The Engineering Geologist

THE GEOLOGICAL SOCIETY OF AMERICA

NEWSLETTER OF THE ENGINEERING GEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA

Volume 23, Number 2 May–June 1988

- AN ARTICLE FROM THE CHAIRMAN -

WHAT DOES AN ENGINEERING GEOLOGIST NEED THE MOST?

What does he need? Does he need another short course on how to trace micturates in the watershed? Does he need an additional volume on the micro-measurement of slopes about to bust loose? Let's face it: those things are useful but only if there is remunerative work to support them. So, the need is for work. Work with pay. Ask any petroleum geologist.

The work an engineering geologist does depends on two things. One is the economy. The other is himself. He has no control over the economy, or at least I know of none. Further, if we believe in the working of the marketplace, the economy owes him nothing. His options boil down to what he can do for himself.

This is where our discipline becomes challenging, because there <u>are</u> ways by which we can enhance our profession. Let me give some examples.

We in the Corps of Engineers have a radiographic laboratory. We examine soils and rock non-destructively and ferret out features that show deformations, effects on strength, densities, etc. This is done by engineering geologists because they did it first and developed it. Elsewhere it is done by soil mechanics types and civil engineers. The engineering geologist does it better, because he knows sedimentation, secondary mineralization processes, jointing, etc.

The engineering geologist interfaces with other disciplines. When they are quickly imaginative and proceed creatively, they stay ahead. Otherwise they end up working for geotechnicians and civil engineers, or not working at all!

It is the same in specifying earthquake ground motions at engineered sites. Properly, that effort is a collaboration between engineering geologists, seismologists and civil engineers. The geologist can contribute the most in this equation, but he has to know what he is doing and he has to come forward convincingly. He has the best feel for geological processes. He can anslyze the infinite influences that are present and he can find the soundest ways for bracketing the ranges of possibilities. Most seismologists are research-oriented and will be examining details to eternity. Civil engineers, on the other hand, can easily become heavy-handed when they synthesize earthquake motions, because they want results in their analyses. Theirs can be a flat-out conflict of interest.

And we could go on. Again, engineering geology interfaces with many disciplines. The geologist's need is to make a place for himself at those interfaces. Otherwise, he is gone. That is the challenge.

Probabilistic seismic risk analysis was created in 1968 by a civil engineer. Its shrillest advocates since then have been civil engineers and mathematicians. They take the vagaries of geological events, the processes that produce earthquakes, from a time interval of 150 years, and they project for 10,000 years. You don't believe it? Attend any earthquake engineering conference! They even pretend to give you the spectral composition of earthquake shaking for 10,000 years. Too bad. They never had an engineering geologist to take hold in the beginning and keep them straight.

If you saw Steven Spielberg's <u>Empire of the Sun</u>, you will remember that Basie, the self-serving former ship's steward, taught Jim to be "light on your toes, first in line."

Good advice. But remember, there are others who need us too. And they need us badly.

E. L. KRINITZSKY
Chairman, Engineering Geology Division
Geological Society of America

GEOLOGICAL SOCIETY OF AMERICA

1987 Annual Report
Engineering Geology Division

By Christopher C. Mathewson, 1986-87 Chairman
Engineering Geology Division, G.S.A.

1. Ststus of the Division:

(a) Financial Condition: The financial balance as of 30 September 1987 is $9,352.25. Division membership declined during 1987 from 1208 in 1986 to 1159. The 1987 dues for members will remain at $5.00; however, Student dues were set at $2.00 to encourage new student members.

(b) Newsletter: Art Keene was appointed as Newsletter Editor for 1987-1988. The Division plans to publish two (2) Newsletters during this year and to investigate the need/desire for Four (4) at the 1988 Management Board Meeting.

(c) Publications: The Division's newest publication, Reviews in Engineering Geology VII: Debris Flows/Avalanches: Process, Recognition, and Mitigation, by John E. Costa and Gerald F. Wieczorek was available at the Annual Meeting in Phoenix.

