson, the President-elect of AAPG and President of the UND Alumni Foundation, at a reception in their honor at Leonard Hall on October 11. Friends, students, and faculty gathered to renew acquaintances or to meet these outstanding geologists, alumni of our Department.

ENERGY AND MINERALS FORUM ORGANIZED

The UND Energy and Minerals Management Forum was organized by Sundar Saluja during the centennial to discuss socio-political & techno-economical issues related to energy minerals development. It has received very encouraging response and its scope has been broadened by inviting institutions and other agencies from the neighboring states; consequently the name has been changed to "Great Plains Forum on Energy and Minerals Management and Policy Analysis".

The first meeting of the new Forum was held at Bismarck on May 22 during the Biannual Lignite Symposium where a Panel Discussion was held on "The Development of U.S. Alternative Energy Supplies Is Critical to the Wellbeing of the Long Term National Wellbeing".

On October 24, Governor George Sinner of North Dakota inaugurated the Proceedings of the Forum for the AY 1985-86 with an address on the importance of Developing Alternative Energy Sources with special reference to the Lessons Learned from the First Coal Gasification Plant at Beulah, North Dakota.

The next meeting is being held at Miami Beach to coincide with the 7th International Conference on Alternative Energy Sources, December 9-11 thus getting participation by experts working in different areas from other countries.
NEWS NOTES

MINING AND MINERALS RESOURCES RESEARCH INSTITUTE

The North Dakota MMRRI has provided approximately $300,000 in scholarships and research support to undergraduate, graduate, and post-doctoral students who have been involved in academic and research programs related to mining, minerals, and energy resources. MMRRI research projects have generated part-time research support for an additional 42 students since the program was authorized in 1979. MMRRI funds have been used to provide equipment and personnel for the Natural Materials Analytical Laboratory (NMAL). NMAL equipment includes a scanning electron microscope with microprobe, x-ray diffraction, and x-ray fluorescence. Allotment funds have also been utilized to purchase essential equipment for the Mining Engineering Laboratory. Completion of the NMAL and equipping of the Mining Engineering Laboratory places the North Dakota MMRRI and the University of North Dakota in a highly competitive position to pursue mineral and energy resource-related projects and greatly facilitates the training of students in mineral and mining programs.

MMMRI research projects during the past year focused on various topics including:

1. reevaluation of the lignite resources and reserves of North Dakota
2. characterization and interpretation of the lignite-bearing strata of North Dakota
3. evaluation of the geothermal resources of selected areas of the Northern Great Plains
4. gravity detection of carbonate reefs in the Williston Basin
5. evaluation of the hydrocarbon potential of the middle Devonian Dawson Bay Formation in the Williston Basin
6. evaluation of the advisability and potential environmental impacts of reclamation of abandoned mined lands in North Dakota
7. determination of the chemical attenuation capacity of coal conversion solid waste disposal site sediments in the Gulf Coast and northern Great Plains regions
8. determination of optimum disposal methodologies and impacts on groundwater of solid wastes from coal-fired power plants in North Dakota
9. detailed chemical, physical, mineralogical, and leaching characterization of fly ash and coal gasification solid wastes from the Great Plains Coal Gasification Complex at Beulah, North Dakota
10. determination of the testing protocol, advisability, and optimum methodologies for codisposal of hazardous and non-hazardous wastes from coal gasification plants

11. determination of the technical and economic feasibility of bulk utilization of soil wastes from coal combustion and coal gasification facilities

12. fly ash and cement testing

13. formation of a Western Fly Ash Research, Development, and Data Center

14. determination of the impacts of oil and gas drilling fluids and brine disposal pits on subsurface water; and brine disposal pits on subsurface water

15. experimental investigation of high-temperature metamorphic reactions.
The North Dakota Geological Survey is now in the process of searching for a replacement for Don Halvorson, who resigned this past summer. We plan to hire a full-time State Geologist for the first time; until now one person has always served both as State Geologist and UND Geology Department Chairman. Our ties to the University of North Dakota will continue, as the new State Geologist will still have an appointment within the Geology Department. Any alumni interested in applying for the State Geologist position may want to read our advertisement in any of several journals (Geotimes, EOS, Oil & Gas Journal, and others) or simply contact Mr. Sidney B. Anderson here at the Survey for more information. Sid is Chairman of the Search Committee and also Acting State Geologist while the search for a new State Geologist is underway.

Our research, however, has continued without interruption. At latest count, NDGS geologists and engineers were involved in about 40 separate research projects. Some of the projects involve cooperation with Geology Department faculty and graduate students supported by the NDGS.

We are nearly finished with our detailed appraisals of the geology of all of North Dakota's counties. These studies have been underway since about 1960, and we have now mapped the geology of virtually the whole state at a scale of 1:125,000 (1 inch to two miles).
This summer, John Hoganson continued his work of excavating Oligocene mammal and mollusk fossils in Stark County, in cooperation with the Manitoba Museum of Man and Nature in Winnipeg. Studies are also underway to determine the feasibility of establishing protected status (Nature Preserves, etc.) for various paleontological sites and other geologically significant sites.

Ed Murphy, with help from Alan Kehew, is continuing his studies of the effects that oil and gas exploration and production have on shallow groundwater in western North Dakota. Ed is also studying shallow groundwater in areas near reclaimed abandoned lignite strip mines. Alan Kehew is working on possible contamination problems caused by municipal sewage lagoons.

Survey geologists have undertaken a number of oil and gas production and engineering studies concerning oil production, reservoir characteristics, and other factors relating to oil production in North Dakota. A partial listing of studies includes one by Sid Anderson and Mary Rygh on hydrocarbon migration in the Madison Group in Bottineau and Renville Counties, a scanning-electron microscope study by Dave Brekke of the pore geometry and pore mineralogy of cores from the Mission Canyon Formation, an overview by Dave Fischer, along with Dick and Cheryl Pilatzke (Dick is with Coastal Oil & Gas and Cheryl is with Southport Exploration, both in Denver) of Devonian Duperow Formation oil production in the Williston Basin, a study by Dave Fischer and Will Gosnold of the relationship between the earth's heat flow and oil production in the Billings Nose area of western North Dakota, a study by Dave Fischer, Lee Gerhard, and Erling Brostuen to determine the relationship between deep Red River Formation oil production and shallower shows of hydrocarbons, and a study by Randy Burke and Lee Gerhard comparing Madison Group oil reservoirs in North Dakota with the oil-producing Yates Formation in west Texas.

Julie LeFever and Sid Anderson are studying the Nesson Anticline stratigraphy, structure, and petroleum engineering characteristics. Other subsurface studies include studies of selected Spearfish Formation "sands", of the Madison Mission Canyon and Charles Formations in portions of Renville, Ward, and Bottineau Counties, of the Mondak Field, of the Duperow Formation in Billings County, and of the geochemistry, log characteristics, and distribution of potash in North Dakota.

Other projects underway include a study of the origin of glacial-lake spillways throughout the state (Alan Kehew), a study of the geology of the glacial Lake Souris area (Mark Lord, a UND graduate student), a study of certain subglacially molded surfaces and ice-thrust features in west-central North Dakota (John Bluemle), a study of the sedimentology and geomorphology of anomalous hills in southeast North Dakota (Ken Harris), and a study of the preglacial drainage and other interglacial and post-glacial drainage evolution in North Dakota. We are cooperating with the USGS on a Decade of North American Geology (DNAG) volume on Quaternary Nonglacial Geology of the Conterminous United States.
Hello. My name is Mary Sand and I took over the position of Geology Librarian on June 17. I was born and reared in Grand Forks and attended UND for 5 years, receiving a B.S. in Elementary Education and a B.S. in Library Science - Audio Visual. My husband, Tom, is a firefighter in Grand Forks.

I enjoy my job here at the University and have managed to accomplish several things in the short time I’ve been here. Among them: locating 483 books that were declared missing, shelf reading books, working on well logs, cleaning the library and the librarian's office, changing displays, and locating all overdue materials. I am currently working on several projects, one of which is complete map inventory of all USGS and Canadian maps and another is updating the publication holdings we have from all 52 state Geological Surveys.

My major goal, while I'm here at the Geology Library, is to bring the library as up-to-date and current as possible. The major problem is that the library is very crowded. We need to expand. Current statistics show that the world's libraries double every 8 years. At present, the Geology Library holds, 11,748 books, 20,472 periodical volumes, and regularly receives 743 current series titles. As you can see, it does not take long for space to be used up.

At present, several journals are kept in boxes on the floor of the aisles because the shelves are full. There is room to build a second floor above the present library. This would enable us to have the space we so desperately need. (Editor's note: requests for funds to double-deck the library have been submitted to the University without success, over the past 2 Biennia.)
FACULTY NEWS

MIN CHU  Hi Alumni! After coming back to Grand Forks on July 23rd from a long trip to Taiwan and California I was busy with many things. The first thing was to find a new apartment. We finally settled down in the Gallery Apartments which are close enough to Lake Agassiz elementary school for Mark to walk.

We ordered some equipment for the petroleum laboratory last summer, namely, a Ruska gas permeameter, N.I. Baroid viscometer, mud balance, digital pH meter, Marsh funnel viscometer etc. With the help of Marvin Rygh we ran some tests and got good results. All of the mud testing equipment will be used in Geology 351 - Petroleum Development Engineering.

Recently, my research is concentrated on microcomputer applications to petroleum engineering. I also have to prepare the teaching materials for the course entitled Evaluation of Oil & Gas Properties which Burt Folsom taught. So, it looks like the fall semester will be very busy.

ALAN CVANCARA  produced another natural history book for the lay person with Prentice-Hall -- A Manual for the Amateur Geologist was published in January, 1985. A forthcoming book, the manuscript of which is due in January, 1986, focuses on fresh-water ecology but includes sections on the origin and death of lakes and stream behavior. Alan has spent substantial parts of the past two summers taking photographs for the book. Alan and his family took another learning vacation this summer -- he mostly learned, the family mostly vacationed --, to coastal New Brunswick. Planning was poor as rainy weather prevailed about 80% of the time.

HOWARD FISCHER  I was awarded a Summer Research Professor appointment from the Graduate School and was fortunate enough to have a chance to interact with six graduate students and conduct my own research during the past summer session. My research, begun on the Summer Fellowship, is on Pressure Solution Features in the Williston Basin. The summer work led to my receiving a $15,000 grant from the American Chemical Society - Petroleum Research Fund. This grant, beginning Sept. 1, 1985 will be a two-year study of Pressure Solution Features and Responses in Williston Basin Carbonates.

This summer I was also able to complete and submit an article, with Dr. John Bush of the University of Idaho, to the Journal of Sedimentary Petrology. The article, entitled Cambrian Age Evaporites from Northern Idaho, stems from my dissertation. For the Fall semester, it's Carbonate time again. This year, there are 11 students in the graduate carbonate class. In addition to the general course, a second semester of advanced carbonate geology has been added to the curriculum.

In the past two years we have been adding equipment to the carbonate laboratory. We recently purchased a Minolta macrophotography set-up for core and sample illustration and a Nikon Photomicrography set-up for core and sample illustration and a Nikon Photomicrography system for thin section photography. This semester we have added an IBM-PC for faculty and student research use. As it now stands, our equipment, coupled with the NMAL SEM/Microprobe, is top-quality and we are capable of doing modern, up-to-date research.
WILL COWNOLD  The past year was filled with diverse projects and a few new approaches to some of my courses. For example the Advanced Structural Geology course has covered a different topic each of the three times I have offered it. In 1983 we covered plate tectonics, in 1984 it was applied geophysics, and in 1985 we looked at flexure of the lithosphere. The 1985 class was especially good because we took a close look at some of the newly proposed models for formation of intracontinental basins including the Williston Basin. This summer I submitted forms for a new graduate course, Advanced Topics in Geophysics, which will allow us to explore various geophysical methods at the graduate level. This fall semester I am introducing more computer work in the senior-level geophysics course. Most of the homework assignments involving computation will require use of a computer.

There are a number of old and new research projects in progress. I am conducting a geothermal resource assessment of South Dakota for the U.S. Department of Energy. Also, I am attempting to compile similar assessments for Iowa, Missouri, Minnesota and eastern Colorado to be included in a new geothermal map of the United States. We are starting to get a few graduate students interested in geophysics and a few more are using geophysical methods in their theses.

This summer included a good deal of travel. During the first week of June I attended an international conference on "Modeling the Thermal Evolution of Sedimentary Basins" at Bombarde, France. The conference was sponsored by the Institut de Francais du Petrole (French Petroleum Institute), and was attended by scientists representing 24 different countries. Technical papers given during the five days of the conference will be published in Editions Technip and will include my contribution on "Heat Flow Studies in Sedimentary Basins."

Most of the latter part of this summer was spent conducting a gravity survey in western North Dakota for Tenneco Exploration Co. Three graduate students, Mark Luther, Steve Braun, Moira Campion, and one undergraduate, Mark McDonald, took part in the project which was partly designed to give students experience in geophysical field work. This project developed from a nascent geophysics program we are trying to develop. We sent letters announcing the program to virtually every exploration company operating in the Williston Basin.

GERRY GROENEWOLD  This year I continued my dual role as Director of the MMRRI and Associate Professor of Geology. It was a good year for research and I published eight papers and reports. Six additional papers have been submitted for publication. I am also principal investigator on eight research grants awarded during the past year, in addition to five grants already in progress.

I was a session chairperson at the Thirteenth Biennial Lignite Symposium held in Bismarck on May 21-23, 1985 and also a session chairperson and field trip leader for the Rocky Mountain Coal Symposium which was held in Bismarck on October 2-4, 1984. Currently I am a conference coordinator for the Annual Meetings of the Materials Research Society to be held in Boston in early December.

