

A Message from the Chair

Dr. Steven Chiesa, P.E.



The Civil Engineering Department started out the 2005-06 academic year with some changes at the top. After 15 years of dedicated service as the department chair, Dr. Sukhi Singh re-

turned to a more traditional full-time teaching and research position. We all wish to thank Dr. Singh for his many years of leadership and guidance. The new administrative structure includes myself as chairman and Dr. Reynaud Serrette as associate chairman. Any questions related to the department can be addressed to either of us.

The new academic year also start with an upswing in freshman student interest as evidenced both by the number of declared majors and the enthusiastic involvement freshmen with a civil engineering design project in ENGR 1 (Introduction to Engineering). The civil engineering project involving an iterative theoretical truss design using West Point Bridge Designer followed by an elective truss fabrication and testing competition drew the highest number of students of any course project option.

On the other side of the spectrum, senior civil engineering students have already started work on their capstone design pro-

jects. There are a large number of team projects this year with students selecting to work on a great variety of structural, transportation, and water resources oriented projects. Our seniors also have a lot to look forward to after graduation in June because based on all available evidence it looks like a very good job market will await them.

Lastly, the Civil Engineering Department has been working closely with its student organizations to better link each organization's external professional speakers with courses offered that same term. This is planned for sophomore, junior and senior level courses throughout the year and will hopefully help bridge the gap between the academic side of learning and professional applications. Early feedback shows this plan to be very successful.

A New Vision: School of Engineering Master Plan

Jacqueline Wender (Assistant Dean for Finance and Operations)

Last year's re-accreditation of the School of Engineering by ABET upheld many of the attributes of Civil Engineering – and the School as a whole – that we work hard to preserve. Chief among those is our emphasis on the quality of undergraduate education. Like all thorough reviews, however, this one helped to point out areas where the department and the school can become even better. Of particular concern was the Structures and Materials Testing Laboratory, which requires a new infrastructure to support both teaching and research.

In response to the School's proposal to simply build a new lab, Joe Sugg, Assistant Vice President for University Opera-

tions, suggested that we first undertake a more comprehensive study of our space needs for the coming decades. With great enthusiasm, the School has embarked on this master planning project with Perkins+Will Architects, the first step in the development of a new Structures Lab for Civil Engineering.

The study comprises two phases. Phase I, Needs Assessment, will define the vision for the School's future and will provide a needs assessment of the facilities prior to defining the facilities master plan. Phase II, Program Definition and Concept Design, will define the physical program and the conceptual design to validate the information gathered in Phase I. Input for

Phase I comes from all units within the School as well as the general university community and external constituents.

A project steering team holds primary responsibility for working with the architects. The members includes faculty and staff from the School, Dean Daniel Pitt, and colleagues from University Facilities. Civil Engineering is represented by Professors Mark Aschheim and Reynaud Serrette.

As always, we welcome your ideas, and we encourage you to participate with us in moving toward the realization of our vision.

Research Highlights

Global Warming, Climate Changes: What's in Store for California?

Dr. Edwin Maurer, P.E.

Rising global temperatures, and resulting changes in climate patterns, are already resulting in impacts related to water resources. Anthropogenic greenhouse gas emissions (mostly from oil and coal burning to satisfy our transportation and energy consumption) have been recognized as the leading cause of the warming experienced in recent decades, and will account for a rising proportion of the warming projected over the next century. [*cont'd page 2*]



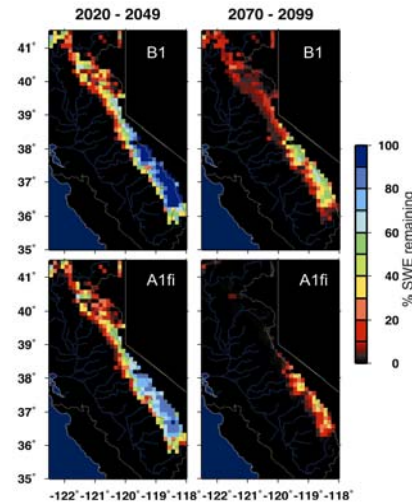
Research Highlights .. cont'd

Global Warming [cont'd]

