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CUREe is a California nonprofit corporation dedicated to the advancement of earthquake engineering. CUREe's member institutions are:



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CUREe at the Curie Point

Executive Director's Remarks

Having now been CUREe's Executive Director the past half year, I'm beginning to view the organization with enhanced perspective and to appreciate how exciting our future prospects are. I remember telling the Search Committee that uncertainty can be a good thing—it makes life more interesting—and that I was attracted to the uncertainty inherent in helping to develop a relatively young organization. Frankly, only seldom had I come across mention of CUREe prior to coming on board, but I've now absorbed the CUREe culture so thoroughly that when I hear "CUREe" my first reaction is no longer to assume the speaker is referring to either Marie or Pierre.

It was Pierre who discovered that at a certain temperature, now called the Curie Point, a substance's magnetic alignment becomes unfrozen and is free to reorient in relation to whatever magnetic field it then finds itself. When the temperature falls beneath the substance's Curie Point, the magnetic re-orientation is locked in.

Many of you are aware of the importance played by paleomagnetic studies of the ocean floor in the validation of the plate tectonic hypothesis in the 1950s, 60s, and 70s. The phenomenon of the Curie Point provided a convenient record dating back millions of years showing where particular areas of rock used to be when they flowed to the seafloor's surface, because shortly after that time they cooled to the point where magnetic north at that moment was permanently imprinted. Magnetic stripes can be detected today in the rock of the seafloor, and combined with the fact that the earth's magnetic field has periodically changed and that the location of the magnetic north pole has migrated over the epochs, the rate of motion of these bands of rock from their origination in a zone of seafloor spreading can be inferred.

Perhaps in organizations, as in geophysics, there is a Curie Point. If so, then in 1995 CUREe has again reached its Curie Point. I say "again" because the establishment of the organization in 1988 was obviously its first formative event, when out of its molten state it assumed a recognizable form. This year, as CUREe has established an office with a small but efficient staff, as the SAC Steel Program's applied research projects coordinated by CUREe have enlarged and intensified our activities, and as we are about to hold the first in a series of CUREe Symposia, the organization has heated up again to its Curie Point, and a new relatively permanent alignment is forming.

The Board of Directors is dealing with a wide range of interesting new issues and opportunities, making decisions that will put an imprint on CUREe that will last for at least the next few years to come. President Stephen Mahin, along with other members of the Board, has devoted hundreds of hours of effort to CUREe and is in large part responsible for the organization's high current level of funding and activity. They have infused the organization with energy and leadership—both the heat and the magnetic north—that have brought us to our Curie Point again.

Along with the other two staff members here in the CUREe office, Parshaw Vaziri and Wanda Realegeño, I hope you will feel free to write, fax, e-mail, or call if you have any ideas or concerns. I would also encourage you to contact the Board member representing your university: Board meetings are held quarterly, and Directors are asked in advance of each meeting if they would like to add items to the agenda. One of our objectives, now that the organization is succeeding in being more visible and active, is to involve its membership more. I welcome any suggestions you might have.

-BOB REITHERMAN

Project Updates

Northridge Earthquake Research

The **Northridge Earthquake Research Coordination Project** is a FEMA-funded project aimed at increasing collaboration among NEHRP-funded Northridge earthquake researchers and between researchers and users. A conference was held in Los Angeles on December 2 & 3, 1994, with all NSF-funded Northridge Principal Investigators, other NEHRP agency researchers, key NEHRP and other Federal agency representatives, information services representatives, and selected other researchers and representatives of the user communities invited to attend.

Three publications have resulted from this project, and are available at no charge through the CUREe office: *Proceedings of the Northridge Earthquake Research Coordination Conference*, the *Directory of Northridge Earthquake Research*, and *Post Earthquake Research: Final Report of the Northridge Earthquake Research Coordination Project*.

Discussions have been initiated with FEMA and NSF regarding the possibility of a follow-up conference in 1996.

Program to Reduce the Earthquake Hazards of Steel Moment-Frame Structures

In what was the most surprising aspect of the January 17, 1994 Northridge Earthquake, over 100 modern steel frame buildings suffered significant damage. Adding to the concern was the fact that the damage was not of a ductile nature but instead consisted of brittle fractures. These fractures or cracks extended through the welds of the column-beam moment-resisting connections, or in other cases the cracks occurred in the steel columns or beams themselves at the joints.

The earthquake produced three immediate problems for building code officials, structural engineers, building owners, and the construction industry:

1. Damaged steel buildings: How should they be repaired?
2. Existing steel buildings in the Los Angeles area that were not damaged in this particular earthquake, or thousands of

- similarly constructed buildings elsewhere: Do they require upgrading, and if so, how?
3. Future steel buildings millions of square feet in area are designed and built each year: What changes in pre-Northridge design and construction practices are required to bring their performance up to an acceptable level?