On March 16th, Connie and I became the proud parents of a baby boy - Nickolaus Jan Triplett Groenewold. My other son, Gerd, is now in ninth grade and doing very well. The entire family had a very busy summer which included trips to Illinois and the Yellowstone/Teton area. For those of you who remember a particular 1907 Auburn Touring car, rumor has it that it may actually be running by next summer.
DON HALVORSON  During this past summer, I resigned my position as state geologist and department chairman, and I have resumed a full teaching position in the Department of Geology and Geological Engineering. This year, I will be teaching physical geology, geochemistry, and some areas within igneous petrology. Because it has been nearly five years since I taught regularly in the program, much of my time is spent updating my courses.

I am currently involved in two studies of glacial sequences, one in the Wind River Mountains of Wyoming, and one on Mt. Kenya. An article for the East African Mountain volume is now in preparation.

Throughout the years that I was chairman, the Department has received both financial and advisory assistance from industry and from our alumni and friends. I want to take this opportunity to sincerely thank all of you for your generous support, which contributes so much to the success of our program.

BUD HOLLAND  Addition, this past spring, of a 35 mm Nikon camera and macro lens and a Nikon FR photomicrographic set-up, to the paleo lab through financial aid of Exxon, Conoco, and the MNREI, has greatly enhanced our photo capabilities; although now Alan Czarcase and I are trying to acquire a decent copying stand and lights, and a medium-format camera. We've even got a new EL Nikon enlarging lens but can't seem to get the correct lens board for our old junker. The equipment has greatly helped our paleontology program (see short article elsewhere, herein).

This past summer, with fewer theses to read (only five) Mardi and I got in a little traveling. We spent three weeks in June with Mardi's mother visiting relative and Mardi attending the national AAWW convention. As president of the North Dakota Natural Science Society, I spent time in July setting up the annual meeting and a family field excursion at the Knife River Indian Villages National Historic Site north of Stanton (some 50 miles N of Mandan). Then in early August we had the meeting (aided by younger son, Erik, site interpreter there) followed by buffalo stew and fry bread. The last two weeks of August Mardi and I took a tourist-bus trip through England, Ireland, and the corner of Scotland. It was great!

One of the Alumni News editors organizing "Alumni News Notes"
NICHOLAS KOHANOWSKI (Assoc. Prof. Emeritus), who retired in 1975 is still continuing his research on the evolution of minerals which began in 1933 when he got a job in the gold mines of Cripple Creek. Nick says he has seen many changes in mineralogy as a science in those 52 years. Many mineral and rock species have become discredited as species and new ones have been discovered. "The discredited species, however, remain valuable from the point of view that they indicate mineral evolution." So Nick continues to build up his collection of minerals, rocks, fossils, and thin sections which now number more than 3000 specimens from 280 underground mines in both Americas, northern Africa and Europe. Nick likes to stay home and work on his collection and let Babe do the traveling for the family. Mrs. Kohanowski ("Babe") continues busy with activities in various clubs (Historian for two), assisting in the annual bazaar of St. Michael’s Church, volunteer for the Myra Museum and Campbell House (G.F. County Historical Society) and finding time to attend three club conventions and the Folkarama in Winnipeg in July. Nick and Babe have two great-grandchildren and 13 grandchildren from their family of three children (Frank I., Milwaukee; Tamara R. McDermott, Tacoma; and Nicholas IV, Cullman, AL)
ALAN KEHEW  The past year has been as busy for me as usual in my joint position with the Department and NDGS. My Survey duties include review of special waste permits for the state Health Department and research in groundwater and surficial geology. In the department, I've continued to teach graduate and undergraduate groundwater courses as well as a few other courses from time to time. For example, last spring John Reid and I collaborated on a graduate course in fluvial geomorphology. One of my major research interests concerns the development of glacial-lake spillways (outlet channels) in the midcontinent area. In the past year, Mark Lord (PhD candidate) and I presented papers on this topic at the annual GSA meeting in Reno, the fall AGU meeting in San Francisco (at a paleoflood symposium), and at the spring GSA north-central section meeting in DeKalb, Ill.

Groundwater pollution is another research area that interests me. For the past several years I have been studying the effects of sewage lagoon seepage on groundwater quality. Last summer Paul Bulger (M.S. candidate) and I put in 15 new wells at the McVille, ND lagoon, making a total of 29 wells at that site.

Another research project in which I have been involved is a study of the effects of oil and gas drilling and production activities on shallow groundwater systems.

Aside from teaching and research, I have been trying to devote some time to another project. Last fall, I signed a contract with Prentice-Hall to write a textbook called "General Geology for Engineers". This book is designed for the introductory geology course for engineers that I teach. The deadline for the manuscript is December 1986, but I am hoping to complete most of the writing during this school year.

WILSON M. LAIRD (Prof. and State Geologist Emeritus; DSc, '84) and Reba have returned from their summer home in Bemidji to Kerrville, Texas, for the winter after an "exciting" summer. On the 9th of September Doc underwent quintuple-bypass heart surgery at the St. Luke's Hospitals in Fargo. He came through admirably and was sitting up and eating within two days and then beginning lots of walking during a six-week recovery period. He and Reba lived at a new motel complex across the street from the hospital and took breakfast in their suite and other meals at the hospital cafeteria throughout September and then spent October recuperating at daughter Dorothy Katz's home in Wacona, Minnesota. Both had been anxious to get home, for during the latter part of the summer, while Doc had been experiencing some shortness of breath, Reba had had some swelling in her left arm. So while Doc was recuperating in Fargo, Reba had extensive tests and the doctor's could detect no further malignancy, whatever. We hope they continue to do well in Kerrville without a return of such "excitement."

RICH LEFVER The principal research interests remain the depositional environments, stratigraphy, and "big picture" aspects of Cretaceous and Paleocene sedimentary rocks in the Williston Basin, although I am involved to a lesser extent in some research on the clastic units of the subsurface as well. I spent 10 days last May on a field trip with graduate students from my Clastic Petrology class, looking at sedimentary rocks in southern and central Utah, principally in the Book Cliffs areas. In August, I attended the Mid-Year meeting of S.E.P.M., held in Golden, Colorado, where I co-authored a paper with Brian Wallick on the depositional environments of the Bullion Creek Formation in western North Dakota. The meeting was also attended by H. Fischer (faculty), Randy Burke, Becky Durall, Wayne Freisatz, Jean Hoff, Mark Luther, Chris Quinn, Jeremy
Reiskind, Randy Stephens, and Jeff Valvick (students), most of whom gave papers or poster sessions. In addition, attending and involved in presentations were alumni Brian Wallick, Barry Wilson, Dan Daly, Craig Schmit, and Vic Cherven, and former member Art Jacob. I am continuing as Assistant Chairman under the new regime.

DEXTER PERKINS This past six months have been very busy for me. I taught Geology 101 during summer semester and in July Julie LeFever and I taught another course for Kids on Campus (3rd - 6th grade). This fall I seem to be spending a lot of time on the road. I have given guest lectures at three other universities and have attended a thesis defense at the University of Regina. I have also attended two conferences, gone on one field trip and will be playing in the ACBL National bridge tournament in Winnipeg after returning from GSA in Orlando.

Research goes well. Rod Baumann and Steve Chipera are gone, but other students, especially Moira Campion are doing good work. I have two papers currently in press and one on the front burner.

This fall the department bought a PC for my office which has been very useful in my work. I am also giving PC lessons to a handful of our present students, in addition to my regular teaching load. Computers are the way that geology is going -- as well as the rest of the world!

My family does well -- both kids are finally in school and Betsy has a fat job. We are planning a ski trip to Jackson Hole this Christmas -- stop by and ski with us during late December - early January.

JOHN REID This year has been more exciting than usual. I received a $44,000 grant from the Army Corps of Engineers to complete the Lake Sakakawea bank erosion study. Brian Sandberg is working on the project. His predecessor, Mark Millsop graduated in May.

The final report on Orwell Lake, Minnesota was finally published at CRREL Report 84-32 in March and a condensation of the report was published in the Bull, Geol. Soc. Amer. in June. Good comments and suggestions for additional work have been received, especially from Europe and Canada.

Together with two students, I designed and completed an exhibit on Glacial Lake Agassiz for the Grand Forks Historical Society, at the Myra Museum. We
included the first detailed cross-section of the "valley." It has exposed a new group of people to geology, especially the Department and Survey.

Dex Perkins and I became involved in the design of a geology trail at Turtle River State Park; it is worth pushing. We need to advertise geology more at UND. Another way is the offering (this semester) of a 101 course by TV. The course involves 14 programs by BBC with integrated text and lab manual assignments. UND is one of 8 institutions in the State offering the course. The word may get out! On the home scene, Barbara and I have 4 grandchildren and Linda is expecting twins. Being a grandparent is great!

SUNDAR SALUJA I carried out an electrical resistivity survey along county highway 21, through a grant from the ND Public Service Commission to reconfirm the results obtained in 1983. It may be recalled that the results of the 1983 survey, which resulted in a mirror image-like map of underground voids left by ancient mine workings, were presented and discussed at the National Symposium and Workshops on Reclamation of Abandoned Mine Lands where some experts indicated that the results were either a coincidence or a breakthrough. The new study, however, confirmed the earlier results, and even some previously skeptical people are beginning to realize how important resistivity studies can be in detecting and reclaiming abandoned mine lands. I propose to survey a few more sites before presenting it for further discussion; there appears to be a possibility of developing it as a tool to determine the effectiveness/efficiency of reclamation.

I took the Geol. 301 class on a field trip to western North Dakota (coal mines and gasification plan) and the Geol. 302 class visited the Reserve Mining Company, Rabbit, MN. This visit has resulted in collaboration for blasting mechanics research with the help of William Krueger, (1961 Mining Eng. Class - UND), currently head of Mining Engineering, Reserve Mining Co. I have also established contact with David Borg (1959 Min. Engr. Class), Director, Atlas Powder Company, PA. There is a possibility of some collaborative work on evaluation of rock fragmentation through high speed photography.

An equipment grant from NDMMRRI was supplemented by a special grant of $25,000 which has gone a long way, together with equipment in the Departments of Civil and Mechanical Engineering in establishing laboratories in:

1. Soil Mechanics
2. Rock Mechanics
3. Blasting Mechanics
4. Coal Analysis
5. Mine Drainage
7. Experimental Stress Analysis

This past summer I visited the Neyveli Lignite project in Tamil Nadu, India, which is currently producing about 7M tons of lignite. Lignite is used for power generation and for the manufacture of briquettes and fertilizer. The possibility of some collaborative research work between Neyveli Lignite Corporation and Central Coal Fields Ltd. was explored during discussions. The response of both the organizations is very encouraging. Steps are being taken to identify the scientists/engineers India who would be willing to collaborate with scientists/engineers at UND so that the respective agencies in USA and India can be approached for the submission of a collaborative program.

On the home scene, my eldest son is getting married in December. His fiancee is a medical graduate.
ROBERT J. STEVENSON  As the Director of the Natural Materials Analysis Laboratory I have been very busy. I recently returned from a conference on x-ray fluorescence and diffraction held in Snowmass, Colorado, bringing back techniques to increase the accuracy of the x-ray fluorescence spectrometer by ten times. I also learned other techniques for the preparation of clay mounts for x-ray diffraction. This coming November I will present a paper on the genesis of gasification ash at the annual meeting of the Materials Research Society in Boston.

Things are really busy in the lab these days. Ral Larsen, Tim Huber, and Scott Robinson are all being paid to conduct rock/mineral analyses and students seem to line up at the door to use the SEM. Faculty, especially Frank and Dex have been using a lot of SEM time as well. It's nice to see so much work being accomplished.

BANK EROSION – JOHN REID

For the past 4 1/2 years students and I have been studying the processes of bank erosion. After a detailed pilot study along the shores of Orwell Lake, MN (1980-1983), it was discovered that bank failure accompanying spring thaw was the most important process resulting in bank recession. As a result of that study, a contract was awarded to undertake similar studies along the U.S. Army Corps of Engineer's largest reservoir, Lake Sakakawea, in west-central North Dakota. Since the Spring of 1983, when the project was begun, students (especially Mark Millsop and Brian Sandberg) and I have collected a "mountain" of data on the weather, the geology (stratigraphy, lithology, and structure), the rates of bank change, and numerous other related parameters.
The data show that the shores of Lake Sakakawea are receding an average of about 1.6 m (5.2 ft)/year, with the maximum rate of 4.3 m (14.2 ft)/year at one station at Fort Stevenson State Park (Fig. 1). The annual rate is controlled largely by the level of Lake Sakakawea during the summer. The summer of 1983 was characterized by a moderately high "pool" level; 1984, however, had unusually high levels because of an abundance of snowmelt in the mountains and unusually high precipitation downstream from the lake (Kansas and Nebraska, especially), resulting in a decision to reduce the outflow from Lake Sakakawea to minimize the flooding problems. This high pool level was accompanied by a number of storms which created intense wave erosion at the base of the banks. Colluvium, some of which had been accumulating for more than two years, was quickly removed, followed by erosion of the primary Sentinel Butte mudstone and lignite and the overlying Quaternary tills and sands. Recession was severe. This past summer the pool level was the lowest of the three years; little bank recession occurred except during Spring thaw as unstable blocks of till failed along slowly expanding vertical joints. Thaw failure was less than at Orwell Lake because Fall and Winter moisture is considerably lower.

Because relatively high pool levels occur an average of every other year, the average of the data from the 2 1/2 years is presumed to be representative. Historic rates were determined from air photo interpretation and from previous lake basin profiles made by the Corps of Engineers. Comparison indicates that bank recession generally has decreased since 1969 when the maximum operating pool level was first reached. Consideration of the recession trend reveals that over the design lifetime of Lake Sakakawea, 500 years, considerable land will be lost to bank erosion. More than 50% of Lake Sakakawea State Park and Fort Stevenson State Park will be gone by that time. The lake will have become considerably shallower and storage capacity will have been reduced to near ineffectiveness.