Exactly how much warming will occur over the next century is uncertain. Choices we make as a global community are the primary source of emission prediction uncertainty, rather than limits on our understanding of physics or our ability to represent them in models. A new study performed at SCU has projected changes in future climate simulated by multiple global climate models (GCMs). These GCM data were used to drive a hydrology model to simulate the land surface hydrology (especially streamflow and snow pack) of California. Although there is considerable variability between climate models in the projected climate, the temperature changes greatly exceed model variability, as do some of the precipitation changes. The projected climate shows some significant differences under different future greenhouse gas emissions scenarios. Although impacts are large under any scenario, the differences in certain impacts between higher and lower emissions pathways are surprisingly large compared to inter-model variability. For example, the Figure shows the amount of water stored as snow in the Sierra Nevada Mountains (measured as snow water equivalent, SWE), will decline much more dramatically under a future scenario where we continue to rely on fossil fuels (denoted A1fi) as opposed to a future that sees a rapid transition to greater use of sustainable technology (denoted B1). Since transportation and energy generation account for most fossil fuel emissions, much of the focus for the low emissions pathway is on greater use of fuel efficient vehicles (and driving less), and more energy-efficient design of homes, buildings, neighborhoods and cities.

Many of the technologies for reducing greenhouse gas emissions already exist, and the promotion of their wider use is to a large degree a political issue, with an entrenched energy industry fighting a media campaign to distort the scientific consensus and mislead the public. With the leadership of nearly all countries around the world, and the recent Executive Order of the Governor of California helping to nudge the U.S. in a more forward-thinking direction, some of the political barriers to changing our energy consumption patterns may be cleared before humans cause an irreversible, dangerous change in climate for future generations. This research at SCU helps identify some of what is at stake in California, and these models suggest a substantial potential value, vis-à-vis reduced future

costs of adapting to hydrologic impacts of climate change, if emissions are reduced early.

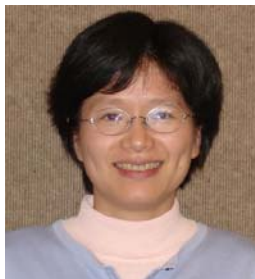


Percent of snow remaining (expressed as snow water equivalent, SWE, which is the amount of water stored in the snow) for two future periods over the Sierra Nevada region of California. San Francisco Bay can be seen on the left edge of each panel.

Flexibility and Reliability of Transportation Systems

Dr. Rong (Rachael) He

Dr. He's research interests include transportation network modeling, origin-destination demand estimation, value pricing modeling and evaluation. Her current research activities focus on transportation system analysis, traffic simulation and management. Under "normal" conditions, the flow and control of traffic in large cities require sophisticated modeling and an in-depth knowledge of "the beat" of a particular city. It is important to study the flexibility of current transportation systems in order to proactively relieve congestion from disturbances such as sports events and traffic accidents. When conditions are different from "normal," the city beat can become chaotic as we have seen in the cases of natural disasters and terrorist attacks. Currently, transportation security and emergency response are some of the hottest topics in transportation re-



search, and evacuation strategies at state and regional levels. Our response to a large seismic event or terrorist attack in the Bay Area will depend on a reliable transportation system with coordinated emergency response programs and evacuation strategies at state and regional levels.

Dr. He's ultimate goal is to develop a regional traffic management model for large cities that may be used under both recurrent congestion and emergency conditions (potential terrorist attack and natural disaster). This challenging problem requires in-depth, multi-disciplinary knowledge in transportation science, operations research, and information technology. Hence, Dr. He has been working on the creation of a transportation research group at SCU that encourages involvement from students. Dr. He and students from Civil, Computer and Electrical Engineering Departments are developing an adaptive route guidance system for recurrent congestion and emergency situations. And at the same time, we are working on the development of a traffic management framework for Bay Area.