The Division is also reviewing the next volume in the Reviews in Engineering Geology Series on debris flows in southern California, edited by J. Slosson and A. Keene.

Division of North American Geology Volume: George Kiersch, editor. Volume is progressing slowly. Many authors have submitted their contributions; however, a number of original authors have dropped out for vsrious reasons. The Division will continue to encourage participation and to assist George to complete the volume.

(d) 40th Anniversary Award: As of 21 July 1987, the fund amounted to $5002.33. The Management Board is still considering a mechanism and criteria for granting this award.

(e) 1987-1988 Division Officers:
Ellis L. Krinitzsky: Chairman
Thomas L. Holzer: Chairman-Elect
Jeffrey R. Keaton: Secretary
Perry H. Rahn: Management Board Representative
Christopher C. Mathewson: Past-Chairman

2. 1987 Division Awards:

(a) The E. B. Burwell, Jr. Memorial Award was presented to Dr. Joseph I. Ziony for his scientific and editorial contributions to

U. S. Geological Survey Professional Paper 1360: Evaluation Earthquake Hazards in the Los Angeles Region-An Earth Science Perspective.

(b) The Distinguished Practice Award was presented to David J. Varnes.

3. Annual Meetings

(a) 1987 Annual Meeting and Symposium, Phoenix, Arizona: Ellis Krinitzsky organized a ½ day symposium on Neotectonics. Approximately 240 people attended the symposium.

(b) 1988 Annual Meeting in Denver: Tom Holzer is currently planning the meeting. He is attempting to avoid conflict with other Divisions (Quaternary Geology and Geomorphology, Hydrogeology). The best EGD sequence of the meeting schedule is a Symposium in morning, Luncheon, and a Technical Session in the afternoon.

(c) 1989 Annual Meeting in St. Louis: Jeffrey Keaton is planning the meeting. It may be possible to have a joint Symposium with the Hydrogeology Division. Jeff will be investigating this possibility.

STUDENT MEMBERSHIP

Happy days are here again! A reduction in student membership duea has been announced effective for 1988. Students no longer must pay $5.00, but only $2.00. The purpose of course is to encourage greater participation in the Engineering Geology Division of G.S.A. This is a recognition that our future lies in the hands of new generations. Members will continue to pay $5.00.

1988 ENGINEERING GEOLOGY DIVISION
- UPDATE -

The following roster is a current update version of the Engineering Geology Division Management Board, submitted by your Secretary Jeff Keaton.

Officers (3 Members) (Chairman, 1 year; Chairman-Elect, 1 year; Secretary, 1 year)

*Chairman: Ellis L. Krinitzsky
Engineering Geology & Rock Mechanics
Waterways Experiment Station
Vicksburg, MS 39180
(601) 634-3329

*Chairman-Elect: Thomas L. Holzer
U.S. Geological Survey
345 Middlefield Road, MS-977
Menlo Park, CA 94025
(415) 329-5637 (Direct)

*Secretary: Jeffrey R. Keaton
EarthStore (Division of Dames & Moore)
250 East Broadway, Suite 200
Salt Lake City, UT 84111-2480
(801) 364-1030

Management Board	(Consists of the Division officers, the Chairman of the preceding year, and one Member-at-Large serving a 2-year term.)
Past Chairman:	Christopher C. Mathewson Department of Geology Texas A & M University College Station, TX 77843-3115 (409) 845-2488 (Direct) (409) 845-2451 (Dept.)
*Member-at-Large:	Perry H. Rahn Department of Geology and Geological Engineering South Dakota School of Mines & Technology Rapid City, SD 57701-3995 (605) 394-2464 (Direct) (605) 394-2461 (Dept.)
Meetings	The annual business meeting of the Division will be held during the annual meeting of the Society.
1988 JTPC Representative: (Normally the Chairman-Elect)	Thomas L. Holzer U.S. Geological Survey 345 Middlefield Road, MS-977 Menlo Park, CA 94025 (415) 329-5637 (Direct)
Makeup	1,164 - 1987 Division affiliates as of December 31, 1987 962 - 1988 Division affiliates registered as of January 1, 1988.
Awards	1) E.B. BURWELL, JR., AWARD Consists of a certificate (mounted on a wooden plaque beginning in 1984). (Note: The monetary award was discontinued in 1982 by action of the Management Board.) 2) MERITORIOUS SERVICE AWARD 3) DISTINGUISHED PRACTICE AWARD
GSA Councilor/ Division Liaison Representative	(Appointed by the President) Richard W. Hutchinson Department of Geology and Geological Engineering Colorado School of Mines Golden, CO 80401 (303) 273-3039 (Direct) (303) 273-3800 (Dept.)
Newsletter Editor	Art Keene County of Los Angeles Department of Public Works 900 South Fremont Avenue Alhambra, CA 91803 (213) 738-4068