By knowing the factors controlling bank erosion at the numerous measurement stations, rates along the rest of the lake can be predicted. From this, the Corps of Engineers can make the necessary plans to purchase the endangered property from private citizens before the land is lost and lawsuits result.
FIELD TRIP TO THE WIND RIVERS – D. PERKINS

The Archean Geochemistry Field Conference takes place every summer. Trip leaders and the location of the conference vary from year to year -- this year's conference was led by John Stuckless of the USGS and took place in and around the Wind River Mountains in Wyoming. The Archean rocks there are some of the oldest in North America -- comparable only to rocks in the Superior province of Canada.

In the past several years, we have been studying the Archean rocks of the Superior Province. When the itinerary for the 1985 field conference was announced, one of my graduate students (Moira Campion) and I quickly signed up. It's very important to get out of your own field area once and awhile to look at similar rocks from other places.

The conference began in Lander on a Saturday evening. We had the first of many nice happy hours and a few talks were given at meetings the first day. Day two was spent driving around the southern end of the Wind Rivers. We visited outcrops of the major plutonic units (including the famous Bear's Ears pluton), examined a suspected dismembered ophiolite, and crawled around in abandoned gold mines. At the end of a long day we ended up at an outfitters camp near Pinedale, Wyoming.

The following day we all hiked 12 miles uphill to a base camp in the heart of the Wind River Range. Pack horses brought along most of the equipment (and a few struggling geologists). The place we camped was fantastically beautiful -- just above tree line and providing panoramas to the south and west.

A standard schedule for the next four days included an hour's worth of talks after breakfast (we gave ours on Thursday) followed by 5-10 mile hikes to visit the spectacular geology nearby. Paul Link and several of his graduate students (from Idaho State University), who were mapping in the area, acted as our field guides. The rocks we examined were indeed very similar to those of western Ontario. Granulite facies charnockitic rocks were the most dominant, but there were also excellent exposures of high-grade metasediments and of a few ultramafic bodies.

The best part of the conference was the same thing that makes all conferences great -- the people in attendance. The 40+ participants included people from a variety of subdisciplines, but all of them shared a common interest in Archean geology. Many of the participants were very important people in their fields and it was terrific to get them all talking together while standing on the outcrops.

The second best thing about the conference was the ambiance. I have never been to a conference that convened in tents at 13,000 feet before, but it was terrific. The hike in and out, the camping, the skinny dipping and the grog around the campfire all added a dimension that is missing at most meetings. We even had a lot of beer and a hacky-sack to while away the evenings.

All in all, this conference was the best that I have ever attended. Next year's trip is tentatively set to visit the Josephine peridotite in Oregon, and will include camping and a white-water rafting trip. I think maybe I will send in my application today.
Correlation of stratigraphic units in the North Dakota portion of the Williston Basin has been largely lithocorrelation based on well cuttings, cores, and, to a greater extent, on well logs. This has resulted in a relatively clear picture of the stratigraphy and structure of the Basin but seldom have chronostratigraphic assignments of lithic units been assessed by paleontologic means. While earlier studies by Holland and Waldren, Carlson, Ziebarth, and Morgan may have indicated potential for paleontological studies in the subsurface, only in recent years has enough material been accumulated and made accessible, through the North Dakota Geological Survey at the Wilson M. Laird Core and Sample Library on the campus at UND, to permit extensive biostratigraphic studies. Stratigraphic studies need from paleontology (a) more accurate time lines through the Basin to evaluate depositional models developed from lithologic association, (b) paleoecological refinement of such models, (c) a method of assessment of presumed time-parallel intervals (log marker-defined units), (d) a way to trace units into areas where lithologic differentiation of units is difficult, and (e) a geologic age for stratigraphic units or erosion surfaces whose age is not well documented. To fill this latter need and to provide paleoecologic data, Grenda undertook a faunal study of the Tyler Formation. His work, principally with the macrofossils, solidified an early Pennsylvanian age for the Tyler.

Current activities center on the Mississippian System where a major problem has been placement of the Devonian-Mississippian systemic boundary. The Bakken Formation, initially considered Mississippian and consisting of two black shales separated by a middle siltstone, is one of the best markers in the Paleozoic; but its age has not been well documented in North Dakota until Hayes broke down the black shale and recovered nearly 700 conodonts. Occurrences of conodont taxa bracket the Devonian-Mississippian boundary. The lower black shale is largely of the Devonian (Famennian), Upper Polygnathus styriacus Biozone, and the upper shale member is of the Lower Siphonodella cremlata Biozone of Mississippian (Kinderhookian) age. Rocks of intervening conodont biozones were not identified; T. P. Huber is studying these rocks in greater detail. A current study by L. C. Thrasher of macrofossils of the Bakken seems to indicate that the upper part of the middle member is Kinderhookian and that the Devonian-Mississippian boundary lies within the middle member.

Waters (considering the third and forth needs above) used corals of the Madison Group to develop a sequence of four local biostratigraphic units or "zonules." These four coral zonules, defined on the occurrence of particular coral taxa, maintain consistent stratigraphic positions within the commonly recognized Madison marker-defined intervals; boundaries of these zonules are remarkably parallel to the thin, fine-clastic "marker horizons" bounding the named intervals. For example, Stelechophyllum banffense occurs in a thin (4.5-6 m) zone, in various lithologies, everywhere 6 m below a well-defined gamma-ray deflection which parallels the top of the Frabisher-Alida interval. This parallelism of paleontologic zonules to the log markers lends credence to the consideration of these marker-defined intervals as para-time-rock units (i.e., essentially time parallel). Moreover, Waters was able to carry the coral zonules west into lithologies, indicative of more open marine conditions, beyond the limits of the log markers which define the intervals in shallow-water parts of
the Basin. This indicates the usefulness of coral biostratigraphy for sub-surface exploration west of the Nessan anticline. K.E. Eylands is now studying foraminiferidalgal associations for the possibility of comparable microfossil zonation of Mississippian strata.

F.K. Lohdell is seeking answers to the first and second of the above needs in comparison of the subsurface fauna of the Stony Mountain Formation to that of outcrops of Ordovician rocks in Manitoba. Utilizing foraminiferids from well cuttings, C.A. Maldonado is studying the Jurassic Swift Formation and has been able to date it as principally Oxfordian. With charophyte oogonia she was able to date strata above the Swift, suspected of belonging to the Jurassic Morrison Formation, as Cretaceous and likely part of the Inyan Kara Group. Jeremy Reiskind is finding calcareous nanofossils from stratigraphic test wells contributory to dating the Niobrara Formation in eastern North Dakota as Santonian and to providing information on the position of the pycnocline in Upper Cretaceous seas.

GEOPHYSICAL RESEARCH AT UND – W.D. GOSNOLD

The alumni news committee asked me to offer a few words on geophysical research at UND, and, after some reflection, I am finding it to be a surprisingly enjoyable task. The reason I am enjoying it is that as the broad picture comes into perspective I can see the use of geophysical methods and general interest in geophysics growing in both student and faculty research. It also is especially encouraging to see undergraduate interest picking up. For example, in 1982, my first year at UND, there were only three undergraduate geology majors who took the geophysics course. Most of the students were in geological engineering, making it a required course for them, or were graduate students. That sort of trend for enrollment in the geophysics class continued for 1983 and 1984. This year mine of the 15 students in the geophysics class are undergraduate geology majors.

To give a broad perspective of what is going on in geophysics, I am going to divide this report into three sections: instruction, graduate student research, and faculty research.

INSTRUCTION

Two critical factors in teaching geophysics at UND are computer facilities and the availability of geophysical equipment. A recently acquired LaCoste and Romberg Model G gravity meter and three other geophysical instruments give the Geology Department the capability to provide high quality instruction in geophysical data collection and interpretation, as well as the capability to conduct basic and applied geophysical research. The other instruments are: a new temperature logging system for heat flow studies, obtained through a grant from the National Science Foundation, new electrical resistivity equipment, provided by the Mining and Mineral Resources Research Institute, and a ground magnetometer. These instruments provide us with equipment for teaching and research in four of the five main research and exploration methods used in geophysics. The fifth method, which is the most widely used geophysical method, is seismology and we soon may gain access to a 24-channel refraction seismograph.
An important part of our program is the use of modern computer techniques in analyzing geophysical data. Geophysical studies at UND include computer-aided analysis of earthquake and exploration seismic data, potential field data, including gravity, magnetic, electrical, and heat flow. In our graduate student instruction we employ forward and inverse computer modeling of gravity, magnetic, and resistivity data, and we use numerical methods for analysis of heat flow and subsurface thermal structure. In the fall semester of 1984 we began to integrate computer-aided analysis into our undergraduate geology program. We presently include forward modeling of potential field data and modeling of seismic reflection and refraction lines as part of the geophysics course, Geology 414. It has been especially gratifying to see the undergraduate students get really excited about seismic wave analysis. The use of interactive programs on microcomputers with good graphics capabilities has greatly enhanced student interest and has given us a better tool for teaching.

A critical factor in interpreting geophysical data is to understand the methodology used in acquiring the data. We find that it is useful to embrace the somewhat crude philosophy of GIGO (garbage in - garbage out) to teach students to handle geophysical data. Our students might not learn a better lesson in acquiring and analyzing geophysical, geological or engineering data than they do in the project we are implementing this semester in geophysics; they must plan and execute a gravity survey and use computer-aided analyses of the data. We can drill constantly in the classroom, but a first-hand experience such as this project has no equal as a teaching device.

GRADUATE STUDENT RESEARCH

Geophysical research at the graduate student level has been increasing in several areas. Two students, Katie Luther and Steve Braun, are working on thesis topics in geophysics. Katie is using gravity data to delineate the Superior Churchill boundary in north-central North Dakota. Steve will be using a combination of gravity and aeromagnetic data to look at basement structures in the Williston Basin. Steve also has participated in an experimental gravity survey for Tenneco Exploration Company.

Another graduate student, Doug Anderson, has become interested in subsurface temperature and the thermal history of oil-bearing rocks in the Williston Basin. He is using some of the techniques developed for geothermal exploration along with a comprehensive approach to time dependence of critical factors such as thermal conductivity, formation thickness, porosity, and geothermal gradient. We look forward to a significant contribution resulting from this study. To whet your appetite for Doug's paper, I have included a figure and a quotation that refer to a common method for analysis of the thermal regime in the subsurface. The figures are from my work and the quotation was modified by me. I say that because I don't Doug to catch any heat for my particular viewpoint on subsurface temperatures.

We are also beginning to see applications of geophysical methods to other geologic problems. For example, two of Dexter Perkins' graduate students have or will use gravity data to enhance studies of the Canadian Shield. A recent graduate, Steve Chipera, included an analysis of gravity data in his study of metamorphism in the English River Subprovince in western Ontario. Steve's use of published gravity data provided supporting evidence for his interpretation.
Hypothetical temperature-depth curves for the Williston Basin in western North Dakota. Curve A was calculated from heat flow data. Curve B was calculated from bottom-hole temperature data.
of crustal structure and metamorphism. Moira Campion, is planning to collect her own gravity data as part of her master's thesis work in an area adjacent to Chipera's. Moira's work will be possible only because of our new gravity meter.

FACULTY RESEARCH

Faculty research is also beginning to take on a geophysical flavor. Frank Karner and I have plans to study the basement structure in North Dakota, with interest in several areas such as the Superior-Churchill province boundary, structures in the Williston Basin, and the mechanism of formation of the Williston Basin. You may be aware of recent literature on these particular topics. I think that continued examination of what now may be considered heterodox concepts will contribute greatly to the search for solutions to these problems.

Dexter Perkins and I have submitted research proposals to the National Science Foundation and the Canadian Embassy to conduct joint petrologic and geophysical investigations of the Archean terrane in western Ontario. We expect that this integrated approach will provide mutually constrained models for continental formation processes during the Archean. Don Halvorson is planning to use gravity studies to investigate the subsurface structure around Devil's Tower and other young intrusive bodies in eastern Wyoming.

Finally, I mention three recent research projects that have both advanced the state of applied geophysical research, while providing a valuable service to North Dakota. In 1982 we rented a gravity meter to develop a method for detecting abandoned mine tunnels in lignite fields in western North Dakota, with funding from the Abandoned Mine Lands (AML) Division of the North Dakota Public Service Commission. The project was highly successful and we were able to provide the AML with timely data for their reclamation projects that summer. We used three student research assistants in that project and produced two publications. The method we developed is now a potentially valuable aid in reclamation of shallow mine tunnels that can be applied over the entire country.

Also in a related project for AML, Sundar Saluja employed a pole-dipole resistivity array technique to detect mine tunnels. Sundar's method was also successful and is considered somewhat of a breakthrough in searching for mine tunnels.

The third project was a geothermal resource assessment of North Dakota and was made possible only by access to the heat flow probe and to good computer facilities. That project built upon the results of a previous three-year investigation by the North Dakota Geological Survey and data collected using the heat flow probe. The results of the project indicate that North Dakota has about 2.5 times as much recoverable thermal energy in hot water in the Williston Basin as there is in oil in the Basin. This project has resulted in four publications, three in international journals, and in continued funding for research by the U.S. Department of Energy and the National Science Foundation.

We have also instituted a geophysical exploration program that is designed to give students hands-on geophysical experience in data acquisition and interpretation. In this program we invite industry to use our resources to acquire geophysical data while aiding our students in applied field and laboratory research.

In summary, I can say that a viable geophysics program has begun to develop at UND. I think that its continued growth will be good for all aspects of our geology program because it stimulates research and inquiry on a broad plane.
Both faculty and students are now doing things in instruction and research that we didn't do before.

**CARBONATE RESEARCH AT UND - H. FISCHER**

The main topic of carbonate research is the effect of burial temperatures and pressures on the Mission Canyon Formation (Williston Basin), and in particular the role of pressure solution on the evolution and occlusion of porosity. Even a casual look at the rocks of the Mission Canyon shows extensive evidence that pressure solution has been active in the formation. In many cores, stylolites occur at intervals of six inches or less. Microscopic examination shows that the Mission Canyon rocks have been affected on an even greater scale with pressure solution features occurring at grain contacts, along bedding planes, and as subtle, wispy laminae within most sedimentation units.

