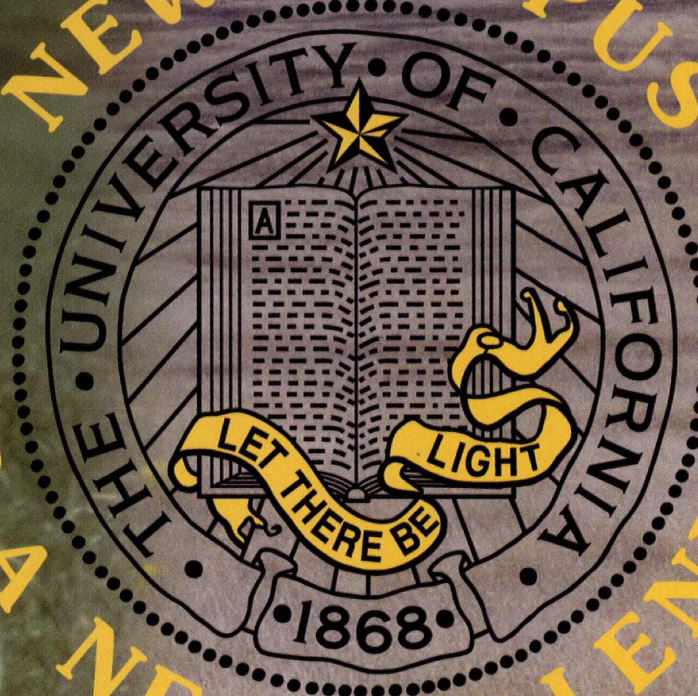


NEW CAMPUS
FOR A
NEW MILLENNIUM



Alliance FOR Minority
Participation

In Science, Engineering and Mathematics

QUARTERLY
WINTER 2000

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CAMP STATEWIDE

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serves as lead campus and
administrative center for CAMP
systemwide

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achievement in science, mathematics,
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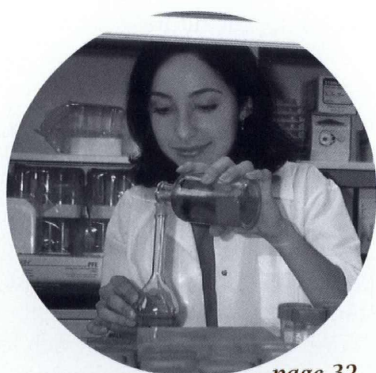
COVER: New campus for the new millennium: site of the University of California's tenth campus at Merced, scheduled to open in 2005. Approved by the Governor, the Regents and the Legislature, UC Merced will serve the Central Valley, a 400-mile area in which the students have been underserved. Chancellor Carol Tomlinson-Keasey heads the effort to build the campus from ground zero. An interview with Tomlinson-Keasey, and a profile of the campus development begins on page 14.

QUARTERLY

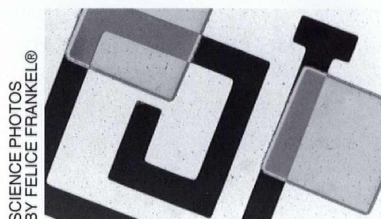
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PHOTO BY FON GOBLE

Vice President Al Gore made a spirited visit to Merced, UC's tenth campus. See page 14.

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Lawrence Livermore National Laboratory Undergraduate Research Semester poster session includes UC Davis graduate

Research interns at Sandia and Lawrence Livermore National Labs presented work completed in a 16-week internship program, having participated in long-range research under the mentorship of a laboratory staff scientist and engineer. Among them is **Miguel Garcia**, UC Davis June 1999 graduate with a B.S. in physics. Garcia completed his internship in December. He was a participant in CAMP and in MURPPS (Minority Undergraduate Research Participation in the Physical and Mathematical Sciences). Garcia will be profiled in the Spring 2000 *CAMP Quarterly*. His research, "Novel Diode-Pumped Solid State High Average Power Laser Design," was supervised by Luis E. Zapata, Laser Science and Technology, LLNL, Office of Defense Programs, U.S. Department of Energy.



Ricardo Miledi

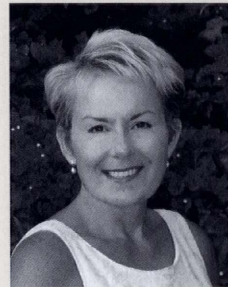
Ricardo Miledi wins science award

Dr. Ricardo Miledi of UCI has been awarded Spain's 1999 Principe de Asturias Prize for Scientific Research for discoveries that may lead to more effective treatments for depression and other mental illnesses. The distinguished neurobiologist received the award in Oviedo, Spain, in ceremonies presided over by King Juan Carlos and Queen Sofia. A prestigious international jury hailed Miledi for unraveling fundamental scientific answers to questions about how nerve cells communicate. Miledi is a recipient of the King Faisal Foundation International Prize for Science and the Queen's Medal by Great Britain's Royal Society last year. In March 2000, he will receive the UCI Medal, the University's highest honor.

UC Santa Cruz's ACE Honors Program wins presidential award for excellence

Starting the new millennium on a high note, the Academic Excellence (ACE) Honors Program at UC Santa Cruz received the **Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring**. Nancy Cox-Konopelski, director of the ACE Honors Program, accepted the award at the White House in December. UCSC is among five institutions and 10 individuals to receive the award. The Division of Natural Sciences established the ACE program in 1986 to help students succeed in entry-level undergraduate science courses. "The ACE Honors Program is unique because it is co-curricular rather than extra-curricular," Cox-Konopelski said. Over the past 12 years, the ACE program has helped approximately 2,000 students succeed in introductory-level courses in biology, calculus, chemistry, and physics. ACE graduation rates and participation in undergraduate research are also higher than average. The national award, administered and funded by the National Science Foundation, includes a \$10,000 grant and a Presidential certificate. ACE was featured ("ACE is the place") in the Fall 1999 *CAMP Quarterly*.

Welcome to the millennium edition of the *CAMP Quarterly*. Quantum physicists, I'm told, often find it easier to explain events by



assuming time runs backward as well as forward. For this issue, we follow their lead in examining the past and the future in a tumbler of eclectic topics.

It is a fitting time to look over CAMP benchmarks. It is equally opportune to look ahead to the building of the University's tenth campus. UC is once again renewing its pledge to serve the citizens of California by providing opportunities in a once remote area. With the new campus on the drawing board, UC shapes tomorrow in profound ways that will impact a whole new generation of students. The interview with Carol Tomlinson-Keasey shows how a seasoned administrator uses her savvy to lead the development.

Guest contributor Chancellor Orbach of Riverside shares his views on the faces of California's campuses, and NSF Director Rita Colwell offers a vision for the future.

Felice Frankel photographs and digitally images science and engineering in laboratories at MIT and throughout the country. Working in collaboration with scientists, Frankel's work explores images and meaning.

The special profiles of *CAMP* participants reflect the dual nature of student and faculty commitment.

We all can't be in Greenwich for the new millennium, celebrating where time begins. But from our own window on the world we can savor the excitement of being alive at the dawn of the next 1,000 years. Cheers!

Margaret DeMartino

GUEST EDITORIAL
BY RAYMOND L. ORBACH
Chancellor, University of California, Riverside

The Faces of California's Future

Look at the faces around you on a University of California campus. There is no better place to define the term "multi-cultural." When I look around at the University of California, Riverside, I see the faces of California's future. I am proud to say that every one of these young people earned a spot at our campus on their academic record alone. Our responsibility to these students is to see to it that they receive the finest education possible; that they become leaders, economically, politically and in the educational sphere, for the state of California and for the nation.

This is not just some kind of noble ideal, but a true imperative if our large and diverse state is going to remain a world leader in productivity and innovation in all of these fields. In a post-affirmative action world, our recruitment efforts must start earlier, to make sure that all students have the chance to qualify for the UC system. To ignore the need to keep our campuses diverse is, quite simply, to fail in our mission of education.

It has been our goal, in the wake of Prop. 209, to show that we can find additional ways to reach out. These new tools are more time-consuming, but they are proving to be successful.

For a variety of reasons, not the least of which is an active and aggressive recruitment program, the UCR campus is known for both its growth and its diversity. A tidal wave of young people, the offspring of the



Chancellor Raymond L. Orbach

"baby boom" generation, has already started to flow onto college campuses. By the year 2005, UCR projections show enrollment growing from the current 11,600 to 17,000 students. Five years later we expect to top 22,000. Just this last fall, for the first time in our history, we enrolled more new freshmen who identified themselves as African-American, Chicano/Latino, and Native American than any other UC campus. Our charge is to make sure that these students — the face of California, the future of California — are included among those receiving their doctorates 10 years from now.

The UCR-CAMP (California Alliance for Minority Participation in

Science, Engineering and Mathematics), ably directed by Professor Emeritus Carl Bovell, is one program that helps level the playing field for our underrepresented students.

We also have an extensive network of partner programs with local schools to reach out and prepare students for the university long before they get here. The social, economic and cultural vitality of California, especially in our region of the state, depends on UCR's successful engagement with K-12 education.

For instance, faculty members from mathematics and from the School of Education have joined hands to create MATE (Mathematics Academy for Teaching Excellence), which offers support to math teachers who want to make sure their students are adequately prepared for the rigors of higher education.

MATE provides teachers with an extensive professional library of materials, stipends, release time from the classroom, credits toward continuing education and new ideas that are interesting, purposeful and relevant to college coursework.

UCR's Early Academic Outreach office offers one-on-one academic advising, parent leadership institutes, test preparation, and one-week summer residential academies in writing, science and mathematics, including calculus for the most advanced students.

UCR reaches students as early as seventh grade, and sometimes even earlier, while they still have time to prepare for the UC system. We also

RAYMOND L. ORBACH CURRICULUM VITAE

Education

Ph.D., Physics, University of California, Berkeley

B.S., Physics, California Institute of Technology

Selected Honors and Awards

Toastmasters International Communications and Leadership Award (Inland Empire, District 12)

Excellence in Economic Development Award, The Valley Group

Andrew Lawson Lecturer, UC Riverside

Faculty Research Lecturer, UCLA Raymond and Beverly Sackler

Distinguished Lecturer in Physics, Tel Avia University

Phi Beta Kappa

Tau Beta Pi, Sigma Xi

National Science Foundation Postdoctoral Fellow, Oxford University

Academic Positions

Chancellor, UC Riverside

Professor of Physics, UC Riverside (1992 to present)

Lorentz Professor, University of Leiden, Leiden, The Netherlands (1987)

Provost, College of Letters and Science, UCLA (1982-1992)

Joliot Curie Professor, Ecole Supérieure de Physique et Chimie Industrielle de la Ville de Paris, France, (1981-82)

Visiting Professor, Catholic University of Leuven, Leuven, Belgium, (1977)

John Simon Guggenheim Memorial Foundation Fellow, Tel Avia University (1973-74)

National Science Foundation Senior Postdoctoral Fellow, Imperial College, London (1967-68)

Professor of Physics, UCLA (1966-1992)

Associate Professor of Physics, UCLA (1963-66)

Assistant Professor of Applied Physics, Division of Engineering and Applied Physics, Harvard University (1961-63)

National Science Foundation Postdoctoral Fellow, Oxford University (1960-61)

place student mentors on middle and high school campuses. These mentors look for students who are just out of reach of the UC system, and they help bridge the gap with tutoring sessions, concurrent enrollment at a community college or counseling for a family problem.

It is nearly a cliché to say that higher education is the key to economic prosperity. We are taught that from such an early age that it almost rings hollow. But statistics produced by the Kellogg Commission on the Future of State and Land-Grant Universities recently turned that sentiment into concrete terms. Just the act of attending and graduating from college increases the average person's chance of obtaining a higher paying job. On average, a college graduate earns 30 percent more than a high school graduate. Someone with a master's degree earns 30 percent more than a bachelor's degree holder. With a professional degree, earnings soar to 230 percent above the bachelor's degree level, and four times what the average high school graduate earns.

While individual students have their own hopes and dreams for their post-university future, it is also in the society's best interest to close the economic gap between the "haves" and the "have-nots" by encouraging young people whose families did not attend college to enroll and to stay long enough to pursue graduate degrees.

