

Inside MAE

MID-AMERICA EARTHQUAKE CENTER

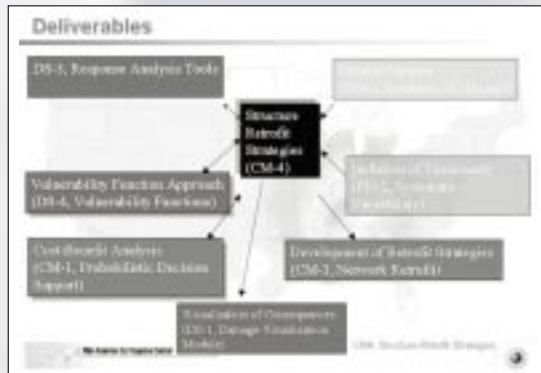
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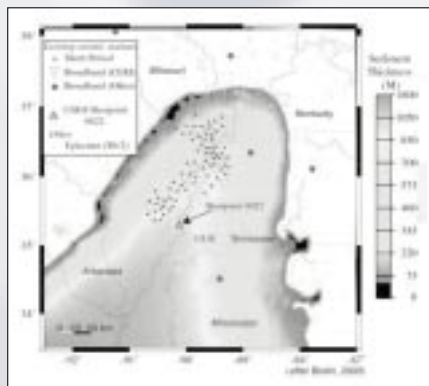
MAE Student Leadership Council (SLC) Series



Analysis Framework - part of project DS-1 in the Damage Synthesis core research area.



Structure Retrofit Strategies - part of project CM-4 of the Consequence Minimization core research area.



Seismic Path Modeling - part of project HD-5 in the Hazard Definition core research area.

This spring the Student Leadership Council (SLC) hosted a Seminar Series with invited speakers from various earthquake-engineering disciplines. The SLC works with the Earthquake Engineering Research Institute (EERI) Student Chapter in selecting speakers, organizing agenda, and making site and video-conference arrangements.

The seminars were broadcast live on the Internet. SLC representatives at each MAE Center school coordinated sites for students and faculty to view the broadcast. At the end of the presentations, students from the off-site locations used a chat session to ask questions of the speaker.

The SLC sponsored a contest for the thrust area seminars (part I, II, and III) with a MAE Center website treasure hunt. The purpose of the contest was to promote Center involvement as well as to encourage students to browse the website while gaining a better understanding of how the MAE Center functions. There was a \$50 prize for the person who turned in the correct answers the earliest.

Continued on page 6

Common Emphasis

In my last article, I discussed parallels between the MAE Center's focus on developing risk assessment technologies with that of an international standard developed in New Zealand and Australia that is being implemented by the EQTAP program of the Japanese Earthquake Disaster Mitigation Center. After recently participating in a MAE international workshop with two European earthquake research programs, I continue to identify similar parallels in terms of not only the Center's research thrusts, but also the overall direction that earthquake research is tending toward internationally.

As mentioned in another article in this newsletter edition, the MAE Center, in collaboration with the Italian national group for the defense against earthquakes (GNDT) and the European Commission's program on Safety Assessment for Earthquake Risk Reduction (SAFERR), organized a one-day workshop on research collaboration at the Joint Research Centre in Ispra, Italy on May 23. Overlapping themes of the three research programs were quite evident in presentations and discussions.

