

MHC
T226L

Items

Volume 2, Number 2
Winter Quarter, 1976

Subsurface of energy & environment

Geological Survey programs link research & service

A wide spectrum of sub-surface investigations is getting increased attention from the Minnesota Geological Survey, and Prof. Matt Walton, director, sees the programs as providers of vital resource information for the state and research material for graduate students.

"The Geological Survey used to be identified principally with mining activity in the state," Walton observed, "but we have relatively little to do with that now and are concentrating on other aspects relating to state needs that are especially relevant today."

Among those "other aspects" are the development of data banks to serve governments at localized levels, many businesses, and environmental or recreational interests. Practical applications of the findings may be helpful in determining locations of large commercial and industrial developments or for often-controversial sites for landfills to handle solid wastes, and for underground storage potentials.

Walton emphasizes that the Geological Survey is an investigative agency. Any regulatory action that may stem from its work is the responsibility of other divisions of government, state or local.

To illustrate the broad scope of informational needs, Walton points out that the glacial drift over Minnesota has never been mapped completely even though glacial action is the basis of this state's agricultural wealth and sub-surface water abundance.

Increasing attention to such problems has been reflected by a significant jump in enrollments of geology departments.



Matt Walton
From 107 Lind



Charles Fairhurst

Merit basis emphasized in student aid

An increasing stack of scholarship and fellowship applications reminds us that another cycle of the rather unique I.T. merit scholarship program is beginning.

This program, involving as it does both undergraduate and graduate students, is an excellent example of cooperation between the University and the business community. Basically, the program channels financial contributions from industry to help meritorious students pursue technical education.

There are positive benefits for I.T. because these top-flight students become part of our University population.

There are eventual benefits also for the supporting businesses because they get talented and professionally-trained employees after the students get their degrees.

Financial aid for graduate students on the basis of merit is not particularly unique, but for undergraduates, support on a merit basis has been almost non-existent re-

MERIT SCHOLARSHIPS

(Continued on page 2)

Fairhurst urges test building underground

Underground construction as a means of reducing the energy demand of buildings is receiving major attention in the Department of Civil and Mineral Engineering, with research activities, instruction and projects both within the university and outside.

A report by department faculty members observes that while the energy-conserving merits are generally recognized, there are areas of possible objection to subsurface building. The report proposes mounting of a full-scale demonstration program to cover technical, economic and psychological aspects, according to Prof. Charles Fairhurst, department head. Because of the wide implications of such a demonstration, it is suggested that federal and state funding inputs should be included along with the university's support.

The University of Minnesota already has an underground building under construction for a future central campus bookstore, with supplementary solar heating. But Fairhurst believes a larger structure planned for a variety of uses would be needed for adequate testing of the principles involved and refining of the engineering and technology.

The preliminary proposal estimates total cost of \$6,500,000 and a program extending for at least two years. The first year, for planning and design, should be financed by \$200,000 from the State of Minnesota and \$200,000 from the U.S. Energy Resources Development Admin-

CIVIL & MINERAL
(Continued on page 2)

MERIT SCHOLARSHIPS

(Continued from page 1)

cently. Need has been a predominant standard for awarding scholarship aid to undergraduates in the years just past. The emphasis on need-related scholarships has not been diminished, but we have been seeing an upsurge of interest here and throughout the country in aid on merit, support to the outstanding students in recognition of their academic performance.

Our Institute of Technology merit recognition and assistance program incorporates two broad sections:

The scholarship program for undergraduates.

The fellowship program for graduate students.

The merit scholarship section has had industry participation since the fall of 1973, when the Ford Motor Company made a three-year grant to the Institute of Technology to promote engineering education of women with demonstrated high ability. Since that time other industrial concerns have added to the program.

For the 1974-75 academic year the Merit Scholarship was reserved for first-year women. The selection committee reviewed 160 applications and awarded 30 scholarships. The top selection was valued at \$1,000, covering tuition for three quarters, fees, and money for books. Other awards ranged down to \$50 for books.

For this current year the I.T. program has been expanded, including again the women's competitive scholarships plus a parallel competition open to both men and women entering students. More than 300 nominees were screened, and the number of awards was doubled for a total of 60.

These programs for the beginning students in I.T. are supplemented by other scholarships, also funded by business and industry and also awarded for meritorious achievement or indications of continued high performance.

The program for high-ability students entering graduate studies is known as the Corporate Associates Fellowship program. It has been in operation since 1969 and is available to graduates in the School of Business as well as to I.T.