We can do this by making sure that when students arrive, they feel included in the learning process, in the community of scholarship and they see their various cultures reflected in the curriculum, whether it be in the scientists held up as models or the faculty members serving as mentors.

We need to make sure they are challenged intellectually by what they hear, and not alienated by it. Fortunately, scholarly developments are addressing this question of the university structure. This can be seen most clearly in the arts, humanities

and social sciences. A theoretical revolution within the academic disciplines is transforming the subject matter and methods of study. Assumptions have been called into question and in many cases discredited. Within the context of this period of theoretical reformulation, the growing awareness of cultural diversity in the United States has generated a remarkable expansion in the list of texts and artifacts counted as worthy of study. Many scholars now recognize that most cultural production by women and members of ethnic minority groups were previously suppressed and excluded from "mainstream" culture because of a bias toward the works of white male artists and writers. Many of these prior aesthetic criteria need to be reexamined and challenged.

The same process must be applied to other areas of the university curriculum, including the physical and theoretical sciences.

We need to engage our students of the twenty-first century with a research and teaching agenda reflective of the enrichment brought by decades of ethnic and gender-based studies. They must become a part of the learning process and identify with the scholarship developments within the academy. This opportunity can only be found in an environment of diversity.

I will conclude with my fondest hope for CAMP students system-wide: that they feel well-prepared for college; intellectually challenged once they get there; and able to pursue their highest dreams. At the University of California, the tools we need to continue our journey toward true equality in the new millennium cannot be limited to our university campuses. We must reach into the grammar schools, the middle schools and the high schools to prepare students equally for the life that lies ahead.

At UCR, we are doing just that.

DR. RITA R. COLWELL
DIRECTOR, NATIONAL SCIENCE FOUNDATION

ADDRESS TO SACNAS

Society for Advancement of Chicanos and Native Americans in Science
Portland, Oregon, October 8, 1999

delighted to be here

I am delighted to be here today. I've had an extraordinary visit to Oregon this week. I've been to the depths of the ocean in the ALVIN to see first-hand the thermal vents at Juan de Fuca Ridge and traveled to the crest of information technologies with a tour of Intel. Yesterday, I visited Portland State for the NSF Grants Workshop. Last night, I had the opportunity to meet many of you and talk about careers in science and your goals and aspirations. These discussions are most exciting and energizing for me. First, I always learn something new. And, second, I feel a strong sense of security that the next generation of researchers holds ever more promise for our future.

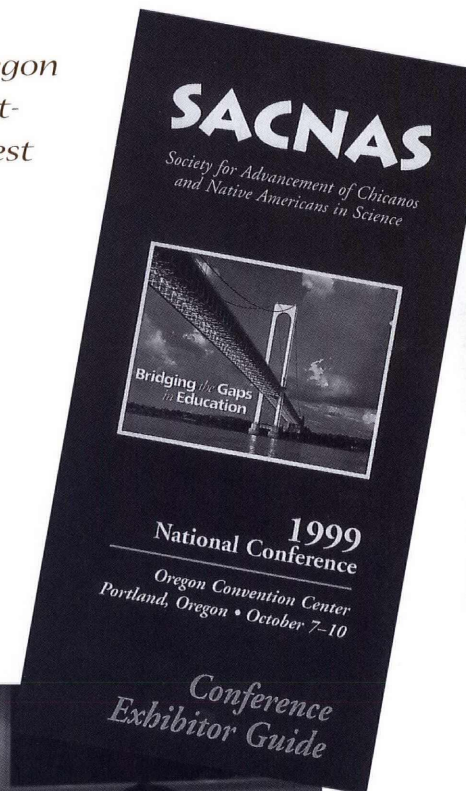
I come to the conference filled with enthusiasm about what we can do together to lead the nation into a promising 21st century. This year, NSF is celebrating its 50th anniversary. I would be honored to be the NSF Director at any time, but during this landmark year it is a distinct privilege. I don't think it is an overstatement to say that the Foundation has helped our nation stay at the frontier across all scientific disciplines for five decades. We look forward to the next five decades with excitement and a sense of adventure.

In keeping with the spirit of new horizons and a better future, we at NSF depend heavily on our strong connections with you at SACNAS. You help inform us of the

changing environment and the evolving needs of students preparing for careers in science and engineering. We also depend on you to spread the word among your



Dr. Rita Colwell, second from left, met with students at SACNAS, following her keynote address opening the conference. She told them, "You will bring [to America] a creativity from the core of your diversity."



constituency about our initiatives and programs. We cannot maintain our position on the cusp of the future without you—you have the network and the know-how to get the word out. In essence, all of you here today will be among those who contribute to advances in science, improvements in our nation, and benefits for the world community.

In order for us to attract first-rate candidates for NSF's Graduate Fellowships, we will not only depend heavily on your outreach but also on your feedback. We want to know the consensus and the concerns. There is a powerful piece of Navajo wisdom that describes the philosophy that directs our work. It says, "When all peoples have the same story, then humans will cease to exist." It is from the vast "pot pourri" of perspectives, insights, attitudes, and understandings that we come to the best decisions and wisest judgment in our society.

The outreach efforts on your part will insure NSF and the nation of having the important advantage of diversity in our talent pool. Diversity for our nation's science and engineering enterprise creates a fabric of strength. In every recent economic study and report, human capital is identified as the key to overall success. In that light, NSF has made the "21st century workforce" a primary focus for our education initiatives. We know that the nation's work force needs are changing rapidly and dramatically.

Alan Greenspan, Chairman of the Federal Reserve Board, spoke of *The Interaction of Education and Economic Change* in a speech he gave in February at the American Council on Education. He said, "The history of education in the United States traces a path heavily influenced by the need for a workforce with the skills required to interact productively with the evolving economic infrastructure. ... America's reputation as the world's leader in higher education is grounded in the ability of... versatile institutions, taken together, to serve the practical needs

of the economy and, more significantly, to unleash the creative thinking that moves our society forward."

Let me repeat, "to unleash the creative thinking that moves our society forward."

Our economy is increasingly based on advances in science and technology. That trend will not only continue, but escalate. You see evidence of this everywhere.

A recent change in the Washington, D.C. economy has driven that new reality home to everyone in the Washington metropolitan area. The federal government has been the largest employer for many years. But today, as we speak, technology services employ more people than the government. The new owner of our hockey team made his money at AOL. Technology leaders are taking local governments to task for better roads and schools. This is historic change. We all know that it is just the tip of the iceberg in terms of our

Shoe Machinery Corporation. Everything was built around the concept of a main line manufacturing town. Now, the biggest employers in Beverly are in health care, scientific and technical instruments, and information services. That's just a snapshot from one city in one state, but it reflects the changes that are taking place across the nation.

Let me point out two important aspects of these changes: First, we are more productive than ever before. For every hour of work, we Americans produce twice as much as we did in 1960. Second, our fastest-growing job categories are all in professions with significant educational requirements: areas like medical technologies, financial systems, and multimedia. Our compass heading is pointing directly to an economy based on knowledge and ideas. Discovery and innovation have been a driving force behind our economic gains. They are the keys to our continuing economic leadership

Lead the nation into a promising 21st century

"This is a landmark time to lead NSF..."

The outreach efforts on your part will insure NSF and the nation of having the important advantage of diversity in our talent pool."

very near future. We are literally living in a different landscape. I notice the changes most dramatically when I go back and visit my hometown of Beverly Cove, Massachusetts (next to Pride Crossing if that helps you recognize where it is). I can't help being struck by how much it's changed.

The four-room schoolhouse I went to is now a subdivision. The rock quarry where I used to go to collect tadpoles is another subdivision. While new development has changed the landscape, economic transformation has changed people's lives. My father made his living in the construction industry. When I was growing up, the biggest company in town was called the United

in the future. Given these trends, a critical goal for NSF and for SACNAS is to expand the talent pool in science and technology.

In order to *jumpstart* that goal, NSF has just launched a new partnership called *Jumpstart 2000*, also known as *your chance to build a better century*. This is a public-private partnership—the largest of its kind—that presents a science and technology challenge for students K through 12. *Jumpstart 2000* aims to teach all youngsters what research is about. You start by finding a problem—something that concerns you or your community. It could be a health risk, a polluted stream, or suburban sprawl. Then, tell why the problem is important and how



science and technology can help solve it. Simply put, it asks kids to use science and technology to make their communities and the world a better place. It represents a national effort to create a significant change in attitudes. We aim to build a continuing involvement of our nation's youth in real life problem solving—in situations that impact their lives. Best of all it gets young people engaged and promotes awareness of the problems that surround them.

I hope you will spread the word in your own communities because the contest has an additional impetus for minority youth populations. We all know that the earlier we can ignite the interest of young people in science and mathematics the more likely they are to swim in those waters with a sense of familiarity, belonging, and confidence. I have made it my personal mission to reach across borders and boundaries to encourage the most diverse mix of talent to careers in science and engineering.

As Director of NSF, I have a major podium to highlight this goal—the same goal, I might add, that NSF has been committed to all along. The demographics of our

nation are changing dramatically, and by the year 2050, the Census Bureau projects that we will be a majority of minorities. The 21st century workforce will, by virtue of our changing population, be increasingly diverse. This increasing diversity is an expanding opportunity for our nation. In fact, a recent issue of Fortune magazine had an article entitled, “Where Diversity Really Works, America's Best Companies for Minorities.” The article tells us that, “companies that pursue diversity outperform the S&P 500.” What better proof could we ask for. This tangible example captures the essence of what Federal Reserve Board Chairman, Alan Greenspan, meant when he spoke of “unleashing the creative thinking that moves our society forward.”

Let me share with you a very different example from the spring 1999 issue of *Winds of Change Magazine*, the quarterly from the American Indian Science and Engineering Society. One of the articles features three Native American beadworkers describing the mathematical and cultural insights they have gained through their craft



Veronica Reyes, UCSB chemistry major, won recognition for research excellence with the SACNAS Vigil Poster Presentation Award.

and how they have applied those insights.

Shirley Reader, one of the three, is a student at Utah State University and will soon graduate and realize her dream of being a teacher. She explained, “When you do loomwork, it is important to know that you always must string your loom so that you have an odd number of beads in each (horizontal) row. This is because the median (bead) acts as

the center point. You use it to flip your pattern so that one side will mirror the other.”

She goes on to say, “We can use this idea with children learning math. How many times as a student did you hear your teachers tell you that what you do to one side of the

equation, you must do to the other? This beadwork example makes this idea real for children. I tell my own children to think of the middle bead as an equal sign so that their patterns are symmetrical.”

Each of you here today brings rich insight from your own cultural

experience and perspective.

America’s science and engineering needs to be enriched by you and your special talents. You will bring a creativity from the core of your diversity. We as a nation are grateful for the opportunity to tap that unique wellspring.