The vast amount of pressure solution that the textures suggest requires that a large volume of carbonate has been dissolved and that the solute has moved through the rocks of the Mission Canyon. This material must eventually have been precipitated as cement elsewhere in the Formation and consequently, may have been responsible for the occlusion of porosity, perhaps in large volumes.

Another aspect of pressure solution that is being studied is the accumulation of insoluble residues in association with loci of pressure solution. Associated with traditional stylolites, any clays, organic material or quartz that were in the carbonate being dissolved will be concentrated as a residue or lag deposit on the stylolite seam. In the smaller, microstylolite seams, most of the accumulated insolubles are clays and organic material. In places, the volume of insolubles becomes great enough that a clay seam develops that is visually difficult to separate from a thin shale bed. Dirk Schwartz, a graduate student studying the Mission Canyon has shown that the concentration of clay along these seams will produce a gamma-ray log response again similar to a clay bed. Often, the thickness of the actual clay seam will produce a log response of anomalous thickness with respect to the actual thickness of the concentrated clay material.

We are also investigating the chemical and morphological effects of pressure solution using the NML SEM/Microprobe. If the cements of the formation can be chemically characterized and the solute from pressure solution can be recognized in those cements,
then we will be able to model the pathways through which the fluids migrated from their origin at a stylolite and their precipitation within the pore network of the developing rock.

GSA - ORLANDO

It was good to see many friends and former students at Orlando this past month. Those attending the reception included:

Frank Karner (of course! It was his room!)  
Nels Forsman  
Tim Huber  
Steve Giddings  
Jim Nordstog  
Paul Bulger  
Brian Sandberg  
Steve Chipera  
Dex Perkins  
Mark Erickson  

Joe Downey  
Fred Lobdell  
Darryll Pederson  
Mary Scott  
Allan Ashworth  
Rod Feldmann  
John and Barbara Reid  
Moira Campion  
Alan Kehew

Others at the meeting, but unable to attend the reception included:

Mark and Symma Rich  
Tom Gustavson  
John Utgard
Baumann, Rodney, M.A.
"Metamorphism and Migmatization of Metasediments in the Precambrian English River Subprovince, Western Ontario"

Advisor: Dexter Perkins

Carter, Kristine D., M.A.
"Middle and Late Wisconsinan (Pleistocene) Insect Assemblages from Illinois"

Advisor: John Reid

Chipera, Steve J., M.S.
Metamorphism in the Eastern Lac Seul Region of the English River Subprovince, Ontario"

Advisor: Dexter Perkins

Forsman, Nels F., Ph.D.
Petrology of the Sentinel Butte Formation (Paleocene) North Dakota"

Advisor: Frank Karner

Jenner, Gordon A., Jr., M.S.
"Tertiary Alkaline Igneous Activity, Potassic Fenitization, Carbonatite Magmatism, and Hydrothermal Activity in the Central and Southeastern Bear Lodge Mountains, Crook County, Wyoming"

Advisor: Frank Karner

Kleesattel, David R., M.A.
"Petrology of the Beulah-Zap Lignite Bed, Sentinel Butte Formation (Paleocene), Mercer County, North Dakota"

Advisor: Frank Karner

Millsop, Mark D., M.S.
"A Quantitative Analysis of Shoreline Erosion Processes, Lake Sakakawea, North Dakota"

Advisor: John Reid

Pound, Wayne R., M.S.
"The Geology and Hydrocarbon Potential of the Dawson Bay Formation Carbonate Unit (Middle Devonian), Williston Basin, North Dakota"

Advisor: Howard J. Fischer

Steadman, Edward N., M.A.
"Palynology of the Hagel Lignite Bed and Associated Strata, Sentinel Butte Formation (Paleocene), in Central North Dakota"

Advisor: F.D. Holland, Jr.

Thompson, Steven C., M.S.
"Depositional Environments and History of the Winnipeg Group (Ordovician), Williston Basin, North Dakota"

Advisor: Richard LeFever
Williams, David L., M.S.
"The Geochemical Evolution of Saline Groundwater Within a Fresh Water Aquifer South of Oakes, North Dakota"
Advisor: Alan Kehew

ALUMNI NEWS NOTES

After 1 1/2 years with the USGS performing geo-analytical investigations of the geology of the San Juan Basin, Mark Hanson (B.S. '82) is now a geologist for TerraScan Corp., Inc. measuring and logging Basin and Range Paleozoic rocks (Primarily Devonian) in connection with the Nevada Reefscan Project but is considering going to school for his master's degree.

Mike Hayes (MS '84) has accepted a position with Exxon out of their Midland office (he must be busy because he doesn't write much). His thesis on conodonts of the Bakken Fm. was published in April in the Mountain Geologist.

Bob Farris (M '84) is working of COSCO (Colorado Scientific Instrument and Supply Co., Denver) selling scientific instruments.

Fred O'Toole (MS '81) transferred in July '85 from Gulf Oil in Casper to Chevron, U.S.A., in Denver. "Karen and I are excited about the move and are looking forward to UND/DU hockey games." Yell loud so we can hear you, Fred!

Kevin Malmquist (MA '79) writes from Grand Rapids and claims he is retired. He works part-time for the Minnesota Department of Natural Resources (DNR) in Hibbing and part-time for the Minnesota Historical Society in Grand Rapids. "Spent the winter working on mineral exploration with the DNR--analysis of glacial esker deposits as an indicator of precious metal occurrences in northern Minnesota. Spent the summer blacksmithing for the Minnesota Historical Society, Forest History Center. Wouldn't mind getting involved in some geological research (volunteer) in exchange for some mental stimulation and possibly a junior authorship. Any takers?"

Terry B. Henderson (PhB '70) During 1970-71 I began work on my MS in geology at U. of Idaho "but needed money so never finished my masters. From 1971-74 I was general Manager for Rocky Mountain Geochemical corporation of Salt Lake. I worked in Spokane where I ran a laboratory for three Canadian provinces and five U.S. It was glorious until the '74 recession hit and I got out of geology. From 1974-84 I was a special duty intelligence officer for the U.S. Navy in San Diego, Washington, D.C., and Denver with 14 months on a ship in the Pacific. Most of my work dealt with Soviet weapons system, oceanography, and space systems. While I still like the Navy I didn't want to be separated from my family so I am currently Personnel Director for a retail business, "The Cresent", with an average of 800 employees in Spokane. Two girls ages 13 and 10, same wife, Emily J. Henderson (nee Rolfson, BA from UND in '70)."
Howard Bobbs (MS '73, PhD '75) "Have worked for the Minnesota Geological Survey since 1977. In the last few years I have switched emphasis from the Late Wisconsinan glacial deposits to the older terrain of southeastern Minnesota which has traditionally been mapped as 'Kansan' and 'driftless'. I prepared a Quaternary deposits map for the geologic atlas of Winona County and am working on a similar one for Olmsted County. We recently had a working conference with geologists from Ill., Ia., Wisc., and Minn. which ended at a spectacular paleosol. Ann (BS in Ed. '74) is doing family day care in our house and is selling Discovery Toys. Children: Cory 9, David 5, and Disa 2 1/2. We took a month's vacation by car this summer to California and many points in between."

Neil Korsmo (BS '84) and wife Chris, since leaving ND, have been working as National Park Rangers at Gulf Islands National Seashore out of Ocean Springs, Miss., until they were transferred in June to Hot Springs National Park in Ark. "where we can enjoy hiking, canoeing, and rock & mineral collecting in an area with four seasons and less humidity."

Steve Bique (BSGE '83) Got BA '83 and MS '85 in math from UND with minors in computer science and statistics; MS thesis "Numerical Analysis for Microcomputers." Summer of '84 worked as a mathematics aide at the Geophysics Lab., Hanscom AFB, Middlesex, MA. Summer of '85 spent vacationing at home in St. Louis, and in Phoenix, Yellowstone, Seattle, and Hawaii. "I have accepted a teaching assistantship for the 1985-86 academic year from the U. of Washington, Seattle, where I shall pursue the PhD in mathematics."

Gordon Jenner (MS '84) is currently working as a production geologist for Exxon in Midland where he gets together with Mike Hayes (MS '84).

Barry Wilson (BS in geol '83) received his MS in August '85 from Southern Ill, U., Carbondale, with a thesis on the Aux Vases Ss. (Mississippian). At the end of Aug. he went with AMOCO in Houston.

Charlie Siebels (BS '77) and wife, Jenifer, visited the Department in July. Following receipt of his MS from U. of Iowa he went with AMOCO in Gulf Coast production. Now he is in exploration in S. Texas with AMOCO in Houston where he sees Randy Reichert (BS '78) also with AMOCO, and Rich Scattolini (MS '72, PhD '78) who has been active with the Houston Geological Society.

Vic Cherven (MS '73) spent a lot of time synthesizing the literature (with Art Jacob) on the Williston Basin Tertiary for the 1985 SEPM paleogeography symposium at the midyear meeting in Denver. Bob Johnson (MS '73), together with Linda and their two children visited him in southern California in April and "I spent a great day with them at Disneyland and Knott's Berry Farm." Vic also wrote that MCO Resources was closing their Los Angeles office on 8/1 "so I'm looking for a job. Hope to do some part-time teaching and consulting."

Sam Harrison (MS '65, PhD '68) was awarded the Julian Ross award for excellence in teaching at Allegheny College. Sam says it reminds him of the example set by Walt Moore when he "won a similar award while I was a grad student." Sam also sent two reprints, "Evaluating system for ground-water contamination hazards"

Jeff Sande (BSGE '84) began working in May '85 as a geological engineer in the Coastal Production Division, Shell California Production, Inc. in Bakersfield, CA, working with their holdings in the L.A. Basin.

Bernold M. Hanson (BS '51) was elected President-elect of AAPG (see elsewhere herein). Congrats, Bruno!

Bryan Johansrud (BSGE '84) was selected by Beta Zeta Chapter of SGE as their W.A. Tarr Award recipient in April of 1985. He is with Texaco in Salem, IL, working in the Illinois Basin.

Randy Riechert (BS '78) has gone with AMOCO to Houston.

Mary Scott (nee Woods) (MA '72), long Geology Bibliographer with Chester Fritz Library, has left us to follow her husband, Mike, who is teaching computer science at Grove City College, Pennsylvania. Mary says she will enjoy being a housewife for awhile and visiting her mother 15 miles away; but she may continue toward her master's of library science at Pitt in the spring. We'll all miss Mary; she's irreplaceable!

Odin Christensen (Faculty '75-'78) is a research geologist with Newmont Exploration in Sparks, Nev. He says, "I'm actively involved with precious metals exploration in the northwestern U.S. -- and loving it. For recreation, I am still running long distance races (50-100 miles) and bouncing canoes down rivers."

Frank Caramanica (PhD '73) visited this summer with Judy and Al. With Texoma Production Co. (although their name has changed) in Houston he says he's keeping his ulcer under control by being "cool". (We don't buy it!)

Cheryl Malonado (BS '81) is taking the first draft of her thesis on the Swift Fm. (Jurassic) with her as she relocates with husband, Lorenzo, and son, Larry, in Tubingen, Germany, where Lorenzo is stationed with the Air Force.

Mary Rygh (BSGE '82) petroleum engineer with the NDGS, is helping in petroleum engineering labs; he recently spoke to SGE on "Major Oil Plays North Dakota."

Friends and colleagues, including Frank Karner gathered to wish Mary Scott a farewell.
Julieann Van Nest (BS '83), after two years of research with UND's Dept. of Anthropology, has accepted a GTA in the Geology Dept. at the Univ. of Iowa.

Gerry Groenewold (MS '71, PhD '72) will become Director of the Engineering Experiment Station on 11/1/85 in addition to his duties as Director of ND's Mining and Mineral Resources Research Institute (MMRRI).

Steve and Angela (Elshaug) Chipera (MS '85, and BS '83) in Los Alamos say, "It's easy to fall in love with life in the mountains. It's not too hot, not too cold. We become tourists every weekend." Steve is co-authoring a paper with Dex Perkins, given at the GSA meeting, and Angie hopes to utilize her BA ('85) in computer science doing programming or geology graphics or modeling.

Wayne Pound (BS Geol. '80, MS '85) is on wells in the Williston Basin for the Analex Division of XCO out of Denver so he stops by the Dept. on occasion.

Bret Fossum (BSGE '82) is an exploration geologist with Conoco in New Orleans "sitting offshore wells from time to time, but spend most of my time working up exploration ideas by interpreting well, paleo, and seismic data and incorporating that information on various types of maps and montages. I have one gripe with Gulf Coast geology -- no rocks. Most of what I am doing is in Pliocene and Miocene and is either gumbo or very unconsolidated sand. The structures get quite interesting though." On a recent camping trip to New Mexico he visited Socorro.

Dave Johnson (former UND faculty member) in Socorro.

Terry Bailey (BS '70) is presently working as a Project Geological Engineer with Tenneco Oil Co. in Lafayette. "Took enough time off last year to spend a couple weeks in England and France. Hot summers in Louisiana make me long for the ND winters." (Now that's a twist!)

Walter Barke (BS '50) retired 6/1/84 as Regional Supervisor of Bridges and Buildings after 30 years with RNRR when the company opened an incentive program for older employees to accept early retirement. "My wife, Christa, and I then started an antique business (in Seattle) which is doing better than we ever expected. So I am no longer retired, but I work when it suits me. We also run around the West in our camper, sail Puget Sound in our 26' sailboat, go river rafting, cross-country skiing, and biking."

Sam Tuthill (MA '63 PhD '69) is senior vice-president of Iowa Electric Light and Power Co. in Cedar Rapids with responsibility for the production side of the company, including Iowa's only nuclear power plant. He and Connie have moved out "into the woods" east of the Amanas. Their family is grown and they have two grandchildren in NJ, two in Laramie, and one in Iowa.

