

PREPARING FOR
THE NEXT
GREAT

EARTHQUAKE

UNIVERSITY of CALIFORNIA
every day, everywhere

California sits on unstable ground. Throughout its history, the fault lines rippling underneath the state have frequently ruptured, sometimes with a terrifying force that has produced widespread damage and loss of life.

April 18, 2006, marks the 100th anniversary of the 1906 San Francisco earthquake and ensuing fire that destroyed the city. This was an event that left an indelible mark on the history and psyche of California — and it remains a vivid reminder of the destruction earthquakes can cause.

Today, even as it has developed into the nation's most populous state, an international center of technological innovation, and one of the world's leading economies, California remains highly vulnerable to the ravages of the next big earthquake.

In anticipation of that event, **faculty, students, and researchers at the University of California's campuses and national laboratories are playing a lead role in conducting research to help us understand, prepare for, and recover from earthquakes.** We invite you to explore the Web site at right, which provides a small sampling of the work being done at UC to both commemorate 1906 and prepare for our seismic future.

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HOME FEATURES SYSTEM-WIDE HOME

UC RESEARCH

- 1906 CENTENNIAL
- CURRENT QUAKE DATA
- MORE RESOURCES
- ABOUT THIS SITE

UC Earthquake Research 1 | 2 | 3

UCIRVINE

Scientists at UC Irvine are working to help "make buildings tougher" using a shake table that has replicated the Kobe and Northridge earthquakes. They also are pursuing research into soil-structure interaction and its impact on building performance in an earthquake.

UCI researchers also have found that the type of fault that led to the disastrous 1994 Northridge earthquake also exists in Orange County, possibly setting the stage for a similar disaster in that region.

UC San Diego is home to the largest earthquake "shake table" in the United States and the only outdoor shake table in the world, ideally suited for testing tall, full-scale buildings. The facility is part of the National Science Foundation's Network for Earthquake Engineering Simulation. UCSD structural engineers are using it to, among other things, identify the right amount of steel reinforcement needed for concrete buildings to withstand powerful earthquakes.

Lawrence Livermore National Laboratory and UC Berkeley scientists, working with the U.S. Geological Survey, have contributed to new computer models that re-create the ground motions from the 1906 San Francisco earthquake. The results of these simulations will be used by earthquake engineers to assess the likely impacts of future earthquakes along the San Andreas Fault. On this web site, movies and map-view snapshots show the seismic waves of 1906 moving outward from the fault as the rupture expands from the epicenter.

VISIT THE WEB SITE:

<http://universityofcalifornia.edu/everyday/earthquake/>

HIGHLIGHTS OF UC EARTHQUAKE RESEARCH

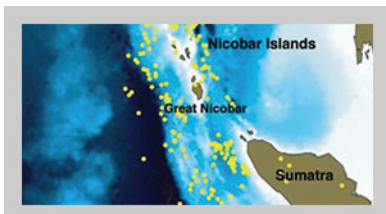
Details on all of these programs are available at <http://universityofcalifornia.edu/everyday/earthquake/>

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UC Davis scientists have led a multi-institution computer simulation study that recently estimated that the San Francisco Bay region has a 25 percent chance of a magnitude 7 or greater earthquake in the next 20 years. The researchers' computer model simulated 40,000 years of earthquakes in California in order to produce the forecast.



Scientists at **UCSD's Scripps Institution of Oceanography** and **UCLA** have developed a new method for imaging the December 2004 Indian Ocean earthquake that could have implications for public-warning and tsunami-alert systems. Researchers at Scripps also have completed a study of the fault rupture that caused the earthquake, with the findings suggesting that previous ideas about where large earthquakes are likely to occur need to be revised — and that regions of the earth previously thought to be immune to such major events may actually be at high risk of experiencing them.

Project RESCUE, or Responding to Crises and Unexpected Events, is a multi-institution initiative led by researchers at the California Institute for Telecommunications and Information Technology at **UC Irvine** and **UC San Diego**. Project researchers are studying ways to enhance emergency responders' ability to gather, manage, use and disseminate information to other responders and to the public.