Sustainable Building Design

Dr. Mark Aschheim, P.E.



Sustainable development is usually defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

While apparently sensible, such a definition suggests an acceptance of environmental changes and presupposes an omniscient ability to project both the consequences of our activities and the possible development of innovative solutions in the future. In practice, neither can be fully anticipated in the present.

Of course, we are accustomed to a very high standard of living, externalizing known and unknown environmental costs while running roughshod over the planet with economic miracles. Our power to affect the environment carries with it a responsibility to wield it wisely. Does this mean we must live a life in which we sequester as much carbon as we release? [cont'd page 3]

If this were the case, we would be challenged to use resources in an extremely limited and very efficient manner.

The choices we make as engineers can appreciably influence the materials (type and quantity) we use and consequently, the rate at which global warming develops. Civil engineers, in particular, are heavily involved in the transportation infrastructure and the bulk of applications that use concrete. Of the total carbon dioxide (CO₂) emissions in the US, 32% are associated with transportation and 8% come from the manufacture of Portland cement, the active agent in concrete. Given the potential for civil engineers to affect CO₂ emissions, a new calculus is needed—when the engineer's pencil hits the paper, a clear picture of the environmental consequences of design decisions should be included in the design process.

Sustainable alternatives are also needed, and SCU civil engineers are actively involved in their development. Last year, one group of Civil Engineering seniors at SCU identified potential improvements in clay brick manufacturing that promise to substantially reduce wood consumed in firing clay bricks while simultaneously enabling earthquake-resistant homes to be affordable to more sectors of society in El Salvador. Other seniors developed an I-joint made from solid section bamboo material and established appropriate anchorage details for use in earthquake-resistant straw bale house construction. This year our seniors are working with Mechanical Engineering students to design soil-based cob houses.



Potential improvements are within reach; working together we can develop innovative alternatives that may become the mainstays of a more sustainable way of life.

ALUMNI IN FOCUS



Mark Saunders earned his bachelors degree in civil engineering from SCU in May of 1965, although he considers himself a member of the class of 1964. Upon graduation, Mark obtained an interim position working for the Bridge Department of the State of California, which is now a part of Caltrans, before entering graduate school at Stanford. During his tenure with the State, he worked as a field engineer on the construction of the Eugene Doran Bridge on Highway 280 between San Jose and San Francisco. Mark received his masters degree in civil engineering (Structures) from Stanford in June of 1966.

After his time at Stanford, Mark went to work at Lockheed Missiles and Space Company (LMSC) in Sunnyvale, where he performed complex structural analyses for design of the C5A aircraft and for various deep submersible vehicles. He left LMSC in 1968 and went to work for John A. Blume & Associates. In 1969, he left Blume and joined Rutherford & Chekene (R&C) Consulting Engineers, where he has remained to the present. He was appointed a Principal at R&C in 1978 and became President in 2000. R&S, located in San Francisco, is one of the largest and most respected privately owned consulting engineering practices in California. The firm is known for performing structural and geotechnical engineering for some of the Bay Area's most prestigious projects. Notable projects include the Monterey Bay Aquarium, the Long Beach Aquarium of the Pacific, SBC Park, the renovation of the San Francisco Ferry Building, and the recently completed New DeYoung Museum.

Mark has served as Structural Engineer of Record on many notable buildings, particularly laboratories and hospitals, in the Bay Area and beyond. His projects have included buildings for Stanford, UC Berkeley, UC Santa Cruz, UC Santa Barbara, Kaiser Foundation Health Plan, Sutter Health, Catholic Healthcare West. His nearest project to SCU is O'Connor Hospital, which was completed in the late 1970's.