ANNOUNCEMENTS

1988·GEOLOGICAL SOCIETY OF AMERICA·1988

1988 Centennial Celebration
Denver, Colorado
October 31-November 3

Abstracts Due . . . . . June 10

Program, Housing & Registration Info . . . .August 1

Preregistration Due . . . . . October 7

Associated Societies Meeting With GSA:

Cushman Foundation·Geochemical Society
Geoscience Information Society
Mineralogical Society of America
National Association of Geology Teachers
Paleontological Society
Sigma Gramma Epsilon·Society of Economic Geologists
Society of Vertebrate Paleontologists

FOR INFORMATION: GSA MEETING DEPARTMENT,
P.O. BOX 9140, BOULDER, CO. 80301 · (303) 447-2020

PROFESSIONAL HORIZONS: GSA-SPONSORED SHORT COURSES

Professional Horizons will be sponsoring short courses during the annual meeting in Denver to be held this Fall, October 31 - November 3, 1988.

Fees will be approximately $75-100 for the firat day, $50-75 for the second day, and $25-50 for the third day. Courses will be held in Denver and Boulder. Actual fees and more information will be available in the May issue of News & Information.

For more information on any of the courses listed below, contact Edna Collis, Course Registrar, GSA headquarters at (303) 447-2020, ext. 34.

Premeeting

Use of Microcomputers in Structural Geology--Friday, October 28, through Sunday, October 30. Co-sponsored by the Structural Geology and Tectonics Division. Roy Kligfield, University of Colorado; David Sanderson, Queen's University at Belfast; Richard H. Groshong, Jr., University of Alabama.

Ore Deposition Associated with Magmas--Friday, October 28, thru Sunday, October 30. Co-sponsored by the Society of Economic Geologists. AJ Naldrett, University of Toronto; Janes A. Whitney, University of Georgia; Phillip A. Candela, University of Maryland; Carl M. Lesher, University of Alabama; Alan H. Clark, Queen's University at Kingston, Ontario; D. E. Mathez, American Museum of Natural History.

Geographic Information Systems: A Tool for Geological Data Analysis and Interpretation--Saturday, October 29. David A. Hastings, NOAA National Geophysical Data Center; Michael Crane, USGS.

Glacial Facies Models--Saturday, October 29, and Sunday, October 30. Co-sponsored by the Sedimentary Geology Division. Gail M. Ashley, Rutgers University; Bruce F. Molnia, Polar Research Board, National Research Council; John B. Anderson, Rice University; Ross D. Powell, Northern Illinois University; John Shaw, Queen's University at Kingston, Ontario.

Seismic Imaging of the Continental Crust--Saturday, October 29, and Sunday, October 30. Co-sponsored by the Geophysics Division. Larry D. Brown, Cornell University; Walter D. Mooney, USGS; Nikolas I. Christensen, Purdue University.

Geological Considerations in Hazardous Waste Site Characterization--Saturday, October 29, and Sunday, October 30. John D. Rockaway, University of Missouri; David E. Daniel, University of Texas; Allen W. Hatheway, University of Missouri; Christopher R. Ryan, Geo-Con, Inc.; Charles Rigga, Sverdrup Corporation.

Quantitative Sedimentary Basin Modeling--Saturday, October 29, and Sunday, October 30. Co-sponsored by the Sedimentary Geology Division. Paul L. Heller and Charles L. Angevine, University of Wyoming.