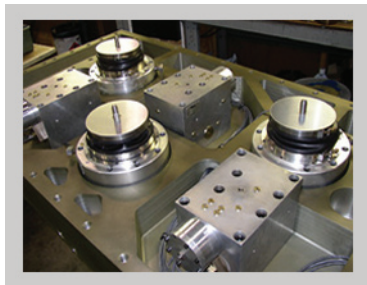
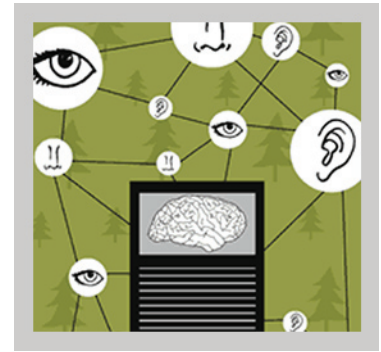
The **UC Berkeley Seismological Laboratory** has, since 1887, been involved in operating seismic networks in central and northern California. The laboratory is involved in a number of projects in geophysical monitoring, earthquake information dissemination, and education and outreach. The lab also co-operates, with the U.S. Geological Survey, the Northern California Earthquake Data Center, a long-term archive and distribution center for seismological and geodetic data.

UCLA researchers have reported that one fault can be damaged by the shaking and stress from an earthquake on a different fault. UCLA is also the site of the Center of Embedded Networked Sensing, a multi-university effort conducting research to develop sensors to monitor seismic activity and structural response in real time; and the campus has an equipment site that is part of the national Network for Earthquake Engineering Simulation specializing in field testing and monitoring of structural performance.

A geophysicist at the **Lawrence Berkeley National Laboratory** has identified possible seismic precursors to two recent California earthquakes, including the 1989 Loma Prieta earthquake that wreaked havoc throughout the Bay Area. Other Berkeley Lab scientists have developed a better way to eavesdrop on the San Andreas Fault — they have constructed CT-scan-like images of the fault revealing nucleation zones of past quakes and areas where stress continues to build, at a resolution 10 times greater than other images.

UC Santa Cruz researchers played a key role in the early analysis of the December 2004 Indian Ocean earthquake and subsequent tsunami and have generated simulations of potential tsunamis that could affect the California coast in the aftermath of a major earthquake. The UCSC Earth Sciences Department maintains an online “earthquake field trip” packed with information about the 1989 earthquake and its effects in the Santa Cruz area.

A team of **UC Riverside** geologists has reported that minerals found deep in the earth can react in ways that trigger earthquakes at depths where they would not be expected to occur, a finding that might eventually help scientists understand the triggers for more shallow earthquakes. And a UCR geophysicist is the originator of the “rate and state” friction law, which is a major advance in understanding friction and may be critical for the eventual development of earthquake prediction strategies.



UC Davis is home to one of the world’s largest geotechnical centrifuges at the Center for Geotechnical Modeling. Researchers from around the world use the facility to study geotechnical problems such as the strength, stiffness and capacity of foundations for bridges and buildings; settlement of embankments; stability of slopes; earth retaining structures; and stability of tunnels, ports and seawalls.

The Pacific Earthquake Engineering Research Center, a National Science Foundation research center located at **UC Berkeley**, is making contributions to understanding a range of earthquake-related issues, including the seismic safety of electric utility systems and the structural failure of older concrete buildings.

The Hazard Mitigation Center at **Lawrence Livermore National Laboratory** provides state-of-the-art hazards mitigation analyses and resources and serves a broad range of clients, including government, industry, and the military. In collaboration with UC Berkeley, the center has used motion sensors to assess the effects of geologic conditions on bridges crossing San Francisco Bay and has developed computer programs to help analyze the response of important bridges and building structures to large earthquakes.

The San Diego Supercomputer Center at **UCSD** has played an important role in producing the most realistic simulations yet of where the most intense ground motion may occur in Southern California during a magnitude 7.7 San Andreas Fault earthquake.

MARKING THE 1906 CENTENNIAL

The vital statistics of the 1906 earthquake, courtesy of the **UC Berkeley Seismological Laboratory**, are available online: http://seismo.berkeley.edu/faq/1906_0.html

The Bancroft Library at **UC Berkeley** has compiled a web collection of thousands of digital images and text files from the 1906 San Francisco earthquake and fire. The web site includes an online collection, digital map of San Francisco, and 360-degree panoramic view of the ruined city: <http://bancroft.berkeley.edu/collections/earthquakeandfire/splash.html>

The **California Digital Library’s Online Archive of California** has an impressive digital collection of images from the 1906 earthquake and fire: <http://oac.cdlib.org/>

The National Information Service for Earthquake Engineering at **UC Berkeley** offers images of historical earthquakes and a Flash presentation on the 1906 quake: <http://nisee.berkeley.edu/>

