Quarterly Newsletter
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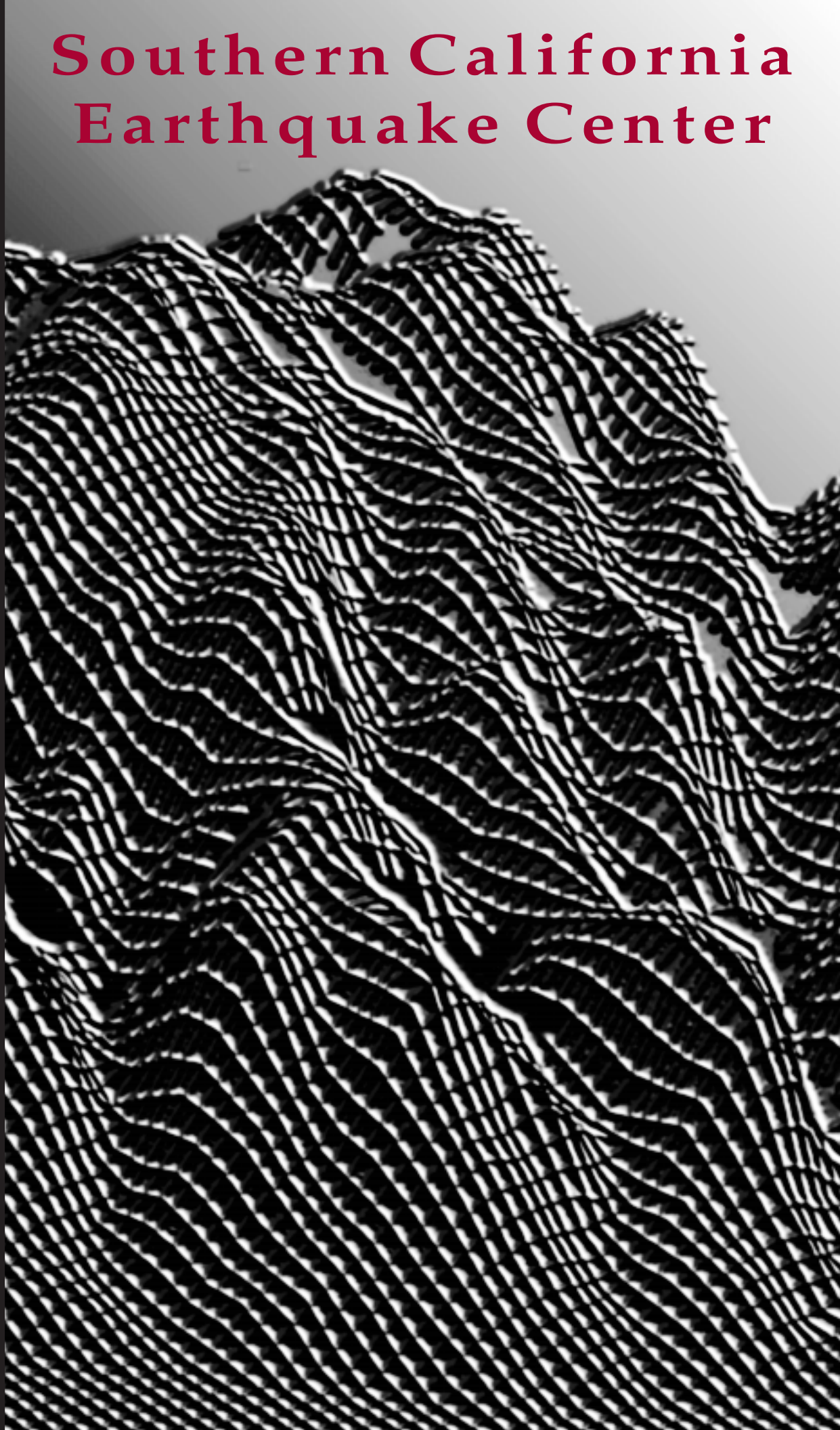
Southern California Earthquake Center

1998 ANNUAL MEETING ISSUE

SCEC



From the Directors . . .

What's Next for SCEC?

SCEC will begin its ninth year on February 1, 1999. As currently constituted, our sunset date is January 31, 2002. Although I will be working hard over the next couple of years to find the best way to continue an earthquake science center in California beyond 2002, we are planning a transition from the current center to its successor.

While we don't yet know the nature of this transition, some aspects will be coming into focus during the coming year. Two major issues will dominate the transition.

First and foremost, we want to leave a legacy from the current center. This means preparing a major document that summarizes the primary contributions of the center and perhaps provides some suggestions for where we should go next. We may also want to sponsor one or more major national/international symposia. The center will have to fund these tasks.

Second, according to NSF's Science and Technology Center guidelines, we will be asked to ramp down our budget during 2000 and 2001. Because funds come from three different sources, we don't yet know the extent of the ramp-down. I will be working with our program directors at NSF and USGS to clarify the situation.

Irrespective of the overall budget impact, it is clear that some difficult funding decisions may have to be made by the board in 2000 and 2001. Let's hope we can keep the impact to our science and outreach to a minimum.

—Tom Henyey

Michael Forrest's Reminiscences and Reactions to the Annual Meeting

Palm Springs Notebook

EDITOR'S NOTE

This issue of the SCEC Quarterly Newsletter focuses on the 1998 annual meeting, held in Palm Springs, October 17-21. Since most SCEC participants attended, we will not reiterate or duplicate the reports and posters. Instead, we'll take casual, personal, introspective, and appreciative views of that event—through the eyes of several well-known contributors.

To start with . . . our regular feature writer didn't realize he was supposed to write an article about the Palm Springs annual meeting, but we confiscated his notebooks anyway. Here are some interesting observations on what Michael Forrest called "another momentous meeting of seismology's finest."

Abdolrasool Annoshehpoor and James Brune have found what must be the hands-down most fun activity geophysicists can legitimately engage in (to further science) since some of the early pioneers gleefully started setting off explosives to create seismic waves.

"Field Test Results for Quasi-Static Toppling Acceleration of Precariously Balanced Rocks. The toppling accelerations of a number of the precariously balanced rocks near Victorville and Jacumba in southern California indicate that ground accelerations less than 0.2 g will topple some rocks" reads their abstract.

One can just imagine the two of them sitting on a hillside above Victorville on a sunny day, viewing the bare, rounded rocks, the San Andreas fault, a cloudless blue-white sky, inhaling the aroma of sage, sand, and gravel. A large boulder hovers gargoyle-like above a deep ravine. "I don't think there's anybody down there Abdolrasool, do you?"

"No, sir! Let's see if this will make her roll." They apply force.

The hillside rumbles as a ten-ton boulder goes airborne. Smash Smash Rumble Crunch! What unspeakable fun. Sign me up for a post-doc.

One rarely sees SCEC scientists as completely focused, so marble-motionless as when listening to Tom Henyey and David Jackson discuss SCEC's final three years and plans for the beyond.

I always discover the most marvelous things in the SCEC poster room—things that just knock me off my feet and make me ache with idea-envy.

For a second I looked past the pool, under the palms, and at the entrance to the bar. I imagined I saw the ghosts of young Bob Hope and Dean Martin—prowling these desert sands when the Riviera Resort was still the Riviera Hilton. They had cigarettes and drinks. They were wearing white dinner jackets, white shirts, white ties, and looked happy and engrossed—which probably means they were talking about earthquakes.

"N-S shortening is fastest across an ESE striking belt crossing northern metropolitan Los Angeles The belt is 5 to 20 km wide and is contracting at 5 mm/yr. Crustal thickening is the main process accommodating the N-S shortening." What a marvelous thing to be able to know. Makes one's whole body tingle with happiness to be living now instead of a hundred years ago.

Famous geologists are walking around the pool where Sammy Davis picked up women.

Whenever I see Ross Stein about to speak, I think of sitting in a packed hallway next to Valerie Ferrazini at Caltech right after the Northridge earthquake. Lots of folks are presenting mountains of data, and we are all talking SCEC politics. Suddenly it was Ross Stein's turn to get up and speak. Valerie hushed us and said, "Let's listen to this guy—he's always good." Ross did his usual fireworks and intellectual magic, and the excited crowd murmured out loud like folks touched by the Spirit.

Tom Henyey with his friendly camera: if he ever leaves the earthquake industry, he can work as a photographer and out-Avedon Avedon.

I'd like to see Kerry Sieh get up and give a speech where he is completely boring, and nobody laughs, and no one is informed about anything. But, then again, I'm a dreamer.

On viewing one of the Coyote Hills seismic interpretations: where is Tom Wright when you need him? Whenever I see one of the L.A. basin cross sections, I always like to stand behind Tom Wright, wait until he's done looking at them, and then

either ask him what he thinks of it or watch his face or listen to him discuss the section. If he likes the section, I look at it more closely. If not, I ignore it.

Over the years during meetings, I've noticed that if someone asks you why you believe one interpretation for the geometry of a fault versus another—you can always cut an argument short and not have to defend yourself by simply saying, "Tom Wright liked this idea." Everyone nods and moves on to the next topic.

Kerry Sieh should have danced with Jill up on stage at the awards dinner. Fred and Ginger. She was at her best. Luminous in her black dress. A bright star in the black sky.

Rubin and Lindvall's 10.5 meters created by only two slippages on the Sierra Madre fault is as terrifying as Legg's tsunami. If the Northridge earthquake cost $42 billion, what would such an earthquake cost? L.A. would never recover. The riots of 1992 only cost us $1 billion; a measly, moderate earthquake costs $42 billion. People aren't capable of causing very much damage to themselves when compared to what nature can do.

Under the rustling palms by the pool, the evening is as warm and pleasant as the sound of satin falling to the floor. Distant laughter, glasses tinkling: SCEC scientists exchanging ideas behind the poolhouse. Stars rise over the silhouette of Mt. San Jacinto. Dinner begins soon. Bliss so perfect, it's almost painful.

TALES FROM THE FRONT

by Susan E. Hough

Meeting at Ground Zero

The SCEC annual meeting has bounced all over the greater southern California area throughout its years of existence. From the glitzy urban jungle of Orange County to the gentle hills of Ojai so elegantly adorned with their California oak trees, the meeting has provided an enjoyable sampler of the amazingly diverse region we call home.

There is something especially fitting about holding the 1998 meeting, once again, in Palm Springs. The southern California desert in autumn is a spectacular place with its bright warm days and crisp clear nights. Wander not too far away from civilization after dark and you are likely to be serenaded by coyotes who seem to defend the turf as their own and welcome you to it, all with a single song.

But Palm Springs is so much more than a dramatically beautiful setting. Geophysically speaking, this is ground zero. As well as any single point on the map, Palm Springs marks the initiation of the great bend of the San Andreas fault.

Although a great deal of SCEC research efforts have been focused on the metropolitan Los Angeles region and the Mojave shear zone, that one bit of geological happenstance—that kink in the San Andreas—defines the seismic hazard for southern California as much as anything else other than the presence of the plate boundary itself.

As detailed geologic and geodetic investigations have provided a better understanding of the deformation field within southern California, it remains striking to me how little the final estimates of the overall convergence rate across the greater Los Angeles area differ from the one that you get if you resolve the plate motion onto the bend using high

school geometry. The devil may be in the details, but the big picture is not a complicated one.

Seismically and geologically, Palm Springs is often the hub around which activity swirls.

Seismically and geologically, Palm Springs is often the hub around which activity swirls: the San Gorgonio knot that appears to isolate the Coachella segment of the San Andreas; the 1992 Joshua Tree and Landers earthquakes; the juxtaposition of granitic batholith against major plate boundary fault; the simple proximity of what is arguably the most famous fault in the world.