Seminar in Engineered Writing for Scientists--Sunday, October 30. Hugh Hay-Roe, Murrsy Associates International.

Postmeeting

The Evolution of Reef Communities--Friday, November 4, and Saturday, November 5. Co-sponsored by the Paleontological Society. J. A. Fagerstrom, University of Nabraska; Erle G. Kauffman, University of Colorado; George D. Stanley, Jr., University of Montana.

ENGINEERING GEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA

Solicitation of Papers
Symposium - Natural Hazard Reduction
Denver - 1988

Presentations are solicited for the upcoming Division symposium that will be part of the GSA Centennial meeting in Denver this fall. It is entitled "Natural Hazard Reduction in the 21st Century." The symposium will review how far we have come in hazard reduction in the last 100 years and speculate on the challenges that must be met if we are to make progress in the next century. Eight speakers have been invited to provide broad overviews on topics ranging from earthquakes to coastal processes. Room remains for volunteered papers on current research results involving natural or man-made hazardous processes or methodologies. If you would like more information, contact either Thomas L. Holzer (415) 329-5637 or F. Beach Leighton (714) 250-1421. Abstracts should be submitted by June 10 to Thomas L. Holzer, MS 977, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025.

FINAL PROGRAM
"SECOND INTERNATIONAL CONFERENCE ON CASE HISTORIES IN GEOTECHNICAL ENGINEERING"

The second International Conference will be held June 1-5, 1988, in St. Louis, (MO) USA.

About 200 papers have been selected for discussion under the following themes, from 350 abstracts submitted from 47 countries including: Australia, Austria, Brazil, Bulgaria, Canada, China, Denmark, Egypt, France, Germany, Ghana, Greece, Hong Kong, India, Indonesia, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kenya, Korea, Lybia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Peru, Portugal, Puerto Rico, Romania, Saudi Arabia, Singapore, South Africa, Sri Lanka, Sweden, Taiwan, Turkey, United Kingdom, United States, U.S.S.R., Vietnam, and Yugoslavia.

1. Case Histories of Geotechnical and Hydrological Management of Solid, Hazardous and Radioactive Wastes.
2. Case Histories in Geological Engineering and Rock Mechanics.
3. Case Histories of Dams, Embankments and Slopes.
4. Case Histories of Geotechnical Earthquake Engineering and Soil Dynamics.
5. New Solutions to Traditional Geotechnical Problems (Case Histories).
6. Case Histories of Soil Structure Interaction.

The special presentations will be made by the following international experts:

1. Bengt B. Broms
   President, International Society
   of Soil Mech. & Foundation Engr.
   Professor of Civil Engineering
   Nanyang Technological Institute
   Upper Jurong Road
   Singapore 2263
2. Marshall L. Silver
   Professor
   Department of Civil Engineering
   University of Illinois
   Chicago, Illinois

3. W.D. Liam Finn
   Professor
   Eivil Engineering
   University of British Columbia
   2324 Main Mall
   Vancouver, B.C. V6t 1W5, Canada

4. George F. Sowers
   Senior Vice President
   Law Engineering Testing Company
   2749 Delk Road, SE
   Marietta, GA 30067

5. Chandrakant S. Desai
   Professor and Ghairman
   Dept. of Civil Engineering
   University of Arizona
   Tucson, Arizona

6. G.W. Clough
   Professor and Head
   Department of Civil Engineering
   Virginia Polytechnical & State University
   Blacksburg, Virginia

7. John Ramage, P.E.
   Director, Civil Engineering
   CH2M Hill, Inc.
   Mid-Atlantic Office
   P.O. Box 440
   Reston, Virginia 22090

The Conference has been sponsored by the following eleven (11) organizations:

1. International Society of Soil Mechanics and Foundation Engineering
2. International Association of Earthquake Engineering.
3. Earthquake Engineering Research Institute.
4. Association of Engineering Geologists.
5. United States Committee on Large Dams.
6. United States National Committee for Rock Mechanics.
7. Transportation Research Board.
8. American Society of Civil Engineers--Mid-Missouri Section.
9. Association of Soil and Foundation Engineers.
10. Engineering Geology Division of the Geological Society of America.
11. United States Army Corps of Engineers.

