

**EERI STUDENT CHAPTER
AT THE UNIVERSITY OF NOTRE DAME**



**ANNUAL REPORT
2000-2001 SCHOOL YEAR**

1.0 General Information

Faculty Advisor: Dr. Yahya Kurama (2000-present)

Current Chapter Contact: Tracy Kijewski-Correa, Acting President

Officers for 2000-2001 School Year:

Richard Christenson, President
Tracy Kijewski-Correa, Vice President
Kenny Farrow, Secretary
Gang Mei, Treasurer
Brian Morgen, Webmaster

New officers were elected in the fall of 2001:

Officers for 2001-2002 School Year:

Tracy Kijewski-Correa, President
Brian Morgen, Vice President
Nelson Duran, Secretary
Ethan Kubatko, Treasurer
Michael May, Webmaster

Chapter Members for 2000-2001 School Year:

Mike Allen
Richard Christenson
Tracy Correa*
Kenny Farrow
Blake Hoskisson
Gang Mei
Brian Morgen*
Manuel Ruiz-Sandoval*

A number of these members have graduated and EERI has now recruited a new body of members. The individuals marked with an asterisk will be renewing their EERI memberships for the 2001-2002 school year. In addition, nine new members will be joining. We anticipate having their applications sent together by the end of September 2001.



The EERI@UND Student Chapter is recognized by the Student Activities Office at the University of Notre Dame as an official University student organization. This recognition entitles us, among other privileges, to use campus facilities and services, engage in on-campus fund raising, and advertise in the student newspaper. However, due to our composition being completely graduate students, we are unable to qualify for club funds through Notre Dame (this requires at least 1/2 of the club officers to be undergraduates). The sole source of funding for our student chapter is from EERI and local chapter dues of \$10.

2.0 Chapter Activities (August 2000-May 2001)

SHAKES & QUAKES: K-12 Outreach Program

Shakes and Quakes is an outreach program designed to stimulate young minds and allow them to better understand the way in which civil engineering structures respond to severe earthquakes. EERI@UND visits local area

classrooms and demonstrates building responses to earthquakes through the use of a portable shaking table. Students are asked to build LEGO and K'NEX models and these student-designed buildings are tested on the shaking table to see how they respond under "real" earthquake ground motions.

EERI@UND members participated in a program jointly sponsored by the Structural Dynamics and Control Earthquake Engineering Lab here at Notre Dame. It was an excellent opportunity to share with students the advances being made in Earthquake Engineering for the betterment of society. This past year we were able to visit two schools: Andrew Jackson Middle School and Stanley Clark Elementary School.

2000-2001: This past year the outreach program was expanded to include K'Nex structures and introduced to other grade levels (5th-7th) at Stanley Clark Elementary and Andrew Jackson Middle School. Shakes and Quakes was handed over to the Earthquake Engineering Research Institute chapter at Notre Dame, headed by Dr. Kurama, in the spring of 2001.

Shakes and Quakes has been used as a supplement to the textbook during an Earth Science unit on earthquakes. The entire project lasts about 3 weeks, with 2 weeks devoted to planning and building the Lego structures and K'Nex. The third week is used for Quake Day, analyzing the results, researching building techniques, and writing the final reports. The first and last classes are led by EERI@UND members, while the teacher is responsible for conducting the discussions and group activities detailed in the second and third weeks. The coverage during the two visits is as follows:

- Visit #1: Students receive a project handout, building supplies are given to the teacher, and a general overview of earthquakes and the project is given.
- Visit #2: At the end of two weeks, the EERI@UND members visit the classroom for Quake Day, bringing a portable shaking table and a computer. The LEGO and K'nex building designed and constructed by the students are tested. Then, a presentation on earthquake-resistant design and structural engineering is then given to conclude (Part II).

Notre Dame's Dr. Y. Kurama, Professor of Civil Engineering and Geological Sciences, in conjunction with EERI@UND, visited two classes to comment on the importance of understanding how bridges and buildings respond to earthquakes and how damaging quakes can be to people and civil structures.

Each of the classrooms had to form groups of about four students in order to build an earthquake-proof building out of Lego blocks, which would be tested on a small earthquake simulator. They had to use their imagination and ingenuity to come up with designs that could beat the deadliest earthquakes known to man.



In each group, students had to choose their individual roles. One person was the owner of the building, one the architect, another an engineer, and the last person was the builder. They would have to learn to work together to fulfill their respective duties without compromising any of their teammates' goals.

They had some rules for designing and constructing their building in order to make the exercise as realistic as possible (see Appendix for rules). These regulations helped them to understand how important efficiency, cost, strength, appearance, and constructability are to any project.

More importantly, the students were also exposed to new life-saving technologies, emphasizing the concepts of energy dissipation and base isolation, a concept even few adults understand, made simple through the use of legos on wheels. Some students even incorporated, albeit unknowingly, friction damping in their designs.



The day was great fun not only for the students involved but also for the EERI@UND members. Additional information is available on the web at: <http://www.nd.edu/~eeriund>.

Mentoring Program (February 2001)



Members of the engineering and science community participated in the Ms. Wizard Day 2001 program on February 10, 2001. The event brought 4th-6th grade girls from the surrounding area to Notre Dame for a day packed with activities including campus and dorm tours, interactive labs, and a career fair.

Ms. Wizard Day is an annual day of activities at the University of Notre Dame designed to encourage young girls to pursue careers in

Science and Engineering. Members of EERI annually participate in the Career Fair with several interactive displays. The activities included a shake table demonstration where the girls could observe the behavior of K'nex buildings of their own design and

reinforce concepts of period and resonance. A poster board display introduces basic concepts of earthquake hazards, risk and mitigation along with elementary dynamics concepts.