The latter two distinguishing features of Palm Springs provided the opportunity for the 1998 meeting to offer attendees a first-hand view of pivotal science in action: the trenches being investigated by Sally McGill, which provide evidence for a most recent event on that part of the San Andreas between roughly 1450 and 1650; and one of the important precarious rock sites investigated in recent years by Jim Brune.

Now might be a good time to confess that, regretfully, I was unable to attend either trip myself. But field trips are but one of the features that give SCEC annual meetings their unique charm. Others include good food—over which interesting science discussions often take place—and open, relaxed poster sessions that one can always count on to be lively and good-spirited. But above all there is the scientific synergy that results from the successful interdisciplinary nature of the Southern California Earthquake Center itself. What better setting to come together for that than one as geologically pivotal, and beautiful, as Palm Springs?

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First Annual

The SCEC Community Outreach Awards

By Jill Andrews

On October 19, at the annual meeting in Palm Springs, the first annual SCEC Community Outreach Awards were awarded. We recognized and acknowledged the exemplary outreach efforts by 20 people affiliated with the SCEC Community. The awards were given to them for their accomplishments in earthquake-related public awareness, education, and knowledge transfer.

SCEC Outreach Team members Mark Benthien, Sara Tekula, and I presented the awards at an after-dinner ceremony.

Traditionally, the definition of outreach has been restricted to activities that are coordinated by SCEC's Outreach Team. We decided to expand the scope of this definition. Community Outreach is our theme for the duration of SCEC as a Science and Technology Center. Community Outreach means any effort—whether formal or not, whether coordinated by SCEC or someone else.

Many people in the audience during the awards ceremony had worked directly with the SCEC Outreach Team for several years, volunteering to participate in our SCEC-sponsored activities such as workshops, conferences, and field trips. Others, we discovered, are donating time to raise public awareness or are involved in education efforts that are not necessarily initiated or coordinated by SCEC. Yet the results are the same—all are directly or indirectly supporting the SCEC Outreach mission:

> To promote earthquake loss reduction and lifelong learning through earthquake-related public awareness strategies, formal and nonformal education programs, and research-based knowledge transfer activities and products.

We surveyed the SCEC community to collect information on such activities and posted summaries of the responses we received on the SCEC Webservice (WWW.SCEC.ORG/OUTREACH/). We also highlighted them in this newsletter (see issue 4.2). There were so many outstanding contributions that we just had to acknowledge them.

We chose to give Outreach Awards in three categories of activities in addition to one for "Outstanding Contribution":

- Public Awareness
- Education
- Knowledge Transfer

Because this is the inaugural year for Outreach Awards, we had a difficult time limiting the awards to ten recipients. So many good deeds needed acknowledgment that we added 11 framed certificates for excellent work in the three categories.

The criteria we used to select recipients included:

- Frequency—number of separate activities or projects
- Duration—amount of time spent
- Impact—number of people reached and documentation produced
- Quality of effort

We consider all people associated with SCEC to be eligible for an award, except SCEC outreach staff and center directors. These awards are for the people who voluntarily serve their communities and who have shown consistent commitment to turning scientific research results into products that benefit society.

Public Awareness

Public Awareness strategies include being available to media reporters and writers, making presentations to civic groups, participating in earthquake fairs, describing your research to people who live near your project sites, or writing simple translations of scientific research results for general audiences.

Michael Forrest

All Photos: Tom Henyey

Michael Forrest, Rio Hondo College, is SCEC's most vocal fan. Michael's boundless energy and enthusiasm is evident in all the projects he has been involved with, for SCEC and beyond. Michael's efforts have increased public awareness to a level matched by few others.

The SCEC Community Outreach Awards

Michael has written features for almost every issue of this newsletter, including interviews with SCEC scientists and many "fault of the quarter" articles.

When the Outreach Program gets requests for speakers from community groups and companies, Michael is often the first suggestion—he will not only jump at the chance but also provide an enjoyable and informative presentation.

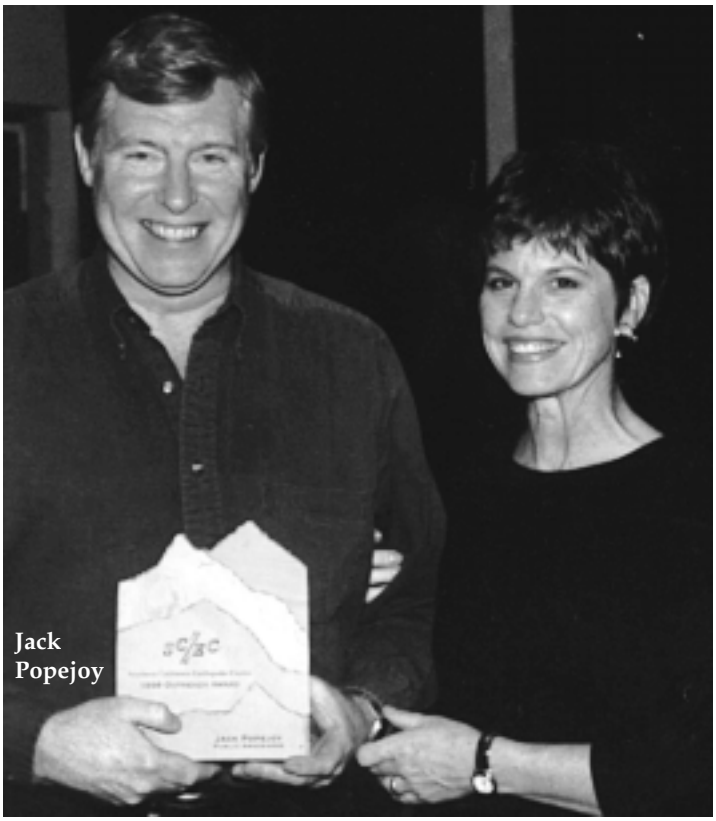
Michael's earthquake lectures while teaching at Cal State Dominguez Hills were videotaped and broadcast via cable to students and the public.

Michael has written more than 20 articles on earthquakes for the *L.A. Times Magazine* in a compelling and entertaining style.

Finally, Michael has undoubtedly raised the level of public awareness most via his more than 20 recordings of "L.A. Underground" with Jack Popejoy for SCEC and KFWB, heard by over a million people each Monday.

Marianne Muellerleile

Marianne Muellerleile is quite a busy woman. On top of being frequently cast in hit television shows, commercials, and movies, she is also the president of her block club, the Adams-Normandie Neighborhood Association, a close neighbor of USC. She has a natural interest in earthquake safety and met SCEC representatives when she took some of the children from her neighborhood to the City Earthquake Fair. About a year later, she was approached by SCEC to help write a grant to USC's Neighborhood Outreach Program to hold a yearlong earthquake watch to help encourage preparedness and mitigation. She jumped at the chance and never looked back. By creating a community preparedness plan, she and her community drew on the resources of the larger community and spread the crucial response duties needed after an earthquake. The yearlong partnership ended with an Earthquake Fair, which she coordinated with great skill. Marianne has also used the remaining funds from the grant to help benefit other communities in her area through the donation of earthquake kits and earthquake fair materials, as well as being the principal author of the *Community Guidebook for Earthquake Preparedness*. She possesses the true elements of the outreach spirit: recognizing opportunities, eagerness, boundless energy, persistence, and the ability to plant seeds that allow a project to continue to grow on its own.



Jack Popejoy

Jack Popejoy, KFWB News Radio Anchor, has been a friend of SCEC since its inception. Most of you are familiar with Jack's Monday broadcasts of the one-minute feature "L.A. Underground" (aired four times during the day). The broadcasts feature SCEC scientists presenting their own work, that of other SCEC scientists, and general geology of California, as well as topical information when earthquakes or volcanoes capture public attention.

The SCEC Community Outreach Awards

Jack, on behalf of KFWB, has offered to host quarterly business breakfasts on topics related to earthquakes for business leaders and entrepreneurs. These 90-minute programs include a panel of four experts who make presentations and field questions from an audience of about 300 people.

Jack also participates in SCEC activities such as local field trips, community awareness meetings, earthquake fairs, and media workshops. And finally, the KFWB Web site provides links to the SCEC Data Center, the SCEC Webservice, and EQNET—all thanks to Jack's efforts and Web-savvy.

There were four certificate recipients for Public Awareness:

Gary Fuis, USGS Menlo Park, for his tireless efforts to inform and educate the public during LARSE I and LARSE II.

Joann Stock, Caltech, for her outreach to the Spanish-speaking communities through the media, interviews, and fieldwork.

Michael Cochran (Brian Cochran & Associates) and **Farzad Naeim** (John A. Martin & Associates), for their commitment to interdisciplinary interactions and long hours writing the first drafts of two FEMA and SCEC-sponsored public awareness booklets on vulnerable buildings.

Education

Education activities include giving talks about your work or leading field trips for teachers and students; acting as a mentor for teachers or students; teaching general undergraduate earthquake courses; writing textbooks; or collaborating on development of new teaching materials.

Meridith Osterfeld, of the California K-12 Alliance for Math and Science, is an exceptional woman. Her vital nature and endless energy are the embodiment of the word "outreach." Everyone who has met her knows that she deeply cares about the education of today's students, especially in science. She believes that in science class, not only are you able to learn more about the matter that makes up our physical world, but you gain vital problem-solving and analysis skills that you take with you for the rest of your life. She is currently serving as regional director for San Diego, Imperial, and Orange counties of the State Systemic Initiative in Mathematics and Science. Although she is responsible for program design, operation, supervision, and professional development for over 50 schools, she has managed to volunteer her time to work with SCEC to help develop its growing Education Program. She has provided the Education Program with a connection to teachers from over 50 schools and continues to recommend exceptional teachers for the DESC Online Advisory Group, which she co-chairs. The education modules have improved drastically because of her expertise and efforts. She has volunteered her time to promote SCEC Education and the DESC Online project at meetings such as the GSA Cordilleran meeting and several of the staff development workshops she has run through the California Science Implementation Network. She was eager to be trained on using handheld GPS instruments in order to train science teachers in the field. She was involved in the planning process for outreach for the proposed California Earthquake Research Center (CERC) and has offered many ideas and resources for projects when the new center is funded. The SCEC Education Program is very lucky to have her as an active member.


Meridith Osterfeld


Mark Legg

The SCEC Community Outreach Awards

Mark Legg, ACTA Inc. and SDSU, is the perfect example of the main reason for the Outreach Program's new community outreach focus. Over the last year we discovered activities of SCEC scientists that were fulfilling the education mission without being part of the official program. The staff was amazed by how involved SCEC scientists are in local schools and communities. Mark Legg is someone who pleasantly surprised the Outreach Team by his exemplification of this kind of involvement.

Mark has talked to students at elementary and middle schools about earthquakes and faulting under the ocean and helped present a workshop on tsunamis and landslides at Peninsula High School. Mark has been an advisor for students from Cal State Long Beach and San Diego State on offshore fault studies and taken community leaders via submersible to view the San Clemente fault scarp. Mark has also led many other field trips.

Through his role as treasurer of the L.A. Basin Geological Society, Mark has arranged for many SCEC scientists to speak at meetings to share SCEC findings with geologists not involved with SCEC.

Andrea Donnellan

Andrea Donnellan, NASA JPL, with her colleagues Maggi Glasscoe, Mark Smith, Anne Mikolajcik, and Mike Watkins, developed a Web-based education module that centers on the use of GPS in earthquake studies. The module was recently publicly released in beta form and Andrea's team is now involved in helping to find schools who can use it and test it.