...creativity from the core of your diversity

1999 SACNAS PARTICIPANTS

UC IRVINE

Gina Artavia, Applied Ecology
Sergio Bustamante, Chemistry
Dora Castañeda, ** Biological Sciences
Alex Cortez, ** Chemistry/
Biological Sciences
Erick Ferran, ** Biological Sciences
Karen Fleming, Biological Sciences
Briz Garcia, Mechanical Engineering
Fernando Gonzalez, Electrical Engineering
Raquel Gulas, Information & Computer Science
Victor Guzman, Biological Sciences
Carlos Herrera, Computer Engineering
Noel Ruiz, Information & Computer Science
Richard Sanchez, Biological Sciences
Richard Silva, Biological Sciences
Ruben Soqui, Mathematics
Kika Friend, CAMP Coordinator

UCLA*

Robert Carrillo, Cybernetics
Elsa Chavez, Life Sciences
Cynthia Chavira, Neuroscience
Armando Del Portillo,
Microbiology & Molecular Genetics

Anthony Fermin, Microbiology & Molecular Genetics
John Gonzales, Physiological Sciences
Christine Greene, Microbiology & Molecular Genetics
Encarnacion Gutierrez, Civil Engineering
Luciana Kohatsu-Arce, Molecular, Cell, & Developmental Biology
Gamaliel Lorenzo, Physiological Sciences
Karla Muñoz, Biochemistry
(See page 32 for feature on Muñoz)
Rosario Rubio, Molecular, Cell, & Developmental Biology
Ajiemar Santiago, Biochemistry
Kelly Smith, Molecular, Cell, & Developmental Biology
Efrain Talamantes, Biochemistry
Scott Heimlich, CAMP Coordinator

UC RIVERSIDE*

Roberto Arellano, Electrical & Mechanical Engineering
Maricela Covarrubias, Biology
Carlos Gaeta, Chemical Engineering
Awilda Jimenez, Biology
Ruben Maldonado, Biology
Nicole Munoz, Biological Sciences
David Quintero, Computer Science
Monica Villarreal, Chemistry
Adriana Rubalcaba, Mathematics
Omar Zuniga, Mathematics
Teresa Cofield, CAMP Coordinator

UC SAN DIEGO

Carmen Carrillo, Animal Physiology/Neuroscience
Anna Cervantes, Molecular Biology
Alejandro Dearie, Biochemistry
Alex Diaz-Lamas, Animal Physiology/Neuroscience
Mauricio Dujowich, Animal Physiology/Neuroscience
Rosemary Garcia, Biology
Liliana Gavino, Biochemistry
Nuvia Guerra, Biochemistry/Cell Biology
Benjamin Leon, Mechanical Engineering
Romina Lopez, Environmental Chemistry
Claudia Oropeza, Biochemistry
Michael Palmer, Biochemistry
Carlos Uranga, Biology
Brian Youngblood, Physics
Sarah Richards-Gross, CAMP Coordinator

UC SANTA BARBARA

Andres Salazer, Biology
Veronica Reyes, Chemistry

UC SANTA CRUZ

Sarah Cordova, Biology
David Garcia, Biology
Laura Macias, Biochemistry
Marlene Robinson, CAMP Coordinator

*Students funded by CAMP, affiliated program, and SACNAS

**See page 36, CAMP-Toshiba Scholars

FACULTY PERSPECTIVE
BY DEREK DUNN-RANKIN
Professor of Mechanical and Aerospace Engineering
CAMP Regional Director, UC Irvine

Undergraduate Research and Faculty Mentoring

An important component of many undergraduate programs (especially CAMP) designed to encourage students to stay in the sciences, engineering, mathematics, and technology (SMET) arena is the opportunity for “research.” Whether or not the emphasis on these research opportunities is warranted and whether or not UC faculty should participate in them is something I’ve examined more closely since I’ve become CAMP Regional Director.

There are two principal areas where involving undergraduates in research has an impact. First, the involvement allows a framework for informal interactions with faculty, graduate students, and post-doctoral researchers, making the academic enterprise more accessible and familiar. This familiarity correlates positively with persistence and retention in the university. Second, being involved in research illuminates the environment and the opportunities available in graduate school. One helps students attain the bachelor’s degree and the other encourages students to achieve advanced degrees. In addition to these graduation outcomes, there is an expectation that learning motivated and intertwined with research is inquiry-based. Learning based on inquiry is thought to generate the creative and independent leaders that

the University of California intends to produce in order to ensure a robust future for the state, the country and the world.

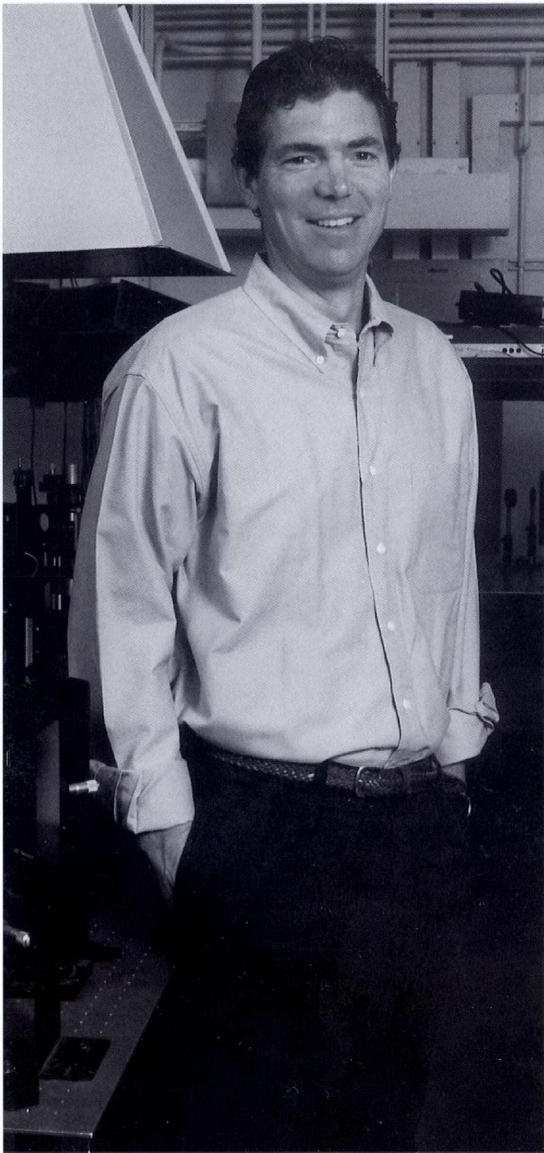
I have come to realize that the relationship between undergraduate research participants and those continuing in graduate study is overwhelming. For example, in a review of the Summer Grant Programs of AIURP/CURSORS/SURE, 68% of participants had pursued advanced degrees after graduating from college. Certainly the students who choose to participate in these research programs are more likely to be considering graduate school in the first place, so the causality of undergraduate research and graduate enrollment is not quite clear. The presumed value of undergraduate research as preparation for graduate research is very clear, however. Nearly all graduate research institutions will weigh positively an undergraduate research experience when evaluating candidates for admission and support. The statistics mentioned above refer to a research program in an undergraduate teaching institution, and it is likely that even higher percentages of those participating at research universities will continue on to graduate school. This is a pipeline issue, and there are direct positive implications for involving undergraduates in research for the simple

purpose of maintaining a well-trained population of graduate school applicants.

The concept of providing research opportunities for graduate-school bound undergraduates is not particularly lofty or subtle. A student with early training in research will make a better-prepared graduate student, one that is ready right away to contribute to the research enterprise. It is more interesting to examine the value of an undergraduate research experience for students who are not considering graduate study.

There are direct positive implications for involving undergraduates in research for the simple purpose of maintaining a well-trained population of graduate research applicants.

There is evidence that undergraduate research can help with student retention. Apparently (and I am a novice here, so please evaluate these statements with some care), the most significant model of student retention in college is due to Tinto (1987). The model postulates that the four key elements of university



Professor Derek Dunn-Rankin

survival comprise: (a) adjustment, both socially and intellectually to the new world of college; (b) difficulty, as related to the meeting of academic standards; (c) incongruence between the interests of the individual and of the institution; and (d) isolation produced by insufficient contact between the individual and other members of the social and academic communities. Academic and social integration is essential to student persistence, and one powerful feature of undergraduate research is that it can aid in this integration. In particular, being involved in a research effort helps students understand the academic environ-

ment and it advances their academic skills. Several other studies demonstrate a high correlation between informal student/faculty interaction and persistence (Pascarella, 1980; Ferguson, 1990; Pascarella and Terenzini, 1980).

In a more recent interview-based study, Nordquist (1993) has confirmed the principal features of the Tinto model and pointed out a further interesting finding. Persisting in college for all students can be strongly influenced (either positively or negatively) by “a single informal faculty-student interaction.” The suggestion is that there is not a simple relationship between the amount of interaction and the persistence, but that it is more like a switch being thrown. One positive interaction has a magnified positive effect on student persistence. This finding, while resulting from a limited number of evaluations, is consistent with my own experience and the experiences of several of my colleagues. It is not far different from the influence

that the one memorable elementary, middle, or high school teacher has had on so many successful students. The finding also suggests that with a little mentoring effort (e.g., a single undergraduate research experience), retention could be improved substantially.

The Carnegie Foundation for the Advancement of Teaching sponsored Boyer Commission report on educating undergraduates in the

“One positive interaction has a magnified positive effect on student persistence.”

research university is titled “Reinventing Undergraduate Education: A Blueprint for America’s Research Universities.” This report includes an Academic Bill of Rights. The Bill says that at research universities, students have a right to expect and be given the opportunity to work with talented researchers to help and guide their efforts. It further states that the number one (of 10) methods for changing the way undergraduates are educated is to move toward inquiry-based learning, “... education by inquiry demands collaborative effort; traditional lecturing should not be the dominant mode of instruction in a research university.” The basic idea of learning as inquiry is the same as the idea of research, and involving undergraduates in research is an effective mechanism for discovery-based learning. The Boyer Commission suggests that involving undergraduates in research should not be a special situation, but rather part of the regular fabric of learning in a research university.

I believe there are three main justifications for investing effort in the involvement of undergraduates in research: (1) for students graduate school bound, the research experience will ease the transition to graduate school and will make the students more effective researchers sooner; (2) involvement of students in a mentored research experience is a powerful and effective retention mechanism that will boost the rates of graduation and lead not only to a more educated population, but one that is sympathetic to the importance of education; and (3) research is fundamentally inquiry-based learning and is the kind of teaching that should be offered at research universities in order to ensure the kind of creative graduate necessary for the health and vitality of human society.

Unfortunately, simply recognizing the benefits of undergraduate involvement in research is the easy part. It is the implementation that is the real challenge. Although all faculty would agree that an impor-

tant mission of the University of California is undergraduate education, there is an alluring (and at times overwhelming) demand for creating new knowledge in research. Hence, even if we all agree that involving undergraduates in research is an important inquiry-based educational experience for the student, what can we say about their impact on the creation of new knowledge? That is, what if the faculty take the point of view that they will participate in activities only if those activities increase their research productivity? Is there then an advantage to taking on an undergraduate in research? In the idealized view of the Boyer Commission report the answer is yes since, "Inherent in inquiry-based learning is an element of reciprocity: faculty can learn from students as students are learning from faculty."

But such reciprocity requires that undergraduates change their attitude toward learning. They must recognize themselves as part of the team of inquirers that includes graduate students, post-doctoral researchers, and faculty. In some fields of endeavor (particularly biological sciences), this team viewpoint has worked very well. The undergraduate student works with graduate students, other researchers, and faculty to develop the skills necessary to carry out some part of the investigation (e.g., dissection, cell staining, DNA separation and replication, electron microscope imaging, chemical analysis, etc.). Working side-by-side with other researchers, the undergraduates learn naturally how the process of knowledge creation occurs while contributing to the gathering of data. The examples of this kind of team effort research project are demonstrable successes (see, for example, the awards received by CAMP students). Conversations I had with the very impressive undergraduate students who were presenting their work at the SACNAS conference reiterated the value of this team effort.

Often, however, faculty are

engaged in research that is highly theoretical, and it is not likely that any undergraduate will have sufficient training to understand, let alone contribute to this research. These same faculty members have been known to lament the lack of training of even graduate students, and they instead rely on post-doctoral researchers for reciprocal and shared relationships in discovery. The trouble with this attitude is that there is an implied hierarchy of research that discounts faculty endeavor involving undergraduate efforts. That is, how does one respond to the question, "how can your research be truly cutting-edge if an undergraduate can be involved in it?" While this attitude is clearly nonsense, since even the most sophisticated of experimental research has somewhere some hardware that undergraduates can master, it has a detrimental effect on faculty commitment to undergraduate research.

How then can an undergraduate student be mentored in theoretical research? If the research involves the running of a computer program that has already been developed, this is something that might be accessible to undergraduates. Library research can also be a useful consideration.

For example, one undergraduate student was asked to research the history of a mathematical construction. An undergraduate student might even be asked to translate for the lay public the goals and values of theoretical research, helping to bridge the esoteric language used by those in the field to terms understandable by an educated audience. With a bit of creative effort, it seems to me likely that all faculty members could develop a research project scoped appropriately for undergraduates. What should undergraduates be expected to accomplish?

I prefer to think of undergraduate research less in terms of research product and more in terms of research enterprise or research process. Through their research

experience, undergraduates should recognize how difficult research is and how much effort is required to generate publishable material. They should understand that it is important to put all research in perspective, both with regards to what has been done in the past, and where the research might lead in the future. An undergraduate researcher should: (a) know whether they are repeating work done by others or breaking new ground; (b) know what the piece of the research they were responsible for was meant to accomplish; (c) know the details of any procedure they followed in data collection or reduction; and (d) categorize and evaluate the results of their investigation.