Similar concepts such as risk assessment, damage synthesis across regions, characterization of seismic hazards, strategies for minimization of earthquake risks or consequences, and vulnerability of regional systems, were inherent in each of the three research



D.P. Abrams

programs. These similarities mark a synchronous approach to identification of research based on holistic needs of stakeholders and decision makers. I personally found the parallel evolution to a systems approach to earthquake risk reduction on both sides of the Atlantic to be interesting because as little as five years ago, research agendas on both sides of the Atlantic as well as Japan, were focused on response and behavior of individual structural systems. The simultaneous shift of emphasis to vulnerability and risk across regions is particularly notable for researchers, including myself, who formerly concentrated on strength, stiffness and deformation capacity of a single type of structure. One example of this is the GNDT project called "VIA" that investigates the reduction of seismic vulnerability of infrastructure systems and physical environment. Included in this research, headed by Professor Michele Calvi at the University of Pavia, are projects on road networks (quite similar to the MAE Center emphasis on transportation networks), electric utility networks, industrial manufacturing plants, and earth dams. A second GNDT program known as "TRIANO" headed up by Professor Edoardo Cosenza at the University of Naples, studies assessment and reduction of vulnerability of urban areas.

This research parallels the MAE Center program on damage synthesis where response analysis tools are being developed to estimate damage of populations of buildings and other structures across a specific region. The interdisciplinary aspects of these GNDT programs are again common with that

of the MAE Center research since each effort combines talents from geophysical, geotechnical, structural engineering and urban planning.

The emphasis of the SAFERR program on assessment and design of structures in low-seismicity regions is in common with the MAE Center focus.

A second program on strategies and techniques for risk reduction is identical in concept to the MAE thrust area on consequence minimization though the SAFERR program is directly focused toward code enhancement. A third area of SAFERR on risk assessment systems investigates new approaches to hazard mapping, expressing vulnerability functions and integrating hazards with vulnerability. This area again parallels much of the MAE Center work on damage synthesis.

Development of the new paradigm known as Consequence-Based Engineering, being developed by the MAE Center, can encompass much of the research currently underway by the EQTAP program in Japan, the Italian GNDT program and the SAFERR program because of their common emphasis on damage, vulnerability and consequences of earthquakes across regions. An excellent potential exists for sharing of research methodologies and results through these international partners.

If nothing else, the striking commonalities between the MAE Center's research plan and that of these international programs strongly suggests that the Center is following the right path toward a unified approach to seismic risk reduction and that future international collaboration is very promising. ■

D.P. Abrams, Director

Thrust Area Research Coordination Meetings to be held in Urbana, June 27, 2002

The semi-annual, thrust area research coordination meetings for the Mid-America Earthquake Center will be held on Thursday, June 27, 2002, at the Beckman Institute at the University of Illinois in Urbana, IL.

The primary objective of these meetings is to bring together faculty and student investigators to coordinate their research, discuss project and program accomplishments, set future program plans, and learn from researchers in other thrust areas and disciplines how the Center is achieving its overall goals.

Project slide sets should be submitted to Birgit Fry (bfry@uiuc.edu) at MAE headquarters by June 20 for printing of hard copy to be distributed at the meeting.

For an agenda of the meeting, information on hotel arrangements, and directions, please see: <http://mae.ce.uiuc.edu/News/Archive/coordination2002.htm>. ■

Jack Kuehn Joins MAE Center Staff



Jack Kuehn joined the MAE Center in April as Research Program Manager. He had previously worked at the University of Illinois as a research technician and lab manager at the Honeybee Research Lab before leaving to attend graduate school, earning an MS in Business Administration in 2000. Before joining the MAE Center, Jack was Director of Human Resources at The Flightstar Corporation, an air charter and aircraft service company. A native of Wisconsin, Jack enjoys biking, backpacking, and kayaking. He has two grown children. Jack may be reached at 217-244-6827 and by e-mail at j-kuehn@uiuc.edu. ■

MAE Center Co-Sponsors Third National Seismic Conference & Workshop on Bridges & Highways

Advances in Engineering and Technology for the Seismic Safety of Bridges in the New Millennium was the theme of the Third National Seismic Conference & Workshop on Bridges & Highways held April 28-May 1, 2002, in Portland, Oregon.