Andrea has conducted seminars at several SCEC universities and lectured in classes at USC. She has delivered presentations at several elementary, junior high, and high schools. She served as a co-leader of the field trip for the SCEC summer interns.

Andrea and others, including Frank Webb and Greg Lyzenga, have been interviewed by reporters and writers concerning SCIGN and other geodetic research. She was involved in the planning process for outreach for the proposed California Earthquake Research Center.

There were four certificate recipients in the Education category.

Maggi Glasscoe, graduate student at UC Davis, for two years' effort in authoring the GPS education module.

John Marquis, Caltech, who has authored the Regional Seismicity Education Module and is now working with SCEC to develop future modules.

Erik Bender, Orange Coast College, teaches undergraduate courses *Earthquakes* and *General Geology*; uses the CUBE system and associated exercises; helped set up a local seismic network available for public viewing; led field trips to local faults for community emergency response teams.

Lisa Wald, USGS Pasadena, led demonstrations about earthquakes for elementary schools; conducted media interviews on seismic activity; provided data from scientists, companies, and the public; participates in Ask-a-Geologist; manages the USGS Pasadena Field Office and TriNet Web sites; helped develop USGS Northridge Research Products Web site.

OFF-SCALE

AUTHORS WHO ARE NOT EARTH SCIENTISTS BUT WISH THEY WERE

"And Never Again Have to Fear Earthquakes"

Can we reduce the friction between the plates and make movement easier? Suppose deep wells are drilled along a fault and water forced into them. The water might find its way between the masses of rocks and make them just a little more slippery, encouraging movement and a series of harmless small quakes. Then the giant killer quake will never come.

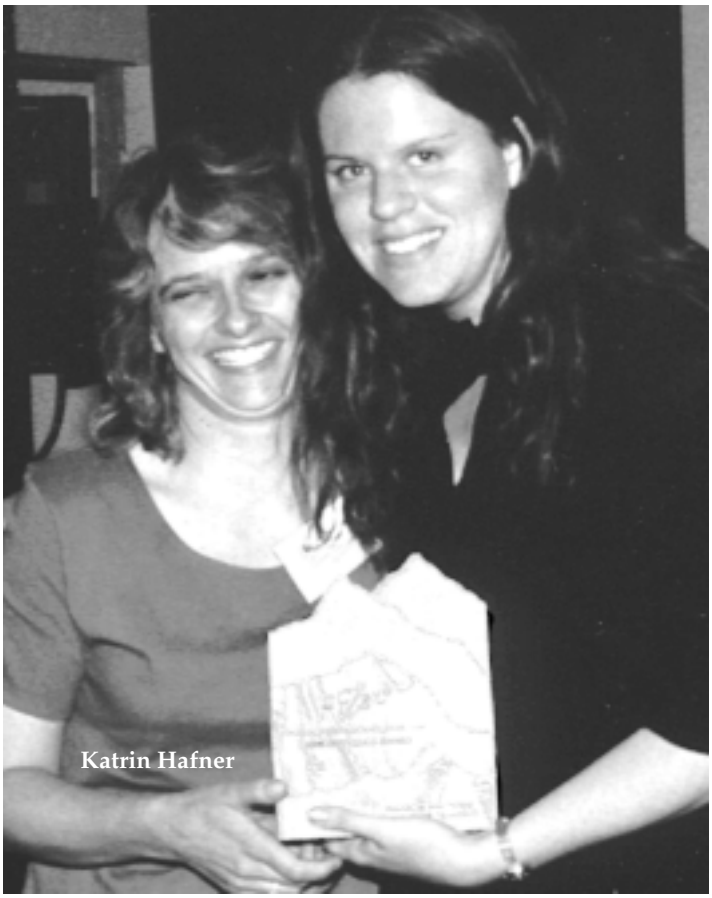
If this, or something like this, can be made to work, human beings could set about lubricating the Earth and never again have to live in fear of earthquakes.

—Issac Asimov, "Lubricating the Earth," from *Change!*

The SCEC Community Outreach Awards

Knowledge Transfer

Knowledge Transfer activities include acting as a consultant for government agencies or private companies, attending workshops and scientific meetings to present research, developing online databases, and leading field trips.


Katrin Hafner

Katrin Hafner, Caltech/SCEC, continues to demonstrate, through the SCEC Data Center, how to use the World Wide Web as a tool to disseminate earthquake information. As well as teaching at local community colleges and overseeing the development of a SCEC education module, she manages the principal archive for seismological waveform and associated parametric data from SCIGN, TERRAscope, portable instrument arrays, and GPS data for southern California. The Web site experiences over 5 million hits a year, and as she continues to improve the quality of the site, the numbers continue to grow. She always manages to keep the information current, accurate, and accessible to all computer platforms. Katrin's efforts put the information in the hands of the people who need it, whenever they need it.


Ned Field

Ned Field, USC, has played a lead role in communicating SCEC research results over the last year and continues to work hard and long in this knowledge transfer role so that engineers, policy makers, developers, and others may apply the information in their professions and projects.

Ned has authored a detailed summary of recent ground motion and velocity model research as presented in the Phase II and III reports and other research. The summary was written for engineers and other end-users so that they can understand the new findings without having a geology degree. This version may be published by SCEC's partner organization, the Earthquake Engineering Research Institute.

Ned is an ongoing partner with SCEC Outreach in many workshops and projects. Ned has recently taken on the task of coordinating the separately authored papers of the full Phase III report for publication, a daunting assignment that shows Ned's bravery. If you've seen pictures of Ned hanging by his fingertips on the side of cliffs, you are assured his bravery is sufficient to the task. Furthermore, his grasp of the big picture and the importance of synthesis will result in another acclaimed publication for SCEC.

Both the summary and full versions of the Phase III report are a significant contribution to SCEC's outreach capabilities and allow a broad audience to appreciate and apply SCEC research findings. Ned still has a lot of work ahead of him, but the time he's already spent and the patience he's shown demonstrate his ability to see it through and produce reports all of SCEC will be proud of.

The SCEC Community Outreach Awards


Kerry Sieh

Kerry Sieh, Caltech, has contributed enormously to the SCEC Outreach programs over the last several years. Although we may have overworked him, he has remained consistently willing to lead field trips for professionals and for students; to conduct television, radio and print media interviews; and to make presentations on his research at workshops and conferences throughout the year. Kerry's presence at a particularly long and arduous local city council meeting was especially helpful to us. Even though West Hollywood has not yet accepted our proposal to create the first earthquake resistant house, interpretive center, and education facility, he has helped us keep the lines of communication open through his consulting services to the city's community development office.

Kerry's outreach efforts extend well beyond southern California into other nations. Besides his research in remote parts of the world, he has been known to sing show tunes to get a point across to an audience of preeminent international scientists.

There were three certificate recipients for Knowledge Transfer:

Michael Forrest, for leading numerous field trips, writing field guides, and writing numerous features for this newsletter.

Greg Lyzenga, for teaching earthquake science to students and insurance companies and developing Web pages and brochures regarding the use of GPS in earthquake research.

Grant Heiken, Los Alamos National Lab Urban Security Group, for leading the effort in partnership with SCEC and others to create a multilayered GIS database tool to aid disaster planners, responders, and recovery experts.

OUTSTANDING CONTRIBUTION
TO EDUCATION AND PUBLIC AWARENESS

The Outstanding Contribution Award is reserved for those whose distinctive outreach activities exceed the highest possible standards.


Lucy Jones

Lucy Jones is our choice for the Outstanding Contribution Award for many reasons. She believes in doing the kind of outreach that provides a catalyst for change (in simple terms, outreach that motivates people to take action).

Lucy is a leader among peers who also partners with people and organizations representing other disciplines. The result, of course, is greater benefit to a society that sorely needs consistent, clear messages from experts in the earth sciences, engineering, social sciences, economics, and public policy.

Lucy believes in "equal opportunity" outreach: school children, teachers, public citizens, reporters, scientists, engineers, politicians, insurers—to name a few—have benefited from her outreach contributions.

We were particularly pleased to give this award in appreciation of the years-long project conceived and crafted by Lucy, which resulted in the public awareness and education booklet *Putting Down Roots in Earthquake Country*. It has been distributed to more than 3.5 million people over the last three years. The booklet inspired a month-long public earthquake awareness campaign jointly sponsored by SCEC and KTLA Channel 5 this last April.

Building Organizational Mountains from "Elemental" Compounds

By Meridith Osterfeld

Coffee whitener, nonstick pans, petrified trees, fiber optic cables, heart valves, computer chips, and granite monuments. What they all have in common is silicon, the second most abundant element in the earth's crust. Silicon doesn't exist in its pure state in nature and is a "bland" element until you combine it with oxygen or other elements to form silica, silicates, or silicone. Then it becomes an essential component in modern life.

> Effective partnerships are the only hope for lasting systemic change in precollege science education. —Bruce Alberts, President, National Academy of Sciences

Partners are a lot like silicon compounds. Each partner, or element, exists in a more or less pure state—usually innocuous, often inert. When combined with other elements, the resulting compound, an organizational partnership, can have a major impact on education and the community, reshaping and building mountains of change and educational progress.

The Southern California Earthquake Center and the K-12 Alliance, a statewide organization representing precollege students, educators, and community members through the California Schools Implementation Network, Science Partnerships for Articulation and Networking, and Scope, Sequence and Coordination are like the elements in silica, silicates, and silicone.

They share common bonds and visions in a desire to promote lifelong learning, scientific literacy, and educating the community-at-large. Each goes about its work in different ways, but as compounds or partnerships, they are catalytic in their impact on society. They can have an "orogenous" effect on the educational reform process.

I was asked in the spring of 1997 to review on-line education modules that would introduce earth science students to GPS and the Southern California Integrated GPS Network. I was asked for recommendations that would help the authors make the modules as useful as possible to educators and students.

I have had a fairly diverse and extensive role in the educational community as an educator, regional director and professional developer for the K-12 Alliance, editorial advisor to a national publisher of science education materials, curriculum developer, and field tester. My experience seemed to pale in comparison in the company of working scientists and graduate students at JPL. I discovered that my experience with curriculum development "storylines" (flows of science concepts building one on another), pedagogy (the process of teaching and learning), my affiliation with a statewide network of science educators, along with my experience with educators, students, and classroom instruction were what I could contribute to this mountain-building process.

My advisory work was considerably ramped up in year two. With Tom Henyey as well as the Outreach Team of Jill Andrews, Sara Tekula, and Mark Benthien, we held a number of meetings to familiarize each "elemental" partner with what the other had to offer, so the right "compound" could be formed.

SCEC had the scientific expertise, the materials, and the personnel to make science content and curriculum meaningful to educators and students. I had the statewide network of educators and students who were eager and willing to avail themselves of what SCEC had to offer. I also offered statewide and national affiliation with those who developed standards, frameworks, and assessment and expertise in professional development and design.

Several requests from educators came through loud and clear. The developing curriculum had to "make sense." It had to teach the big concepts, not merely consist of facts to be recalled. It must have an investigatory "hands-on" nature. And it had to do something that couldn't be done with a "good text." It also needed to address the needs of all kinds of students, have assessment built-in, and address the national and newly developing California content standards—no short order! Meetings with the module curriculum writers and their scientific advisors were designed to familiarize them with what was needed by educators and what would be usable for all students.

I enthusiastically attended the 1998 SCEC annual meeting, which featured a daylong workshop devoted to summarizing and shaping SCEC's outreach efforts. The room was packed with SCEC collaborators—emergency services people, media representatives, scientists, and students. Educators—not just adminis-

> An important feature of science education partnerships is that they effectively weave together the different strands of the science reform movement. Teachers need instruction in new content and skills; they need lessons and materials that embody the new philosophy. Partnerships can be vital in translating from the realm of abstract principles to the world of actual classroom practice. —Art Sussman

trators, but classroom teachers—were also included.