“I prefer to think of undergraduate research less in terms of research product and more in terms of research enterprise or research process.”

In order for an undergraduate in research to achieve the understanding mentioned above, I believe that two elements in the mind of the research mentor are critical. First, the research mentor must have a genuine interest in and commitment to the research problem posed to the student. Without this interest, the research experience is compromised because it is the enthusiastic search for answers that marks an active research effort. A “make-work” research problem is second-rate and can not properly represent the true research enterprise. Second, the research mentor must believe that the student can accomplish the research tasks assigned. There is a challenge in posing tasks that are realistic given the undergraduate student’s skill set, but once posed, there should be an absolute expectation of performance. In general, undergraduate research process and

Dunn-Rankin continues on page 44

FELICE FRANKEL:

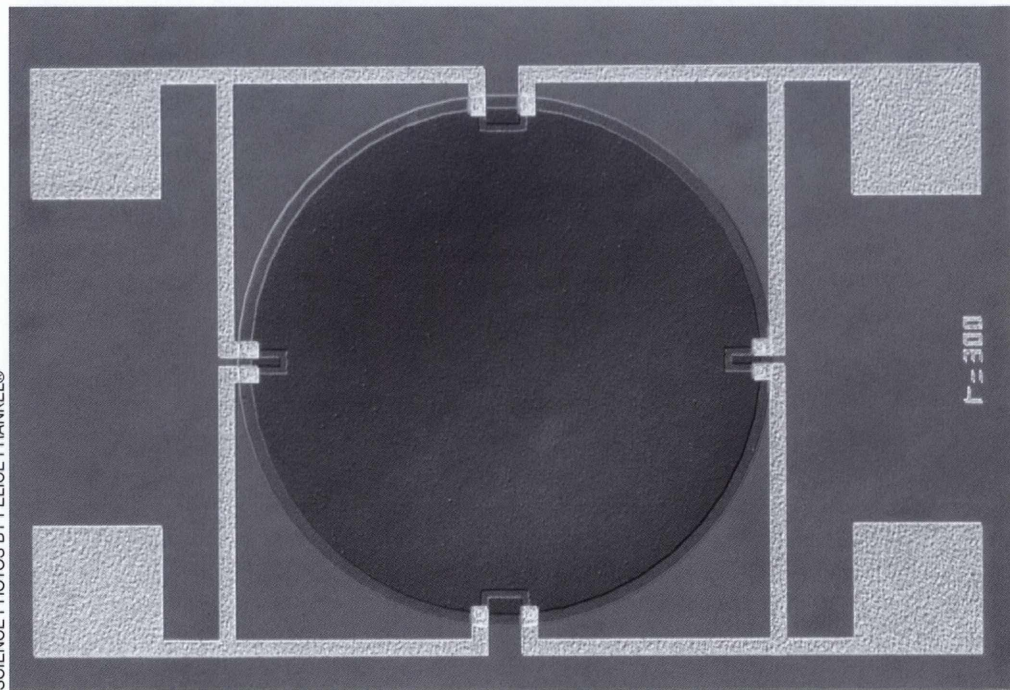
Science from an artistic point of view

Science photographer Felice Frankel conveys her work uniting art and science in "The Power of Images: Communicating Science and Technology," to be presented February 10, 2000 at the Beckman Center of the National Academies of Sciences and Engineering. Frankel is one of fourteen visiting lecturers in the UCI Chancellor's Distinguished Fellows Series. Her exhibition, "On the Surface of Things, Images of the Extraordinary in Science," may be seen at the Beckman through 2000.

Another exhibit, "Envisioning Physics," was commissioned by the American Physics Society to celebrate its 100th anniversary in Atlanta, March 1999.

Her book, "On the Surface of Things," with text by noted Harvard chemist, George M. Whitesides, was published by Chronicle Books in 1997. Frankel's emphasis on the beauty inherent in science brings an aesthetic component to scientific documentation, one that may be used as a tool to draw children to science itself. Looking into science allows them to ask questions and to feel comfortable about it.

"The response to my images particularly from young people is



SCIENCE PHOTOS BY FELICE FRANKEL®

Microscopic image of micro pressure sensor, measuring small changes in pressure.

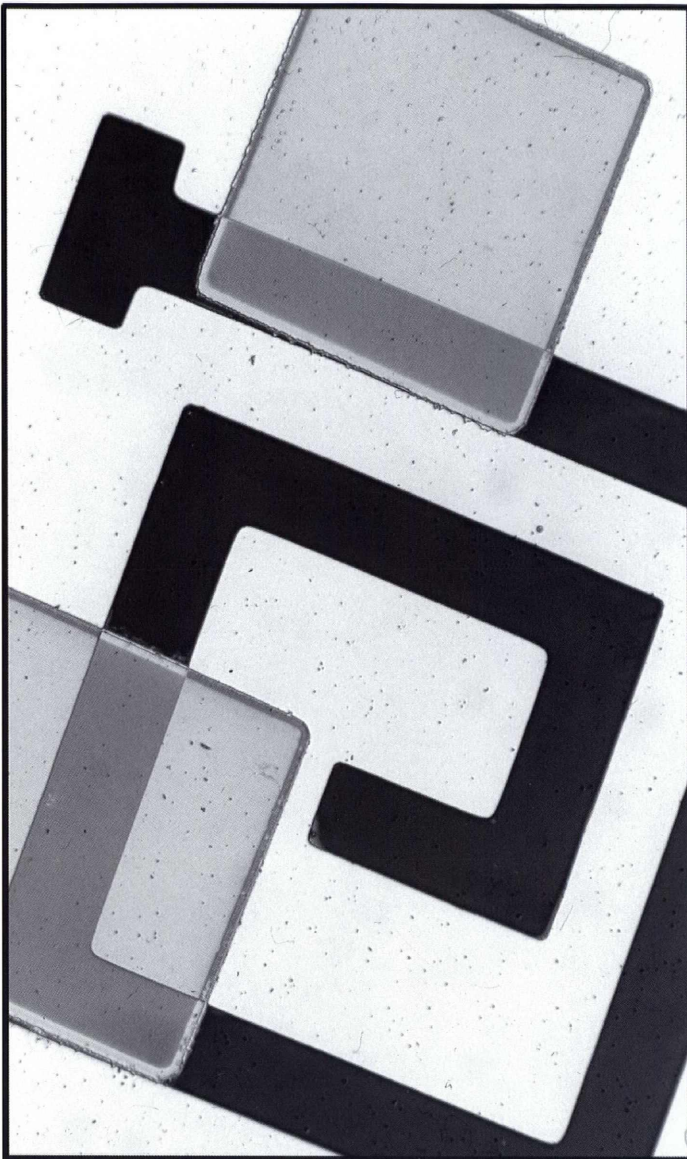
remarkable. Children are drawn to the images," she said.

Frankel uses innovative photographic technology to produce abstract beauty. Her work is shown on the covers of *Science News*, *Science*, *Nature*, the *Journal of Physical Chemistry*, *The New York Times*, *MIT publications* and others.

Her images are recognized for their poetic treatment of color and texture in the natural world.

"That's what I'm about," she says. "I bring the artist's point of view into the science laboratory."

She enjoys conducting critique sessions with faculty and students in small groups, much like a graduate



Above, a microscopic image of layered polymer; right, a 5-inch glass wafer has very fine lines etched onto it for possible application of chemical analysis on a very small scale. Frankel's solo exhibitions include the Chicago Museum of Science and Industry, Musee de L'Elysee (Switzerland), and the New York Academy of Sciences.

seminar, to look closely at computer generated images and discuss the creation of visualization.

"There is usually too much information. . . . you don't know it until somebody else comes and looks at your work." One of the things she enjoys talking about is lighting, how that emphasizes certain structures.

Frankel and her colleagues are planning a conference at MIT in June 2001, part of "Image and Meaning,

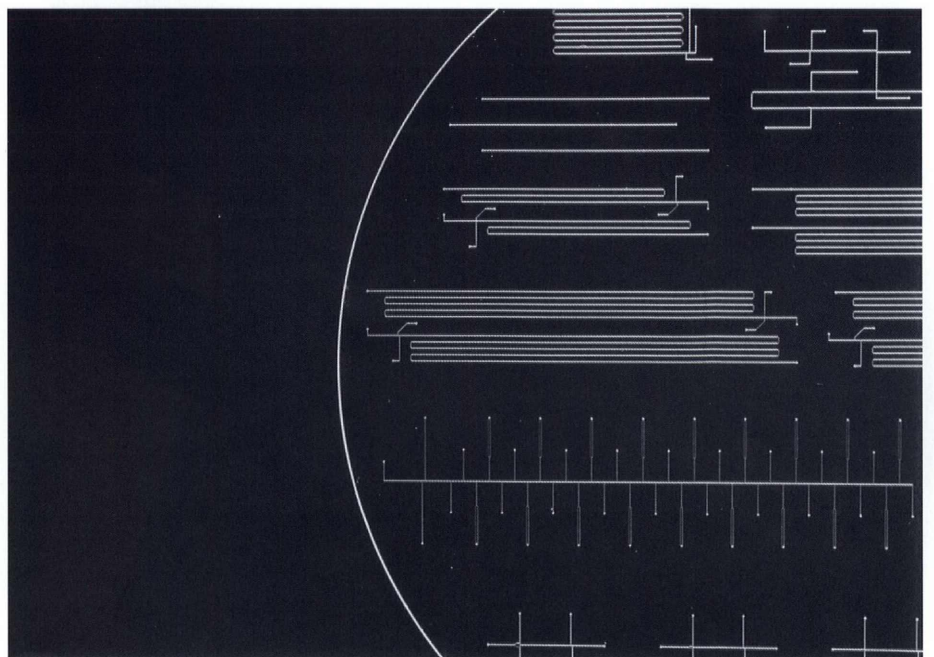
Communicating Science and Technology," an initiative to promote new collaborations among scientists, image experts, and science writers. This major event will convene researchers in all disciplines, journal editors and art directors, science and biomedical imagers, photographers, illustrators, animators, modelers, writers, museum exhibitors and TV and film producers.

She is working on a National Science Foundation project, "Envisioning Science and Engineering," which will incorporate a visual vocabulary of science into curricula and develop a guidebook for students and researchers. Frankel will be starting a NOVA series in March 2000.

Frankel, who has received grants from the National Endowment for the Arts and the Graham Foundation, is a Guggenheim fellow and artist-in-residence in science and technology at MIT. She has been a Loeb Fellow at Harvard University.

She will conduct a seminar for interested CAMP participants, centered on student-generated images. (See *events calendar on page 45.*) More of her work may be viewed on her website: web.mit.edu/edgerton/felice/felice.html

"I bring the artist's point of view into the science laboratory."



MERCED: NEW CAMPUS FOR A NEW MILLENNIUM

Imagine for a moment that you are a California pioneer with 10,000 acres to develop. You have a vision, a plan, a team of engineers and architects—and you have secured the water rights. From where you stand, the Sierra Nevadas reign in the distance, and in all directions, open land beckons. It is a thrilling prospect, peppered with equal amounts of promises and problems. If your name is Carol Tomlinson-Keasey, your mind's eye sees futures rising from the land, represented by the buildings of higher education.

What better way to begin a new century than by planning for the education of future generations. Forecasting, trendsetting, and leading the curve are, after all, synonymous with California. Historically, waves of settlement have swept over the Golden State, from the early enormous ranches and farms to the gold rush, the railroads and the westward migration that hasn't ceased since the era of the dust bowl and the return of servicemen from World War II. California is a cornucopia of many things, not the least of which is its system of higher education. The University of California's tenth campus at UC Merced, approved by the Governor, the Regents and the Legislature, will shape northern California's agricultural heartland in ways yet to be discovered.

Leading the effort is Carol Tomlinson-Keasey, a seasoned administrator well-equipped for the task. Chancellor Tomlinson-Keasey has built her management skills over three decades, through an array of service, beginning as a new Ph.D. at Berkeley, and continuing through increasing responsibilities at Riverside, Davis and the Office of the President. Academic positions include dean of the College of

CAMP QUARTERLY INTERVIEW WITH

Carol



Is there a particular aspect of your service to the university that helps prepare you for the task ahead?