The Third National Seismic Conference and Workshop on Bridges and Highways is the foremost national conference on the latest seismic design and retrofit practices in all seismic regions

throughout the United States. The program featured 50 presentations and 20 poster presentations—and 40 exhibitors of contemporary products and services for seismic design and retrofit. It also featured an international forum of invited speakers who discussed advanced earthquake design and mitigation technologies and approaches that have been implemented in other parts of the world. In all, the conference represents one of the largest gatherings on seismic issues for bridge & highway engineers, design consultants, researchers, students, and federal, state and local transportation agency owners and representatives, this year.

Principal investigators for the MAE Center and invited speakers to the conference included: Reginald DesRoches, Thomas Pfeifer and Roberto Leon, Georgia Institute of Technology. *Full Scale Experimental Tests of Bridge Retrofits in the Southeastern United States* was the topic of their session.

Responsible for the Poster session on April 29, 2002, titled *Proportioning Guidelines for Design of Bridge Substructure Columns for Improved Seismic Performance*, were Mehmet Inel and Mark Aschheim, University of Illinois.

Stakeholder Partners and *access2* members of the MAE Center who presented at the conference included the Federal Highway Administration, Missouri Department of Transportation, Hanson Engineers, Inc., Sverdrup Civil, Inc., Geomatrix Consultants, and URS Corporation. ■



MAE Core Research Projects Slide Sets Available on Web Site

For a better understanding of the Consequence-Based Engineering paradigm, a set of slides for each core research project is available on the MAE web site at <http://mae.ce.uiuc.edu/Research/MAESlides/list.html>. CBE research thrusts areas are Framework Development (FD), Damage Synthesis (DS), Consequence Minimization (CM), and Hazard Definition (HD).

These slides provide summarization of each project's objectives, scope, methods, interaction with other projects, relationship with Consequence-Based Engineering and other relevant information. ■

SLC Seminar Series Treasure Hunt Winners

As part of the spring 2002 MAE Center Student Leadership Council Seminar series, the SLC sponsored contests for the three thrust area seminars with website treasure hunts. The purpose of the contests was to promote Center involvement and a better understanding of the Center among the students, while encouraging them to browse the website and gain a better understanding of how the MAE Center functions. Winners were each awarded \$50.

Peeranan Towashiraporn, Georgia Institute of Technology, was the winner of the treasure hunt associated with Amr Elnashai's presentation, "Consequence-based Seismic Risk Assessment and Mitigation: Introduction to the MAE Center's Core Research Program with Emphasis on the Damage Synthesis Thrust Area." Peeranan works under the supervision of Barry Goodno and Jim Craig.

Mehmet Inel, University of Illinois, won the second treasure hunt, connected with Christine Powell's seminar on "The Role of Hazard Definition in Consequence-Based Engineering." Mehmet is a student of Mark Aschheim.

Joonam Park, Georgia Institute of Technology, won the third treasure hunt, linked to Barry Goodno's presentation, "Consequence-Based Engineering-Consequence Minimization." Joonam is a student of Barry Goodno and Jim Craig.

Congratulations to all our winners! ■



MAE Center Newsletter Changes

This issue of the MAE Center newsletter inaugurates a new design, a new name, and a new publication schedule.

With this issue, *Inside MAE*, will become a quarterly publication; the next issue will be released in September 2002.

For past editions of the newsletter, to update an existing address, or to subscribe, go to our website at <http://mae.cee.uiuc.edu/>. ■

MAE Center Participates in CUSEC Annual Meeting

The Central U.S. Earthquake Consortium (CUSEC) Annual Meeting was held in Little Rock, Arkansas, on March 18-20, 2002. The theme of the meeting was "Making a Difference-Before, During and After."

Speakers included representatives from the CUSEC States Emergency Management Agencies, FEMA, USGS, State Seismic Advisory Councils and Commissions, MAE Center Director Dan Abrams, and Brent Woodworth from IBM's Crisis Response Team.