The session was wisely designed to familiarize collaborators with what the SCEC Outreach effort was doing as well as what various collaborators had to offer. I was delighted to see that the module authors had acted on the requests of the educational community. The regional seismicity module that was ready for preliminary release had a conceptual flow of big ideas, or "storyline." The storyline brought smiles and knowing nods from the educators in the audience.

The SCIGN module had many interactive features, and like the regional seismicity module, had investigations for students. Both modules sought to address the key elements of the National Education Standards. The modules still have a few elements to be added—assessments and perhaps hands-on investigations that can be done by students in the classroom. Once the new California Science Standards are available in final form, the modules will be reviewed to ensure that they comply with the standards.

As a partnership, SCEC and the K-12 Alliance are still "bonding." We continue to explore new and different ways we can combine our elemental parts and form new compounds. Like its silicon compound counterparts, we hope that the elements in our partnership become an integral part of modern life and will help build a mountain of science reform in education, the community, and the world.

Oil exploration data on deteriorating tapes

L.A.'s Vanishing Underground

By Michael R. Forrest

Seismic data—a record of more than 100,000 miles of southern California's shattered and twisted underground, including thousands of hidden faults, millions of rumpled layers of sand, silt, clay, and lava beds—could soon be lost forever. That is, unless a relatively small handful of men like 67-year-old retired Chevron geologist Tom Wright can rustle up some interest for preserving this evidence of L.A.'s extraordinarily dynamic subsurface structure and geologic history.

"It's frightening," says Wright, who estimates that 300,000 magnetic tapes of degrading data exist for California alone.

The tapes were recorded from the 1950s and into the late 1980s, when oil companies spent millions of dollars surveying the subsurface of the region—surveys that would be impossible to do today, given current big-dollar county permitting fees, runaway urban growth and the increasingly dizzying cost of running the surveys themselves.

Over the last dozen years, as this area's oil has become depleted, most of greater Los Angeles's oil companies have been leaving town, selling their producing fields to smaller companies; in the process, some of the tapes have been discarded.

"There are horror stories of companies putting hundreds of cartons of well data and seismic records into the Dumpster," says Wright, who keeps some of the seismic tapes he's salvaged in his den and basement. And, owing to the impermanence of a magnetic charge sitting on a piece of plastic, data on many of the tapes has simply disintegrated.

"There are horror stories of companies putting hundreds of cartons of well data and seismic records into the Dumpster."

Tom Wright's love of L.A. and of the seismic data originated during the 1960s, when Chevron gave him the job of examining the information gleaned from subsurface data on this entire enormous sedimentary basin and integrating it to see what patterns came up—a task Wright found fascinating. In 1991, a few years after he retired, he published everything he knew about the geologic history of the L.A. basin in a 100-page technical paper that has become known as "the bible" among L.A. basin geologists.

"All of us use it as a basic resource," says USC professor Jim Dolan. "Wright's decades of experience are a tremendous resource which he's extremely generous about sharing."

"All of us use it as a basic resource," says USC geology professor Jim Dolan, who studies L.A.'s faults. "[Wright's] decades of experience are a tremendous resource which he's extremely generous about sharing." (Wright may, in fact, know more general geology about the L.A. basin than any one person alive.)

Tom Wright hopes to find an earth science department at a university in the Los Angeles basin willing to become a major repository for seismic tapes and to have an active program in which graduate students examine and interpret the tapes and well data. There's literally enough data for many decades worth of master's and Ph.D. degrees. He also hopes that a current proposal the American Geological Institute has presented to the U.S. Department of Energy for a national archive gets funded so that the tapes can be recopied onto CD-ROM before the information on them completely degrades.

"The generation that worked California geology—especially L.A. Basin geology using seismic profiles—is just about entirely retired," says Wright, "which is a shame. The amount of raw data that could be lost and needs to be interpreted is simply tremendous. And there are marvelous studies that could be done."

BENEATH THE SCIENCE

by Mark Benthien

The SCEC Community . . . a Solid Foundation

The 1998 Annual Meeting has come and gone. While we're still SCEC, I think that it's important to realize the unique nature of the community that has evolved along with the scientific results of SCEC, how it has made us successful, and what lessons we can carry forward into whatever future we design.

I first became aware of SCEC in June 1993, as an undergraduate at UCLA. SCEC had existed with UCLA as a core institution for two years already and was about to begin its first major cooperative effort—the Los Angeles Region Seismic Experiment (LARSE).

Somehow I was soon in a lead position in organizing people from many SCEC schools together to deploy and service 60 seismometers that were deployed in a line from Seal Beach to Barstow in order to record distant earthquakes. I experienced firsthand the evolution from institutional separateness to the initial stages of SCEC as a community and marveled at its potential.

Practices developed then are still in place today—our "SCECall" email list was first used by the LARSE team to communicate and has since been expanded to 500 names. The Northridge earthquake occurred one month after the end of LARSE 93, and I'm sure benefited from the "dry run" of coordinated SCEC effort. LARSE 94, which incorporated buried explosions as sources, was a greatly expanded effort. With each cooperative effort, including writing the Phase "n" hazard reports, and as recently as preparing the CERC proposal, the SCEC Community has grown and developed to be a model for other coordinated research efforts.

"Community" is especially present at the annual meetings, where we all come together to share our work and plans for the future. I've attended four annual meetings, one as a SCEC undergraduate summer intern and three as SCEC outreach specialist. My first annual meeting experience was at the 1994 meeting in Temecula. I was part of the first SCEC summer internship group, and we were there to display posters describing our work. I remember the discussion was much more discipline-specific than today, as SCEC was still developing and the first major integration of SCEC research (Phase II) had yet to be published. That was the meeting where I met Lucy Jones and spoke with her about her ideas for as earthquake booklet. Little did I know that I would one day be the distributor of *Putting Down Roots in Earthquake Country*.

This year's meeting was evidence for how the SCEC Community has matured. Much of the conversation centered on what the legacy of SCEC will be, how we will "wrap up" our investigations, and how the legacy will be communicated. I noticed how many scientists in SCEC have broadened their interests and are able to share in the discussions of colleagues in other SCEC working groups. In addition, I appreciated the attendance of many SCEC scientists at the Outreach workshop the day before the meeting, which demonstrated increased participation in center activities beyond basic science. The notion of SCEC Outreach being a community effort rather than just the work of a few people was evident.

Because of the increased community effort in Outreach, we decided to acknowledge individuals who have played key roles by presenting Outreach Awards at the banquet on Monday evening. Most of these awards were given to people who sent us lists of what they do each year, as requested in previous editions of this column. The awards are not intended to be "rewards" but rather as symbols of how the community appreciates the work that people have done "beyond the call of duty." This being the first time, we weren't sure how the award concept was going to be received, but I was very happy to see almost everyone stay and be very warm in their applause for each winner. I was surprised by the number of people who remained after the ceremony to congratulate and talk with the winners and to socialize generally. Many people said they thought the awards were a great idea, so next year I'm sure the choice of awardees will be even more difficult than this year.

This annual meeting demonstrated how the relationships between people from different institutions and different disciplines have grown and matured since SCEC began. SCEC's scientific progress and the development of a multidisciplinary community are linked very closely; as more cooperation is established, better science is conducted—and vice versa. If this is true, then activities that strengthen community will improve and hasten SCEC scientific progress, both in terms of the community goals as well as the scientific progress of the individual members. These activities should be relevant to the interests of SCEC scientists and other participants, including scientific issues and outreach opportunities as well. By balancing the cooperative and multidisciplinary approach developed during SCEC with community outreach, the SCEC Community can build a solid foundation for whatever future will be created.

This year's meeting was evidence for how the SCEC Community has matured.

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SCEC Makes a New Partner in Education

Coalition for Earth Science Education Holds Its Fourth Annual Meeting

The national headquarters of the United States Geological Survey in Reston, Virginia, recently provided a scenic and historical backdrop for the fourth annual meeting for the Coalition for Earth Science Education.

The theme of the meeting, "Enhancing Networking and Cultural Diversity through Collaboration," brought in people from all over the nation from various backgrounds for one purpose: to enhance the quality of earth science education for all Americans.

Keynote presentations were given by acting USGS Director Thomas J. Casedevall and Mike Mayhew from the NSF Geosciences Directorate, as well as by representatives from NASA's Goddard Space Flight Center, the GLOBE Program.

SCEC was represented in the poster sessions with Sara Tekula presiding.

Also represented in short presentations or poster sessions were the American Meteorological Society, the Center for Science Education, Northwestern University, the Gulf Coast Marine Laboratory, the Ohio State University, USGS Menlo Park, American Geophysical Union, the Program for Earth System Science Education, the Universities Space Research Association, the Inter-American Institute for Global Change Research, the U.S. Satellite Laboratory, and NASA.

Tekula presented a talk and poster session titled "From the Field to the Classroom and Back: Encouraging Application of Earthquake Research Results for Students and Teachers." She identified barriers to efficient communication between information providers and end users and demonstrated how concepts in knowledge transfer activities were also important in the educational arena.

"It is imperative that students and teachers are treated as equal partners, both in the each other's eyes and in the eyes of the outside world," Tekula specified. "They are all end-users of a product (a piece of knowledge) and will ultimately apply what they learn to the real world."

The meeting provided a platform for several "hot topics" in earth science education, such as the National Science Education Standards and the implementation of them in the classroom.

Before parting ways after the four-day meeting, those in attendance vowed to work together to support the standards in some sort of nationwide initiative. SCEC Outreach plans to play a large role in this initiative for the state of California. For more information about CESE, email Frank Ireton of AGU at FIRETON@KOSMOS.AGU.ORG.

Group E's Latest Product

New Crustal Deformation Velocity Map Incorporates More Data

The SCEC Crustal Deformation Working Group (Group E) recently announced the availability of a new version of the Crustal Deformation Velocity Map for southern California.

The entire contents of the new release version are available on the Web at: WWW.SCECDC.SCEC.ORG/GROUP_E/RELEASE.V2/

This new solution results from an analysis of nearly all the EDM, VLBI, and SCEC-archived GPS data (both survey and continuous mode) acquired for southern California between 1970 and 1997.

The maps and accompanying tables include new estimates of the horizontal velocities for 363 stations. Uncertainties in these estimates are less than 5 mm/yr. For stations close to the Landers epicenter, we provide estimates of both the pre- and post-Landers velocities.

Important differences between Release 2.0 and Release 1.0 (October 1996) of the map are (1) the direct use of the VLBI data and (2) the addition of several additional sets of GPS data:

- Continuous GPS observations since 1992
- Post-Landers surveys of the epicentral region
- A 1992 survey of about 60 stations in and near Los Angeles
- A 1997 resurvey of about 60 stations in the vicinity of the southern San Andreas fault and Salton Trough

These additions incorporated into the new solution have added 76 stations to the map and have reduced two-thirds of the station velocity uncertainties to about 1 mm/yr.

A discussion of planned work on improving the velocity map is in the group's 1997-1998 annual report:
WWW-SOCAL.WR.USGS.GOV/HUDNUT/SCEC/SCEC_GROUP_E.HTML

SCIGN Annual Report Online

"The SCIGN Project," a recent report submitted to the NSF, is also now available in full on the Web at:

WWW.SCIGN.ORG/ARI/

The 24-page report describes activities during the past year. All figures included in the report are in-line on the Web page so it may be slow to download. Those who prefer to obtain the document via FTP may find electronic files at:

FTP://FTP.GPS.CALTECH.EDU/PUB/HUDNUT/SCIGN/

Word98 binary and binhex files are available, as is an RTF file—but note that the RTF file is about 24 MB.