The final program of the Conference may be obtained from:

Shamsher Prakash
Conference Chairman
Professor, Civil Engineering
University of Missouri-Rolla
308 Civil Engineering
Rolla, MO 65401 USA

FOUNDATION ENGINEERING CONFERENCE

*-Call for Abstracts by May 15, 1988-

On June 25-29, 1989, there will be a FOUNDATION ENGINEERING CONGRESS to be held at Northwestern University, Evanston, Illinois. We expect this Congress to be a major geotechnical engineering event in North America for 1989.

The AEG and the ASCE are jointly co-sponsoring a session titled Response of Foundation Systems to Seismic Loading. The session developers are:

For the AEG -
Ellis L. Krinitzsky
Geotechnical Laboratory
USAE Waterways Experiment Station
P. O. Box 631
Vicksburg, Mississippi 39180-0631

For the ASCE -
Pedro de Alba
University of New Hampshire
Department of Civil Engineering
303 Washington Street
Dover, New Hampshire 03820

*Abstracts for papers to be presented at this sesaion were to be received before May 15, 1988. However, please send your abstracts to Ellis Krinitzsky for a post session that may handle them.

ASSOCIATION OF ENGINEERING GEOLOGISTS

The Kansas City-Omaha Section of the Association of Engineering Geologists will host the 31st annual meeting. The meeting will be held at the Hyatt Regency Hotel at Crown Center in Kansas City, Missouri, from October 16 to 21, 1988. Contact:

William Bryson
Kansas Corportion Commission
4th Floor, State Office Building
Topeka, Kansas 66612
(913) 296-5113

Technical Program
The technical program will include the technical sessions, short courses, and symposia. Abstracts of papers for technical sessions and symposia to be presented at the annual meeting should be related to the theme of the meeting and to any of the following tentative topics, should not exceed 250 words, and should be submitted to the Technical Session Chairman by May 2, 1988.

Technical Sessions
New (and new applications of older) methods of drilling, logging, and sampling of test holes.

Areal mapping, analysis and presentation techniques including: field-mapping and remote-sensing methods; fault, lineament, and terrain analysis techniques (creekology revisited); computer analysis and enchancement of data; sutomated cartographic preparation and presentation of maps.

Linear or transect surveys including: high-resolution shallow seismic and other geophysical methods; mobile automated soil-gas sampling and analysis (black box and peach twig revisited). Outcrop, trench, or tunnel logging using precise documentary photogrammetry; closed-channel video, and other methods (twine new and plumb-bob revisited). Papers on studies of subsidence and groundwater studies related to engineering geology are encouraged, as well as presentations on general engineering geology related subjects and histories.

Symposia
Remote sensing. A one-and-a-half-day remote sensing symposium will follow the remote sensing short course. The symposium is being organized by Richard Kent under the auspices of AEG, ASTM, ASPRS, ASCE and GSA. The deadline for submitting abstracts was February 22, 1988. For more information contact:

Richard Kent
P. O. Box 30664
Walnut Creek, CA 94598
(415) 934-5902

Groundwater. A half-day symposium on "Computer Simulation as a Tool in Groundwater Investigations" will be organized by Dr. June Oberdorfer of San Jose State University. For more information contact:

Dr. June Oberdorfer
Department of Geology
San Jose State University
San Jose, CA 95192
(408) 924-5027

Instruction For Abstracts
You must submit three copies of the abstract in AEG format, 250 words maximum. Speaking time will be strictly limited to 20 minutes, including discussion for technical papers. Receipt of your abstract will acknowledged. Poster sessions will be available and authors are encouraged to submit their papers in this format. Abstracts can be submitted on plain bond paper, but all information requested on the official abstract form MUST be provided. Acceptance or rejection of abstracts is based on the abstracts as submitted by authors. Decisions on acceptance or rejection of abstracts are the responsibility of the Committee and are final. Abstracts are invited from members, students and non-members. Accepted abstracts will be distributed as formal publications. Authors may submit as many abstracts as he or she wishes. However, possible scheduling difficulties may preclude an author from presenting more than one paper. No substitutions or corrections of abstracts will be possible after the submittal deadline. Abstracts are due May 2, 1988:

Thomas McClain
Kansas Geological Survey
1930 Constant Avenue
Lawrence, KS 66046
(913) 864-3965

OTHER MEETINGS FOR 1988

Case Histories in Geotechnical Engineering 2nd International Conference, June 1-5, 1988, St. Louis, Missouri. Information: Shamsher Prakash, Room 308, Department of Civil Engineering, University of Missouri, Rolla, MO 65401; (314) 341-4461.

Second International Symposium on Rockbursts and Seismicity in Mines, June 8-10, 1988, Minneapolis, Minnesota. Information: Charles Fairhurst, Department Civil and Mineral Engineering, University of Minnesota, 500 Pillsbury Drive S.E., Minneapolis, MN 55455-0220.

29th U.S. Symposium on Rock Mechanics, June 13-16, 1988, Minneapolis, Minnesota. Information: Jan Becker, Department Professional Development, University of Minnesota, 315 Pillsbury Drive S.E., Minneapolis, MN 55455; (612) 626-1358.

International Working Meeting on Soil Micromorphology (meeting of Subcommission B of the International Society of Soil Science), July 10-15, 1988, San Antonio, Texas. Information: L.P. Wilding, Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474; (409) 845-3604.

39th Annual Highway Geology Symposium, August 17-19, 1988, Park City, Utah. Information: Highway Geology Symposium, T. Leslie Youd, 368 Clyde Bldg., Department Civil Engineering, Brigham Young University , Provo, UT 84602; (801) 378-6327.

International Symposium on Rock Mechanics and Power Plants, September 12-16, 1988, Madrid, Spain. Information: ISRM Symposium, Sociedad Espanola de Mecanica de las Rocas, Paseo Bajo de la Virgen del Puerto, 3, 28005 Madrid, Spain.

Clay Minerals Society Annual Meeting, September 18-21, 1988, Grand Rapids, Michigan. Information: T. J. Pinnavaia, Department of Chemistry, Michigan State University, East Lansing, MI 48824; (517) 353-4511. Abstract deadline was April 29, 1988.

International Symposium on Engineering Geology: Study Preservation and Protection of Ancient Works, Monuments and Historical Sites, September 19-23, 1988, Athens, Greece. Information: Paul G. Marinos, Greek Committee of Engineering Geology, 1988 Symposium Secretariat, P. O. Box 19140, GR-117 10 Athens, Greece; Telex 45 4312 POLX.

International Conference on Disposal of Radioactive Waste in Seabed Sediments, September 20-21, 1988, Oxford, England. Information: Society for Underwater Technology, 1 Birdcage Walk, London SW1H9JJ, England; phone 01-222 8658; Telex 917944.

Advances in Ground-Water Hydrology, November 16-18, 1988, Tampa, Florida. Information: American Institute of Hydrology, 3416 University Avenue S.E., Suite 200, Minneapolis, MN 55414; (612) 379-1030.

GSA 1988 Annual Meeting, October 31-November 3, Denver, Colorado.

COMMENTS FROM THE EDITOR

As you may have observed, the E.G.D. Newsletter in this issue contains business type information and professional announcements. This is needed and appropriate, but is not too interesting to the general public, governmental agencies, and politicians with whom engineering geologists must interface. If the E.G.D. is to have an influence on the general public regarding geologic/soil hazards and the financial impact of groundfailures, toxic waste disposal, groundwater resources, education, etc., the members must contribute their personal experiences to the newsletter in The form of FEATURE ARTICLES. We can make of the E.G.D. Newsletter a unique means of communicating with our society in general, and not with just ourselves, in a manner similar to the discontinued newsletter published by the National Research Council Committee on Ground Failure Hazards and entitled Ground Failure. Remember, glossy photos of a feature article "grab" the attention of the reader. Space will always be available in each issue for newsworthy feature articles.