CUSEC's Annual Meetings help shape the future of earthquake preparedness in the central U.S. Through this year's theme, the meeting focused on improving the working relationships among organizations concerned with earthquake issues in the Central U.S. and developing a multi-year regional action plan to address those issues.

The MAE Center exhibited at the conference and is an active member of CUSEC. ■

Upcoming Events

2002

July 21-25: 7th U.S. National Conference on Earthquake Engineering: Urban Earthquake Hazard, Boston. Contact: Andrea Dargush, 716-645-3391 x 106; dargush@acsu.buffalo.edu.

July 29-August 3: United Engineering Foundation International Conference on High Performance Materials in Bridges, Kona, Hawaii. Contact: Dr. Atorod Azizinamini, 410-472-5106; UEF website: <http://www.engfnd.org>.

August 15-20: International Conference on Advances and New Challenges in Earthquake Engineering Research, Harbin and Hong Kong, China. Contact: <http://mceer.buffalo.edu/outreach/intActivity/ANCER/conference.asp>

September 8-11: 19th Annual Association of State Dam Safety Officials, Tampa, Florida. Contact: www.damsafety.org.

September 9-13: Twelfth European Conference on Earthquake Engineering, Barbican Center, London, UK. Contact: Rachel Coninx, 12ECEE Secretariat, Institution of Civil Engineers, London SW1P 3AA, UK; e-mail: 12ECEE@ice.org.uk.

September 26-28: Structural Engineers Association of California (SEAOC), Santa Barbara. Contact: Michael Cochran, 310-207-6638 (voice); MLCSE@aol.com.

October 9-11: 3rd DIANA World Conference: Finite Elements in Civil Engineering Applications, Tokyo, Japan. Contact: www.diana.nl/Tokyo2002.

MAE-GNDT-SAFERR Research Collaboration Workshop

On May 23, 2002, the MAE Center held an international workshop to explore collaborative research with the Italian national earthquake research effort (GNDT) and the European Commission's research program on Safety Assessment for Earthquake Risk Reduction (SAFERR). The meeting was hosted by the European Laboratory for Structural Assessment (ELSA) of the EC Joint Research Centre in Ispira, Italy and chaired by the MAE Associate Director, Amr Elnashai. Over fifty earthquake engineering researchers, ranging in age and experience from several European countries and the U.S., met to discuss potential areas of research. Dr. Claudio Eva, the GNDT Director, overviewed research of the Italian program including four basic themes: seismic risk assessment for building heritage at a national scale, simulation of seismic events and damage in urban areas, effects of earthquakes on physical environments and infrastructure, and strategies to reduce

seismic risk. Amr Elnashai, the leader of the SAFERR program, outlined four task areas of the EC program to stimulate mobility among young researchers across European countries: characterization of the seismic hazard, assessment and design in low seismicity regions, strategies and techniques for risk reduction and risk assessment systems. The MAE Center Director, Dan Abrams, summarized similarities in regional risk assessment approaches with corresponding research thrust areas of the MAE Center on damage synthesis, consequence minimization and hazard definition. Discussions on collaboration at the project level followed in a series of breakout sessions

combining researchers from the three entities. Considerable potential for future collaboration was identified with respect to reduction of seismic vulnerability of infrastructure systems and across urban regions, among other more specific topics in seismology and engineering. A summary of the workshop, along with resolutions to direct future endeavors will be posted on the MAE Center website. One primary outcome of the meeting was to initiate an international topical workshop starting in June of 2003 at a historical site in Erice, Sicily, on a theme common to the three research groups. ■



MAE-GNDT-SAFERR Research Collaboration Workshop participants.

MAE Center Director Speaks on Consequence-Based Engineering (CBE) at Notre Dame

On April 4, 2002, MAE Center Director Daniel P. Abrams spoke at the University of Notre Dame's Linbeck Distinguished Lecture Series in Earthquake Engineering: Challenges for the New Millennium.