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To Guide Education Module Development

DESC Online Advisory Group Selections and Inaugural Meeting

SCEC Outreach has selected the permanent members of the Development of Earth Science Curricula (DESC) Online Advisory Group. This group will be responsible for guiding the continuing development of the SCEC education modules with the aim of making them useful and available to classrooms nationwide.

The use of this advisory group is the next step in gathering information from key informants—a group of people who have unique skills or background related to the DESC Online project. One of the group's main tasks will be to guide the development of supporting hands-on activities for use in the classroom.

On December 2, 1998, the final invitees were brought together for a variety of purposes. The group is composed mainly of experienced science teachers, representing the ideas and attitudes of the teaching population in southern California, the main target for SCEC Outreach.

This group will promote the value of the DESC Online project, advise throughout DESC Online product development, as well as carrying out specific tasks in that development. The advisory group will be co-chaired by SCEC Outreach Specialist Sara Tekula and Regional Director for the California K-12 Alliance for Math and Science (CAMS) Meridith Osterfeld. (Also see the article by Osterfeld elsewhere in this newsletter.)

The members of the DESC Online Advisory Group are:

Cory Wisnia (middle school/SCORE)
Ray Wiltsey (middle school/SCORE)
Ursula Sexton (San Ramon Unified School District/1998 NSTA Teacher of the Year)
Phil LaFontaine (CAMS)
Steve Mull (Lakeside Farms School)
Cindy Anderson (Mission Meadows School)
Paul Killian (ABC Unified School District)
Mike Sullivan (Dana Hills High School)
Myles Loveall (La Cañada High School Seismology Institute)

The members receive reimbursements for travel and classroom substitutes, honoraria for participation at each SCEC development workshop, a free subscription to the SCEC Quarterly Newsletter, and the opportunity to publish in the newsletter, as well as payment for take-home assignments that they are given to develop add-on pieces for the modules.

According to Tekula, "This unique group brings to the table information concerning causes, reasons, and best approaches from an 'insider' point of view about the DESC Online Project. Their advice and feedback increases the credibility of our final products. They will also provide SCEC a pipeline to pivotal groups in curriculum development and teacher training."

Regional Seismicity and GPS

Both Education Modules in the Beta-Release Stage

SCEC Outreach recently announced the release of both education modules (regional seismicity and GPS) in "beta" version. They are available through links from the SCEC Webservice; however, they are recommended solely for "trial runs" in the classroom.

Experienced teachers who are willing to try something new and give feedback to the authors and the DESC Online Advisory Group (see related news brief) are encouraged to test them in their classrooms.

Both modules are aimed at advanced high school and undergraduate college students and are excellent sources of in-depth information about measuring earthquakes over space and time.

When complete, the modules will find their home at the DESC Online Web site (currently under construction)—to be called "The Earth Is Constantly Changing." The site will be hosted by and linked to the SCEC Webservice. The site will serve as a resource and curriculum hub for every earth science classroom, as well as an excellent source of information for any member of the public.

The module "Investigating Earthquakes through Regional Seismicity," under the supervision of Katrin Hafner and the authorship of John Marquis (both of Caltech), is a three-part module with sections titled "What Is an Earthquake?"; "The Distribution of Earthquakes"; and "Measuring Earthquakes."

There is a "Concepts Covered" page, which is an outline of the built-in science storyline coupled with activities, as well as a useful table of contents that lists all the main questions addressed in each section and the activities that correspond to them.

In summing up his experience, Marquis said, "In addition to increasing my technical skills as a Web developer, working on the educational module has helped me better understand the special challenges faced by educators—and specifically, earth science educators. The interaction with educators has been invaluable, and for me, the aspect of this project that makes it special."

"Exploring the Use of Space Technology in Earthquake Studies" is a module that teaches the basic concepts of earthquake science and the Global Positioning System and highlights the Southern California Integrated GPS Network's contributions to measuring ground motion in southern California.

Under the direction of Andrea Donnellan and designed by Maggi Glasscoe, a former SCEC undergraduate intern, the module is divided into sections addressing plate tectonics, earthquakes, GPS, space technology at work, activities, people in SCIGN, and a glossary. The activities section is particularly inventive, addressing questions such as "How Many Earthquakes Does It Take to

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Make a Mountain?" and "How Long Will It Take for San Francisco and Los Angeles to Meet?"

Maggi Glasscoe, module designer and primary author, described the people she has worked with on the module and those whom she has encountered at meetings and module demonstrations as having been universally excited and supportive. She says that it has "made the effort very exciting and worthwhile."

She expanded on this by saying, "Developing these materials has really helped me to get a better understanding of the science I am involved in, and it is one of the greatest things to see other people get excited about it, too, when they use the module. I've learned a lot about expressing concepts in earth sciences in a manner that is both understandable and relevant to everyone, not only those involved in the science." She hopes the materials make an impact on the lives of students, teachers, and just about anyone interested in how and why we study earthquakes.

The DESC Online Advisory Group has made sure that the modules address the key issues in the National Science Education Standards, as well as the standards set by the California Department of Education. During this beta-testing stage, the module authors will meet with the advisory group quarterly, as well as integrate feedback from users' comment forms. Outreach Specialist Sara Tekula added, "We encourage anyone interested to visit both sites and offer feedback." "Investigating Earthquakes through Regional Seismicity" is on the Web at this URL:

HTTP://WWW.SCECDC.SCEC.ORG/MODULE/MODULE.HTML

"Exploring the Use of Space Technology in Earthquake Studies" is at:

HTTP://SCIGN.JPL.NASA.GOV/LEARN.

SCEC Board of Directors

New Members for USGS and LDEO

Lucy Jones was recently appointed Southern California Coordinator at the Pasadena office of the USGS, replacing Jim Mori. According to the SCEC bylaws, the coordinator sits on the SCEC board of directors. However, Jones exercised the option allowed in the bylaws of designating an alternate to serve in her place. Accordingly, Ken Hudnut is now serving as the USGS representative on the board.

In another passing of the baton, Nano Seeber's place on the board, representing Lamont-Doherty Earth Observatory at Columbia University, has been assumed by Bruce Shaw, a physicist at Lamont-Doherty.

USGS News

New Earthquake Web Page

A new Web page (WWW-SOCAL.WR.USGS.GOV/NORTH) that summarizes the work of the U.S. Geological Survey following the 1994 Northridge earthquake is now online. Users can download data and maps showing many aspects of the earthquake, such as mainshock rupture, damage patterns, local site response effects, and landslide effects. Also available are various supporting data sets including a fault database, digital geologic maps, topographic data, and reference lists to Northridge publications. The site has photos from the earthquake and animations of the earthquake rupture and aftershock sequence.

Nuclear Event Detection

Kinemetrics Selected to Supply Treaty Monitoring Seismic Equipment

The U.S. Air Force Technical Applications Center and allied agencies have selected Kinemetrics as the supplier of the Seismic Data Acquisition System for their global nuclear event detection solution. The center's SDAS program will modernize numerous arrays on seven continents. When fully implemented, SDAS will establish Kinemetrics as the premier provider of nuclear treaty monitoring seismic systems (WWW.KINEMETRICS.COM). For more information on data availability from the National Data Center: WWW.TT.AFTAC.GOV.

SCEC Core Institution

CUREe-Caltech Woodframe Project Receives Over $5 Million

FEMA and the California Governor's Office of Emergency Services have announced a grant of $5.2 million to Caltech for a three-year multi-university project to reduce damage and losses to woodframe construction in future earthquakes. The concept for "Earthquake Hazard Reduction of Woodframe Construction" originated following the 1994 Northridge earthquake, in which approximately half of the property loss was caused by damage to woodframe construction.

Professor John Hall of Caltech will be the project manager. Consulting engineering and other tasks will be carried out under subcontract to California Universities for Research in Earthquake Engineering (CUREe). The Structural Engineers Association of California will advise the project, along with representatives of the insurance, construction, and wood products industries; building officials; PEER; and others. For information, email CUREE@NISEE.CE.BERKELEY.

SCEC Research Publications

The following is a list of recent publications based on SCEC-funded research. SCEC authors must obtain SCEC contribution numbers for all papers in order to acknowledge SCEC funding. In return, their papers are added to the SCEC Publication Database. This database is reported to the NSF during each SCEC evaluation. To receive a SCEC contribution number for a recently submitted paper (or for a published paper that did not originally receive a SCEC number), email Mark Benthien (BENTHIEN@USC.EDU) with the authors, title, publication name, ***abstract*** (very important) and any other bibliographic information available. The SCEC number will be returned via email along with the proper NSF/USGS/SCEC acknowledgement statement. The SCEC Quarterly Newsletter now publishes the references only for published articles, no longer listing ones that are submitted, in review, in press, etc. The complete list (both searchable and sortable) is available at WWW.SCEC.ORG/RESEARCH/PAPERS.HTML, and will no longer be printed in the newsletter in its entirety each year. A hardcopy version of the list can be obtained by calling 213-740-5843 or emailing SCECINFO@USC.EDU.

317. Anderson, J. G., Seismic Energy and Stress Drop Parameters for a Composite Source Model, Bulletin of the Seismological Society of America, 87, pp. 85-96, 1997.

    This article examines relationships among radiated energy and several stress-drop parameters that are used to describe earthquake faulting. This is done in the context of a composite source model that has been quite successful in its ability to reproduce statistical characteristics of strong-motion accelerograms. The main feature of the composite source model is a superposition of subevents with a fractal distribution of sizes, but all with the same subevent stress drop (Ds_d) that is independent of the static stress drop (Ds_s). In the model, Ds_d is intended to represent the effective dynamic stress, and it does this well when $Ds_d > 2\,Ds_s$. The radiated energy in the S wave is $E_s^{CS} = 0.233\, C_E\, (Ds_d/m)\, M_0$, where M_0 is the seismic moment of the earthquake, m is shear modulus, and C_E is a dimensionless parameter that equals unity when $Ds_d > 2Ds_s$. The apparent stress (s_a) is $s_a = 0.243\, C_E\, Ds_d$. The effective stress is $s_e \sim 0.44\, C_E\, Ds_d$. The Orowan stress drop (Ds_o) is $Ds_o = 0.486\, Ds_d$. The root-mean-square (rms) stress drop (Ds_{rms}) is $Ds_{rms} = Ds_d I_q^{1/2} M_0 / M_{os}(R_{max})^{1/2}(f_c/f_0)^{1/2}$, where f_0 is corner frequency of the earthquake, $M_{os}(R_{max})$ and f_c are the moment and corner frequency of the largest subevent, and $I_Q^{1/2}$ is a dimensionless constant approximately equal to 1.7. Finally, the Savage-Wood ratio (SWR) is given by $SWR \sim C_E Ds_d / Ds_s$. These results clarify the relationships among all of the stress parameters in the context of a complex fault, showing the critical role of the subevent stress drop. They also provide an additional tool for energy, stress, and Savage-Wood ratio estimation. Since the process of modeling strong motion with the composite source uses realistic Green's functions, estimates of energy and stress parameters using this model are expected to have a good correction for wave propagation.

370. Hardebeck, J. L., J. J. Nazareth and E. Hauksson, The static stress change triggering model: Constraints from two southern California aftershock sequences, Journal of Geophysical Research, 103, no. B10, pp. 24427-24437, 1998.