As I try to build this campus, all of my experience comes into play, from working with the senate to recruiting 500 outstanding faculty, to being dean of two colleges. All of those kinds of experiences are things I will need to draw upon to make this a success.

Do you have a mentor?

I have had many and I appreciate them all, from one of my first professors at Berkeley who was a woman. She was very well-known nationally, and she had a husband and children and she managed to do it all. I watched her very carefully and learned a lot from her, but also I learned from Rosemary Schraer, who was the first woman chancellor at Riverside—and the first woman UC chancellor. More recently, I learn



Tomlinson-Keasey

Chancellor, UC Merced

By Marjorie DeMartino

from Larry Vanderhoef. I only wish I could be half as good a chancellor as he is. He just does everything right in my book. And Judd King at the Office of the President is such a wise, sensible person who has kept his sense of humor as different issues explode. I've learned a lot from all sorts of people.

Were you part of the site selection for the tenth campus and what are some the criteria that led to choosing Merced?

I was not on the site committee, but I have spoken to those who were and there were different criteria for each stage of the process. Over 100 possible sites were narrowed through the process of elimination down to eight, and, as it happened, those eight were all in the Central Valley. Then the eight were narrowed to three and then to one. At each of the steps, the committee employed criteria and characteristics. Water was a very big concern. In the end, there were several factors that led the Regents to consider Merced. One was the fact that the water to the site was assured and was a known



Where does the UC Merced story begin? A dream for the future is one answer. Here, these youngsters, part of an outreach program called "Kids Around the University," are trying to imagine what the campus will look like. Some day they may be engineering majors. Their suggested plans may be viewed on the UC Merced web site: www.ucop.edu/ucmerced/uckids.htm

MERCED: NEW CAMPUS FOR A NEW MILLENNIUM

Humanities and Social Sciences at Riverside and dean of the College of Letters and Science at Davis. Of her many accomplishments, she sees her role in bringing 500 top faculty to the university among the most important. Recently, she served as vice provost for academic initiatives and senior associate to the UC Office of the President. As vice provost she helped launch the California Digital Library and initiated a UC center in Fresno.

Along her academic career path, she has had "many mentors," including Larry Vanderhoef, during his chancellorship at Riverside, and then at Davis, and Judd King, in the Office of the President, who inspires "level-headed and thoughtful responses" to explosive issues. Throw in to the hopper the fact that Tomlinson-Keasey is a licensed psychologist, and you have someone who knows not only how to manage university business but also to mediate and liaison with many sectors. Service on systemwide committees, including the task forces on diversity, improving undergraduate education, distance learning (particularly relevant to serving the Central Valley), and grievances and complaints brings additional dimension to her repertoire of considerable skills. If ever experience is the passport to leadership, it is true here.

What will the new campus be like? Certainly it will be a place where students examine and understand their personal values. Certainly it will reflect the University's mission of intellectual development and life-shaping experiences. Its students will develop leadership ability and promote involvement in community service. UC Merced will define its own special character and atmosphere, and its buildings will reflect multiple cultures. These core attributes become immediately apparent when Chancellor Tomlinson-

commodity. Water in the Central Valley, as you know, is very highly regulated. At some of the other sites, we were not confident that we could get the water that we needed to build out a campus that will ultimately serve 25,000 students.

Will you share your thoughts on the site?

It's a beautiful site. You've got the Sierra Nevada in the background, and on the right day, with binoculars you can see Half Dome. What a fantastic opportunity it is, to maintain the beauty of the site and introduce students to higher education.

For the start-up phase, you must seize on a variety of things.

Where do you begin planning for a brand new campus?

We are working on about five fronts right now. One of the big things is the physical planning and we have multiple kinds of activities going on, including addressing environmental issues and getting the permits. We are beginning the long range development plan, and have to do an environmental impact report—and think about breaking ground. Simultaneously, on the academic side, we are thinking about the first appointments, and we're about to search for a director of the Sierra Nevada Research Institute, which will be one of the foundational aspects of the campus.

What are some of the issues related to the area's remoteness?

One of the issues is ensuring that all students in the Central Valley have access to the campus, so we are working on developing multiple sites—in Modesto, Fresno, and Bakersfield, with the hub of course being at Merced. We are thinking about technology—and starting at ground zero, there are lots of ways we can use technology.

And of course we are concerned about fund raising. We have many different strands in process. The valley is one of the unsung areas of California. People sort of know the valley is there, but they don't understand the expanse of it. We are talking about a 400-mile area in which the students have been underserved. We need to involve more of them in the University of California and in higher education.

Have you any preferences for the campus's architectural design?

We're a way from making that kind of decision, but I would like the architecture to reflect the heritage of the valley in some way. I don't quite know what that means, but it doesn't mean skyscrapers. I'd like to have multiple cultures represented.

How has the local community—the civic and business leaders—responded?

The community is extraordinarily supportive. As a chancellor, you couldn't ask for a more gracious, welcoming community than this.

CAROL TOMLINSON-KEASEY

EDUCATION

Ph.D., UC Berkeley, Developmental Psychology, 1970
M.S., Iowa State University, Psychology, 1966
B.A., Pennsylvania State University, 1964

ADMINISTRATIVE EXPERIENCE

Senior Associate to UC Office of the President
Vice Provost, UC Office of the President, Academic Initiatives
Vice Provost, Academic Planning & Personnel, UC Davis
Dean, College of Letters and Science, UC Davis
Vice Provost, UC Davis
Chair, Department of Psychology, UC Riverside
Dean, College of Humanities & Social Sciences, UC Riverside
Chair, Human Development Program, UC Riverside

TEACHING EXPERIENCE

Professor, UC Davis
Professor, UC Riverside
Visiting Associate Professor, UC Riverside
Assistant and Associate Professor, University of Nebraska, Lincoln
Assistant Professor, Rutgers, The State University

PROFESSIONAL AFFILIATIONS

American Association of University Women
American Association for Higher Education
American Psychological Society
International Society for the Study of Behavioral Development
Society for Research in Child Development
American Psychological Association, Division 7

AWARDS & HONORS

Who's Who in America
YWCA Woman of Achievement in Science, UC Riverside, 1990
Distinguished Teaching Award, UC Riverside, 1985
Outstanding Educators of America, Psi Chi Psychology Honorary
Outstanding Young Individual, Sigma Xi Research Honorary



Every place I go, people are so eager to help, and anxious to offer their services in any way they can. I feel very lucky on that score. That is not to say that there are not issues we have to work together on. A lot of it is the university community and the county. We need to work together in very intimate ways on lots of tasks. Many folks are interested, some in having us use one or more of their products, especially in technology.

Chancellor Tomlinson-Keasey signs a "memorandum of understanding" with the National Park Service, creating a partnership for research and education.

MERCED: NEW CAMPUS FOR A NEW MILLENNIUM

Keasey speaks about the campus.

Working together with the community, UC Merced's founding chancellor faces a daunting task with unparalleled support. She says, "The [UC] chancellors have been very supportive. I have known most of them for a while, but I get to know them at a different level as a member of the council of chancellors."

An abundance of things demand attention; it's a happy predicament, with so much to do at once. As she balances multiple projects that address the need for roads, utilities, environmental impact, and the architectural design of the buildings themselves, she invokes the power of her first mentor at Berkeley who could "do it all." The Regents themselves see her as "someone who can get the job done." President Richard Atkinson, Governor Gray Davis, and Vice President Al Gore each have pledged support to Tomlinson-Keasey and the development of the new campus.

In conversation, it becomes immediately apparent that Tomlinson-Keasey also thinks photographically, keeping crisp focus on the area's geographic and demographic features. When UC Merced opens its doors to 1,000 students in 2005 the power of imagination will have been made real by commitment and concrete goals. From her position overseeing this ambitious enterprise, the future looks very bright indeed.

Our phone interview the day before she moved her office permanently to Merced and the determination in her voice reflect her passions and preoccupations. Little wonder these days she's a bit myopic. All day long, it's

**Merced,
Merced,
Merced.**

What will be the profile of a typical UC Merced student?

If you look at the demographics, one would predict that the student would be Hispanic female who would be transferring to the campus from a community college, and coming in as a junior in the area of her choice. That's based on the probabilities. Many will have an interest in science and technology. We hope to welcome 1,000 students when we open in five years.

How will you go about building the faculty for UC Merced?

Our first hire will be the director of the Sierra Nevada Research Institute. We have had an enormous range of help from the existing campuses. The faculty have been terrific. I have very much appreciated their graciousness and generosity in helping me plan the campus, and that's from the task force right



PHOTOS BY RON GOBLE

Chancellor Tomlinson-Keasey, center, enjoys ribbon cutting ceremony at the March 19, 1999 grand opening of the Merced Tri-College Center. She is assisted by Dr. Marvalene Hughes, President, CSU Stanislaus, and Dr. Benjamin Duran, President, Merced College.

down to scientists who are making recommendations on the Sierra Nevada Research Institute or the engineering program. For most of the hires, we will conduct a national search.

You are recognized as an outstanding professor. As chancellor, will you lose that part of your personality that lets you connect so well with students?

I always try to keep in my head that this is for the students. That's why we are embarking on this amazing project: to help students attain a higher education, and help them have productive lives as citizens of California and certainly of other places as well. If every day you say to yourself, 'won't it be great when the students walk on campus,' 'won't it be great when we have our first graduating class,' 'won't it be great when our first graduate starts his or her new company,' 'won't it be great when our students are publishing books'—all these things help me keep in mind why I'm doing this.

In Fall 2005, in your first address at the new student convocation, what will you tell your students?

I will ask them to think with me about what higher education means and what it means in their lives and how it will transform their lives. The opportunity to have an education is extremely valuable. In California we are so lucky because every student has a chance to work through the community colleges, or the CSU or the UC to take this critical step in their life path. I would want my students on that first day to share that vision with me.

What does diversity mean to you?

Diversity to me is accepting the array of differences and viewpoints that have made our country great. So from the university perspective,

we welcome diverse points of view. That's what university means: to welcome the whole universe of ideas. And that whole universe of ideas comes with expressions from very different communities and reflects different needs and backgrounds. So I would hope that UC Merced would be a monument to the diversity of ideas, the diversity of peoples, and the diversity of culture and heritages that have made California great.

You're a licensed psychologist. How has this training influenced your administrative work?

It has been very helpful to have that kind of background, and I'm sure I use it without thinking about it. That's just one set of skills that a chancellor needs: understanding human beings.

Do you have an immediate high priority for the campus?

Hiring the best faculty. That will ensure the success of this campus as quickly as anything I can do.

What makes a good chancellor?

High level of energy, sense of humor, ability to keep multiple projects going, and a broad view of education, especially higher education. Those would be four things you really need.

How do you replenish your energy?

I like to do a variety of active things. That helps clear my mind and let me think about the real issues rather than getting bogged down in details or obstacles. If I can walk or run or scuba dive, then I can approach things in the right perspective.

UC MERCED 1999 CHRONOLOGY OF EVENTS

JANUARY 6: Governor Gray Davis supports UC Merced in his State of the State Address.

JANUARY 21: University Community Concept Planning Core Group outlines three development scenarios.

JANUARY 22: Selection Committee for UC Merced announced.

JANUARY 29: UC Merced exhibit at Merced County Courthouse Museum.

FEBRUARY 10: UC President Richard Atkinson and Regent Davies agree on the University's commitment to Merced as location of the tenth campus.

FEBRUARY 18: UC Merced's importance to accommodating future UC-eligible students is highlighted in a new enrollment demand report.

FEBRUARY 20: UC Merced development concept unveiled for 10,400 acre community at University Community Planning Fair.

MARCH 18: UC Regents hear update on planning for UC Merced from Carol Tomlinson-Keasey and Trudis Heinecke.

MARCH 19: UC Merced joins in grand opening of Merced Tri-College Center, the result of UC Merced's partnership with Merced College and California State University, Stanislaus.

APRIL 21: Governor Gray Davis announces intention to appoint Odessa P. Johnson as a member of the UC Regents. Johnson is Dean of Community Education at Modesto Junior College.