This support enables I.T. departments to compete with any graduate school in the country for the truly exceptional advanced students.

Almost 100 students have held graduate fellowships in the six years of the Corporate Associates Program. Follow-up studies indicate that of students already graduated under the program, almost 50 percent found their first full-time employment in this state or with Minnesota-based companies.

WALTER H. JOHNSON
Associate Dean, I.T.

CIVIL & MINERAL

(Continued from page 1)

istration (ERDA), according to the plan.

The report emphasizes that energy-saving implications of underground buildings are especially significant in northern parts of the United States because the area's cycle of severe winters and hot summers creates high energy demands for heating and cooling.

It points out that underground structures benefit from the smaller temperature differences in the subsurface environment, that the ground itself has insulating qualities comparable to the best above-ground insulation, and that ventilation heat recovery is more effective due to the greatly reduced infiltration losses below the surface.

The Department of Civil and Mineral Engineering analysis suggests that a major building requested in future plans of the Institute of Technology could be built below surface and of sufficient size and encompassing mixed uses—classrooms, offices, laboratories, and storage, for example—to serve as an experimental model. Many of the hypotheses of sub-surface construction would be tested at every stage of design and development.

The I.T. department is a headquarters base for the American Underground Association, and Fairhurst is a past chairman of the Underground Construction Research Council of the Society of Civil Engineers.

items

INSTITUTE OF TECHNOLOGY

University of Minnesota
Minneapolis, Minn. 55455

Volume 2, Number 2
Winter Quarter, 1976

ITems is a quarterly publication of the Institute of Technology at the University of Minnesota, with special support from the I.T. Alumni Association. Material from this publication may be reproduced without cost, but credit to ITems will be appreciated. Requests to be placed on the mailing list or other inquiries may be directed to Clarence A. Berg, at the above address. Phone (612) 373-4838.

Dean: Richard A. Swalin
Associate Dean: Walter H. Johnson
Assistant Dean, Industry
and Professional
Relations: Arnold A. Cohen
Assistant Dean,
Student Affairs: Paul A. Cartwright
Director of Continuing
Education in I.T.: M. E. Nicholson
Director of Special
Programs: Clarence A. Berg
I.T. Alumni President:
James A. Lenarz
Editor: Angelo Cohn

The University of Minnesota adheres to the principle that all persons shall have access to its facilities, activities, and employment without regard to race, creed, sex or national origin.



CONTINUING EDUCATION in Engineering and Science

UNITE reaching beyond range of TV circuit

A new dimension is being introduced experimentally in the I.T. UNITE program to make it possible for engineers outside of the existing closed circuit TV network to participate in regular University courses at their places of employment.

Expansion of the system is accomplished through videotape of the courses sent over the closed circuit network "live from campus classrooms." The one difference is that the videotape users do not have immediate talk-back capability, but a schedule of telephone question periods is expected to fill that need.

Tape cassettes are made during the UNITE campus classes and shipped immediately to the participating plant locations. Handbook materials and problem assignments are sent by mail.

Early and late classes arranged to assist engineers on the job

Principal undergraduate courses of the Department of Civil and Mineral Engineering are being offered through extension division night classes, making it possible for an employed person to earn a degree outside of the daytime class schedule.

The evening class curriculum is structured on a three-year cycle, and degree work can be completed during that period while the student remains in full daytime employment.

Development of a program of graduate courses outside of normal working hours for practicing engineers also is under way in the department. Current planning is focused on part-time study, with classes to be set up either at early morning or late afternoon-evening hours to facilitate attendance by

Practitioners teach and study Timber design for buildings

Modern emphasis on timber as a structural material is being examined in the fourth course of a five-part series offered through the I.T. program of Continuing Education in Engineering and Sciences for practicing engineers.

The timber design short course, like others in the series, is a cooperative undertaking in post-campus education involving I.T. and professional or industrial groups.

Designated as *Timber Design Applied to Buildings*, the current course has been developed by John Goehl of the Structural Wood Corporation in St. Paul. Starting Feb. 10, the course includes four weekly sessions of two hours each.

In a brief introduction to the curriculum outline prepared for the course, Goehl explained that the sessions are oriented to serve structural engineers, analyzing

basic characteristics of wood construction and helping them to develop a basic feel for designing with wood.

The first two sessions cover design aids and codes and applicable texts or reference materials from both government and industry sources.