Roy Kulland (MS '75) is working the Federal Offshore Gulf of Mexico with Anadako Production Co. "We have been quite successful lately in acreage acquisition and have recently brought on stream an estimated trillion cf gas field in the Matagorda Island area." He and wife, Alanna, had son born Easter Sunday (4/7/85) but "he doesn't seem to be too interested in the geosciences yet (his mother is a geologist too). (Keep working on him, Roy)
Jim Welander (PhB '70) says he is "still gold mining at our jewelry store in Fergus selling lots of diamonds at 20 percent on invoice," running a photo business and gardening.

Henry Gertje (BSGE '85) has entered graduate school at Michigan Tech. He was married on 5/17/85.

Rod Norby (BS '71) of the Illinois Geological Survey was one of the co-authors of a guidebook on the Silurian of the Des Plaines River area near Chicago for the GSA's north-central sectional meeting in April, 1985.

Sid Anderson (PhB '51) is Acting State Geologist and chairman of the search committee for a new director of the NDGS and State Geologist. (Any applicants or nominations, anyone?)

Gordon L. Bell (Faculty, '53-58) attended the ND Academy of Science meetings in Minot in April. Although Dr. Bell has retired from the ND Highway Department, he and his son are operating a small geophysical company from his home in Bismarck and keep plenty busy.

Mark Stadum (BSGE '83), Craig Schmit (BS'70), and Dan Daly (MS '84) keep busy with Gerry Groenewold (MS '71, PhD'72) on ground water and coal studies and other aspects of mineral resources work in the MMRRI offices in Rm 108 (former 101 lab. and then student lounge) in Leonard Hall.

Andrew G. Alpha (BS '34, MS'35) received a Sioux Award, UND's highest award, for his achievements in his chosen profession, geology, at the '85 Homecoming. (Our congratulations, Andy!)


John Klemer (BS '52), consulting geologist from Bismarck and Engineering Advisory Council Committee Chairman of Geology, was a big help to the Department during the recent visit of the ABET accreditation team.

Mark Millsop (MS '85) has joined STS Consultants, Ltd. in Green Bay, WI, where he is responsible for several projects involving groundwater contamination prevention and correction. He says he is learning a great deal and enjoying the area and the work. He and Joni became the parents of their 2nd daughter (4th child) this summer. Mark and John Reid presented a paper at the GSA.

Craig Foss (BS '83) has been accepted for graduate study in Urban Forestry at the University of Idaho. Finally, Craig's avocation of tree-Trimming will become his new vocation. Best of success, Craig!
Rob Meek (BS '85) is working toward his master's in exploration geophysics program at SMU. He writes that when he got to Dallas he found that he didn't have an RA or TA as he thought they'd offered, but he landed a job as a geophysical technician in exploration geophysics at the Mobil Research Laboratory processing data for the geophysicists. The data processing is about the same as done at UND on Dr. Reid's Lake Orwell and Lake Sakakawea projects except it pays $13 per hour. He says, "The experience I gained (at UND) was as valuable as the education I received in class work. I sure wish I'd had more math when I was at UND. Some of the classes I'm taking, like Potential Fields, deal with vector calculus which I've never had. I'm learning it real fast though."

There are enough alums employed at UND's Energy Research Center (ERC), formerly DOE or BuMines for older alums, so that they could put a hockey team on the ice: Ed Steadman (MA '85) and Dave Kleesattel (MS '85) are continuing there as research fellows; both went to Alaska this past summer where they collected Miocene brown coal at the Usibelli Mine at Healy (between Anchorage and Fairbanks). Doug Beckwith (BS '84) is a lab tech at the ERC and Rae Ann Brown (BS '84) is doing CRD work in the analytical division while Kevin Henke (MS '84) is working as a chemist on waste-water characterization and Dave Brown (MS '83) is project manager on fine-coal cleaning. But it is Sharon Falcone (MA '83) research supervisor of ash and slag in basic coal science division, that must have the good job! This summer she visited the Hermann Research Labs in Melbourne (yes, Australia) and collected in brown-coal mines east of Melbourne. She visited New Zealand (on vacation) and then collected fossil birds in caves in the Cook Islands for Dave Steadman (formerly with the USNM and now vertebrate paleontologist with the NYNM at Albany) while he was busy with Smithsonian World filming his research there. Let the record show at least a dozen geology professors in the Department who will be glad to go to Australia to collect coal, ash, slag, ice, opals, corals, archaeocyathids, migmatites, ignimbrites, coprolites, etc. for anyone!

Brian Wallick (MS '84) made two poster presentations at the SEPM midyear meeting in Boulder and has stayed in Colorado seeking support for doctoral work (or we suspect he would accept a job with an oil company). Meantime, he has not been idle and is out measuring sections along the Front Range behind his house in Fort Collins.

It was fun to hear Dr. John Wade (former UND hockey great from 1956 and now Dean of the faculty of medicine at U. of Manitoba and 1985 Sioux Award winner) tell stories of (and on) Ben Cherski (BSMIE '55), Bill Reichert (PhB '57), Ray Huot (BS Geol. '55), and Bill Steenson.

Igor Kohanowski (BSMIE '51) continues as Manager of Business Development, Mineral Systems Division, for Allis-Chalmers, in Milwaukee.

We understand that Dr. E.A. Noble, former Chairman of the Department and State Geologist, has been loaned by the Dept. of Interior to the Pakistan government to aid them in developing their coal resources. Polly and Ned left for Islamabad, West Pakistan, in late September. Well, the skiing ought to be good in the Karakoram Mountains!
C.B. 'Burt' Folsom
C.B. 'Burt' Folsom, 68, 415 N. 25th St., died Wednesday while driving on South Washington Street.
Memorial services will be at 2 p.m. Monday in Hanson-Anderson Mortuary. Veterans of Foreign Wars Post 1874 will conduct military honors. The family prefers memorials to the C.B. Folsom Fund in Petroleum Engineering at the University of North Dakota.

Mr. Folsom was born June 14, 1917, in Denver, where he grew up and attended school. He attended the University of Colorado School of Mines and received two degrees in petroleum engineering. He was employed by Phillips Petroleum Co. in Texas before World War II. During the war, he served in the Southwest Pacific Theater as a captain.

He acted as head of the Petroleum Engineering Department at the University of New Mexico at Socorro from 1947 to 1953. In 1953, he came to UND as chief engineer of the North Dakota Geological Survey and assistant professor of petroleum engineering until 1981. He was involved in revising North Dakota's oil and gas rules and regulation for the state Industrial Commission in 1953.

He belonged to the American Institute of Mining Engineers, Society of Petroleum Engineers, Sigma Gamma Epsilon geological honorary society and Veterans of Foreign Wars. He was past master of the Masonic Lodge in Socorro and served on the Regulatory Practices Committee of the Interstate Oil Compact Commission.

Survivors are his daughter, Marta Karin Sullivan, Guelph, Ont.; son, Bruce, Wichita Falls, Texas; six grandchildren; and sister, Dorothy (Mrs. Herman) Rossoll, San Diego.

The short obituary carried by the Grand Forks Herald on Thursday, August 15, 1985, could not convey, in this limited space, but a fraction of the loss to the Department brought by Burt's death. It doesn't point out that Burt continued to teach, without remuneration, several of the petroleum engineering courses ever since his official "retirement" in 1981 (having taught these for years without expense to the University before retirement). It doesn't point out the depth of practical experience that Burt shared with young men and women on their way toward careers in the petroleum industry. It does not convey the sense of pragmatism that Burt brought to his courses, his advice to students, and his dealings with people; for Burt was ever an exponent of the "common sense" so often decried as lacking in academic instruction. While the Department was forced to make adjustments in scheduling and course loads (with Mary Rygh, petroleum engineer with the North Dakota Geological Survey helping Prof. Min Chu with classes) it was students at Homecoming who expressed to us how much they valued the instruction, advice, and help that Burt had given to them so freely. Thus the Department is only beginning to sense the magnitude of his loss.

The short newspaper article doesn't tell that Burt was always the first person on the staff to arrive at his office each day nor express the extent of his dedication to sound industrial practices and to sound education. It only hinted at the magnitude of his service to the people of the State in the early emplacement of sound regulatory practices during the early days of the development of oil and gas industry in the state.

Neither the article nor these words can convey adequately, to someone who didn't know Burt, the thread of cynical good humor that pervaded all that Burt did. But many of us will remember that he was one of the founders and guiding lights of the Society for the Preservation of the Memory of Outstanding Goofs; and many of us can recall the wry smile, the tongue in cheek, or the quiet chuckle always present as he'd deal with daily minor crises or the bumbling good intent of students, bureaucrats, or misguided professors. Yet all who knew him realized that he could manage the same slight shrug and self-effacing smile when the prodding turned toward him as he graciously received (and prized) his citations and awards in 1968 and 1969 for ineptitudes in the lab and in golf.

The naming in 1982 of UND's student chapter of the Society of Petroleum Engineers of AIME, the C.B. Folsom Chapter, will help to perpetuate his memory, the establishment at UND by his family of the C.B. Folsom Fund in Petroleum Engineering will help to perpetuate his memory, his contributions to the Univer-
sity, the State, and industry through service and his publications will continue to stand as a memorial, but the real tribute to Burt is the words of the student who said, "You can't believe how much his wisdom, advice, and teachings meant to me as I started out in the field. What a loss." We all feel it!

FRANK CLINGAN FOLEY  
1906 - 1985

Dr. Frank C. Foley, UND Professor of Geology from 1933 to 1941 and State Geologist from 1938-1941, died March 26, 1985, in Topeka, Kansas, having resided for some time at the Presbyterian Manor there. Frank Foley was born August 8, 1906, in Belleville, Ontario. He received his BA from the University of Toronto in 1929 and his Ph.D. from Princeton in 1938. He taught geology at Dartmouth, 1929-30 and at Princeton, 1930-33, before coming to UND and then succeeding Howard E. Simpson as State Geologist upon the death of the latter in 1938. Having brought Wilson Laird to UND in the Fall of 1940, Dr. Foley joined the USGS early in 1941 and then served 1942-45 as a major in the U.S. Army Corps of Engineers in Morocco and Italy. After WWII he was a geologist for the Illinois Geological Survey until he became State Geologist of Kansas in 1954. At KU he served as Chairman of the Department of Geology from 1957 to 1963 and retired in 1970. His numerous papers on ground-water geology brought him considerable acclaim and he served as a consultant to the United Nations on water resources in Saudi Arabia and Africa.

We have received word that Robert S. Crawford (Ph.B '52) died in Dillon, Montana, on March 20, 1976.

It has recently come to us that Keith L. Hanson (BSGE '61) has died; we don't know of the time or circumstances.