MAY 13: UC Merced signs memorandum of understanding with National Park Service, Yosemite, Sequoia and Kings Canyon National Parks, creating a partnership for research and education.

JUNE 14: California Postsecondary Education Commission (CPEC) recommends approval of UC Merced.

JULY 15: UC President Richard Atkinson announces selection of Carol Tomlinson-Keasey as founding chancellor of Merced campus.

AUGUST 1: Tomlinson-Keasey's appointment as chancellor effective.

SEPTEMBER 30: Tomlinson-Keasey officially opens office in Merced.

See You There!

CAMP STATEWIDE 2000

UNDERGRADUATE RESEARCH SYMPOSIUM

APRIL 7-9, 2000 • UNIVERSITY OF CALIFORNIA, SAN DIEGO
ABSTRACTS & APPLICATIONS DUE FEB. 11

OBTAIN DETAILS FROM YOUR LOCAL UC CAMP COORDINATOR

EVENTS

Friday, April 7: registration, lab visits, campus tours, reception
Saturday, April 8: concurrent technical talks, dinner, beach party
Sunday, April 9: poster sessions, workshops, awards lunch

FEATURES

Special Guests
Faculty Chats by Discipline
Graduate School Recruiters
Personal Statement Workshop
Refining Presentation Skills Workshop

TOURS

San Diego Supercomputer Center
Scripps Oceanographic Institute Stephen Birch Aquarium
Biomedical Research Buildings
The Stuart Collection of Commissioned Sculpture

Math & Computer Science • Biology & Life Sciences
Physical Sciences • Engineering

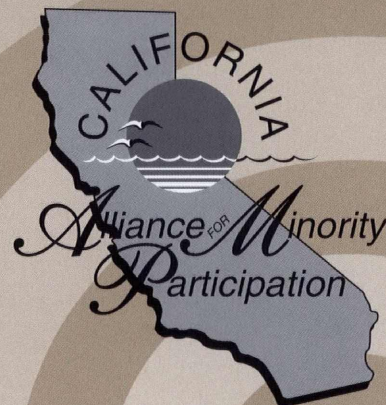
LOCATION

All Presentations and Workshops:
UCSD Faculty Club

Symposium Hotel:
San Diego Marriott La Jolla
East Edge of UCSD Campus
4240 La Jolla Village Drive
La Jolla, CA 92037
(858) 597-6332

The undergraduate symposium is a professional development opportunity for new and seasoned presenters.

Symposium Coordinator:
Sarah Richards-Gross
srichard@ucsd.edu



CAMP PARTICIPANTS!

CALL FOR ABSTRACTS

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Into the 21st Century

Welcome 2000!



*“We knew
we were creating
something
unprecedented
when we first
discussed the
Alliance for
Minority
Participation.
It started a
revolution.”*

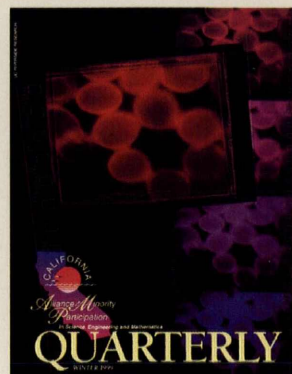
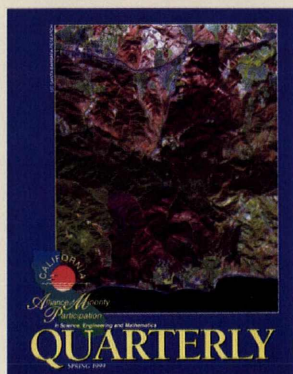
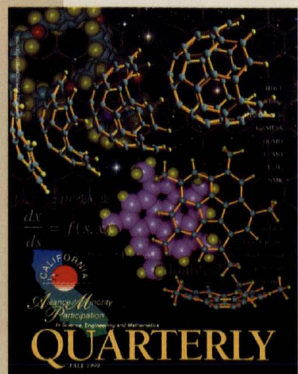
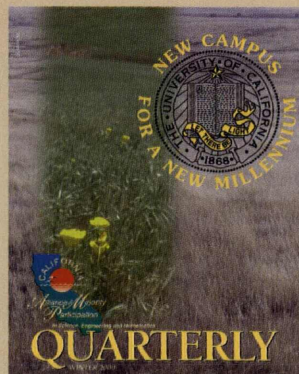
—Dr. Eloy Rodriguez,
Cornell University,
Founding P.I.

An exciting time, ushering in beginnings and endings and futures yet unimagined. Potential and unmatched opportunity. Threshold and watershed. A time fostering discussions of time and space, in an age where .com is part of our everyday vocabulary.

Every project has its roots and shoots and branches that at the outset extend in directions unknown. CAMP is such a project, catalyzed by a call for proposals for a brand new program offered by The National Science Foundation. The CAMP timeline began a decade ago when a core of UCI faculty and administrators met to collaborate on a program design whose time had come. What do students need to succeed? What can the university do to nurture their dream of a B.S. degree in science, engineering or mathematics—majors which traditionally had seen a high attrition rate for students from underrepresented backgrounds. Ten years ago, three leading UCI Professors— Eloy Rodriguez, Ralph J. Cicerone, and L. Dennis Smith—thought that faculty mentoring, focused on laboratory research, would engage students and sustain their interest and progress toward the degree. Their early collaboration shaped the program first at Irvine and then expanding to all eight UC campuses. Where they are today is another indication of their leadership in higher education: Rodriguez is an endowed chair at Cornell University; Cicerone is UCI Chancellor, and Smith is President of the University of Nebraska system.

Another individual who has been engaged since the concept was first entertained is Vice Chancellor Manuel N. Gómez. He continues to serve as the statewide executive director, overseeing fiscal integrity of the alliance. It signaled the first systemwide initiative that held a core of academic offerings focused on a single goal: to double the number of B.S. degrees granted to students in mathematics, science, engineering and information technology majors from underrepresented groups.

From their personal motivation and commitment to the opportunities afforded by CAMP, participants shine at local, statewide and national scientific symposia and conferences. In April 2000 they will converge upon UC San Diego for the CAMP Statewide Undergraduate Research Symposium. Who knows what future professors or science and engineering leaders will emerge? In the 1990s, UC students have grown and changed in many ways. In the new millennium they will be going where none has ventured before, and many, we hope, will become the new faculty for the University of California.



**CAMP Millennium Moments...
What a difference
a decade makes**

DECEMBER 1989

Dr. L. Dennis Smith, Dean, School of Biological Sciences, directs faculty committee to seek resources for women and minorities in science and engineering.

JANUARY 1990

National Science Foundation addresses "the pipeline problem:" how to keep minorities from turning off the path to careers in science, engineering and mathematics. Alliances for Minority Participation (AMP) comes into focus.

JULY 1990

NSF Planning Grant awarded to UCI to develop CAMP proposal. Conceptual process begins regionally and expands systemically.

JANUARY 1991

CAMP proposal forwarded to NSF by UCI Chancellor Jack Peltason. CAMP is multi-institutional program coordinated by UC Irvine. Principal investigators: Drs. Eloy Rodriguez, L. Dennis Smith, Ralph J. Cicerone. (Phase I: 1991-1995)

AUGUST 1991

Jack Peltason, L. Dennis Smith, Eloy Rodriguez, Manuel Gómez, Juan Lara visit NSF to negotiate CAMP cooperative agreement.

DECEMBER 1991

NSF funding for CAMP, \$5 million over 5 years, announced at press conference at UCI University Club.

SEPTEMBER 1992

CAMP begins with four UC campuses: UCLA, UC Santa Cruz, UC Davis, and UC Irvine; and CSU partners.

Message from the Statewide Director

The interesting coincidence of time and space we call the millennium makes this a special issue of the *Camp Quarterly*. Looking back over the nine years of CAMP, there have been numerous alterations and transformations, reflected in the evolution of this publication. As the world anticipates the revolutions a new century inevitably brings, those of us involved in CAMP humbly believe that this program represents a quiet revolution in the opportunities it has given to many students across the state.

We sometimes tend to think that leadership positions are reserved for the boldest and sometimes even most reckless among us; those independent souls unable or unwilling to adapt themselves to the status quo. But in truth, we all have moments in our lives when we become leaders, and these moments remain significant for us, whether they be modest or grand.

Creating opportunities for leadership through learning remains the cornerstone of CAMP. Despite the clichéd popularity of the notion that education equals power, it is a truth that we live by and instill in our students. Not only do opportunities for success multiply with years of education and degrees attained, but the mind's continuous expansion opens doors not even glimpsed or approached.

So with all this millennial madness, we decided to take a rather sane approach to this passage and revisit our unchanging commitment to learning and leadership. Every moment of our present and our past shapes and tones the future, and we need only reflect on where we have been to understand where we are now going.

Sincerely,

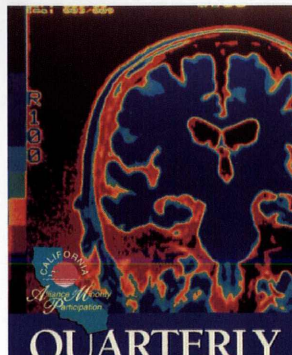
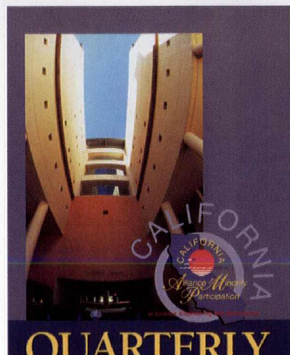
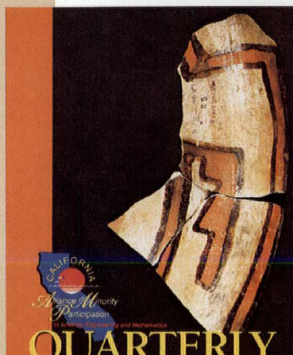
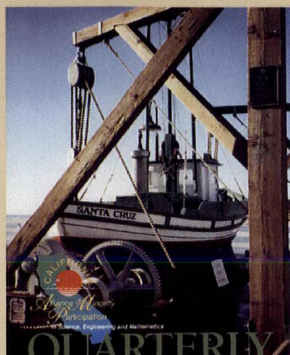
Manuel Gómez

Manuel N. Gomez
Vice Chancellor
Statewide Director, CAMP



"I'm so glad I had a role in CAMP as P.I., to provide leadership for undergraduate education. I myself was an undergraduate researcher, and it provided a gateway to my career in science."

—Dr. Laurel L. Wilkening, former chancellor, UCI





“It was energizing to plan CAMP and lay the foundation for what has become California’s model for undergraduate education in science and engineering.

I was proud to have announced that NSF would fund our proposal—considered very ambitious at the time.”

—Dr. L. Dennis Smith, President, University of Nebraska, Founding P.I.

Message from the Statewide P.I.