The two later sessions, Feb. 24 and March 2, will focus on fastenings and connections, comparing different types, design specifications, theoretical factors and engineering or economic considerations for installation labor.

Classes meet in the evenings at the headquarters of Ellerbe Architects, Engineers & Planners in Bloomington, Minn.

The four class sessions are each of two-hour duration, and opportunities for questioning by the participants are emphasized along with the specialized presentations.

Earlier courses in the series covered building design with steel, masonry and reinforced concrete. Industry faculty members working with Goehl on the current course are Frank Frankowski of Clark Engineering Company and Jack Meyer of Meyer, Borgman & Johnson, both firms in Minneapolis.

Coordination of the courses is handled by the I.T. department of Continuing Education in Engineering and Sciences and the University's department of Continuing Education and Extension. There is a \$35 fee for the four sessions.

The final course in the series, beginning March 16, will be on Prestressed Concrete in Building Design with Prof. Ladislav Cerny as instructor.

engineers who already hold degrees and are employed in the profession but may wish to take specific graduate courses toward further degrees or personal advancement.

The Civil and Mineral Engineering Department also is engaged in a cooperative continuing education program with the Minnesota State Highway Department supported under terms of the federal highway safety act. Traffic engineering and traffic design for highways are covered in a series of one-week seminars.

In a further joint activity with the Minnesota Highway Department, Prof. Jesse Fant has been on loan to the state agency for part-time assistance in upgrading land survey activities.

AM Award for 1975 honors F. W. Boulger, '34, Metallurgist

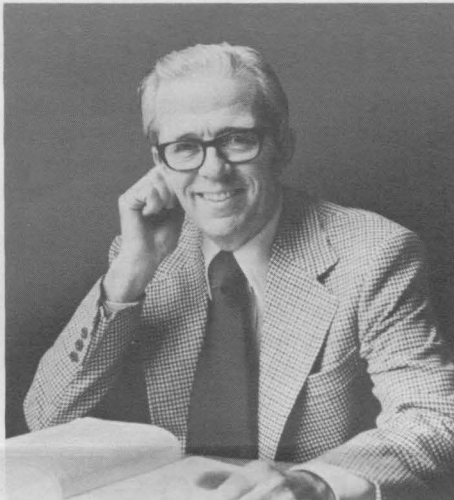
Francis W. Boulger, who received his B.S. degree in metallurgy from Minnesota in 1934 and has been a research adviser at Battelle Memorial Institute for practically all of his professional career, was named winner of the 1975 AM Award from American Machinist magazine.

The AM Award is presented by editors of the professional-technical publication in recognition of distinguished contributions to manufacturing.

Boulger, eleventh winner of the annual award, was cited for his "research into the properties, machinability, and deformation of metals and for his help to others in their search for new and better production methods."

Boulger's present assignment is on the Battelle Research Council, a five-member group responsible for evaluation, guidance and review of projects spanning many fields, including education and economics programs as well as the technologies. His career at Battelle includes a 19-year stint as chief of the Ferrous Metallurgy Division.

Boulger also has been author or co-author of numerous technical papers, articles and books dealing with metal properties and manufacturing processes. He previously received the Gold Medal of the



Francis W. Boulger

Society of Manufacturing Engineers, one of many professional organizations in which he holds memberships. In August of last year Boulger was elected president of the International Institution for Production Engineering Research, a global group of only 125 members from 26 countries and having just 11 U.S. members.

Named to U.S. committee

Rodger F. Ringham, '42 B.Aero.E. and now a resident of Lake Forest, Illinois, has been appointed to the Transportation Advisory committee, Federal Energy Administration.

Solar energy 'update symposium' attracts business and government

An "update" seminar on technology and solar energy applications, with business and industry representatives, federal and state officials and faculty members from Minnesota and other universities as lecturers and panelists, attracted an equally wide variety of participants in mid-January.

Organized by Dr. Richard C. Jordan, head of Mechanical and Aerospace Engineering in I.T., the day-long seminar was sponsored by the University and the Minnesota State Energy Agency.

The sessions included reviews of solar energy research and projects, with attention to financial, legisla-

tive, community interest and legal aspects as well as on the current state of technology.

Presentations and reports were by Joan Berkowitz of the Arthur D. Little research organization in Cambridge, Mass.; George Löf, Colorado State University, Lloyd O. Herwig of the U.S. Energy Research and Development Administration (ERDA); Frank Bridgers, a New Mexico consulting engineer; John Duffie, director of Solar Energy Laboratories; Edward G. Zoerb, manager of solar energy technology at Honeywell, Inc.; James R. Johnson of the 3M Company, and Donald Anderson of Sheldahl, Inc.

