

I.A.M.G. NEWS LETTER



Proper Function and Role of I. A. M. G. in the Revolution in Geological Sciences

The modern revolution in geological sciences, which is sweeping out of existence many of the classical attitudes in geology, results from our new ability to look at the Earth from space, our new understanding of the surprisingly profound differences between continents and the ocean floor, and lastly, our new capability for mathematically checking our geological conceptions. The International Association for Mathematical Geology is responsible for development in the last area. This is a large responsibility, as we will improve, or fail, the whole of geological science.

Experience indicates that mathematical geology can be developed along the following lines. Major geological features are the realizations of stochastic processes, and random fields in particular. There is an urgent necessity for investigation into the nature of the organization of the medium of geological processes. Mathematics should be introduced into geology in a form adequate to test models of geological conceptions or hypotheses. Obtaining significant results requires nontrivial mathematics with special definitions of probability measures and the thorough elaboration of specific statistics. Models should be developed for definite types of random processes and statistics should consider dependent observations. The most important recent problem in mathematical geology is creation of fundamentals in the form of models of the most important geological processes. These fundamentals will permit us to obtain the soundest results of both scientific and industrial importance.

There are dangerous elements in the modern development of mathematical geology. These include a natural desire to solve big industrial problems on the basis of inadequate and oversimplified mathematics. There is also a naive conviction that big collections of programs and large modern computers can generate serious, stable results without a profound mathematical analysis of the geological problems. We tend to overestimate our newly found abilities. All these perils lead to a vulgarization of mathematical geology. This can discredit our science and deprive geology of a most important line of development at the crucial moment in scientific evolution. Caution, thoroughness, self criticism, and caution again must be the basis for our activities.

Andrew B. Vistelius
Past President

Additional 1974 Corporate and Academic Members

The following organizations have generously renewed their Corporate Memberships in the International Association for Mathematical Geology. This support will enable us to widen our service to the profession. Our thanks to these 1974 Corporate Members!

§ AGIP-AMI, Direzione Mineraria, Milano, Italy §
§ Kennecott Copper Corporation, New York, U. S. A. §

I. A. M. G. Financial Summary for 1973

Our society began 1973 with assets of 5,763.98 Swiss francs.* During the year, income has been over \$7,000 U.S., with expenses of approximately \$3,500. The Association has received income from members' dues/subscriptions for 1973, Corporate and Academic Memberships, and an operational expense grant from the I. U. G. S. Expenses have been for members' subscriptions to the Journal and operating costs associated with the offices of the President, Secretary General, and Western Treasurer. The approximate unencumbered assets of the Association, as of January 1, 1974, were \$3,700.

1973 income	\$7,131.56
1973 expenses	-\$3,503.80
encumbered '73 and '74	
subscriptions	-\$1,608.00
	\$2,019.76
previous assets	\$1,692.93*
current Association balance	\$3,712.69

\$1,000 of the current balance has been invested in medium-term securities yielding 6.75% interest. Members may obtain a copy of the complete financial statement submitted to the Council by writing to the Western Treasurer.

Mathematical Geology to Six Issues/Year

A new contract has been negotiated by our Editor, D. F. Merriam, with Plenum Publishing Corp. which calls for bimonthly publication of our Journal. Each issue will be slightly slimmer than current numbers, but the yearly page total will be 75 pages greater. There will be NO increase in member's subscription price, a significant accomplishment in this era of rising prices. The new publishing schedule will begin with Volume 7 in 1975.

Teaching of Geomathematics in North America

A distant dream of the Association is to see the day when geology is a genuinely quantitative science. We will be able to recognize this day when it arrives because it will be the time when a quantitative approach is routinely used in all the various courses given in geology departments. However, a glance at the curriculum of a typical geology department of today should reassure traditionalists that this dream is distant indeed!

In order to appraise how far we have to go, it would be helpful to see how far geology teaching has progressed today. In North American universities ten short years ago, only a small handful of instructors introduced numerical methods in their classes. Courses in statistical or computer methods applied to geology were unknown. A single textbook existed in the field of geomathematics. Today, 45% of the doctorate-granting departments teach one or more special courses in geomathematics. There are at least ten textbooks on the market, and more on the way. Most importantly, more geology students are taking extra classes in mathematics, statistics, and computer science.