    Static stress change has been proposed as a mechanism of earthquake triggering. We quantitatively evaluate this model for the apparent triggering of aftershocks by the 1992 Mw 7.3 Landers and 1994 Mw 6.7 Northridge earthquakes. Specifically, we test whether the fraction of aftershocks consistent with static stress change triggering is greater than the fraction of random events that would appear consistent by chance. Although static stress changes appear useful in explaining the triggering of some aftershocks, the model's capability to explain aftershock occurrence varies significantly between sequences. The model works well for Landers aftershocks. Approximately 85% of events between 5 and 75 km distance from the mainshock fault plane are consistent with static stress change triggering, compared to about 50% of random events. The minimum distance is probably controlled by limitations of the modeling, while the maximum distance may be because static stress changes of < 0.01 MPa trigger too few events to be detected. The static stress change triggering model, however, can not explain the first month of the Northridge aftershock sequence significantly better than it explains a set of random events. The difference between the Landers and Northridge sequences may result from differences in fault strength, with static stress changes being a more significant fraction of the failure stress of weak Landers-area faults. Tectonic regime, regional stress levels, and fault strength may need to be incorporated into the static stress change triggering model before it can be used reliably for seismic hazard assessment.

382. Bock, Y., M. Van Domselaar, S. Williams, P. Fang, and K. Hudnut, Southern California Permanent GPS Geodetic Array: Continuous Measurements of Crustal Deformation in the Los Angeles Basin between the 1992 Landers and 1994 Northridge Earthquakes, Northridge Earthquake Research Conference, California Universities for Research in Earthquake Engineering, Richmond, California, II, Earth Sciences, pp. 207-215, 1998.

    We investigate the time series of daily positions estimated for two continuously Global Positioning System (GPS) sites in the Los Angeles region in the 19-month period between the 1992 Landers and 1994 Northridge earthquakes. The site at the Jet Propulsion Laboratory in Pasadena (JPLM) was active throughout the 19-month period; the site on the Palos Verdes Peninsula (PVEP) was activated only nine months before the Northridge earthquake. A comparison of the post-Landers site velocities with those derived from Global Positioning System (GPS) and very long baseline interferometry measurements collected over 5-8 years prior to the earthquake indicate a significant change in the displacement rate at JPLM. The velocity difference after the Landers earthquake is manifested primarily as a decrease in magnitude of about 2 mm/yr in a direction nearly coincident with the direction of coseismic surface displacement. Since the same pattern of deformation is observed over a wide-aperture in southern California we infer that the entire Los Angeles basin experienced postseismic deformation in order of 1-2 mm/yr in the 19-month period preceding the Northridge earthquake. By analyzing the coseismic and postseismic displacements at the JPLM and PVEP site locations, we infer (1) an increase in the contraction rate of the Los Angeles basin after the Landers earthquake, which is relieved by the Northridge earthquake; and (2) a possible role for the Landers earthquake in triggering the Northridge earthquake.

397. Vucetic, M., G. Lanzo, and M. Doroudian, Damping at Small Strains in Cyclic Simple Shear Test, ASCE Journal of Geotechnical and Geoenvironmental Engineering, 124, no. 7, pp. 585-593, 1998.

    Cyclic tests were conducted to study damping properties of two reconstituted sands and three laboratory-made clays at small cyclic shear strain amplitudes of gamma(c) ~ 0.001-0.04%, employing a recently developed constant-volume equivalent-undrained direct simple shear device for small-strain testing. The tests were strain-controlled with an approximately sinusoidal shape of cyclic straining. The effects of cyclic strain amplitude (gamma(c)), frequency of cyclic loading (f), plasticity index (PI), silt content, vertical effective

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consolidation stress (sigma prime (c)) and overconsolidation ratio (OCR) on the equivalent viscous damping ratio, lambda, were investigated. The results show that, for a given gamma(c), lambda decreases with sigma prime(c) and OCR, but both of these effects become smaller if PI increases. The effect of f on lambda was not observed for f ~ 0.01-0.1 Hz. The results also show that below gamma(c) ~0.005%, lambda for clays is larger than lambda for sands, which is exactly the opposite of the trend above gamma(c) ~ 0.005% established previously. Such a reversal of the trend of lambda with respect to the type of soil is explained by the relative contributions of soil nonlinearity and soil viscosity to the area of the hysteretic cyclic stress-strain loop at small versus large cyclic strains.

400. Walls, C., T. Rockwell, K. Mueller, Y. Bock, S. Williams, J. Pfanner, J. Dolan, and P. Feng, Escape Tectonics in the Los Angeles Metropolitan Region and the Implications for Seismic Risk, Nature, 394, pp. 356-360, 1998.

Recent damaging earthquakes in California, including the 1971 M(w)=6.7 San Fernando, 1983 M(w)=6.5 Coalinga, 1987 M(w)=6.0 Whittier Narrows and 1994 M(w) 6.7 Northridge events, focused an awareness on thrust faulting as both potentially hazardous seismic sources and as a major mechanism for accommodating shortening in many regions of southern California. Consequently, most recent geologic models emphasize that major thrust faults pose the greatest seismic hazard and account for the majority of the estimated 5-7 mm/yr of contraction across the greater Los Angeles metropolitan area indicated by published Global Positioning System (GPS) geodetic measurements. However, our studies demonstrate that less than 50% of the geodetically observed contraction is accommodated on the principal thrust systems across the Los Angeles region. In this paper we integrate the most recent geologic, geodetic, and seismologic data, to assess the spatial distribution of strain across the Los Angeles Metropolitan region and demonstrate that a significant component of seismic moment release and shortening is accommodated by east-west crustal escape, or "extrusion," along known strike-slip and oblique-slip faults.

402. Alex, C. M. and K. Olsen, "Lens-Effect in Santa Monica?" Geophysical Research Letters, 25, pp. 3441-3444, 1998.

We used finite-difference simulations of 10-Hz P-SV and SH waves to estimate the contribution from the deep basin structure to the large ground motion amplification in Santa Monica, California, observed for seismic waves incident from the north. Our simulations of a 17-km deep Northridge aftershock with epicenter 30 km north of Santa Monica show that focusing at the lens-shaped boundary of the sediments can only account for less than half the amplification observed in the area that was heavily damaged during the 1994 M 6.7 Northridge earthquake. The focusing in the simulations caused amplification of up to 1.6 times in a zone 0.65-2.4 km south of the Santa Monica fault and de-amplification at sites just south of the fault where some of the largest amplification is observed in the data.

You can access the paper including figures and a movie at HTTP://QUAKE.CRUSTAL.UCSB.EDU/~KBOLSEN/LA3D_DIR/SM/2D/LENSGRL.HTML

426. Kagan, Y. Y. and D. D. Jackson, Spatial aftershock distribution: effect of normal stress, Journal of Geophysical Research, 103, Special Issue: Stress Triggers, Stress Shadows, and Implications for Seismic Hazard, pp. 24453-24467, 1998.

We study the spatial clustering of shallow aftershock hypocenters with respect to focal mechanisms of mainshocks. We use the Harvard centroid-moment tensor (CMT) global catalog, the Preliminary Determination of Epicenters (PDE) earthquake list, the Caltech/USGS catalog of earthquakes in Southern California, and a catalog of focal mechanisms for all earthquakes since 1850 in Southern California with magnitude larger than 6. We need to account for possible systematic bias in hypocenter distribution due to the geometry of seismogenic zones, especially that of subduction zones. We also select only strike-slip earthquakes from the catalogs to investigate aftershock clustering in circumstances more favorable for direct observation. We compare the spatial distribution of hypocenters before each strong earthquake with the distribution during the first 250 days after the earthquake and for the time interval extending beyond 250 days. If the friction coefficient in the Coulomb criterion is non-zero, one expects that after a strong earthquake, aftershocks and other earthquakes would concentrate in the direction of the P-axis (dilatational quadrant) rather than in the direction of the T-axis (compression quadrant). Such correlations have been pointed out previously for selected earthquake sequences. But is such correlation a general feature of earthquake occurrence? We study spatial earthquake distributions before and after each event for several choices of focal sphere partition, cutoff magnitude, focal mechanisms of large events, time periods, distance from a mainshock, etc. Although some earthquake distributions agree with a non-zero friction coefficient, others produce the opposite pattern, suggesting that the concentration of events along the P- and T-axes is due to random effects. This result implies that the friction coefficient in the Coulomb law is close to zero.

449. Li, Y. G., K. Aki, J. E. Vidale and M. G. Alvarez, A delineation of the Nojima fault ruptured in the M7.2 Kobe, Japan, earthquake of 1995 using fault zone trapped waves, Journal of Geophysical Research, 103, no. B4, pp. 7247-7263

We used four linear seismic arrays of portable seismometers at the northern Awaji Island, Japan, to record fault zone trapped waves from aftershocks of the 1995 M7.2 Hyogoken Nanbu (Kobe) earthquake from April to June 1996. Three arrays were deployed across the Nojima fault, which ruptured during the mainshock, while one array was deployed across the Higashiura fault, which did not break recently. We observed significant fault zone trapped waves with relatively large amplitudes and the long wave train following S waves only when both the stations and aftershocks were located close to the Nojima fault. The coda-normalized spectral amplitudes of trapped waves show a maximum peak at 4-7 Hz, which decreases rapidly with distance from the fault trace. The normalized amplitudes of trapped waves also show a decrease with hypocentral distance along the fault, giving an apparent Q of approximately ~25 at 4-7 Hz. In comparison, the array across the Higashiura fault recorded much shorter wave trains with higher frequencies after S arrivals for the same events. We simulate these trapped waves as S waves guided in a low-velocity waveguide sandwiched between high-velocity wall rocks. We find an adequate fit by using a waveguide 60 m wide at the northern site and 30-40 m wide elsewhere along the Nojima fault, a waveguide S velocity of 1.5-1.7 km/s, and a Q value of 25. For the Higashiura fault, the S velocity is 2.5 km/s, and the Q value is 80. The locations of aftershocks for which we observed fault zone trapped waves show that the Nojima waveguide is 9 km long and dips southeastward at 80o-85o to a depth of ~16 km. It extends 6 km farther southwestward along the Asano fault, though there are no obvious surface breaks along it. However, the waveguide is disconnected from the Suma fault on the main island, which was also ruptured during the Kobe earthquake, possibly because of the existence of an offset between the Nojima fault and the Suma fault.

A TEACHABLE MOMENT...

by Sara Tekula

At the SCEC Family Reunion

Working at SCEC up until this year's annual meeting had been simply a test of my ability to create something real out of something completely abstract. Much like trying to use GIS to capture the intricate curves in a city street, I had survived almost a year as an outreach specialist with only a roughly generic map of who I was working with and for.

With little experience working alongside research scientists, I couldn't imagine what it would be like to be dissolving in an ocean of them. To be looking into their eyes and sharing their thoughts on the weather, the quality of the food, and the 20,000 Harley riders who filled the streets of Palm Springs for a convention the very same weekend.

What a surreal experience! After my groping in the dark, I found a huge light shining on the SCEC Community, allowing me to see finally. Not only is the community composed of talented scientists and other professionals, it is glued together by fascinating conversationalists and good people.

Unlike the common myth that scientists don't have anything to do with outreach, I noticed that everyone in attendance wanted people to understand what they do for a living and what research results they come up with, or else they wouldn't have attended the annual meeting.

One of the most glaring observations I made in Palm Springs was that many of the scientists I spoke with were interested in what was being done about the earth sciences in other disciplines, other areas of education and industry, and other areas of research.

> I witnessed firsthand the synergy that takes place when they are all in the same room.

Before the annual meetings, I spoke to handfuls of SCEC scientists on the phone, sent and received email to and from them, but never before could I witness firsthand the synergy that takes place when they are all in the same room.