If you know of classmates who have died, please let us know, along with the year of death if known.
Beckwith, Douglas C. (BS 1984)
Beeks, Clifford H. (BS 1966)
Beeks, Wayne R. (BSME 1962)
Beiers, Jan C. (BS 1960)
Bell, Gordon L.
Berg, James A. (BS 1979)
Berg, Larry D. (BS Geol 1960)
Bergan, Gail R.
Berglund, Almit D. (BS Geol 1970)
Bergstrom, John R.
Bertram, Ronald E. (BSGE 1970)
Betcher, John T. B. (BS 1971)
Beyers, Ron H. (BS 1959)
Bickley, William B. (MS 1970 PhD 1972)
Binde, Scott C. (BSGE 1984)
Binegar, Randall D. (BSGE 1983)
Bique, Stephen F. (BSGE 1983)
Birk, Emmet C. (BA 1937)
BJorlie, Peter F. (BS 1976 MS 1978)
BJorlie, Sidney C. (BS Geol 1973)
Blain, William S. (BS Geol 1955 MS 1968)
Bleau, Dale J. (BS 1972)
Block, Douglas A. (PhD 1965)
Blumen, John P. (PhD 1971)
Blumen, Mary E. (MST 1967 EdD 1975)
Blum, Raymond L. (BS Geol 1957)
Bohan, Timothy W. (BS 1981)
Bogh, James D. (BSME 1961)
Bojeski, Jean M. (BS 1984 BS GE 1984)
Bolstad, Erling M. (BSME 1939)
Bonneville, John W. (BS Geol 1956 MS 1961)
Braaten, Dennis A. (BSGE 1979)
Brandjord, Irwin M. (PhB 1956)
Braun, Stephen M. (BS 1983)
Breitling, Barbara
Brekke, David W. (WA 1979)
Brekke, Karla (BSGE 1982)
Breza, Michael (BSME 1956)
Brinster, Kenneth (MS 1970)
Brostuen, Erling A. (PhD 1965)
Brouillard, Lee A. (BS 1977)
Brown, David J. (MS 1983)
Brown, Rae Ann (BS 1984)
Brown, Ronald G. (BS 1968)
Budzisz, Gail R. (BS 1979)
Buechler, Barbara J. (BA 1965)
Bulger, Jeffrey W. (BS 1981)
Burke, Randolph R.
Burkhardt, Barry W. (BS 1972)
Bushaw, Dewey J. (BS Geol 1957)
Collender, Edward (MS 1964 PhD 1968)
Camara, Michael (MS 1977)
Cameron, David A. (BS Geol 1975)
Carmanica, Frank P. (PhD 1973)
Carlson, Clarence C. (MS 1960)
Carroll, William K. (MS 1978)
2451 Estabrook Dr. Grand Forks ND 58201
PSC 2275 APO New York NY 09224
10576 West Sundance Mt. Littleton CO 80127
IALAPCO, 601 California St. San Francisco CA 94108
515 N. 22nd St. Bismarck ND 58501
130 Riverside Park Road Bismarck ND 58501
Box 72 Bowbourne ND 58721
1663 Hyland Greens Drive Grapevine TX 76051
KK 1 Box 200-G Buffalo WY 82834
Geology Dept. U of Wisc. Eau Claire WI 54701
Ashby MN 56309
2500 9 St. N. #5 Bismarck ND 58501
1130 Lucrene Ave. Cape Coral FL 33904
5797 S Kenton St. Englewood CO 80111
Rt. 1, Box 31 Fortuna ND 58844
3018 Manchester Dr. Bismarck ND 58501
3801 Brooklyn Ave. NE Seattle WA 98105
5346 S. Magnolia Terrace Whittier CA 90601
7401 NW 107 Oklahoma City OK 73132
7237 S Independence Littleton CO 80123
2414 Broadway Fargo ND 58102
Route C Box 7-2 Roseau MN 56751
2301 Harlem Crest Rd. Rockford IL 61111
1215 Cherry St. Grand Forks ND 58201
1215 Cherry St. Grand Forks ND 58201
10150 East Harvard #E-341 Denver CO 80231
1905 Westfield Avenue Minot ND 58701
PG Box 9802-340 Austin TX 78766
PG Box 134 Williston ND 58801
7910 W Becher West Allis WI 53219
2233 Cardinal Drive Plano TX 75023
2600 Apache Big Spring TX 79720
1043 Oakcrest Casper WY 82601
817 1/2 Belmont Road Grand Forks ND 58201
409 SW Red Hills Drive Dundee OR 97115
NDGS ~ University Station Grand Forks ND 58202
SEE MARCHELL
106 Washington Harbor Washington DC 20309
1324 University Ave. Grand Forks ND 58201
715 42nd St. NE #101A Grand Forks ND 58201
SEE BERGAN
SEE BREITLING
5511 SE Hawthorne Blvd Portland OR 97215
NDGS ~ University Station Grand Forks ND 58202
192 Norris Ct. Billings MT 59105
1802 Corral Drive Houston TX 77069
15631 Pagehurst Dr. Houston TX 77084
1510 Chatham Colony Reston VA 22090
11723 Clearview Ave Whittier CA 90604
52 Riverview Heights Mandan ND 58554
6610 Glenn Lakes Drive Houston TX 77069
1163 Ave B West Bismarck ND 58501
Route 4 King Ave West Billings MT 59106
Dumonceaux, Gayle (MS 1984)
Duncan, Joseph (BSME 1959)
Dunsworth, Robert A. (BSME 1955)
Dykes, Merrill E. (MST 1970)
Efteland, Jon N. (MA 1973)
Elfealdt, Robert T. (BSGE 1981)
Einarson, Marvin G. (BS 1951)
Ekren, Einar R. (BS Geol 1949)
Elofson, Richard R. (BS Geol 1963)
Emmons, Dale C. (MA 1975)
Endres, Joel A. (BS 1972)
Engbrecht, Eric F. (BS 1949)
Englehardt, Paula (BS Geol 1970)
Englerth, Edward (BS Geol 1958)
Ensninger, Robert H. (PhD 1958)
Erickson, A. Kirth (BS Geol 1967 MS 1970)
Erickson, J. Mark (MS 1968 PhD 1971)
Erickson, Jerrold J. (BS Geol 1976)
Erickson, Margaret O. (BA 1939)
Erickson, Ronald L. (BSGE 1959)
Ewers-Gilbert, Holly
Eylands, Kurt F. (BA 1981)
Facco, Fosco V. (BS 1970)
Paflik, Richard E. (BS Ed 1975 MA 1979)
Faigle, George A. (MS 1964)
Falcone, Sharon K. (MA 1983)
Falkenstein, George (BA 1931 MS 1945)
Farquharson, Philip (BS Geol 1975)
Farringer, Dale (BA 1938)
Farris, Robert S. (MA 1984)
Fashbaugh, Earl F. (MS 1979)
Peldman, Robert H. (EX 1962)
Fender, Thomas J. (BS 1982)
Fendt, Paul (BSGE 1981)
Fenner, William (MS 1974 PhD 1976)
Federer, David A. (BS 1982)
Ferguson, Lori H. (MA 1984)
Fischer, David W. (MS 1980)
Flewitt, William E. (BS Geol 1957)
Pohl, Deborah K. (BA 1973)
Forsgren, Frank M. (BS Geol 1980)
Forslund, Neil (BS Geol 1974 PhD 1985)
Foss, Craig (BS 1983)
Foss, Stuart B. (BS 1973)
Foumou, Bret (BSGE 1983)
Frederickson, Dean (BSGE 1985)
Friestad, Harlan K. (BS Geol 1966 MS 1969)
Friestad, Mark B. (BS Geol 1970)
Froehlich, Charles (BSME 1960)
Froehlich, Lawrence (BS Geol 1964)
Frye, Charles R. (PhD 1967)
Fulmer, Thomas C. (BS 1980)
Fulton, Clark (MS 1976)
Furman, Marvin J. (MS 1970)
Fyten, Alice E.
Gableman, Paul D. (BS Geol 1954)

1516 2nd Ave. N., Apt. 2 Grand Forks ND 58201
PO Box 182 Elmwood IL 61529
8860 Roseville Drive Richmond BC V7A 2K3
22835 Rum River Blvd Anoka MN 55303
200 Sugarwood Drive Knoxville TN 37922
Box 31162 Lafayette IN 47903
Box 2057 Farmington MN 55024
32082 Horseshoe Drive Evergreen CO 80439
30632 Fourth Ave. So. Federal Way WA 98003
401 6th Ave NE Oskaloosa MN 55369
2155 Northridge Dr. N. Mankato MN 56001
1526 N. Yeso Circle Hobbs NM 88240
240 Bonita Glen Dr. Ft. Tnt Chula Vista CA 92010
1214 N 1st St Bismarck ND 58501
4523 Alton Place NW Washington DC 20016
5990 S. St. Paul Way Littleton CO 80121
15 Church Street Canton NY 13617