Warner Medal to P. G. Hodge of Aerospace

Prof. Philip G. Hodge, Jr., of the Department of Aerospace Engineering and Mechanics has been awarded the Worcester Reed Warner Medal for outstanding contributions to the permanent literature of engineering.

A statement accompanying the presentation of the medal at the annual winter meeting of the American Society of Mechanical Engineers in Houston last December 2 cited Hodge for "a group of papers, monographs and books published over a twenty-year period."

Hodge has been a member of the I.T. faculty at Minnesota since 1971. Before coming to Minnesota he held faculty positions at Brooklyn Polytechnic Institute, Illinois Institute of Technology and UCLA; and had been a visiting faculty member or lecturer at several other universities, including institutions in England, Spain, Poland and Romania.

He is the author or co-author of five books, which have been translated into as many different foreign languages. Emphasis in his publications has been on plasticity and plastic structural analysis.

Honorary Ph.D. to van der Ziel

Aldert van der Ziel, who has been widely recognized for his guidance of advanced students in electrical engineering to Ph.D. degrees, has himself received another doctoral degree, this one an honorary Ph.D. from the University of Toulouse, France.

The honorary degree, awarded last Dec. 10, is in recognition of the Minnesotan's research in physics.

Earlier last year van der Ziel had received the Vincent Bendix Award from the American Society for Engineering Education. He was the third member of current I.T. faculty and the fifth University of Minnesota scientist to receive that award, also in recognition of research and teaching.

FROM ALUMNI PRESIDENT

Davis outlines career aid for I.T. students

The I.T. Alumni Association's new board assembled for its first meeting December 10 at the Normandy Inn in Minneapolis to begin developing its program of activities for 1976 and to welcome new members to the board.

Following dinner, Dean Richard Swalin was given the first spot on the program and brought board members up to date on Institute of

Technology operations and prospects. Dean Swalin discussed enrollment trends and reviewed the budget for the coming year. He also talked of the continuing problems with I.T. building needs which, like the budget, are part of the University's total legislative program.

It was a pleasure for our alumni board to have as special guests for the evening two representatives

from the I.T. student body. They were David Solberg, who is president of the I.T. student organization, and Nicholas LeBrasseur, a member of the student board. Both are seniors.

We discussed at some length the possible ways in which alumni can assist I.T. students, who are concerned with career planning. A committee to look into the situation and report back at a future meeting was appointed, with Wayne Schmaedeke, alumni secretary-treasurer, as chairman and David Hagford, Earl Hoffman, Mark Mund and Anthony Yapel, Jr., as members. They were instructed to work with the student organization and authorized to consider other possible projects as well as the career planning matter.

We received a brief report on the 1975 annual meeting, covering both the afternoon seminar and banquet, and were informed that this major event of the alumni year was the third one that was financially successful. (A resume of the seminar and a list of the new board members are carried separately in this issue of I.T. items.)

The board discussed objectives and purposes of those events and, following adoption of a motion from the floor, the executive committee was asked to prepare a written set of objectives for presentation at the next board meeting.

After noting that in the last two years seminar attendance has fallen off as those sessions were held at increasingly greater distance from the campus, board members indicated a feeling that the University campus is the best site for the seminar, being especially accessible to students and faculty.

HORACE R. DAVIS, President
I.T. Alumni Association

48 patron tables set record for annual alumni dinner

Record industry support of the Institute of Technology and I.T. Alumni Association were reflected at the association's 1975 annual meeting when 39 companies sponsored 48 patron tables at the annual banquet.

The sponsoring industrial and professional or technological firms are listed here alphabetically.

- American Hoist & Derrick
- Bemis
- Buckbee Mears
- Control Data
- DeVac
- Donaldson Company
- Ellerbe Architects
- Fingerhut
- Fluidyne
- Fowler Hanley
- H. B. Fuller
- General Mills
- Gould
- Hoerner Waldorf
- Honeywell
- IBM, Rochester
- E. F. Johnson
- Lundquist, Wilmar, Martin & Schultz
- Metal Matic
- Midwest Research Institute
- Minnesota Gas Company
- 3M
- Minnesota Power & Light
- Northern Natural Gas
- Northern States Power
- Northwestern Bell
- Onan
- Paper, Calmenson & Co.