Recently I attended the National Science Foundation’s diversity programs meeting for project directors at NSF headquarters. Marjorie DeMartino and I represented CAMP, and participated in the AMP exhibits as well. Several speakers emphasized that the U.S. is challenged to build and sustain a strong scientific workforce and to ensure that our citizens have opportunities in science and engineering. Dr. Roosevelt Calbert addressed the AMP directors for the final time prior to his retirement, giving the following charge not only to the alliances but to all programs in the Human and Resource Development Division:

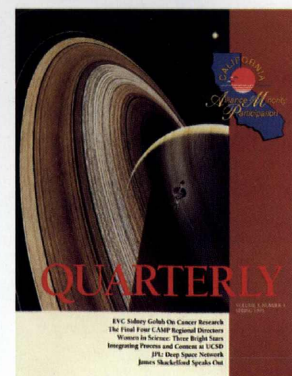
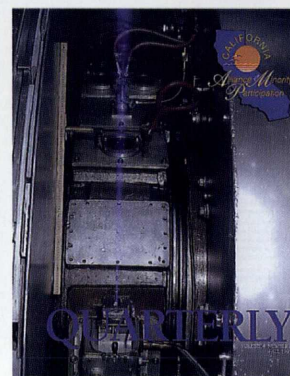
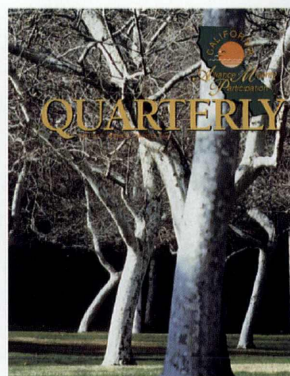
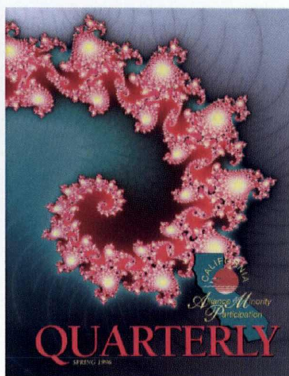
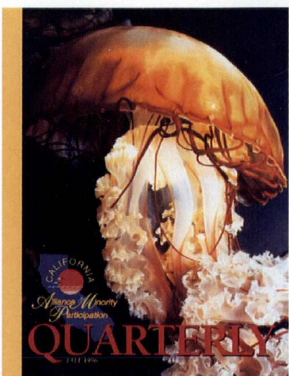
- Identify what works and share best practices
- Promote cultural change within the institution
- Maintain focus on accountability
- Increase collaboration among projects and awardee institutions

Synergy of effort was at the heart of Calbert’s message. He emphasized that the AMP program is the “center of gravity” in the diversity continuum. In California, we feel that UC is likewise the center of gravity for the state. It was an NSF study that reported not long ago that the UC produces more research leading to patented inventions than any other public or private institution in the nation. CAMP capitalizes on the research endeavor and promotes systemwide engagement with faculty in the laboratory. We hope that the CAMP model will serve to facilitate the goals of the new MGE consortium in UC. We also recognize that the scope of our work is expanded through MGE and through the opportunities offered through Cal State LA’s CEA-CREST initiative. I trust that the New Year will present us with fresh opportunity to ensure that CAMP reflects the nature of the University, embodied in the mentored research experience. On behalf of my colleagues systemwide, all good wishes for a Happy New Year 2000.

Alexopoulos

Nicolaos Alexopoulos
Dean, School of Engineering
CAMP P.I.

CAMP



MARCH 1994

EVC L. Dennis Smith accepts presidency of University of Nebraska system; Eloy Rodriguez accepts appointment of endowed chair at Cornell University; Laurel Wilkening takes helm as UCI Chancellor and CAMP P.I.

MAY 1994

CAMP presented to UC Regents. CAMP receives permanent allocation through Regents Diversity Initiative.

SEPTEMBER 1994

CAMP expands to all eight UC general campuses, each with regional faculty director and program coordinator.

JULY 1995

CAMP hosts the national AMP undergraduate research conference.

JANUARY 1996

NSF approves "Phase II" CAMP award of \$5 million (1996-2001).

MARCH 1996

Wilkening presents CAMP to National Science Board, convened at UC Davis.

APRIL 1997

Wilkening, an astrophysicist, takes students to view Comet Hale-Bopp, with its 40 million-mile-long tail. The last time the comet visited Earth was 4,200 years ago. It won't be back for some 2,400 years.

SEPTEMBER 1998

Dr. Nicolaos Alexopoulos, Dean, UCI School of Engineering, begins appointment as CAMP Statewide P.I.

JANUARY 1999

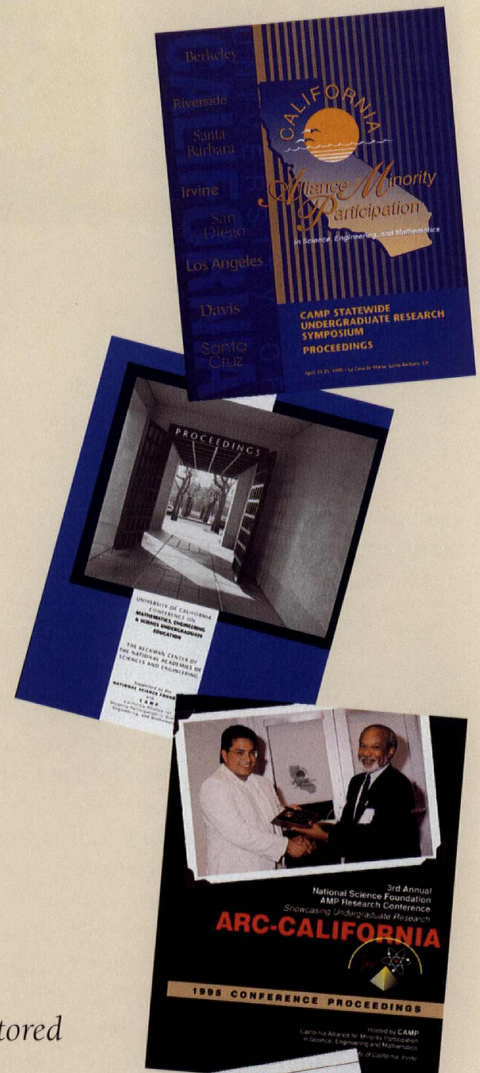
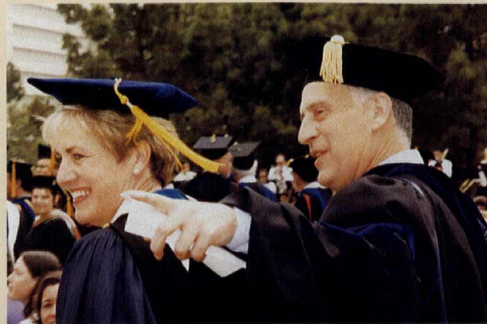
CAMP contributes to a 73% increase in UC minority SEM B.S. degrees granted, since baseline year, 1990-91.

APRIL 1999

CAMP Statewide Undergraduate Research Symposium.

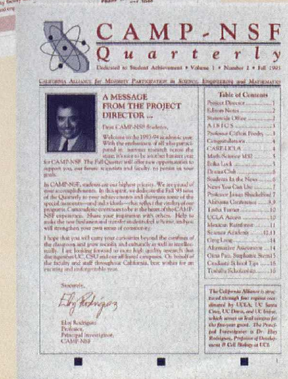
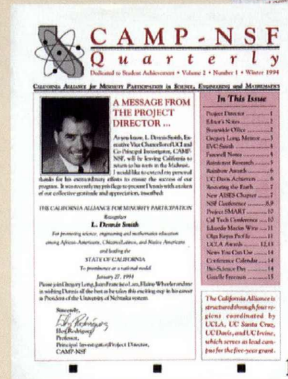
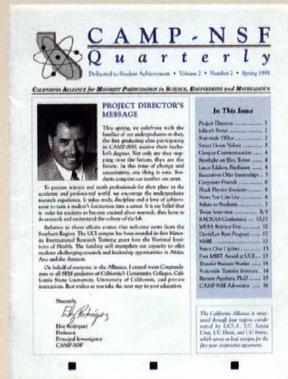
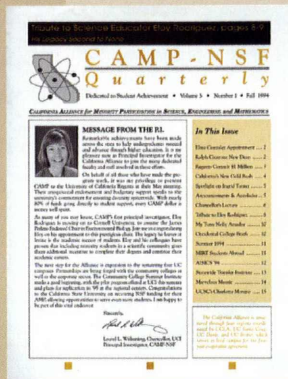
JANUARY 2000

21st issue of CAMP Quarterly.



"I strongly support CAMP's approach to mentored research experiences, and I try to take in their presentations whenever I can. Students gain an unbeatable foundation for graduate school."

—Dr. Ralph J. Cicerone, Chancellor, UCI, Founding P.I.



STUDENT SPOTLIGHT

Luis Rodriguez

UC SAN DIEGO ENGINEERING MAJOR

“My goals are to complete a bachelor’s degree in mechanical engineering, and a masters in robotics to improve healthcare delivery and to help people overcome disabilities through mechanical aids. From a young age, I have been interested in health related issues, especially after the death of my grandmother. Consequently, my personal goals go beyond a college degree and economic stability. They include helping the community to overcome poverty through education and establishing a scholarship fund for talented and inspired students.

I have participated in the elementary school outreach program for the Society of Hispanic Professional Engineers, held in conjunction with the UCSD School of Engineering. The program reaches children at a young age and cultivates their interest in science and engineering throughout their elementary and high school years, in hope that they will pursue a career in the sciences. This experience has enhanced my leadership and communication skills, in addition to providing me with the opportunity to influence our youth.

One of my academic achievements includes being the first in my family to attend a four-year university. In order to accomplish all my personal goals I need to achieve academic success. I have been the recipient of the Provost’s Honors Award and the William Stout Scholarship. I have also accepted two research opportunities that have proved very enriching. These summer research projects have helped me gain valuable research experience, and they have provided

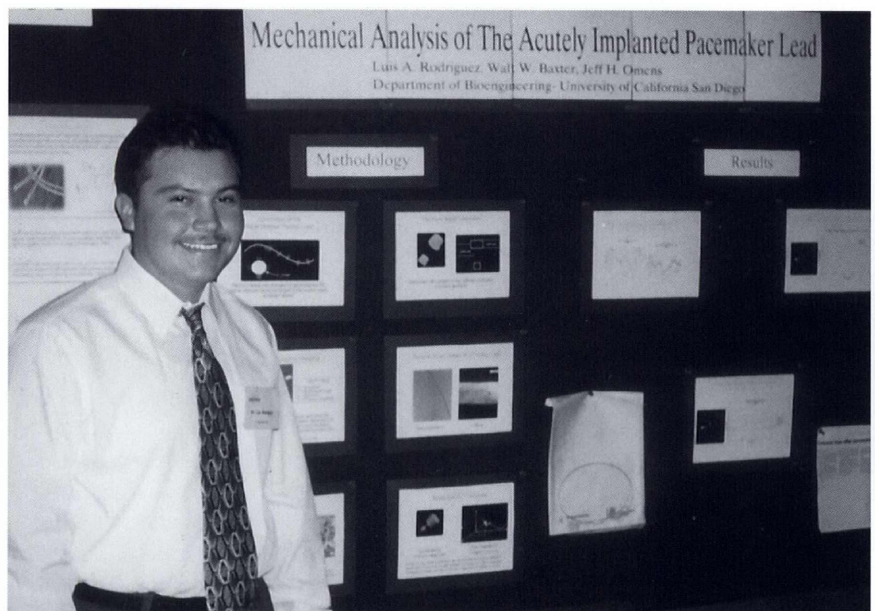
me with mentors. Most importantly, these experiences have reinforced my interest in health related issues and improved my communication skills.

In the summer of 1998, I had the privilege to participate in the CAMP Summer Research Program sponsored by UCSD’s Academic Enrichment Programs. The program proved to be extremely valuable, since it exposed students like myself to research, resources, and most importantly to potential mentors. It also offered a GRE mock exam and provided GRE workshops to improve our scores. In addition, we were awarded a stipend to help with our expenses and reduce our financial burden during the academic year.

We were encouraged to submit our abstracts to national conferences, such as SACNAS (Society for the Advancement of Chicanos and

Native Americans in Science). A large number of UCSD students, including me, were invited to attend. Undergraduates, graduates students, post-docs, faculty and world-renowned researchers attend this conference to share resources and advice. As a result, I was encouraged to speak to San Diego high school students about my research project in hopes of motivating them to pursue a career in the sciences or engineering.

I also attended the National LSAMP conference in Montana as well as the annual SACNAS conference, where I received a poster award. I learned about graduate school and most importantly whether or not I want to do research. My abstract on medical devices is the result of my participation in CAMP-mentored research.”



Luis Rodriguez presented his research project “Mechanical Analysis of the Acutely Implanted Pacemaker Lead.” He has won a Nokia Scholarship.

Microbiology affords dynamic, rewarding career

By Jane Wong

State of California, Public Health Microbiologist

Microbiology has evolved into a large field of biology. Not only are there millions of different kinds of microorganisms to study, but microorganisms are also used as “lab animals” in many research areas. Where would molecu-

lar biology be without *E. coli*? My particular field of microbiology, Public Health Microbiology, involves identification of microorganisms which are of clinical or public health significance, and in determining if organisms involved in an “outbreak” are related to each other. We are like medical detectives, where we have to find out the

characteristics of a microorganism or a group of microorganisms to solve a problem. Our purpose is to protect the health of the public by finding out the cause of illness and finding ways to prevent further spread of disease.