The Western Treasurer conducted a survey of geomathematics courses in the 108 doctorate-granting geology departments of the United States and Canada early this year. Ninety departments, or 83%, responded. (We assume the remaining 17% failed to answer out of embarrassment over their unenlightened condition and that they have no program in geomathematics.)

Seventeen courses in 16 departments are offered exclusively for undergraduates. Typically, an undergraduate course in geomathematics carries three credit hours and has an enrollment of 15 to 20 students. Twenty courses in 14 departments are offered jointly to upperclassmen and graduate students. Average enrollment is 10 to 12 students for three credit hours. Forty-four geomathematics courses in 33 departments are reserved for graduate students only. Most classes offer three hours credit and have enrollments of about 10 students.

At the time of the survey (spring semester, 1974), over 750 geology students were enrolled in courses in geomathematics in the U.S. and Canada. Approximately one-half of these were undergraduates. For comparison purposes, the 108 schools included in our survey have about 2,000 students in the Ph.D. program and at least as many master's candidates. Therefore, less than 10% of the geology graduate student population is enrolled in geomathematics courses. A comparable estimate cannot be made for undergraduates because of the much larger number of departments (403 schools according to the AGI), but the percentage of undergraduates taking geomathematics courses is obviously minuscule.

Thirteen geology departments offer quantitative courses jointly with other departments. Of these, ten are cooperative geology/geography efforts,

seven are biometrics courses offered in conjunction with zoology or biology, five are geology/statistics, and four are offered with an engineering department. Total enrollment in cooperative courses is about 80 students.

Departments were asked if their students took mathematics, statistics, or computer courses beyond the usual liberal arts minimum requirements. Fifty-six departments responded that their students were required to take a course in computer science, 40 departments required a course in probability and statistics, and 26 departments required advanced calculus or differential equations.

Syracuse University, with five catalog listings, has the distinction of offering the greatest number of geomathematics courses. However, the University of Massachusetts wins the enrollment race with 45 students in three classes. Largest undergraduate enrollment is at McGill University, where "Analysis of Geologic Data" has a class attendance of 30 students.

Our survey has disclosed that geomathematics courses are more widely taught than might be suspected, although to a small fraction of the student body. The outlook for continued proliferation is good. A minor indication of this is given by the three departments who responded that they had no courses in this area but wished to offer them, and requested Association help in their planning and implementation. No doubt some academic interest in geomathematics reflects the concern of future employers about the nature of the education being given young geologists. The American Association of Petroleum Geologists, for example, has requested a summary of our survey to be published as a service to the petroleum industry.

Apparently, we are making more rapid progress toward our goal than most of us had thought possible. It is undeniable that we still have a long way to go. In fact, a true milestone will have been reached when the number of geomathematics courses eventually begins to decline! This will mean that the quantitative approach has pervaded the other courses of the geology curriculum, and the need for "special" geomathematics courses has disappeared! (Specific questions about courses or programs reported in the survey will be answered by the Western Treasurer.)



In a somewhat sarcastic response to our Christmas News Letter, one I.A.M.G. member has suggested that the patron saint of mathematical geology is really St. Judas Thaddaeus, better known as the patron saint of Lost Causes. He was martyred with a halberd, an unpleasant end which may have influenced his later association with endeavors of a hopeless nature.

Forthcoming Meetings

Audio-visual course entitled "Practical Introduction to Mining Geostatistics" (June 10-15, 1974) and application course entitled "Operational Mining Geostatistics" (August 5-10, 1974) to be given at the Centre de Morphologie Mathematique. Both courses will be taught in English and deal with the application of the theory of regionalized variables to mining problems. For information, contact: Centre de Morphologie Mathematique, 35 rue St. Honore, 77305 Fontainebleau, France.

10th International Symposium on Mathematical Geophysics, June 25-July 6, 1974, Cambridge, England. Three main topics will be discussed: geophysical dynamic processes, determination of geophysical structures, and statistical methods in geophysics. Contact Dr. J.A. Hudson, Dept. Applied Mathematics and Theoretical Physics, Silver Street, Cambridge, England for further details.