- Physical Electronics
- Pillsbury
- Rieke, Carroll Muller Assoc.
- Rosemount, Inc.
- Sheldahl
- Sperry Univac
- Thermo King
- Toltz, King, Duvall, Anderson & Assoc.
- Toro Company
- Twin City Testing
- Whirlpool

New officers for I.T. alumni board

New officers for the I.T. Alumni Association were announced at the annual meeting, with Dr. Horace R. Davis, Chem. '49, succeeding James Lenarz, BEE '49, as president.

Everett H. Dale, from the same department and class as Lenarz, was elevated to first vice president and Noel T. Stone, BEE '42, was elected second vice president. Dr. Wayne Schmaedeke, who had received the BS degree in math at Minnesota in 1957, and the Ph.D. in 1963, is the new secretary-treasurer of the I.T. alumni group.

Newly named to the board of directors were Richard M. Barker, George A. Champine, David Hagford, Earl Hoffman, Mark Mund, David Pederson, Meredith S. Ulstad and Anthony Yapel, Jr.

Seminar hears five biomass energy plans

Five approaches to developing non-petroleum fuel sources were examined in the afternoon seminar preceding the Institute of Technology Alumni Association's annual meeting and banquet.

"Biomass—Minnesota's Abundant and Renewable Energy Resource," was the seminar topic. Perry Blackshear, Director of the Center for Studies of the Physical Environment and professor of mechanical engineering, who served as moderator, provided the following summary of the seminar:

It has been pointed out that if, as is suspected, the environmental upper limit of per capita energy use in a fully populated ($15 \cdot 10^9$ people) and fully industrialized (5-10 KW/person) world is 10-15 KW/person when energy is drawn from stores, then the United States must either bear the unpopularity of using more than its fair share or learn to derive its energy by intercepting and using the solar flux.

This alternate form of energy growth is of immediate relevance to Minnesotans. A state energy agency study suggests that we face at best a constant supply potential in the immediate future.

Thus, even with heroic conservation measures, if we are to have continual growth in energy use, we expect a 10^{14} BTU/yr

COMPARISON OF BIOMASS ENERGY POSSIBILITIES

Type of Fuel Processing	% Yield	Capital	State Cost 1980 in \$	Time to Deploy
Course grinding—direct firing	95%	\$.30/10 ⁶ BTU/yr	$30 \cdot 10^6$	Immed.
Fine grinding—use as fuel expander	90%	1.5	$150 \cdot 10^6$	1-2 yrs
Low temperature pyrolysis (produces heavy oil)	50%	1.5	$150 \cdot 10^6$	2 yrs
Fermentation (produces methane)	35%	10	$1 \cdot 10^9$	1 yr
Gasification and reforming (produce NH ₃ , H ₃ OH, synthetic natural gas, synthetic petroleum)	50%	7	$.7 \cdot 10^9$	5 yrs

shortfall in 1980 and $1.4 \cdot 10^{14}$ BTU/yr shortfall in 1985. Minnesota's crop, feedlot, and timber residues contain $9 \cdot 10^{14}$ BTU/yr.

Studies suggest that these could be harvested; ground, delivered, and burned in existing large scale stationary boilers for less than \$2/10⁶ BTU and processed for use in homes, factories, and automobiles with the development and construction of conversion equipment.

Research suggests that in any one year at least 15 percent of these residues can be harvested with no long-term disbenefit to the soil and that the yield could be increased enormously by:

- a. Modified cropping practices
- b. Harvesting some wetlands.

Thus:

1. The state could supply the needed extra energy for growth in the short run by using somewhat modified existing equipment.

2. Ultimately become energy-independent with long range growth potential without contributing to the heat burden of the atmosphere.

A number of processes for the conversion of residues into fuel that can be utilized in existing burners and engines could be deployed where appropriate. The percent of the initial energy delivered, the capital equipment cost, the total capital cost to the state, and time for deployment are given as estimates in the accompanying table. Research on economic and technological factors, applied as well as basic, are assumed.

Members of the panel who presented the various energy alternatives were James Carter, research director of the State of Minnesota energy agency, and four University faculty members: Walter Maier of Civil and Mineral Engineering; Dale Moss, Agronomy and Plant Genetics; David Kittelson, Mechanical Engineering; Patrick Starr, Industrial Engineering and Research.

items

INSTITUTE OF TECHNOLOGY
University of Minnesota
107 Main Engineering
Minneapolis, Minnesota 55455

Second class postage
rates paid at
Minneapolis, Minnesota

ISSUED QUARTERLY