Art Keene

NEW PUBLICATIONS

Probabilistic Approach to Landslide Hazard Mapping in Cincinnati, Ohio, with Applications for Economic Evaluation

RICHARD L. BERNKNOPF
RUSSELL H. CAMPBELL
U. S. Geological Survey, MS 922 National Center, Reston, VA 22092

DAVID S. BROOKSHIRE
Department of Economics, University of Wyoming, Laramie, WY 82071

CARL D. SHAPIRO
U.S. Geological Survey, MS 105 National Center, Reston, VA 22092

- ABSTRACT -

The economic value of geologic hazards research and data can be estimated only if the information is used in ways that are associated with specific economic consequences, such as a decision whether or not to mitigate against a potential landslide hazard at a specific location. The economic benefits of a decision to mitigate are measured by the expected losses that can be avoided if mitigation is undertaken, after the costs of mitigation activities are subtracted. To evaluate the spatial distribution of expected losses in a Cincinnati, Ohio, study area, we used regional geologic and topographic information to establish a regression equation that estimates the probability of landslide occurrence in 100-m square units. The distribution of different landslide probabilities can be mapped.

Probability estimates provide a numerical measure of the relative hazard potential for each subunit of a community and permit systematic estimation of expected losses where property values are known. By postulating a sequence of community decisions about where to impose regulations that require individuals to incur the expense of mitigation activities, a forecast of the economic consequences of decisions made with and without specific kinds of regional information can be quantitatively estimated. The probabilistic assessment of landslide susceptibility provides an essential tool for economic evaluation of community-imposed requirements for landslide hazard mitigation.

A set of hypothetical strategies for community mitigation that impose the provisions of the Uniform Building Code (UBC) Chapter 70 (International Conference of Building Officials, 1979) were applied to a study area in Hamilton County (Cincinnati), Ohio. One strategy requires mitigation throughout the entire area. This strategy would yield annualized gross benefits (losses avoided) of $4.9 million at a cost of $5.0 million for mitigation activities-an annualized negative net benefit (net loss) of $0.1 million. In otherwords, the uncritical application of the UBC Chapter 70, grading code provisions to the entire study area would probably not be cost-effective. Cost-effective alternative strategies might require mitigation only in selected parts of the area. For example, if the areas that require mitigation are selected by using regional topographic information (i.e., slope), the best strategy requires mitigation where slopes are steeper than 8° and provides annualized gross benefits of $3.1 million at a cost of $1.7 million-an annualized positive net benefit of $1.4 million. If the areas are selected by using both slope and regional geologic information (i.e., the regional distribution of surficial materials having different shear strengths), the optimum strategy requires mitigation where slopes are steeper than 14° or where materials have shear strengths (tan) less than 0.49. This strategy provides annualized gross benefits of $3.1 million at a cost of $1.4 million-an annualized positive net benefit of $1.7 million. The use of regional geologic information in addition to the slope data, therefore, yields to the community an incremental improvement (annualized marginal net benefit) of $0.3 million annually, and annual return that is greater than the one-time cost of acquiring the information.

JOB OPPORTUNTIES

ENGINEERING GEOLOGIST

Tenure-track position involving field and laboratory research and public service, for New Mexico Bureau of mines and Mineral Resources Division, New Mexico Institute of Mining and Technology. Good fringe benefits, support facilities, and publication opportunities; no consulting privileges. Emphasis on geologic hazards, environmental impacts, hazardous waste siting; close collaboration with environmental geology and hydrogeology staff. MS or PhD degree in geology, with academic and/or professional specialization in engineering geology required. Salary range from $24,000 to $32,000. Apply: New Mexico Tech Personnel Office, Campus Station, Box C-033, Socorro, NM 87801. AAEOE