SEE OROS
Box 51754 Lafayette LA 70501
802 N.E. 81st St. Seattle WA 98115
109 4th Ave. S. #3 Grand Forks ND 58201
Box 95 Ear Falls Ontario POV 1T0 CANADA
2323 Washington Ave. Terre Haute IN 47803
3403 W. Ohio Midland TX 79703
505 S. 6th St. #4 Grand Forks ND 58201
529 Miller St. Yuba City CA 95991
Earth Sci. Dept. MSU Bozeman MT 59717
5303 Garner St. Springfield WA 22151
2150 Lafayette St. Denver CO 80205
2400 Shady Tree Lane Edmund OK 73034
2942 Belvedere Drive Billings MT 59102
7544 Skyview Drive Kent OH 44240
Box 721 Williston ND 58801
209 Orange View In. Lakeland FL 33803
4706 Briar Bend Rd. Houston TX 77035
7921 W Glasgow Place Littleton CO 80123
4280 Casa Brazzilia Dr. St. Louis MO 63129
NDC - University Station Grand Forks ND 58202
3019 Linden Drive SW Calgary AB T3K 6C8
RR 1 Box 139 Bismarck ND 58501
PO Box 9615 Reno NV 89507
1646 28th Ave S #2 Grand Forks ND 58201
RR 1 Devils Lake ND 58301
545 North Grotto St. Paul MN 55104
321 Deave Ave. Tioga ND 58852
601 California Street San Francisco CA 94108
Brinsmade ND 58820
1833 Green Oak Drive Gretna IA 70053
126 Reno Bismarck ND 58501
212 North Avenue Mayville ND 54468
5015 King David Blvd Annandale VA 22003
1104 NW Columbia St Bend OR 97701
1611 Teal Ct. Richland WA 99352
3479 Ross Road Palo Alto CA 94303
201 East 8th Street Superior WI 54880
Galambos, William E. (BS Geol 1958)
Garaas, Howard (BS 1942)
Garske, Jay T. (BS Geol 1957)
Garske, Jeffrey W. (BS Geol 1976)
Gatheridge, Alan K. (BS 1979)
Geirmann, William J. (BS Geol 1947)
Gerhard, Lee C.
Gertje, Henry (BS Geol 1985)
Gessner, Charles J. B. (BS Geol 1959)
Gibbs, James F. (PhB 1956)
Gibbs, Mackintosh J. (BSMEE 1958)
Giles, Timothy F. (BS 1972)
Gillin, Donald S. (BS Geol 1958)
Gillis, David (BS Geol 1984)
Giltner, Eric (BS Geol 1982)
Gjestvang, Nory D. (BS Geol 1984)
Glaser, Mary Jo
Gordon, John P. (PhB 1955)
Gray, Lockhart R. (BS Geol 1959)
Gregoire, Joel L. (BS Geol 1982)
Grenda, James C. (PhD 1977)
Griffin, John A. (BSMEE 1977)
Griffin, Leonard F. (BS 1942)
Grilley, Nena L.
Groenewold, Gerald H. (MS 1971 PhD 1972)
Groenewold, Joanne (MS 1979)
Grossman, I. C.
Grove, Jr., Clayton (PhB 1950 MA 1959)
Crunether, Arland C. (PhB 1956)
Grygo, Roland (BS 1957)
Guenther, Kenneth M. (BS 1971)
Gullikson, David M. (RA 1955 BSMEE 1956)
Gulmon, Gordon (BA 1937)
Gustason, Thomas C. (MS 1964)
Haaeh, Jerry D. (BA 1975)
Haake, Ellis V. (BS 1969)
Haberlach, Anthony F. (BA 1960)
Haeter, James F. (BS 1981)
Hagen, Gregory D. (BA 1979)
Hagruiser, J. Ladd (MS 1967 PhD 1971)
Hall, Gary C. (MS 1958)
Halvorsen, Corey W. (BS 1977)
Halvorsen, Darrel L. (MS 1971 PhD 1979)
Halvorsen, Joseph Gene (BS 1957 M Ed 1965)
Hamilton, Robert W. (BS 1970)
Hamilton, Thomas N. (MS 1967 PhD 1970)
Hannes, James H. (BS Geol 1957)
Hansen, Dan E. (BS Geol 1950 MS 1955)
Hanson, Bernd M. (BS Geol 1951)
Hanson, Mark S. (BS 1982)
Hanson, Roy E. (BS Geol 1947)
Harkal, Horald C. (BS Geol 1952 MS 1953)
Harki, Ahmed (BS Geol 1983)
Harkins, Vernon (BS Geol 1984)
Harris, Kenneth L. (MS 1973 PhD 1975)
7549 E. Cerramello Colorado Springs CO 80909
5702 S. Havasu Cr. Englewood CO 80110
3248 Jellison Wheat Ridge CO 80033
427 W Reno Avenue Bismarck ND 58501
1515 17 St. Grand Forks ND 58201
6045 West 47th Avenue Wheatridge CO 80033
4105 South 3340 East Salt Lake City UT 84117
10093 E. Lake Drive Englewood CO 80111
Michigan Tech Institute Houghton MI 49931
2129 W. St. Anne Rapid City SD 57701
6892 Chalina Lane San Jose CA 95129
400 146 Front St. Toronto ON CANADA
2419 Spruce Street Boulder CO 80302
1620 11th St. Lewiston ID 83501
2700 Ernest St. Apt #318 Lake Charles LA 70601
314 N. 51st St. Grand Forks ND 58201
993 Kelly Drive Washburn ND 58577
512 Rayland Houston TX 77009
1013 Durango Drive Great Falls Mt 59404
110 Voyeur Avenue Winnipeg, MB R2Y 0H9 CANADA
3622 High Vista Dallas TX 75234
403 W. Ave. D. San Angelo TX 76903
P.O. Box 372 South Heart ND 58655
P.O. Box 248 Deaver Springs AR 72543
3512 Partridge Lane Casper WY 82604
1807 Willow Drive Grand Forks ND 58201
SEE IERUD
12201 Sunrise Valley Dr. Reston VA 22092
3020 N Elm Street Fargo ND 58102
412 Lansing Lane Bismarck ND 58501
12573 Bradley Ave #14 Sylmar CA 91342
RR 2, Box 62 Oslo MN 56744
1430 Allison Drive Loveland CO 80537
P.O. Box 1363 Natezeh MS 39120
3406 Saddlestring Tr. Austin TX 78749
908 5th Avenue N. Walthamton ND 58075
Box 2202 Williston ND 58801
Rt 2, Box 2568 A La Grande OR 97850
Exlog 550 Havana St. Denver CO 80239
#9 Fairway Drive Minot ND 58701
7625 Copper Glen St. Worthington OH 43085
2906 South Fonton Denver CO 80227
28 Graves Ct. Odessa TX 79762
6 Forest Park #1 Enterprise AL 36330
201 Leeward Hills Lane Grand Forks ND 58201
Box 357 Lake Park MN 56554
8668 E Soland Drive Scottsdale AZ 85253
19818 Summerset Way Houston TX 77094
21916 50th Ave Tanglewood AC V3A 3T3 CANADA
455 South Nelson Denver CO 80226
P.O. Box 1212 Midland TX 79702
10760 W. 8th Ave. #2 Lakewood CO 80215
208 Salisbury St. Rehoboth Beach DE 19971
Box 323 Northwood ND 58267
Route 1, Box 65-5 Dickinson ND 58601
1209 Cherry St. Grand Forks ND 58201
Joeretz, Richard W. (BS Geol 1973)
Johnson, Algot R. (BSMIE 1939)
Johnson, David B.
Johnson, Hume T. (PhB 1950)
Johnson, Irwin S. (BS Geol 1957)
Johnson, Jeffrey (BSCE 1983)
Johnson, Jon W. (BS 1973)
Johnson, Karl D. (BSCE 1982)
Johnson, Kent A. (BSCE 1969 MS 1971)
Johnson, Linda J. (BSGE 1980)
Johnson, Robert C. (PhB 1967 BSCE 1973)
Johnson, Robert P. (BS 1970 MS 1973)
Johnson, Robert R. (PhB 1967)
Johnson, Ronald M. (BS 1985 BSCE 1985)
Johnsrud, Bryan C. (BSCE 1984 BS 1984)
Johnstone, Kenneth W. (PhB 1940)
Julian, Frederic M. (PhB 1957)
Juni, Charles H. (BS Geol 1951)
Kalberer, William A. (BS Geol 1950)
Kana, Darrell W. (BSMTE 1959)
Kasper, Roland J. (PhB 1954)
Keaveny, Guido W. (BSCE 1984)
Keller, Donald D. (BS 1973)
Kelley, Lynn J. (MS 1980)
Kelly, Fred Baker (BSCE 1984)
Kenaley, Douglas S. (MS 1982)
Keogh, James P. (RA 1938)
Kerian, Robert J. (BS 1979 BSCE 1981)
Kichline, Robert D. (PhB 1968)
Kiefer, Duane J. (BSCE 1984)
Kiefer, Paul L. (MST 1973)
Kingsman, Paul N. (BS 1972)
Kjelmry, John P. (BS 1971)
Klauder, Elmer J. (BS Geol 1957)
Klerner, John N. (BS Geol 1952)
Klipfel, Clarence J. (BS 1952)
Klosterman, Mary Jo (BS 1978)
Klotzkin, Charles E. (Ex 1963)
Knauss, Wayne L. (BS 1950)
Krudnov, Benjamin D. (BS 1979)
Krudnov, Bruce E. (BS Geol 1975)
Koch, Charles A. (BSMTE 1958)
Kock, Michael S. (BS 1985)
Koehler, Patrick M. (MST 1973)
Kohanowski, Frank (BSMTE 1951)
Kohanowski, Nicholas
Koons, Robert R. (BS Geol 1957)
Kornbrath, Richard W. (MS 1975)
Korso, Neil R. (BS 1984)
Korwin, David J. (PhB 1959)
Kostelecky, Lewis E. (BS 1954)
Kovar, Mark (BSCE 1979)
Kraft, Leonard S. (BSCE 1958)
Kramlick, Kerry (BSCE 1985)
Kresl, Ronald J. (BS Geol 1955 MS 1964)
Krieg, Fredric A. (PhB 1970)
Krueger, William E. (BSMTE 1961)
1420 Harmon Ave. Bismarck ND 58501
RR1 McGregor ND 58755
Geoscience Dept NM Tech Socorro NM 88081
2164 Prospect Street Penfield NY 14526
10031 Avery St. Houston TX 77042
POB 83418 Fairbanks AK 99708
1025 10 St. NW Minot ND 58701
35 Hemlock Babbitt MN 55706
7862 Valentina Way Englewood CO 80112
5700 Ming Ave. #66 Bakersfield CA 93309
101 East 22nd Ct. Owasso OK 74055
351 S. Brandon Loop Bismarck ND 58501
Box 2014 Anchorage AK 99503
1301 Lorane Dr. Grand Rapids MN 55744
106 Dahlins Drive Apt. #2 Sales IL 62881
4937 Purdue Avenue NE Seattle WA 98105
2428 S. Allison Way Lakewood CO 80227
1500 Douglas Midland TX 79701
1205 Hermitage Rd. Colonial Heights VA 23834
8313 Shadowood Lane Broken Arrow OK 74012
310 Linzien Lane Bismarck ND 58501
605 W. 6th #7 Liberal KS 67901
Box 483 Garrison ND 58540
328 High St. Abbotsottown PA 17301
Rt. 2, Box 138 Devils Lake ND 58301
1115 Abana Houston TX 77090
1812 1st Avenue North Grand Forks ND 58201
Box 4192 Casper WY 82604
911 Church Street Bozeman MT 59715
1420 N. 13 St. Bismarck ND 58501
13 Bon Price In St. Louis MO 63132
16813 126th Avenue SE Renton WA 98055
8251 Arrowhead Way Littleton CO 80124
Box 363 Hazen ND 58545
Box 411 Bismarck ND 58501
PO Box 10757 Dhahran FCN SAUDI ARABIA
SEE GLASSER
65 Norman Avenue Lake Hiawatha NJ 07034
1180 SW Pacific Hwy Tigard OR 97223
Box 158 Hardin MT 59034
17487 E. Rice Circle #D Aurora CO 80015
1520 Country Ln. Bismarck ND 58501
427 S. Washington Bismarck ND 58501
5757 Standish Ave. S. Minneapolis MN 55417
2821 N. Park Dr. Milwaukee WI 53222
5532 10th Avenue North Grand Forks ND 58201
9431 S. Wasatch Place Tucson AZ 85715
SR Box 9812 Hiland Rd. Eagle River AK 99577
521 Reserve Ave. Hot Springs AR 71901
140 NW 22nd St. Gresham OR 97030
7709 Bellwood Drive Houston TX 77055
6530 Village Casper WY 82601
8781 Templeton Drive Omaha NE 68134
46 8th Ave. W. Dickinson ND 58601
2421 Mathews Ft. Collins CO 80521
PO Box 2120 Union TX 77455
52 Fir Circle Babbitt MN 55706
McDonald, Gerald B. (BS Geol 1965 RSBA 1966)
  - McDonald, William F. (BSMIE 1922)
McFarlane, Paul E. (RA 1971 BE ED 1972)
McGowan, LaVerne L. (BS 1955)
  - McKeechrie, Daniel (BA 1980)
McKee, James W. (PhB 1953)
McKenzie, Robert L. (BS Geol 1953)
McLean, William (BSMIE 1961)
  - Meek, Robert A. (BS 1985)
Meirs, Monte C. (BS 1974)
Meldahl, Charles E. (BS Geol 1962)
Meldahl, Elmer G. (BS Geol 1955 MS 1956)
Melik, James C. (MA 1960)
Mellom, Ralph M. (BSMIE 1957)
Melvin, Richard L. (BS 1975 BSCE 1977)
Merrell, John (BSCE 1962)
Merritt, James C. (MS 1967)
Meyer, Gary N. (MS 1979)
Mickelson, Kermit B. (BS Geol 1950)
Mikkelsen, Dean H. (BS 1956)
Mikkelsen, Dwight (PhB 1960 BS 1973)
Miller, Arthur C. (PhB 1960)
Miller, Daniel J. (BA 1984)
  - Miller, James (BSCE 1983)
  - Miller, Kenny E. (BSCE 1977)
Millsop, Mark D. (MS 1985)
Miner, Roger (BSMIE 1958)
Mittet, Robert A. (BSPA 1974)
Mo, Kimberly M. (BSCE 1985)
Mo, Richard B. (BS Geol 1958)
Mo, Thomas A. (BSCE 1982)
  - Mohs, David P. (Ex 1978)
Monroe, Richard G. (PhB 1956)
Moore, Richard B. (MS 1970)
Moore, Walter L.
Moran, Stephen A.
Morgan, Douglas H. (MS 1964)
Morin, Kevin A. (MS 1979)
Moss, James C.
Mouser, Jayne M (BSCE 1984)
  - Moultrie, Gerard E. (BSCE 1920)
Moun, Michael R. (BS 1971)
  - Muhes, Robert A. (BSMIE 1951)
Murphy, Edward (BS Geol 1979 MS 1983)
Naplin, Charles E. (PhB 1967)
Neis, Richard J. (BSCE 1984)
Neitzke, Richard C. (MST 1970)
Nelson, David O. (BS 1975)
  - Nelson, Donald K. (BSMIE 1950)
Nelson, John P. (MS 1981)
  - Nelson, Kenneth (BS 1959)
Nelson, Lyle S. (BS 1970 MS 1973)
Nelson, Maynard A. (PhB 1938)
Nepper, John P. (BSMIE 1953)
Neseneier, Bradley D. (MS 1981)
Ness, Carl E. (BSCE 1984)
Ness, Thomas P. (BS Geol 1978)
  - 2501 Guenca Drive San Ramon CA 94583
  - 2560 Carson Way Sacramento CA 95821
  - PO Box 59 Colusa CA 95932
  - 398 Green Street Flin Flon MB CANADA
  - 2 Churchfield Ave. Waybridge, Sury PC ENGLAND
  - 8125 186th St. SW Edmonds WA 98020
  - 4012 Varden Road NW Calgary AB CANADA
  - 7040 Holly Hill, #355 Dallas TX 75231
  - 2005 E Dakota Parkway #12 Williston ND 58801
  - 815 Kendall St. Edgewater CO 80214
  - 3237 Flora Ave. Billings MT 59102
  - 13-15 High St. Waybridge Sury PC ENGLAND
  - Rt 2 Wellesley Way Greenville SC 29607
  - 6247 S. Niagara Court Englewood CO 80111
  - Box 88 Swastika ON P0X 1T0 CANADA
  - 6761 Sherwood Ave. Anchorage AK 99504
  - 114 45 St. W. Minneapolis MN 55409
  - 9020 Duncliff Lane Dallas TX 75231
  - 3022 NW Expo Suite 413 Oklahoma City OK 73112
  - PO Box 362 Bunker TX 77413
  - 1 Dorset Road St. Paul MN 55118
  - 8t 1 Borup MN 56519
  - 1203 6th St. SW Minot ND 58701
  - 2525 North View Ct. Howard WI 54303
  - 3522 Brookside Drive Bishop CA 93514
  - 1745 Marion St. #1 St. Paul MN 55113
  - 3635 Knox Ave. Minneapolis MN 55412
  - 816 Prince Phillip Dr. Virginia Beach VA 23452
  - 1815 4th St. North Grand Forks ND 58201
  - 7601 17th Ave. S. Richfield MN 55423
  - 3647 E 67th Anchorage AK 99507
  - Hawaiian Nat'l Park HI 96718
  - 7334 San Ramon Dr. Houston TX 77083
  - PO Box 693 Tripoli LIPYA
  - 557-A King St. E. Kitchener ON N2G 2L9 CANADA
  - Beach ND 58621
  - 2123 11th W Seattle WA 98119
  - 414 4th Ave S.W. Jamestown ND 58401
  - 135 Pressley Kellogg ID 83837
  - 1802 South 20th St. #21 Grand Forks ND 58201
  - Route 5 Thief River Falls MN 56701
  - PO Box 78 Devils Lake ND 58301
  - 4945 Dominic Drive Hopkins MN 55343
  - 17453 Renton Maple Valley Maple Valley WA 98038
  - 3640 Archwood Drive Rocky River OH 44116
  - 3815 Varayas Road Memphis TN 38111
  - 2112 St. Claire Brentwood MO 63144
  - 1601 N. Main Fairfield IA 52556
  - 1440 Beaumont Dr. NW Salem OR 97304
  - 9826 Hartman Omaha NE 68134
  - PO Box 569 Story WY 82842
  - 4 St 3rd Ave. NW Kenmare ND 58746
  - Box 616 Bismarck ND 58502
Sabo, John M. (BSGE 1982)
Sabo, Joe (Ex 1956)
Sackreiter, Donald K. (MS 1973 PhD 1975)
Salisbury, Richard A. (MA 1966)
Salomon, Nona L. (BS Geol 1974)
Samuelson, Wallace J. (BS Geol 1950)
Sande, Jeffrey J. (BSGE 1984)
Sanderson, Chad M. (BSGE 1985)
Sandy, Bruce G. (BSGE 1982)
Savage, Merle J. (BSGE 1967)
Scardigli, Wayne E. (BSGE 1968)
Scardigli, Wayne E. (BSGE 1968)
Scattolini, Richard (MS 1972 PhD 1978)
Schaan, Cory J. (BS 1985)
Scherer, Edwin H. (BS 1981)
Scheider, Joel D. (BSGE 1984)
Schimelfenig, Carrie (BS 1983)
Schley, Carleton C. (PhD 1969)
Schmid, Jacqueline S. (BSGE 1964)
Schmid, Roger W. (BS 1960)
Schmidt, Orville L. (BSME 1957)
Schmit, Craig R. (BS 1970)
Schmitz, Emnett R. (MS 1955)
Schwacke, Artuar (BS 1962)
Schneider, Gregory J. (Ex 1953)
Schofield, Ronald C. (BS Geol 1958)
Schott, David W. (BSGE 1981)
Schulte, Frank J. (BS 1965 MS 1971 PhD 1972)
Schulze, Henry W. (BSME 1951)
Schwachter, Sara J. (BS 1984)
Schwachter, Thomas O. (BSGE 1985)
Schumann, John P. (Ex 1963)
Schwartz, Danny L. (BS Geol 1975)
Schwartz, Guy L. (BSGE 1983)
Scott, Mary L. (MS 1972)
Setherlund, Richard P. (BSME 1957)
Seymour, Morris E. (BSME 1928)
Shannon, Wilfred A.
Sherrod, Neil R. (MS 1963)
Shide, Daniel T. (BSGE 1984)
Short, Harry W. (PhD 1956)
Siebels, Charles J. (BS 1977)
Sigsby, Robert J. (PhD 1966)
Sillerud, Jerrol C. (BSGE 1978)
Simpson, Howard E. (BA 1940)
Sinkbell, Raymond F. (BS 1949)
Skene, George W. (BSME 1937)
Slama, Louise A. (BS 1973)
Smallwood, James C. (BS Geol 1954)
Smith, Carol J. (BS 1953)
Smith, Gordon A. (BSME 1958)
Smith, Leonard J. (BS 1950)
Smith, Louis D. (BS Geol 1970)
Smith, Richard D. (BS 1967)
Smith, Wayne G. (BSME 1959)
Smyers, Larry E. (MS 1979)
Sogard, Patrick O. (BSGE 1982)
1133 6th Avenue NE Valley City ND 58072
Box 11 Suite l3 SS 3 Calgary, AB T2J 3M9 CANADA
6433 Zang Court Arvada CO 80004
1825 S. Endicott Denver CO 80226
SEE GRUENEL
6308 S Halen Fort Worth TX 76133
5051 Ming Ave. #15 Bakersfield CA 93309
1103 22nd Ave. So. Grand Forks ND 58201
Box 256 Westhope ND 58793
7109 NE 244th St. Battle Ground WA 98604
7109 NE 244th St. Battle Ground WA 98604
16246 Alamitos Dr. Fort Bend County TX 77083
c/o General Delivery Berthold ND 58718
Box 1431 Building 718 Duncan OK 73533
1102 Ave "C" Bismarck ND 58501
535 N 2nd Carrington ND 58421
500 S E 19th Street Rochester MN 55901
100 South Sevanado #18 Orange CA 92669
1920 Catherine Bismarck ND 58501
14315 Heritage Ct. Wichita KS 67230
821 36th Ave. S #2 Grand Forks ND 58201
2633 S Balsam Street Lakeview CO 80227
2646 Gallighouse New Orleans LA 70114
250 Hemlock Street Froomfield CO 80020
1812 Bay Shore Road SW Calgary AB T2V 3M1 CANADA
PO Box 800 c/o Amoco Co. Denver CO 80201
343 Pawlake Houston TX 77079
1219 Vista Circle Globe AZ 85501
106 Cherokee Ave. Bismarck ND 58501
106 Cherokee Bismarck ND 58501
1666 Clarendon Drive Lewistsville TX 75067
PO Box 1177 Minot ND 58701
PO Box 1156 Watford City ND 58854
201 N. Broad St.1st Floor Grove City PA 16127
12123 Westmore Houston TX 77077
1955 Steelees Ave. # 318 Willwoodale ON CANADA
1201 Buttonwood Dr. Ft. Collins CO 80525
Route 1, Box 92C Laronde ND 58251
724 Santa Ana Lane Concord CA 94518
12447 Hedgehill Lane Houston TX 77077
933 Winona Mandeville LA 70448
1401 Aineslee Midland TX 79701
2020 Washington Avenue Golden CO 80410
501 Rustic Rd. Hutchinson KS 67501
3000 Rankin Rd. NE Minneapolis MN 55418
SEE MAIDNER
2202 Parkdale Kingwood TX 77339
SEE PENDER
675 N. First St. #500 San Jose c/o Dibrien CA 95111
37828 297th Place Enumclaw WA 98022
184 Park Estate Pl Calgary AB T2J 3M1 CANADA
PO Box 100779 Anchorage AK 99510
5339 S. Greenwood Street Littleton CO 80120
Alamo ND 58830
Solheim, Dale S. (BS Geol 1958)
Sorenson, Vernon S. (BSEE 1940)
Sowokinos, Janice
Speath, Richard M. (BS 1972)
Stadium, Mark A. (BSCE 1983)
Staiger, LeRoy A. (BA 1970)
Stallman, Gerald M. (BSCE 1982)
Stallman, Tim L. (BA 1975)
Stancel, Steven G. (BS 1974)
Stefanovskiy, Gary L. (BS 1983)
Steig, Wade D. (BA 1979)
Steiner, Mark A. (MA 1978)
Steinle, Kirk M. (BSCE 1985)
Stiening, Jodie D. (BSGE 1984)
Stone, William J. (PhD 1973)
Stordahl, Gerald L. (MST 1969)
Storhau, Dennis G. (BS 1970 BSCE 1977)
Strake, James E. (BS 1970)
Strand, Gilmor A. (BA 1939)
Strecker, Erwin J. (BS Geol 1950)
Streich, Eldon A. (PhD 1969)
Streibel, James E. (BSME 1963)
Streibel, Edmund L. (BA 1980)
Strong, Gary R. (BS 1972)
Strube, Delton D. (MS 1979)
Sturm, Stephen (MA 1982)
Suess, John M. (BSCE 1983)
Sullivan, Raymond W. (BSME 1928)
Sunderland, Gary L. (BS Geol 1971)
Surnergren, Edwin C. (MST 1968)
Swenson, Karl F. (BSME 1956)
Switzer, Kenneth B. (BS 1966)
Syvertson, David I. (BSCE 1980 BS 1980)
Tesarowski, Chester S. (BA 1967)
Thompson, Gary G. (BS Geol 1962)
Thompson, Jack C. (PhD 1949 BS Geol 1950)
Thompson, Stephen C. (MS 1984)
Thomte, Dennis L. (BS Geol 1957)
Timm, Elbert C. (BA 1939)
Ting, Francis T.S.
Tinker, John R. (MS 1968 PhD 1970)
Tokach, Kenneth C. (PhD 1965)
Trapp, John S. (PhD 1967)
Traynor, Patricia (BS 1974)
Traynor, Terrance O. (BS Geol 1977)
Tribitt, Robert C. (BS 1980)
Trimbam, William C. (BS 1954)
Trostgruben, Eldon M. (PhD 1971)
Truax, Calvin O. (BS Geol 1951)
Tschida, Edward A. (BS Geol 1957)
Tuthill, Samuel J. (MA 1963 PhD 1969)
Twyman, Christopher A. (PhD 1971)
Ulmer, James H. (MS 1973)
Utgaard, John E. (BS 1958)
Van Alstine, James B. (MS 1974 PhD 1980)
Van Nest, Julieann (BS 1983)
Van Oornum, Joanne (BS Geol 1971)
812 Granger Road Detroit Lakes MN 56501
2769 Vist Del Oro Carlsbad CA 92008
3501 7th Ave. No. Grand Forks ND 58201
2261 Fallcreek Court Grand Forks ND 58201
810 17th St. So. Grand Forks ND 58201
6202 Bradley Drive Corpus Christi TX 78414
El Rancho Motel Riverton WY 82501
3532 River Drive Fargo ND 58103
3196 S Xenia Street Denver CO 80231
5257 5 Ave. N Grand Forks ND 58201
909 13th Ave. W. Williston ND 58801
3701 F. Fox Lair Dr. Flagstaff AZ 86001
417 Tulane Ct. Grand Forks ND 58202
251 Northridge Hills Grand Forks ND 58201
Rt. 3 Box 757 Belden NE 68702
Box 113 Williston ND 58801
7800 West Friend PI Littleton CO 80123
1111 8th Street Portland ND 58274
3139 LaQuinta Missouri City TX 77459
450 Haugen Heights Whitefish MT 59937
PO Box 4381 Houston TX 77210
52 Valley Drive Casper WY 82601
Rt. 4, Box 355-A Minot ND 58701
472 Walnut, FPI Colorado Boulder CO 80301
2170 W. 10th Ave. #1-205 Broomfield CO 80020
1927 East 9th Ave. Hibbing MN 55746
2208 Ivy Court Findlay OH 45840
4179 Bidwell Drive Fremont CA 94538
Esso Malaysia, Exxon Box 857 Kuala Lumpur FON MALAYSIA
1022 W Montana Chicago IL 60614
1652 McCreary Rd. Winnipeg, MB R3P 0M7 CANADA
1511 Poly Drive Billings MT 59102
Box 7581 Metairie LA 70010
513 Fleetwood Dr. Norman OK 73069
3616 S 94th Avenue Omaha NE 68124
2505 Westridge Drive Plano TX 75075
Geology Dept. U of W. Va. Morgantown WV 26505
3624 Pickering Place Eau Claire WI 54701
Box 201A Buffalo Star Rt. Sheridan WY 82801
US Nuclear Regulatory Com Washington D.C. 20555
SEE NONE
712 4th Street North Bismarck ND 58501
3520 60th Street #24 Monroe IL 61265
339 Bayside Road Bellingham WA 98225
Park River ND 58270
6346 Prairie Hills Drive Cheyenne WY 82001
9 Golfview Court Sugarmill Woods, Homosassa FL 32646
Rural Route 1 Arvada IA 52203
1003 Larsen North Thief River Falls MN 56701
Route 4 Box 490 Frazee MN 56544
912 Glenview Carbondale IL 62901
Rural Route 1 Morris MN 56276
Star Route Pequot Lakes MN 56472
SEE LERU
Vandergron, David D. (BS 1969)  
Vandersluys, Heidi N. (BSME 1960)  
Verner, Ianny D. (BS 1978)  
Vickers, Jeffrey P. (BSCE 1978)  
Vig, Reuben J. (BSME 1937 MS 1963)  
Voigt, Harold E. (BSCE 1984)  
Walden, Charles H. (BS Geol 1954)  
Walker, Daniel M. (BS 1979)  
Walker, Thomas F. (MA 1967)  
Wallick, Brian M. (MS 1984)  
Walsh, Robert G. (RD 1975)  
Wangerud, Kenneth W. (BS Geol 1974)  
Warburton, Stanley M. (BS Geol 1951)  
Wartman, Brad (MS 1983)  
Waters, Douglas (MS 1984)  
Waxvik, John N. (BS Geol 1966)  
Weaver, James G. (PhB 1967)  
Webster, Mark H. (BSCE 1984)  
Webster, Rick L. (BS 1980 MS 1982)  
Wehrfritz, Barbara D. (MS 1978)  
Weinland, Janice (Ex 1973)  
Welander, James D. (PhB 1970)  
Wells, Jay A. (BS 1985)  
Wenben, Richard V. (BSME 1956)  
West, Edmund G. (BSME 1959)  
West, Roger C. (MS 1969)  
Wheeler, Raymond D. (PhB 1964)  
White, Stanley P. (BS 1980)  
Wiken, Kent W. (BSCE 1964)  
Wilkie, Kenneth C. (PhB 1953)  
Wilkinson, Michael (MS 1982)  
Williams, Barrett J. (BS 1958 MS 1960)  
Williams, David M. (PhB 1964)  
Willson, Robert C. (BS 1967)  
Wilson, Barry J. (BS Geol 1983)  
Wilson, Everett E. (BS Geol 1956 MS 1958)  
Wilson, James W. (BSCE 1976)  
Winbourn, Gary D. (BS Geol 1978)  
Winterer, Timothy R. (BSME 1959)  
Wockovich, Marvin R. (PhB 1953)  
Wold, Paul D. (BS 1949)  
Wolff, Robert A. (BSCE 1982)  
Wosick, Frederick D. (BS 1974 MS 1977)  
Wyborny, Sylvester J. (BSME 1958)  
Wylie, Jan C. (BS 1971)  
Yearous, Jenny D. (BS 1985)  
Young, Daniel R. (MA 1980)  
Zabel, Dean A. (MS 1979)  
Zedlick, Roger C. (BS Geol 1957)  
Zich, Terrance J. (BSCE 1977)  
Ziebarth, Harold C. (MS 1962 PhD 1972)  
Zimmerman, James T. (BS Geol 1955)  
Zodrow, Dain M. (BS Geol 1950)  