The Federal Emergency Management Agency (FEMA) and the California Office of Emergency Services have underwritten a \$2.3 million study, now being completed, to solve these problems. This work, "**SAC Phase I**," is being accomplished by the SAC Joint Venture. "SAC" stands for the three joint venture partners: **SEAOC**, the Structural Engineers Association of California, representing the profession in California which over the past 50 years has developed the seismic provisions used in the Uniform Building Code, and whose members are relied upon for the earthquake-resistant design of steel-frame structures; **ATC**, the Applied Technology Council, devoted to the development of structural engineering design guidelines, with over 20 years experience in the earthquake field; ATC documents have formed the basis for codes and standards used nationwide in the earthquake-resistant design of buildings and bridges; and **CUREe**.

Over the past year, **SAC Phase I**, which is unprecedented in the earthquake field in terms of how rapidly a large-scale effort combining practice and applied research has been conducted, has involved hundreds of practicing engineers, researchers, industry representatives, and code officials in workshops and reviews of reports. In addition to numerous Design Advisories, testing reports, workshop proceedings, and other products, Phase I's end-product is an interim set of guidelines that provide the best answers presently available to building officials and structural engineers. These guidelines are based on the Topical Investigations, 34 applied research projects designed to answer specific questions, all of which have been completed in the past 6 months in Phase I under CUREe direction. The investigations were conducted by universities and engineering consultants in California as well as in other states.

SAC Phase II, the planned continuation of the SAC Joint Venture's Phase I work, is presently being negotiated with FEMA, which intends to allocate approximately \$8.6 million for a three-year period. As in Phase I, the work will build on the capabilities of SEAOC, ATC, and CUREe, and will include

nationwide and international input as well. Brittle fracture damage to welded steel frame structures in the January 17, 1995 Great Hanshin or Kobe Earthquake was even more extensive than in the Northridge Earthquake a year earlier, and SAC investigators have been actively "sharing notes" with Japanese counterparts. In Phase II, physical testing, analysis, and the experience of engineering practitioners and industry experts will form the foundation for updated and more definitive design guidelines. Phase II will also look at cost impacts, the information needs of government policy makers and private building owners, interrelationships between various codes and standards that may require facilitation, and the continuing education needs of engineers, building officials, construction trades, and others. Announcements of intended areas of subcontracted work will be broadly disseminated by SAC.

CUREe-Kajima Research Program

In September, the second year of Phase II of the **CUREe-Kajima Joint Research Program** will be completed. Presently, there are nine active projects at six member universities, with 2 new projects slated to begin in the third year of the Program. A listing of these projects can be found in Table 1.

Negotiations have already begun for a possible extension, Phase III, of the Program. The CUREe Joint Oversight Committee (JOC) met with Dr. Yoichi Nogiri, Director of Kajima's Technical Research Institute, in San Francisco in August. The CUREe members of the JOC are: W.D. Iwan (chair), S.A. Mahin, and H.C. Shah.

Structural Control Research

Professors George Housner and Sami Masri are the Principal Investigators for several NSF-funded CUREe grants in the area of Structural Control. The **U.S. Panel On Structural Control Research** is an ongoing project funded by NSF that began in 1989 and whose first task was to establish Structural Control as a discipline. This has been achieved through a series of publications, conferences and workshops dating back to 1990. The most recent of those, the **First World Conference on Structural Control** was held in Pasadena in August 1994 and was attended by 250 participants.

Last year, the Panel established a non-

profit California corporation named the International Association for Structural Control (IASC) which will be producing a newsletter and journal in the future. Other future goals of the Panel include preparing recommendations for important research that should be undertaken in the US, convening in 1996 the Second International Workshop on Structural Control, and the Second World Conference on Structural Control in 1998.

CUREe Symposium in Honor of George Housner

For half a century, Professor George Housner has been one of the country's leaders in the field of earthquake engineering, as well as one of the driving forces behind the formation of CUREe. In what will

the world to join Professor Housner in discussing the progress made in numerous areas pioneered by him including structural engineering, ground motion, public policy and education. As well as making connections with Professor Housner's seminal work in these areas, the symposium presentations will include thoughts on future developments. A reception will be held Friday night at Caltech's Athenaeum. A special reduced registration rate is available until **October 13**. For more information or a registration form, please contact the CUREe office.

Principal Investigator	Institution	Project Title
Alfredo Ang	UC Irvine	Reliability-Based Optimal Aseismic Design of Reinforced Concrete Buildings
James Beck	Caltech	Reliability Bases and Integrated Computer Tools for Optimal Structural Design
Armen Der Kiureghian	UC Berkeley	Reliability Bases and Integrated Computer Tools for Optimal Structural Design
John Hall	Caltech	Near-Source Ground Motion Studies for Northridge and Hanshin Earthquakes
Donald Helmberger	Caltech	Development of an Early Warning System
Jiann-Wen Ju	UCLA	Advanced Constitutive and Damage Mechanics Modeling of Multiphase Fiber Reinforced Concrete
Jiann-Wen Ju	UCLA	Innovative Damage and Constitutive Modeling of Fiber Reinforced Cementitious Composites Subjected to Earthquake Loads
Anne Kiremidjian	Stanford	Methodologies for Evaluating Socio-Economic Consequences of Large Earthquakes
Sami Masri	USC	Reliability Bases and Integrated Computer Tools for Optimal Structural Design
Jack Moehle	UC Berkeley	Methodologies for Evaluating Socio-Economic Consequences of Large Earthquakes
H. Allison Smith	Stanford	Reliability Bases and Integrated Computer Tools for Optimal Structural Design
Mladen Vucetic	UCLA	Methodologies for Evaluating Socio-Economic Consequences of Large Earthquakes