BIOGRAPHIES OF THE CANDIDATES
ENGINEERING GEOLOGY DIVISION, GEOLOGICAL SOCIETY OF AMERICA

THOMAS L. HOLZER was born in 1944 in Lafayette, IN. He received his BSE degree in Geological Engineering from Princeton University in 1965, his MS in Hydrology from Stanford University in 1966, and his PhD in Geology from Stanford in 1970. From 1970 to 1975, he taught hydrogeology and engineering geology at the University of Connecticut. In 1975, he became a Research Geologist with the U.S. Geological Survey in Menlo Park, CA. From 1982 to 1984, he served as USGS Deputy Assistant Director for Research in Reston, VA. He is the editor of the Newsletter of the Hydrogeology Division of the Geological Society of America and of Reviews in Engineering Geology, Volume VI, Man Induced Land Subsidence. He is a member of the American Geophysical Union, the National Water Well Association, and Sigma Xi. His research interests include studies of ground failure associated with land subsidence and earthquake induced liquefaction. His current address is: U.S. Geological Survey, M.S. 977, 345 Middlefield Road, Menlo Park, CA 94025.

JEFFREY R. KEATON was born in 1949 in Pittsburgh, PA. He received his BS degree from the University of Arizona in 1971 and his MS from the University of California at Los Angeles in 1972. He has worked as engineering geologist with Dames and Moore in Los Angeles from 1971 to 1979 and in Salt Lake City, UT, from 1979 to 1986. He is a member of the Association of Engineering Geologists, International Association of Engineering Geologists, and American Society of Civil Engineers. His research interests include engineering geology of alluvial fans and hazards from debris flows, landslides, and earthquakes. His current address is: EarthStore, Dames and Moore, 250 E. Broadway, Suite 200, Salt Lake City, UT 84111.

PERRY H. RAHN was born in 1936 in Allentown, PA. He received his BS degree in Civil Engineering and BA degree in Geology from Lafayette College in 1959 and his PhD in Geology from the Pennsylvania State University in 1965. He has taught engineering geology, ground water, and geomorphology at the South Dakota School of Mines and Technology since 1968. He is a Professor of Geology and Geological Engineering. He has worked for the California Department of Water Resources, the University of Connecticut, and Argonne National Laboratory. He serves on the Burwell Award Committee. In 1986 he published a textbook, Engineering Geology, an Environmental Approach. He is a member of the Association of Engineering Geologists, National Association of Geology Teachers, National Water Well Association, Association of Professional Geological Scientists, and the National Society of Professional Engineers, among others. His research and consulting interests include regional hydrogeology and applied geomorphology studies and the application of engineering geology to urban planning. His current address is: Department of Geology and Geological Engineering, South Dakota School of Mines and Technology, Rapid City, SD 55701.

Charles W. Welby was born in 1926 in Taft, CA. He received his BS degree in Economic Geology in 1948 and his MS degree in Geology in 1949 from the University of California at Berkeley, and his PhD degree in Geology from Massachusetts Institute of Technology in 1952. After two years with the California Co. (1952-54), he began his teaching career at Middlebury College, VT (54-58), then Trinity College, CN (58-61), Rensaler Polytechnic Institute, NY (61-62), University of Southern Mississippi (62-65), and at North Carolina State University since 1965. He has acted as consulting geologist on a variety of projects chiefly related to ground water and dam failures. He is a member of the Association of Engineering Geologists, American Institute of Professional Geologists, American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and National Water Well Association. He is currently Editor of the Journal of Ground Water, Chairman of the AEG Ground Water Committee, and Vice Chairman of the American Water Resources Association Publications Committee. His research interests include ground water and urban runoff studies as related to land use planning, contaminant movement in ground water in the Piedmont Province, and application of remote sensing technology to mass wasting problems. His current address is: Department of Marine, Earth, and Atmospheric Sciences, Box 8208, North Carolina State Univeristy, Raleigh, NC 27695.

THE GEOLOGICAL SOCIETY OF AMERICA
3300 Penrose Place • P.O. Box 9140
Boulder, Colorado 80301

FIRST CLASS
Postage Paid
at Boulder, Colorado
Permit No. 82