EERI@UND members participated in the morning career fair, alongside ASCE and other graduate and undergraduate members of the Department of Civil Engineering and Geological Sciences, in this collaborative program between various organizations and departments campus-wide.





The EERI@UND display brought the notions of earthquake engineering and hazards mitigation home with a computer demonstration of El Centro response of two buildings to illustrate the effects of natural frequency on earthquake response as well as a mass damper model to illustrate the use of tuning and inertia to control response. The girls also experimented with the notions of base isolation and liquid dampers.

More importantly, the girls were alerted to the awesome power of earthquakes and their destructiveness with images of recent quake damage to reiterate how important it is to have students with strong math and science backgrounds prepared for the challenges of making the world safer for us all. They learned the important lesson that not only doctors save lives but engineers can too by reducing the loss of life and property in earthquakes.

The Natural Hazard Mitigation Program in Japan

Each year, the National Science Foundation (NSF) sends U.S. graduate students to Japan for an intensive summer research experience through the Summer Programs in Japan. University of Notre Dame Professors Spencer and Kurama coordinate the Natural Hazard Mitigation Program in Japan (NHMJ), a supplement to the Summer Programs in Japan, to provide unique opportunities to the graduate students to explore the state of research and practice in natural hazard mitigation in Japan. In 2001, EERI@UND assisted in the coordination and execution of the NHMJ Program, as well as sent a member representative to Japan, Manuel Ruiz-Sandoval. Past and current EERI@UND members have participated in the Summer Programs in Japan: Mike Allen, Richard Christenson, Kenny Farrow, and Brian Morgen. A brochure for the NHMJ Program, which EERI@UND helped design, can be found in the Appendix.

EERI Student Chapter Website

The EERI@UND website serves as a portal for current and prospective members, industry leaders, faculty, and other EERI student chapters to keep track of current EERI@UND events. This year, the website was redesigned to better promote our Outreach program. The goal is to provide information to elementary/middle school students and teachers who would like this or a similar program to come into their classroom as well as for other university faculty and students who may want to get involved in community outreach and start up an Outreach program of their own. To better illustrate what the Outreach program involves, a short flash movie has been created to show the positive impacts the program has on students, teachers, and all those involved in the experience. For more information, visit the EERI@UND website at <http://www.nd.edu/~eeriund/>.

Earthquake-Related Research Projects at the University of Notre Dame

- Coupled Building Control for Seismic Protection
- Seismic Response Mitigation via Semi-Active Control Strategies including MR Fluids and Liquid Column Dampers
- Seismic Response Mitigation via Real-Time Model Predictive Control with Autoregressive Modeling of Seismic Inputs
- Non-Emulative Precast Concrete Structures with Supplemental Passive Energy Dissipation
- Seismic Capacity-Demand Index Relationships for Performance-Based Design

3.0 Future Activities

Increase EERI Student Chapter Membership

In our inaugural year, it became evident that interest in EERI was not constrained to those with backgrounds in science and engineering, as the impacts of earthquakes touch the lives of everyone. However, for non-engineering

majors, the cost to join EERI's national roster was a deterrent, as they cannot fully reap the benefits of *Earthquake Spectra* and other reports and found it difficult to rationalize paying these dues. Therefore, we have proposed the notion of a local membership for non-engineering majors, at a reduced cost, e.g. \$10. The revenue generated could be used to fund chapter activities, such as our outreach programs and lecture series. The local members can learn more about earthquake hazards and mitigation while having lasting impacts on the young students they work with in the outreach programs.

This concept was well received by Chris Poland during an earlier visit and will be used this year to increase our chapter membership. Increasing the membership, especially in terms of undergraduates, will qualify us for additional university funding and provide enough individuals to execute fundraisers on campus, allowing us to expand our campus activities. The membership drive will kick off in early September, where we especially hope to attract a number of undergraduate students and combine forces with ASCE. Although a number of our veteran members will be moving on, the influx of new structural graduate students and our undergraduate membership drive should replenish our ranks with active students ready to carry on the work of EERI at the University of Notre Dame.

Linbeck Distinguished Lecture Series in Earthquake Engineering

Similar to the last year's Natural Hazards Lecture Series that was co-sponsored by EERI@UND and the University of Notre Dame Department of Civil Engineering and Geological Sciences, EERI@UND is planning to host a series of lectures during the 2000-2001 academic year. The lecturers include: Thomas D. O'Rourke (Cornell University), Helmut Krawinkler (Stanford University), Joseph Penzien (University of California, Berkeley), Hiroo Kanamori (California Institute of Technology), Sharon Wood (University of Texas, Austin), Eric Elsesser (Forell/Elsesser Engineers, Inc.), and Daniel P. Abrams (University of Illinois at Urbana-Champaign). Funding is provided by the Department of Civil Engineering and Geological Sciences through the Leo Linbeck Distinguished Professor Fund, the Provost's Office, the Friedman Family Visiting Professional Program of the Earthquake Engineering Research Institute, and the IBM Endowment.

Outreach 2001

In collaboration with the Structural Dynamics and Control Earthquake Engineering Lab here at Notre Dame, the EERI@UND chapter will continue its support of the Outreach program at local elementary schools and its participation in the Ms. Wizard Day program.

SEAOI Dinners

To remain in contact with local practicing engineers, EERI@UND plans to attend at least one of the scheduled dinner meetings organized by the Structural Engineers Association Of Illinois in Chicago.

Natural Hazard Mitigation in Japan Program

EERI@UND will assist in the coordination and execution of the NHMJ program, as well as possibly send representatives to Japan during the summer of 2002.

4.0 Appendix

Please find these items in the Appendix:

- Outreach 2000 Handout
- NHMJ-2001 Brochure
- Leo Linbeck Lecture Series Poster