516 7th St. Devils Lake ND 58301  
Box 962 Spearfish SD 57783  
391 Monino Avenue #9 Belmont Heights CA 90814  
723 14th St. W. Williston ND 58801  
RR J Box 3680 Rapid City SD 57701  
Halliday ND 58636  
11426 Coldspring Drive Houston TX 77043  

PO Box 12 Silverdale WA 98383  
2418 W. Olive Fort Collins CO 80521  
Rt6 Country Club Box 124 Minot ND 58701  
8854 W Quarto Avenue Littleton CO 80123  
2225 Orchard Street Lake Charles LA 70601  
9700 Glenfield Ct. #1402 Houston TX 77096  
2401 Ohio Drive #1108 Plano TX 75075  
5401 Wilcox Tavern Fairfax VA 22030  
3347 N. 57th Omaha NE 68104  
PO Box 817 Riverdale ND 58565  
9955 Village Bell Lane Houston TX 77038  
621-A First Street Golden CO 80401  
SEE SOWOKINDS  
919 East Mount Faith Ferguson Falls MN 56537  
6793 Overton Dr. Fridley MN 55432  
14315 F. Marina Drive Aurora CO 80014  
Rt. 1 Box 160 Spokane WA 99204  
2601 Fairway Drive Moorhead MN 56560  
Road 1 Box 25 Dolgeville NY 13329  
8412 S Timberwood Street Highland Ranch CO 80126  
10 Manitoba Ave. Grand Forks ND 58201  
2636 Laurel Crescent SW Calgary 10, AB T3E 6B3  
PO Box 767 Maumee OH 43537  
2757 Arlondale Drive Tucker GA 30084  
1839 61st Ave. N. St. Cloud MN 56301  
1614 Rickey Road Charlottesville VA 22901  
3222 Hollyberry Ct. Falls Church VA 22042  
6404 Kensington Court Oklahoma City OK 73132  
1133 Henry Road Billings MT 59102  
3737 West Princeton Bismarck ND 58501  
12614 Vindon Houston TX 77024  
45 Verbaalee Lane Hillsborough CA 94010  
3106 Hamilton Way Casper WY 82601  
1061 East Sandpiper Drive Temple AZ 85283  
4415 Crown Point Rd. Mandan ND 58554  
220 E. Brandon Dr. Bismarck ND 58501  
1021 Oak Grove Detroit Lakes MN 56501  
1805 Country Club Road Cleburne TX 76031  
1458 E. Old Shakopee Bloomington MN 55420  
2507 W. 43rd Ct. Anchorage AK 99503  
220 W Graaf Ave. Ridgecrest CA 93555  
Attn:GSGS 6500 Brooks Ln Washington DC 20315  
1709 E. Omaha Drive Bismarck ND 58501  
7352 S. Delaware Street Littleton CO 80120  
6905 Edenvale Blvd Eden Prairie MN 55344  
1112 South Main Minot ND 58701
Gerald R. Rauch    BS 1957
William A. Peal    BSCE 1983
Kenneth Brienster  MS 1970
Erling A. Brostuen  PhD 1965
Lee A. Brouillard   BS 1977
Ronald G. Brown    BS 1968
Charles W. Cook    BS Geol 1968  MS 1974
Gerald C. Dohn      PhD 1966
Jerrold J. Erickson RS Geol 1976
Bret Rossman  BSCE 1983
Ahmed Harki  BSCE 1983
Gregory D. Majczak  BSCE 1974
Paul E. McFarlane   BA 1971  RS ED 1972
Kerry E. Miller     BSCE 1977
Stephen A. Moran
James C. Moss
Jeffrey Plescia    Ex 1973
Merle J. Savage    BSCE 1967
Wilfred A. Shannon
Leonard J. Smith    BS 1950
James E. Straka     BS 1970
Edmund L. Stiebel   PA 1980
Kenneth B. Switzer  BS 1966
Daniel M. Walker    BS 1979

Cover Photos:  -(top) Andy Alpha receives the Sioux Award from President Clifford
-(bottom) Bruno Hanson, Alan Cvancara and Will Gosnold converse at reception
(see page 7 for both stories)
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