For instance, the common language among SCEC scientists and associates serves as evidence of community. Although it may not allow much time for translation, the annual meeting is a place for scientists to practice communication among themselves. While I was reminded of the times in my youth where I created a secret language to exclude my younger siblings (guys, if you're reading this, I apologize), I understood the reasoning and efficiency behind forming a complex language among experts. Why waste time saying, "the shortest line between two points on any mathematically defined surface, such as a sphere" when you can say "geodesic"?

Which leads me to the next point: my role in this community. Although I tended to feel like I fit well into the SCEC family, I couldn't hide my clear-cut role as "nonfluent younger sibling."

You know what they say: "The best way to learn a language is by immersion." So every chance I got I introduced myself to someone and found myself saying and understanding things that were Greek to me just hours before.

I also soon found that just about everyone I talked to was interested in the future of the SCEC Outreach Program. Many were pleasantly surprised to hear that I had a background in a field that examines mental instability, not crustal instability.

Of course, earth scientists are not excluded from the countless individuals who ask me, "Well, since you're a shrink, are you going to try to figure me out now?" I just tell them, "You study a slightly different kind of deformation, if you will, but deformation just the same." Thankfully, SCEC scientists have great senses of humor, too!

Earth science is the science of everything that makes up the earth—including us humans. The moment that people see themselves as a part of this complex system, they are given the opportunity to see the connectivity that results from science investigation and sharing data—no matter what language they speak.

Because SCEC represents a multidisciplinary approach to doing science, it made me smile to realize how truly happy it makes scientists to be able to share with each other. That happiness didn't need to be translated for me.

Seeing the whole community together energized me and provided me with a springboard from which to dive into my future academic and professional pursuits. I am now considering becoming an earth and environmental science journalist.

Education Web Sites for Science Teachers and Students

Compiled by Sara Tekula

SCEC-Sponsored Modules (DESC Online)

"Exploring the Use of Space Technology in Earthquake Studies"
HTTP://SCIGN.JPL.NASA.GOV/LEARN

Science Education Standards

U.S. National
HTTP://WWW.NAP.EDU/READINGROOM/BOOKS/NSES/HTML

State of California
HTTP://WWW.CA.GOV/GOLDSTANDARDS

Education Programs at Scientific and Engineering Organizations

Southern California Earthquake Center
HTTP://WWW.SCEC.ORG/OUTREACH

IRIS
HTTP://WWW.IRIS.WASHINGTON.EDU/EANDO/

Geological Society of America
HTTP://WWW.GEOSOCIETY.ORG/EDUCATE/INDEX.HTM

Pacific Earthquake Engineering Research
HTTP://PEER.BERKELEY.EDU/HTML/EDUCATION.HTML

Multidisciplinary Center for Earthquake Engineering Research
HTTP://WWW.MCEER.ORG

Mid-America Earthquake Center
HTTP://MAE.CE.UIUC.EDU/RESEARCHPROGRAMS/OEIP/BODYEDUCATION.HTML

Earthquake Engineering Research Institute
HTTP://WWW.EERI.ORG/CHAPTERS/CHAPTERS.HTML

American Society of Civil Engineers
HTTP://WWW.ASCE.ORG/PETA/PROGRAMS.HTML

American Geological Institute
HTTP://WWW.AGIWEB.ORG/EHR.HTML

American Geophysical Union
HTTP://WWW.SOEST.HAWAII.EDU/KARSTEN/MALIA/CHER.HTML

Seismological Society of America
HTTP://WWW.SEISMOSOC.ORG/EDUCATION/EDUCATION.HTML

American Association for the Advancement of Science
HTTP://WWW.AAAS.ORG

Princeton Earth Physics Project
HTTP://LASKER.PRINCETON.EDU/PEPP.SHTML

Colorado School of Mines
HTTP://WWW.MINES.EDU/OUTREACH

University Corporation for Atmospheric Research Education
HTTP://WWW.UCAR.EDU/UCARGEN/EDUCATION/EDUHOME.HTML

Government Organizations

USGS
HTTP://WWW.USGS.GOV/EDUCATION

Los Alamos National Laboratory
HTTP://WWW.LANL.GOV/EXTERNAL/EDUCATION/

Los Angeles Public Library
HTTP://WWW.LAPL.ORG/

Los Angeles Zoo
HTTP://WWW.LAZOO.ORG/LEARN.HTM

Los Angeles County Office of Education
HTTP://WWW.LACOE.EDU

California Division of Mines and Geology
HTTP://WWW.CONSRV.CA.GOV/KIDS/INDEX.HTM

Association of Bay Area Governments
HTTP://WWW.ABAG.CA.GOV/BAYAREA/EQMAPS/KIDS.HTML

Science Education and Teachers' Organizations

International Geoscience Education Association
HTTP://WWW.COSM.SC.EDU/~CSEMGR/CARPENTER/NEWSLTR.HTML

National Association of Geoscience Teachers
HTTP://OLDSCI.EIU.EDU/GEOLOGY/NAGT/NAGT.HTML

Science Education Association
HTTP://SCIENCE.COE.UWF.EDU

Teach for America Math and Science Initiative
HTTP://TEACHFORAMERICA.ORG/APPLY/MATH.HTM

Lawrence Hall of Science
HTTP://WWW.LHS.BERKELEY.EDU/SEPUP

Los Angeles Educational Partnership: Target Science
HTTP://WWW.LALC.K12.CA.US/TARGET/

Los Angeles Educational Partnership: SMART Program
HTTP://WWW.LALC.K12.CA.US/LAEP/SMART/SMHOME.HTML

Virtual Libraries

Websurfer's Bi-Weekly Earth Science Review
HTTP://SHELL.RMI.NET/~MICHAELG/WEEKSREVIEWS.HTML

Virtual Earth Science Library
HTTP://WWW.GEO.UCALGARY.CA/VL-EARTHSCIENCES.HTML

Virtual Geophysics Library
HTTP://WWW-CREWES.GEO.UCALGARY.CA/VL-GEOPHYSICS.HTML

Virtual Geotechnical Engineering Library
HTTP://GEOTECH.CIVEN.OKSTATE.EDU/WWWVL/INDEX.HTML

Other Online Educational Products

"Plate Tectonics" CD-ROM from TASA
HTTP://WWW.SWCP.COM/~TASA

"This Dynamic Earth—The Story of Plate Tectonics"
HTTP://PUBS.USGS.GOV/PUBLICATIONS/TEXT/DYNAMIC.HTML

Calendar

January 1999

10-14—Session planned for the World Archaeological Congress, Cape Town, South Africa. "Catastrophism, Natural Disasters, and Cultural Change." Info: WWW.UCT.AC.ZA/DEPTS/AGE/WAC/

19–21—2nd Conf. on Applications of Remote Sensing and GIS for Disaster Management, Wash., DC

31—Deadline for registration and receipt of abstracts for INQUA symposium "Ice Sheets, Crustal Deformation and Seismicity: Neotectonics of Glaciated and Deglaciated Terrains," Durban, South Africa, August 3–11, 1999. Contact Iain Stewart (IAIN.STEWART@BRUNEL.AC.UK) or Jeanne Sauber (JEANNE@STELLER.GSFC.NASA).

February 1999

15—Newsletter 5.1 articles and copy due to editor. Contact Ed Hensley, 916/353-9996.

3–6—EERI annual meeting, San Diego: eeri@eeri.org

8–11— Basic Hazards U.S. (HAZUS) Training—use of FEMA's earthquake loss estimation methodology. National Emergency Training Center, Emmitsburg, MD. For information: Lillian Virgil at (301) 447-1490 or Laura Middleton at (202) 289-7800 ext. 166.

17–19—5th Calif. GIS Conference, Oakland: Stephanie King, 650-725-0360, SKING@CE.STANFORD.EDU; WWW.CALGIS.ORG.

March 1999

1–3—Mid-America Highway Seismic Conference, St. Louis. Federal Highway Administration, Glenn Fulkerson, 573-636-7104 or GLENN.FULKERSON@FHWA.DOT.GOV.

April 1999

8—Earthquake Awareness Fair, State Capitol, Sacramento, 10am-3pm. Exhibits, California Seismic Safety Commission, 916-322-4917.

19–21—ASCE 1999 Structures Congress, New Orleans.

26–29—Basic Hazards U.S. (HAZUS) Training—use of FEMA's earthquake loss estimation methodology. National Emergency Training Center, Emmitsburg, MD. For information: Lillian Virgil at (301) 447-1490 or Laura Middleton at (202) 289-7800 ext. 166.

May 1999

7—Los Angeles Tall Buildings Structural Design Council Annual Meeting, L.A.: Marshall Lew, MLEW@LAWCO.COM.

17–19—SEE3, Third International Conference on Seismology and Earthquake Engineering, Tehran, Iran: SEE3@DENA.IIEES.AC.IR.

June 1999

13–16—8th Canadian Conference on Earthquake Engineering (8CCEE), Vancouver BC: 604-822-6135; SEXSMITH@CIVIL.UBC.CA.

15–17—ERES 99, Catania, Italy: WWW.WESSEX.AC.UK.

21–25—2nd International Conf. on Earthquake Geotechnical Engineering, Lisbon, Portugal: SICEGE@INEC.PT

July 1999

5–9—International Workshop on Tomographic Imaging of 3-D Velocity Structures and Accurate Earthquake Location, Pafos, Cyprus. Dr. Nitzan Rabinowitz, Geophysical Institute of Israel, WORKSHOP@IPRG.ENERGY.GOV.IL

22–27—IUGG99, Int. Union of Geodesy and Geophysics XXII General Assembly, Birmingham, UK. Abstracts by Jan. 15: WWW.BHAM.AC.UK/IUGG99/.

August 1999

12–14—5th U.S. Conf. on Lifeline Earthquake Engineering, Seattle: DBBALLAN@EQE.COM or TDO@CORNELL.EDU.

January 2000

29–Feb. 5—12th World Conference on Earthquake Engineering (12WCEE), Auckland NZ: see link at WWW.EERI.ORG.

November 2000

12-15—6th International Conference on Seismic Zonation, Palm Springs, CA.

Highway Seismic Design Report

The Applied Technology Council (ATC) report *Seismic Design Criteria for Bridges and Other Highway Structures: Current and Future* is now available. This 152-page report documents the findings of a four-year project to assess current seismic design criteria for new highway construction to provide a basis for developing new design guidelines for highway structures.

The ATC-18 report was developed under a larger project on new highway construction conducted by the Multidisciplinary Center for Earthquake Engineering Research, State University of New York at Buffalo (formerly NCEER), with funding from the Federal Highway Administration. Copies of the ATC-18 report can be obtained from ATC, 650-595-1542; ATC@ATCOUNCIL.ORG.

New Doctoral Program Offered at USC

The USC Environmental Sciences, Policy and Engineering Sustainable Cities Program is a new multidisciplinary doctoral training program funded by NSF. It is a campuswide collaborative that brings together multiple disciplines involved in environmental research, policy, and management around the theme of building sustainable cities for the 21st century.

Collaborative faculty projects are built on linkages to major decision-makers and stakeholders, and results will have implications for public policy in the region and beyond. Ph.D. students admitted to the Sustainable Cities Program can expect to receive fellowships ($15,000) awarded on a competitive basis. In addition they will receive cost-of-education allowances and a modest research support fund. All Sustainable City Program students must also be admitted to a USC doctoral degree program in their field of specialization (such as earth sciences). The program's Web site is WWW.USC.EDU/DEPT/ENGINEERING/ESPE-SC. The program's co-directors are Joseph Devinny (DEVINNY@USC.EDU) or Jennifer Wolch (WOLCH@USC.EDU).