2nd International Joint Conference on Pattern Recognition, August 13-15, 1974, Copenhagen, Denmark. Conference will cover all aspects of theoretical and practical pattern recognition; industrial applications, feature extraction, image processing, and scene analysis will be emphasized. Additional information may be obtained from: Mr. E. Backer, E. E. Dept., Delft University, Delft, The Netherlands.

Symposium on Stereology (Quantitative Analysis of Microstructures) at the International Metallographic Meeting, October 16-18, 1974, Leoben, Austria. The efficiency of stereometry for solving problems in materials research and evaluation will be emphasized. Conference languages will be German and English. Contact Dr. H. E. Exher, Max-Planck-Institut fur Metallforschung, D-7 Stuttgart-80, Busnauer Str. 175, Germany, for additional details.

Publications of Interest

"Geomathematics: Mathematical Background and Geo-science Applications" by F.P. Agterberg has been published by Elsevier (approx. \$54.00). Special attention is given to ore reserve evaluation and the probabilistic estimation of regional mineral resource potential.

"MANIFILE: University of Manitoba Computer Processible File of the Au, Ag, Cu, Zn, Pb, Cr, Sn, W, Mo, Sb, Hg Ore Deposits of the World" has been published by the University of Manitoba. The price of the file is \$1,200.00 (Canadian); a descriptive booklet entitled "MANIFILE: Its Contents and Use" is available for \$2.00. For further information, contact the Center for Precambrian Studies, Dept. Earth Sciences, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.


"GEOSAURUS: Geosystems' Thesaurus for Geoscience and Guide to Geotitles Weekly" by Graham Lea, Rosalind Charles, and James Shearer. Geosaurus contains nearly 4,000 terms. Review copies are available on request from Geosystems, P.O. Box 1024, Westminster, London SW1, England. The price is £5 in the U.K. and Europe and \$15 elsewhere.


3rd General Assembly


The I. A. M. G. will convene three technical sessions at the International Geological Congress in Sydney, Australia, August 16-25, 1976. The first session will be titled "Random Events in Geology" and will be chaired by Prof. A. B. Vistelius (USSR) and Prof. E. H. T. Whitten (USA). The session will be concerned with the theory of stochastic processes and random fields, and their applications to problems in geology. The second session will be "Quantitative Methods for Future Exploration Strategy" and will be chaired by Prof. J. C. Davis (USA) and a co-chairman yet to be named. This meeting will be concerned with search theory, conditional probability in exploration, and optimization of exploration strategy. The third session will be open, with the title "Recent Developments in Geomathematics." It will be chaired by Prof. D. F. Merriam (USA) and Prof. A. C. Cook (Australia).


The General Assembly of the I. A. M. G. will be held immediately following the open technical session. All meetings will be afternoon sessions during the Congress, but specific dates have not yet been assigned. They will be announced in the News Letter when fixed.


Persons interested in participating in the sessions should contact the respective chairmen.

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Our cover logo shows a 14th century alchemical symbol for the element Earth. This element personifies the attributes Dry, Cold, Solid, and Melancholic.

Down-Under Regional Organization

A two-day meeting on "Computer Applications in the Earth Sciences" was held at Wollongong University College on March 23rd and 24th. Approximately 75 Australian scientists attended and voted to establish a regional organization affiliated with the I.A.M.G. The chairman of the regional group is Prof. Alan C. Cook, Dept. Geology, Wollongong University College, Wollongong, N.S.W. Secretary-Treasurer is Dr. K.R. Johnson, School of Applied Geology, University of New South Wales, P.O. Box 1, Kensington, N.S.W. The new regional organization promises to be one of the largest and most active groups in the I.A.M.G. Members in Australasia who wish to affiliate with the new group may write to either the Chairman or the Secretary-Treasurer.

Whatever your reaction to I.A.M.G. News Letter No. 3, pause and reflect on the appropriateness of the words of that great American president, Abraham Lincoln, who said: "People who like this sort of thing will find this the sort of thing they like."

New Members of the I.A.M.G.