Table 1: Phase II CUREe-Kajima Research Projects

In addition, the **U.S.-Japan Cooperative Research Plan in the Area of Structural Control Research** has been funded to help collaborative efforts between the U.S. and Japan, namely to enable groups from the U.S. and Japan to meet and collaborate on research activities. For copies of reports, contact Professor Sami Masri, Department of Civil Engineering, USC, Los Angeles, CA 90089.

be the first in a series of symposia to showcase the lifelong accomplishments of individuals contributing to the understanding of earthquakes, CUREe will honor the career of Professor Housner during the weekend of October 27-28, in Pasadena at the Doubletree Hotel.

Co-sponsored by the California Institute of Technology, the symposium will bring together scientists and engineers from around

Board of Directors At-Large Election

The CUREe Board of Directors plays a vital role in the planning and direction of CUREe's activities. Each participating university appoints a Director and four additional Directors are appointed representing the engineering, industrial and public sectors. Four more members are elected directly by the membership. The current **CUREe Board of Directors roster** can be found on the back cover of this publication. CUREe is in the midst of an election to fill the At-Large positions on the Board of Directors that are expiring in November 1995. The positions are currently held by H. Krawinkler (Treasurer) and R. Shepherd (Secretary). A call for nominations has already been mailed to CUREe members, and a ballot will be mailed in early October.

Special Board Meeting

A special strategic planning Board of Directors' meeting was held on August 24, hosted by Board member Phil Richter at Fluor Daniel, Inc. in Irvine. The Board met to discuss CUREe's future strategies, and also the interests of CUREe and its institutional members in connection with Federally-funded earthquake centers, or the California Seismic Safety Commission's (CSSC) proposed Center for Earthquake Risk Reduction (CERR).

Seismic Events

SAC Workshops: October 12-San Francisco;
October 13-Seattle
CUREe Symposium in Honor of George Housner, October 27 & 28, Doubletree Hotel, Pasadena
CUREe Board of Directors' Meeting, October 26, Caltech, Pasadena

Electronic Media

CUREe is pleased to announce the availability of on-line information through the Earthquake Information Gopher maintained by the National Information Service for Earthquake Engineering (NISEE) at EERC. The gopher site contains on-line editions of the *Directory of Northridge Earthquake Research* and *CUREe News*, and will soon have information relating to the Housner Symposium, future Request for Proposals, publications information, and other CUREe-related items. Be sure to check this site in the upcoming weeks for these new items, as well as other interesting earthquake-related items available from the Earthquake Information Gopher.

You can access this gopher by one of the following ways:

- 1) If you are using gopher software, the address is:
[gopher nisee.ce.berkeley.edu](http://gopher.nisee.ce.berkeley.edu)
- 2) If you are using World Wide Web browsing software (e.g., Netscape):
gopher://nisee.ce.berkeley.edu

The SAC Joint Venture now has a World Wide Web home page at:

<http://www-sac.isr.umd.edu/>

This site currently contains an on-line edition of the *SAC Design Advisory #3*, as well as several photos. Several additions are in the works, including other SAC publications, additional testing and damage photographs, and information pertaining to SAC Phase II.

Publications

The Architectural Institute of Japan (AIJ) has released its special report, *Damage to Steel Building Structures*, on the 1995 Kobe (Hyogoken-Nambu, or Hanshin) earthquake. The report documents several types of steel and moment frame buildings with varying levels of damage, based on a survey of 988 buildings. The report contains 324 high-quality color photos and a 20-page abridged English translation. Copies of the report can be ordered for \$75.00 (California orders add 8.25% sales tax or other locally applicable

amount), by mailing a check or money order to the CUREe office. Please make all checks payable to "CUREe".

The **1996 CUREe Calendar** will soon be available. A complimentary copy will be sent to all CUREe members, and additional copies can be purchased from CUREe or at the Housner Symposium.

The *Proceedings of the Northridge Earthquake Research Coordination Conference* is available at no charge from CUREe.

Directory of Northridge Earthquake Research is available at no charge from CUREe.

Post Earthquake Research: Final Report of the Northridge Earthquake Research Coordination Project is available at no charge from CUREe.

SAC Design Advisory #3 is available through ATC, (415) 595-1542.

SAC Interim Design Guidelines is available through ATC, (415) 595-1542.

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☞ Reminder: Register for the October 27 and 28, 1995 CUREe Symposium in Honor of George Housner by October 13 to receive a special pre-registration discount.

CUREe's offices are located in the Earthquake Simulator Laboratory Building at the UC Berkeley Earthquake Engineering Research Center.