NSF Funds "Smart Buildings"

NSF recently announced its funding of a project in which engineers Billie Spencer Jr. and Michael Sain from the University of Notre Dame are designing systems that counteract damaging structural responses to earthquakes, windstorms, traffic, and explosives. According to NSF, these "smart buildings" adjust to changing conditions without requiring massive amounts of energy. A description is now available from the NSF Online Document System: WWW.NSF.GOV/CGI-BIN/GETPUB?PR9848. For more information on the Notre Dame project: WWW.ND.EDU/~QUAKE.

Earthquake Information Resources Online

SCEC on the Web
www.scec.org

SCEC Data Center

HTTP://WWW.SCECDC.SCEC.ORG/
SCEC Data Center home page

HTTP://WWW.SCECDC.SCEC.ORG/RECENTEQS
Recent earthquake activity in northern and southern Calif. Maps and earthquake lists are interactive and updated at the time of an event

HTTP://WWW.TRINET.ORG/EQREPORTS
Southern California Seismic Network weekly earthquake reports

HTTP://SCEC.GPS.CALTECH.EDU/FTP/CA.EARTHQUAKES
SCSN weekly & monthly earthquake reports (archives to Jan. 1993)

HTTP://WWW.SCECDC.SCEC.ORG/SEISMOCAM/
Caltech/USGS Seismocam: waveform displays of data 30-seconds-old earthquakes in southern California: includes aftershock maps, animations of aftershock sequences and rupture models, a clickable map of historic southern California earthquakes, and Putting Down Roots in Earthquake Country (online book)

HTTP://WWW.SCECDC.SCEC.ORG/EQSOCAL.HTML
Main page

HTTP://WWW.SCECDC.SCEC.ORG/CLICKMAP.HTML
Southern California clickable earthquake map

HTTP://WWW.SCECDC.SCEC.ORG/LABASIN.HTML
HTTP://WWW.SCECDC.SCEC.ORG/EASOCAL.HTML
Los Angeles basin clickable earthquake map

HTTP://WWW.SCECDC.SCEC.ORG/EQSOCAL.HTML
Earthquakes in southern California

HTTP://WWW.SCECDC.SCEC.ORG/BYMONTH.HTML
Time-lapse animations of southern California seismic activity

HTTP://SCEC.GPS.CALTECH.EDU/CGI-BIN/FINGER?QUAKE
"Finger Quake" ftp (updated frequently)

HTTP://WWW.SCECDC.SCEC.ORG/FAULTMAP.HTML
Southern California fault map

HTTP://WWW.SCECDC.SCEC.ORG/LAFAULT.HTML
Faults of Los Angeles

HTTP://WWW.SCECDC.SCEC.ORG/LARSE.HTML
LARSE home page

HTTP://SCECDC.GPS.CALTECH.EDU/CATALOG-SEARCH.HTML
Interactive SCSN seismicity catalog search page

HTTP://WWW.SCECDC.SCEC.ORG/EQCOUNTRY.HTML
Putting Down Roots in Earthquake Country (online book)

USGS Web Sites

HTTP://WWW.USGS.GOV
General USGS site

HTTP://GLDSS7.CR.USGS.GOV/
National Earthquake Information Center

HTTP://GEOLOGY.USGS.GOV/QUAKE.HTML
Earthquake information

HTTP://QUAKE.WR.USGS.GOV/
USGS Menlo Park

HTTP://WWW-SOCAL.WR.USGS.GOV
USGS Pasadena

HTTP://GEOHAZARDS.CR.USGS.GOV/NORTHRIDGE/
USGS Response to an Urban Earthquake — Northridge '94

HTTP://WWW-SOCAL.WR.USGS.GOV/NORTH
Summary of work of USGS after Northridge '94, including datasets

HTTP://WWW-SOCAL.WR.USGS.GOV/LISA/NETBULLS
Southern California Seismic Network (bulletins)

HTTP://WWW.SEISMO.UNR.EDU
Nevada Seismological Laboratory

Work by two SCEC-funded researchers, John Anderson and Steve Wesnousky. Contains lists, maps, and seismogram data from recent earthquakes, including searchable earthquake catalogs and more

HTTP://ERP-WEB.ER.USGS.GOV/
Recent USGS NEHRP Research Contracts

USGS email addresses

NEIC@USGS.GOV
National Earthquake Information Center

NGIC@USGS.GOV
National Geomagnetic Information Center

NLIC@USGS.GOV
National Landslide Information Center

Paleoseismology

HTTP://INQUA.NLH.NO/COMMPL/PALSEISM.HTML
The INQUA Subcommission on Paleoseismicity: content list and authors for the special issue of journal of geodynamics arising from the INQUA Berlin 1995 symposium on paleoseismicity.

Active Tectonics

HTTP://WWW-GEOLOGY.UCDAVIS.EDU/~GEL214/
University of California, Davis—Active Tectonics
- Lecture notes ("Contents")
- Problem sets ("Problems") for this course
- WWW links ("Links") of interest to students and researchers
- References

GIS Web Sites

HTTP://WAREHOUSE.GEOPLACE.COM/
Bibliography of GIS & environmental applications

HTTP://PASTURE.ECN.PURDUE.EDU/~ENGELB/
Bernie Engel, professor of agricultural engineering: soil and water conservation, environmental issues, systems engineeering

HTTP://WWW.LIB.BERKELEY.EDU/CGI-BIN/PRINT_HIT_BOLD.PL/UCBGIS/
UCB GIS Task Force integrates GIS activities with other resources

HTTP://WWW.NWI.FWS.GOV/THINKTANK.HTML
GIS think tank on problems of digital mapping for NWI data

HTTP://FGDC.ER.USGS.GOV/LINKPUB.HTML
List of FTP directories for federal Geographic Data Committee

Continued on next page . . .

Online Resources *continued*

HTTP://MIS.UCD.IE/STAFF/PKEENAN/GIS_AS_A_DSS.HTML
Paper on how to use a GIS as a DSS generator

HTTP://SPSOSUN.GSFC.NASA.GOV/EOSDIS_SERVICES.HTML
A spectrum of services, from casual user to researcher

HTTP://WWW.GGRWEB.COM/
Information technologies, GIS, GPS, & remote sensing industries

Geodetic Information

HTTP://LOX.UCSD.EDU
This site is the IGPP & Scripps Orbit and Permanent Array Center (SOPAC) and features global (IGS) and regional (SCIGN) continuous GPS archive, SCIGN maps, time series, and site velocities.

GMT

HTTP://QUAKE.UCSB.EDU
Make shaded relief maps with GMT. Catalog of maps by Geoffrey Ely at ICS/UCSB. DEM for southern California. Click on "Mapping" and then "Geoff's Map Catalog."

Preparedness, Disaster Management

HTTP://WWW.BEST.COM/~TRBU/OES/
California Governor's Office of Emergency Services: information on Earthquake Preparedness Month campaign

HTTP://WWW.SEISMIC.CA.GOV/SSCCATR.HTM
California's earthquake hazard mitigation plan

HTTP://KFWB.COM/CUCAMONG.HTML
KFWB Webservice exclusive: trenching the Cucamonga fault

HTTP://WWW.HIGHWAYS.COM/LASD-EOB/
The Los Angeles Sheriff's Emergency Operations Bureau

HTTP://WWW.KFWB.COM/EPC/EPCFACT.HTML
Emergency Preparedness Commission for L.A. City & County

HTTP://WWW.JOHNMARTIN.COM/EQPREP.HTM
John A. Martin & Associates

HTTP://WWW.EERC.BERKELEY.EDU/
Earthquake Engineering Research Center offers extensive, searchable database of abstracts, reports, and other resources. New: "Lessons from Loma Prieta,"with papers, images, and data.

Earthquake Information Sites

HTTP://WWW.EQNET.ORG/
EQNET

HTTP://WWW-SOCAL.WR.USGS.GOV/SEISMOLINKS.HTML
Comperhensive list of links to seismology, geology, vulcanology

HTTP://WWW.GEOPHYS.WASHINGTON.EDU/SEISMOSURFING.HTML
Clearinghouse of research data & informmation

HTTP://WWW.TRINET.ORG/
Trinet—the seismic system for southern California

HTTP://MCEER.ENG.BUFFALO.EDU/ENEWS
Express news, customizable service that delivers earthquake/ hazards information selected from MCEER Information Service

HTTP://WWW.CIVENG.CARLETON.CA/CGI-BIN/QUAKES
Recent quakes (with a good map viewer)

HTTP://WWW.CRUSTAL.UCSB.EDU/SCEC/WEBQUAKES/
Up-to-the-minute southern California earthquake map—latest 500 earthquake locations. Java-enabled browsers only.

HTTP://KFWB.COM/EQPAGE.HTML
KFWB Quake Page (by Jack Popejoy)

HTTP://SMDB.CRUSTAL.UCSB.EDU/
A relational database strong motion recordings.

HTTP://WWW.CONSRV.CA.GOV/DMG/SHEZP/PSHA0.HTML
Probabilistic Seismic Hazard Map, California

HTTP://WWW.ABAG.CA.GOV/BAYAREA/EQMAPS/LIQUEFAC/BAYALIQS.GIF
Bay Area hazard map

HTTP://WWW.WSSPC.ORG
Western States Seismic Safety Policy Council site, an overall earthquake safety information source.

HTTP://WWW.SEISMIC.CA.GOV/SSCLEG.HTM
State and federal bills being tracked by Seismic Safety Commission

HTTP://WWW.SEISMIC.CA.GOV/SSCSIGEQ.HTM
Seismic Safety Commission—significant damaging earthquakes

HTTP://SHELL.RMI.NET/~MICHAELG/WEEKSREVIEW.HTML
Biweekly earth science review

Internet Discussion Groups

WSSPC-L@NISEE.CE.BERKELEY.EDU
Western States Seismic Policy Council discussion group

EQ-GEO-NET@GSJTMWS8.GSJ.GO.JP
Paleoseismic ListServe

GVN@VOLCANO.SI.EDU
Global Volcanism Network

QUATERNARY@MORGAN.UCS.MUN.CA
Research in quaternary science

SEISMD-L@BINGVMB.BITNET
Seismological discussion list (SEISMD-L)

QUAKE-L@LISTSERV.NODAK.EDU
Earthquake discussion list

Education

HTTP://WWW.SCEC.ORG/OUTREACH
SCEC Education Pages: semi-complete; check it out & give us feedback

HTTP://WWW.USGS.GOV/EDUCATION
USGS Learning Web:A great site with many resources

HTTP://MCEER.BUFFALO.EDU
MCEER Education Program

WWW.IRIS.WASHINGTON.EDU/EANDO
IRIS Education Outreach: Try the "Seismic Monitor"

HTTP://PEER.BERKELEY.EDU/HTML/EDUCATION.HTML
Pacific Earthquake Engineering Research: terrific ed. program

HTTP://WWW.AAAS.ORG/
American Association for the Advancement of Science

HTTP://WWW.AGIWEB.ORG
American Geological Institute

SCEC Quarterly Newsletter

a component of the Center's Outreach Program

For more information on
the SCEC Outreach Program,
see the Outreach Web page at
WWW.SCEC.ORG
OR contact:

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213/740-3459 or jandrews@terra.usc.edu

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(general information, publications, WWW)

Sara Tekula, Outreach Specialist
213/740-2099 or stekula@terra.usc.edu
(education and community outreach)

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University of Southern California
Los Angeles, CA 90089-0742

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Newsletter on the Web: WWW.SCEC.ORG/NEWS

Current issues can be accessed only by current recipients of the newsletter. Back issues are accessible without a password. The online newsletter will feature active links to other Web pages with related information. To access the current issue online, enter the following when prompted:

username: scecnewsletter
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Fax: 213/740-0011; Email: SCECinfo@usc.edu

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SCEC Quarterly Newsletter

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