R. P. Phillips, La Jolla, California
J. M. Parks, Lehigh Univ., Pennsylvania
A. S. Horowitz, Indiana Univ.
D. N. Lumsden, Memphis State Univ., Tennessee
J. K. Hall, Geological Survey of Israel
L. B. Lipson, New Orleans, Louisiana
S. Mizutani, Nagoya Univ., Japan
A. C. Riccardi, Museo de Ciencias Naturales, Argentina
R. Till, Univ. of Reading, England
P. Laffitte, Ecole des Mines de Paris, France
M. E. Campana, Univ. of Arizona
E. V. Goodin, Petroleum Information, Colorado
A. Hubaux, Italy
W. Mayo, Bureau of Mineral Resources, Australia
G. Drapeau, INRS-Oceanologie, Canada
V. Fois, Geotecnico, Italy
F. W. Oldroyd, Geosystems, England
J. J. Veevers, Macquarie Univ., Australia
D. G. Farmer, Inst. of Geological Sciences, England
Y. Beauchemin, Ecole Polytechnique, Canada
C. F. Chung, Geological Survey of Canada
R. W. May, Wilfrid Laurier Univ., Canada

A. Stessel, West Germany
J. E. J. M. van Landewijk, Univ. of Ghana
H. Burger, Free Univ. of Berlin, West Germany
J. L. Brande, Facultad de Ciencias Univ., Spain
J. B. Campbell, Jr., Kansas Geological Survey
A. Siehl, Geologisches Institut, West Germany
B. Bollegraaf, Univ. of Amsterdam, Netherlands
G. de Marsily, Ecole des Mines, France
A. Mukhopadhyay, Oil India Ltd., India
W. E. Dean, Jr., Syracuse Univ., New York
W. T. Deubel, Univ. of Kansas
D. J. Howell, Esso Australia Ltd., Australia
B. Shaw, Univ. of Michigan
D. M. Stewart, Univ. of North Carolina
M. Pena, Syracuse Univ., New York
D. R. McConnell, Univ. of Illinois at Chicago
M. M. Godinho, Univ. de Coimbra, Portugal
D. R. Ojakangas, Univ. of California at Davis
U. Grenander, Brown Univ., Rhode Island
R. A. Bideaux, Computing Associates Inc., Arizona
R. Jorgensen, Univ. of Illinois at Urbana
U. D. Brovedani, Canada-Cities Service, Ltd.
R. L. Sandefur, Utah International Inc., California

K. Badiozamani, Amux Coal Company, Indiana
A. J. Davies, Consolidated Diamond Mines of South West Africa, Ltd.
C. Y. Meng, Chinese Petroleum Corporation, Republic of China
J. H. Monteiro, Direcção-Geral de Minas e Serviços Geológicos, Portugal
J. Serra, Centre de Morphologie Mathématique, France
S. R. Divi, Geological Survey of Canada
H. V. Tuominen, Univ. of Helsinki, Finland
I. Pauncz, Univ. of New South Wales, Australia
R. W. Le Maitre, Univ. of Melbourne, Australia
M. G. Michie, Wollongong, Australia
D. R. Piteau, Piteau Gadsby Macleod Ltd., Canada
H. Berner, Terrestrial Geodata, NFR, Sweden
S. L. Lopez, Universidad Nacional Autónoma de Mexico
Mr. Waters, Flinders Univ., Australia
K. L. Burns, C.S.I.R.O., Australia
R. Turner, B.M.P., Australia



Pointed Reminders to the Members

▶ A few of you are still delinquent in your 1974 dues! Volume 6, No. 1 of Mathematical Geology has been mailed, so don't delay in sending your dues or the resulting confusion on our publisher's mailing list may be impossible to untangle.

▶ Don't sit there, recruit new members! A bounty consisting of a complete set of News Letter back issues will be given to anyone turning in a new member to the Western Treasurer.

▶ Send news! If you've been promoted, demoted, transferred, or exiled, tell us and we'll tell the world. Whether you've found a mind-bending solution to a common problem, or your mind is bent trying to solve an uncommon problem, write us and we'll display your success (or failure) for all to see. The News Letter needs news of meetings, publications, programs, projects, or other items of interest to the membership. We print Position Available or Job Wanted announcements. Send comments on the objectives and methods of the Association, on what the Association should (or shouldn't) be doing. Write now, before you forget!

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NO. 3