Over the years Mark has served the Structural Engineering profession and the building design and construction industry continuously. He has served as President and Director of the Structural Engineers Association of Northern California (SEAONC) and the Applied Technology Council (ATC). He has also been a Director of the Structural Engineers Association of California (SEAOC). He has served on numerous code writing committees, including the AISC Seismic Committee, the Provisions Update Committee of BSSC, SEAONC and SEAOC Seismology Committees and a number of ad-hoc committees. After the 1994 Northridge Earthquake, Mark served as Lead Guideline Writer for the document ultimately known as FEMA-350 that provided new guidelines for the design of steel moment frames. He has been serving as a member of the Hospital Building Safety Board for California's Office of State-wide Health Planning and Development (OSHPD) since 2000. He currently serves as a member of the SCU Civil Engineering Department Advisory Board.

Mark attributes much of his professional success to the broad education he received at SCU. He recommends that all engineers have a strong grounding in the liberal arts, and that they develop strong speaking and writing skills. *"It's great to be able to do the math, but if you can't explain orally or in writing what you have done, much of the value of your work will be lost, and limitations will be placed on your ability to advance."*



A native Californian, **Nancy Rickert (Piepho)** attended SCU from 1988 through 1992 and graduated from SCU in 1992 with a Bachelor's degree in Civil Engineering. While at Santa Clara, Nancy was active in student activities and had the distinction of leading the ASCE student chapter from 1991 through 1992, a period during which all the officer positions in the ASCE chapter were held by women.

After graduation, Nancy moved to Seattle, Washington where she worked for Turner Construction while simultaneously pursuing graduate studies in Structural Engineering/Construction Management. As she got more involved

ALUMNI IN FOCUS .. Cont'd

with her studies, Nancy decided that construction was her passion and after a short one and one-half years of study with full-time employment she received her Master's degree in Construction Management from the University of Washington. Shortly after graduation Nancy joined the team at Sellen Construction Company (a firm with 62 years of experience and a construction volume of \$350 million last year) where she is a Project Manager. Her position and responsibilities at Sellen have included project engineering, budgeting, estimating and scheduling, and managing subcontracts. The majority of her work has focused on medical facilities: in particular, Swedish Medical Center and Children's Hospital of Seattle. Nancy notes that one of the toughest and most rewarding aspects of her job is working with owners, state and federal regulations, standards and specifications for hospitals, and where projects involve renovations, extensions and retrofits, working with hospital personnel to ensure ongoing activities are not impaired and patient comfort and safety. Nancy reflects that one of many critical skills for getting her jobs done on time and on budget is the ability to work and effectively communicate with all constituents in the construction process. She is looking forward to working on a major bio-tech/research project for Vulcan and the University of Washington.

Nancy resides in Seattle with her husband, Eric Rickert, a firefighter with the City of Bellevue and their two beautiful children, Alex (7) and Lauren (4). Nancy's outside interests include playing soccer with an all-women's soccer league (indoor and outdoor), camping, Geocaching, reading and hosting dinner parties.

The civil engineering department is proud to have Nancy and Mark as alumni and we wish them continued success with their careers and families.

Events Calendar

ASCE Career Fair: February 13, 2006, California Mission Room, Santa Clara University

ASCE Workshop for Student Chapter Leaders: February 13-15, 2006, Hilton Salt Lake City Center, Salt Lake City, UT

Mid-Pacific Concrete Canoe and Steel Competition: April 28-30, 2006, University of California-Berkeley, Berkeley, CA

Senior Design Conference: May 4, 2006, School of Engineering, Santa Clara University, Santa Clara, CA

FE Exam: April 22, 2006 (Application postmark deadline: February 17, 2006)

PE Exam:

General Civil: April 21, 2006

Seismic and Surveying: April 22, 2006

Next Issue

Senior Design Highlights

Cold-Formed Steel Research at SCU

Performance of Landfill Liners in Seismic Events: A Joint Effort between SCU Engineers, University of Cambridge (England), Dundee University (England) and Loughborough University (Scotland).

When we build, let it not be for the present use alone. Let it be such work as our descendants will thank us for.
(John Ruskin, English Philosopher)