Dr. Abrams's talk was entitled "Consequence-Based Engineering Approaches for Reducing Earthquake Losses in Mid-America." Consequence-Based Engineering is a systems-based

methodology for minimizing seismic risk through selective intervention to critical components of a respective system.

This new paradigm is intended for use by practicing engineers responding to needs of their clients. The clients, or stakeholders, have a significant vested interest in mitigating seismic risk. Stakeholders are individuals or groups likely to sustain major losses when an earthquake strikes. The mitigation action plans developed by using CBE can apply to various systems ranging from the built environment across a small community to a national transportation or utility network.

An engineer may adopt the CBE

approach today by using existing tools for estimating hazards, vulnerability and loss. However, the method will grow more stronger and effective as research is conducted using advanced technologies to develop state-of-the-art tools for risk assessment and visualization.

To find out more about the CBE approach, read the paper recently published by the MAE Center's Director, Deputy Director and Associate Director, which can be found on the MAE Center's web site at: <http://mae.cce.uiuc.edu/News/Archive/cbepaper.pdf>.

View a video clip of Dr. Abrams's talk on CBE at <http://stream.goldendome.com/linbeck/archived.htm>. ■

University of Memphis/FedEx Send Aftershock Studies Team to New York

The University of Memphis's Center for Earthquake Research and Information (CERI) sent two staff members to upstate New York to assist in aftershock studies performed by the Lamont-Doherty Cooperative Seismic Network at Columbia University.

According to the US Geological Survey, a magnitude 5.1 earthquake occurred about 15 miles southwest of Plattsburgh, New York, at 6:50 EDT, April 20, 2002, and was felt from Cleveland, Ohio to Maine and Baltimore, Maryland. Roads, bridges, and residential structures were damaged in the epicentral area; however, most damage was limited to cracked walls and toppled chimneys.

A few roads and bridges were severely damaged.

Several aftershocks occurred and more are likely. Aftershock studies involve the deployment of seismic stations to provide precise information on the orientation and size of active faults.

CERI has an international reputation for field deployments of this nature. With the help of FedEx, CERI shipped four portable, state-of-the-art, solar-charged, seismic stations to assist in these studies.

CERI's field team was Jim Bollwerk, Seismic Network Engineer, and Chris Watson, Digital Systems Support Staff. Seismologists from the

US Geological Survey, Lamont-Doherty and CERI will analyze the data gathered in this field deployment.

To contact the CERI team, send an email to: Gary Patterson, CERI Information Services Director/Geologist, glpttrs@postoffice.memphis.edu.

For information on previous CERI/FedEx aftershock studies, see: <http://www.ceri.memphis.edu/gujarat/index.shtml>. ■

Cover story

Amr Elnashai, MAE Center Associate Director/Damage Synthesis Coordinator, was the guest speaker at the MAE Center Student Leadership Council Consequence-Based Engineering (CBE) Seminar Series, part I, on Thursday, March 14, 2002, in the Grainger Library Commons Room. Dr. Elnashai spoke on "*Consequence-Based Seismic Risk Assessment and Mitigation: Introduction to the MAE Center Core Research Program with Emphasis on the 'Damage Synthesis' Thrust Area.*"

Christine Powell, Associate Director, Center for Earthquake Research and Information (CERI) and Professor, Department of Geological Sciences, University of Memphis, was the guest speaker at the seminar series, Thursday, April 11, 2002. Dr. Powell is also the MAE Center's Hazard Definition Coordinator. Dr. Powell spoke on "*The Role of Hazard Definition in CBE.*" This was part II of the Consequence-Based Engineering (CBE) Seminar Series.

Barry J. Goodno, Professor of CEE, Georgia Institute of Technology, and Consequence Minimization Coordinator, was the guest speaker at the MAE Center Student Leadership Council Seminar Series, Wednesday, April 17, 2002. Dr. Goodno spoke on "*Consequence-Based Engineering (CBE) Consequence Minimization.*" This was part III of the Consequence-Based Engineering (CBE) Seminar Series.

The SLC Seminar Series also had James E. Beavers, MAE Center Deputy Director/Stakeholder Program Coordinator, as guest speaker, Thursday, March 28, 2002, in the Grainger Library Commons Room. Dr. Beavers spoke on "*A Multi-Hazard Approach for the Mid-America Earthquake Center.*" In his presentation he emphasized that the Mid-America Earthquake Center will be focusing on the reduction of losses from earthquakes using the Consequence-Based Engineering (CBE) paradigm as its foundation.

Mario Rodriguez, Professor, National University of Mexico, Mexico City, spoke on "*Simulated Seismic Loading of a Two-story Precast Reinforced Concrete Building.*" Thursday, April 25, 2002. Both seminars were also broadcast via videoconference.

To see a schedule of upcoming and past seminars, visit: <http://mae.ce.uiuc.edu/Education/SeminarSeries/SeminarSeries.html>.

Seminar webcasts are located at: <http://maelive.ce.uiuc.edu>. ■

UIUC 2002 Engineering Open House

March 8-9, 2002, marked the 82nd Engineering Open House at the University of Illinois at Urbana-Champaign. The two-day event, attended by grade school, middle school, and high school students from throughout central Illinois, featured 130 student exhibits, corporate exhibits, four design contests, guest lectures, and performances by musical guests. Bill Nye "The Science Guy" was the keynote speaker. Many of the exhibits were hands-on, including the Mid-America Earthquake Center's display, staffed by graduate and undergraduate Center students. ■



Visitors had an opportunity to test their K'Nex structures on the Center's mini-shake table.

Earthquake Resource Links for Teachers Now Available

Newly published pages provide teachers with a compilation of links to earthquake lesson plans, general earthquake information, earthquake activities, and information about the New Madrid Seismic Zone (NMSZ).

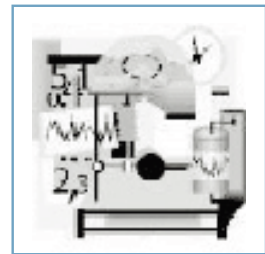
Lesson plans will direct teachers to web pages with tips and entire class plans to instruct their students about earthquake activity, the locations of faults, and earthquake hazards.

Activities include word search puzzles, books and stories about earthquakes, virtual experiments, and interactive investigations of the nature of earthquakes.

General earthquake information will direct teachers and students to interesting facts about earthquake preparedness, magnitude and intensity, the largest earthquakes in the world, and a glossary of seismologic terms.

The New Madrid Seismic Zone includes information about the 1811-1812 earthquakes, the Mississippi valley, and the earthquake hazard in Mid-America.

To view the Earthquake Resource Links for Teachers, go to: <http://mae.cee.uiuc.edu/Education/Teachers/resource.htm>. ■



Taiwan Earthquake Field Study Fellowship Winners

Taiwan Earthquake Field Study fellowship winners are Cale Ash (University of Illinois), Stephanie Arbogast (Southern Illinois University-Edwardsville), Jennifer Knapp (Georgia Institute of Technology), and Amber Grubbs (Texas A&M University).

These MAE Center students were joined by PEER and MCEER students for a week-long hands-on field assessment exercise in Taiwan, May 17-24, 2002. Professor Paul Roschke from Texas A&M University was the group leader and the National Center for Research on

Earthquake Engineering (NCREE) in Taipei hosted the event. Seminars, tours of NCREE laboratory facilities, a site visit to Chi-Chi, and field trips to investigate retrofit structures and new infrastructure projects were among the activities the students participated in.

For more information about the Taiwan Field Mission, including assignments, schedule, maps, and pictures, see <http://mae.cee.uiuc.edu/Education/Fieldmission/2002.htm>. ■



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For further detail on news items see the MAE Center web site at <http://mae.cee.uiuc.edu>