I have worked for the State of California for 29 years, and have become experienced in identifying a

wide variety of microorganisms which make their way into California. I have also had to keep up with changes in the field of microbiology, and there have been many. In 1970, for example, no one knew about Legionnaire’s Disease, Toxic Shock

Syndrome, AIDS, Lyme Disease, or Hantavirus Pulmonary Syndrome. There were no DNA probes, Polymerase Chain Reaction (PCR) assays, gene mapping techniques, ribotyping or pulsed field gel electrophoresis (PFGE) assays.

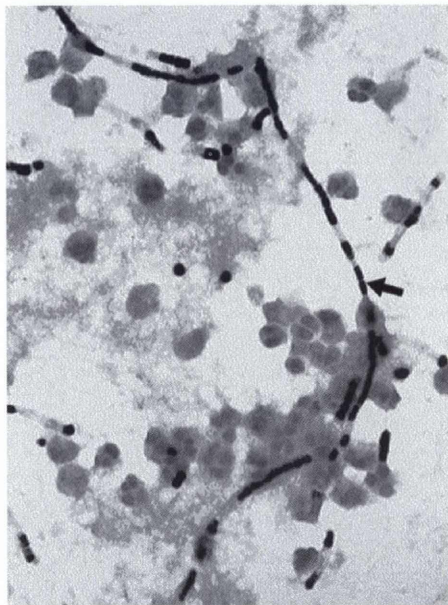
My favorite microorganisms are those which cause severe disease in both humans and animals (zoonotic

diseases)—although they are rarely seen in California. Anthrax, brucellosis, plague, and tularemia (caused by *Francisella tularensis*, which was named for Tulare County in California, where it was first described) are examples of zoonotic diseases. Plague is the disease that caused the “Black Death” in Europe in the 14th

Century. It is caused by an organism named *Yersinia pestis*, and it is found in ground squirrels in California, especially in mountainous areas. It is spread by flea bites. The State Health Department tests squirrels that are found dead in areas such as campgrounds. If the rodents are found to have plague, measures are taken to keep people away from these areas until the fleas can be killed. An experienced microbiologist can recognize these bacteria by the way they grow and the way they look under the microscope.

Many public health laboratories perform the laboratory work for public health clinics, and so may perform tests for tuberculosis or sexually transmitted diseases as well as on environmental samples. For example, they may test water and milk to be sure that they meet standards. In larger public health laboratories, subtyping of microorganisms is done to determine sources of contamination in food and other consumable items. Some of this subtyping is done using molecular biology techniques such as plasmid analysis, PFGE, ribotyping or nucleic acid sequencing.

Because California has a large and diverse population, with visitors from all over the world, a wide variety of infectious agents are submitted to public health laboratories for identification. Some of these are extremely rare and exciting to see and identify. For example, travelers who drink unsafe water bring



Gram stain of the organism that causes anthrax. With permission of the Massachusetts Society of the New England Journal of Medicine.

interesting intestinal parasites back to California. People who eat cheese made with unpasteurized milk may become infected with an organism (*Brucella* sp.) which causes a disease called brucellosis, milk fever, or undulant fever. Although it can be treated with certain antibiotics, it may not be diagnosed unless a microbiologist identifies it when it is isolated from a patient. Melioidosis is a disease caused by an organism which is not found in the U.S. The causative organism is called *Burkholderia pseudomallei*, and it is found in wet tropical soil. Melioidosis is difficult to diagnose without identifying the causative agent because the illness resembles other illnesses, such as tuberculosis. This organism has been isolated from California patients who have traveled in Southeast Asia and Central America.

Working for a state laboratory provides opportunities to collaborate with the Centers for Disease Control in Atlanta, which is our national reference laboratory. My job has given me opportunities to meet microbiologists from all parts of the globe who work on the same microorganisms. Professional organizations, including the American Society for Microbiology, also provide opportunities to hear experts and to meet others in the same field.

A career in public health microbiology is intellectually stimulating because the field is constantly growing and changing. It also gives a sense of public service, since the purpose is to improve the health of the people in the community. There is a lot of satisfaction in solving a diagnostic problem and helping a patient to become healthy again.

—See the American Society for Microbiology's web site for more information on microbiology as a career: www.asmtusa.org

MGE

Minority Graduate Education

UC Forms Systemwide Consortium For New NSF Grant

The National Science Foundation has awarded three University of California campuses each with a Minority Graduate Education (MGE) award to significantly increase the number of minority science, mathematics, engineering and technology (SMET) students pursuing graduate degrees and to fuel the faculty pipeline. The campuses at Berkeley, Irvine and San Diego received three of ten awards made nationally, laying the foundation for a UC systemwide consortium for MGE.

Dr. Martha Mecartney, UCI Professor of Engineering and Associate Dean of Graduate Studies chairs the MGE Steering Committee for the consortium. Dr. Colette Patt of UC Berkeley serves as co-chair. The UC Graduate Deans comprise key membership of the committee, as do representatives of CAMP and MESA-MEP (Mathematics Engineering Science Achievement/MESA Engineering Program) as well as additional administrators from the UC Office of the President. A broad integration of efforts for academic enrichment and retention distinguish the MGE, which has the potential to enhance diversity among the faculty in California higher education.

The overall goal of the MGE is to contribute to the national agenda to triple the number of underrepresented minorities receiving doctorate degrees each year in SMET disciplines over the next five years. In so doing, it will significantly increase the number of minorities who enter the professoriate in those areas.

The UC consortium will feature a variety of innovative strategies and components to recruit, admit, retain, and graduate minorities—still severely underrepresented in postsecondary faculty ranks. The University will seek maximum

collaboration to achieve the goals.

“Participation in one UC graduate program is a gateway to the other UC campuses,” Martha Mecartney said to the inaugural Steering Committee meeting, held in November. The committee will meet quarterly.

The Irvine model, “Fast Track to the Professoriate” features a summer Competitive Edge program, (modeled in some respects after the UCI-CAMP summer academy), a teaching apprenticeship followed by a two-year research fellowship and a “portable pedagogical post-doc” providing intensive pedagogical training and development activities.

UC Berkeley will pursue a robust graduate recruitment strategy with diversity officers in each department. The campus, which coordinates the northern region of California through collaboration with UC Davis, UC Santa Cruz, and UC San Francisco, will amplify the graduate pipeline to the doctorate by integrating its most successful models of recruitment, retention, and graduation.

The UCSD program focuses on outreach to CSU campuses and includes an undergraduate summer research internship, multi-year financial support packages for new graduate students, mentoring and networking opportunities, and professional teacher training.

Synergy among NSF programs capitalizes on the individual strengths of each campus and the infrastructure and networking developed over the past nine years through CAMP. The consortium will pursue a recruitment partnership with not only CAMP and affiliated alliances but also with CEA-CREST at Cal State L.A. Additional feeder programs include McNair and MSP (Minority Science Programs in the Biological Sciences).



UC Riverside academic muscle

By Teresa Cofield, CAMP Coordinator

At UC Riverside, incoming freshmen who are declared science, engineering and mathematics majors are given an edge through the Summer Academic Enrichment Program in Mathematics & Chemistry. The intensive four-week residential program readies students for the demands of science and engineering curricula at UCR and ensures their enrollment in the fall quarter in two critical courses, calculus and general chemistry. Participants make a full time commitment to the program, which mirrors the schedule of a typical science student: approximately 20 hours of lecture and nine hours of study groups and tutorials per week. Students are immersed in university life and shown the path to success.

From our perspective, the connection with UCR faculty is one of the most vital aspects of the program. Dr. Pamela Clute has taught the pre-calculus course for the program since its inception in 1995. Dr. Hartland Schmidt, Professor Emeritus of Chemistry, has taught chemistry since we expanded to include chemistry in 1996. Both faculty use a collaborative learning approach.

“The participation is what impresses me most about CAMP,” Professor Schmidt says. He also notes that “the students remain in contact with one another and help one another.”

From the student perspective, making friends also counts a lot.

Program highlights include faculty seminars, science excursions and activities, study groups and tutoring, and five units of credit for pre-calculus.

Dr. Carl Bovell, CAMP-UCR Director, and I are proud of the students who comprise our program and the way they support each other’s goals. We extend our appreciation to the faculty who enrich our efforts and challenge all of us to “rise to the occasion.”

freshmen build through CAMP-UCR

FRESHMAN PROFILE

GAMEL JOHNSON

- Freshman, Mechanical Engineering
- CAMP-UCR Summer Academic Enrichment Program in Mathematics and Chemistry

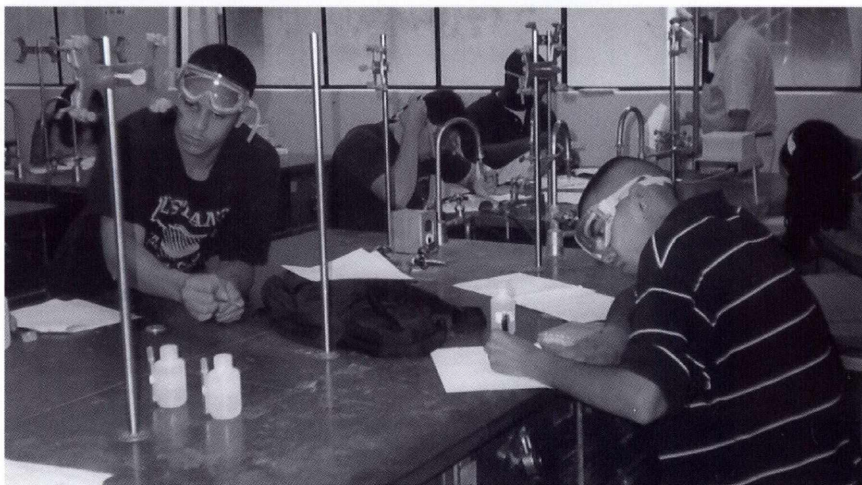
“The most helpful aspect of the CAMP summer program was exposure to the UCR campus, faculty and services. I felt very comfortable when fall quarter began. Engineering interests me because of the math and science involvement. I attended John Muir high school in Pasadena. After the first few weeks of college, I realized how much extra effort it was going to take in order for me to succeed. I want to make my parents proud of me.”

PROGRAM ALUMNI PROFILES

MONICA VILLARREAL

- Senior, Chemistry
- Faculty Mentor: Werner G. Kuhr, Professor of Chemistry
- Member, Latinos in Science Club
- CAMP-UCR Program Assistant
- Science Tutor, St. Catherine of Sienna Catholic Church

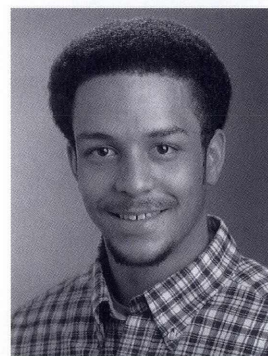
“After my summer of revelation at Marquette University, I became more focused academically and personally. I discovered how to work with my weaknesses and make the best of my



Gamel Johnson, left, and Victor Albizures, right, work together on a chemistry experiment.

strengths. To enrich my laboratory techniques, I have done research in the area of surface analysis via Atomic Force Microscopy (AFM) and Scanning Tunneling Microscopy (STM) on gold electrodes in the UCR Department of Chemistry. To support my goal of becoming a dentist, I have learned of the many applications microscopic imaging has in the dental field. Most importantly, summer research has taught me how to better apply classroom knowledge to practical use. In my career, I hope to not only contribute quality care but also to help break the barriers created by economic obstacles.”

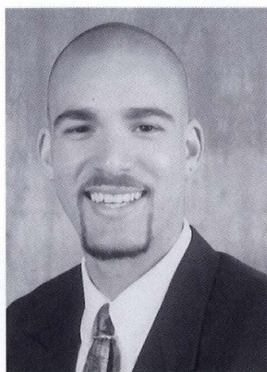
—Villarreal credits her parents and great teachers for her decision to pursue a science major. She would like to see more career seminars at the high school level. She received straight As in all her high school mathematics and science courses, including conceptual physics, trigonometry and Advanced Placement Calculus. She has participated in science demonstrations for middle school students through Science Awareness.



Gamel Johnson



Monica Villarreal



Boaz Cotton: "I'm looking forward to presenting my research, 'Three dimensional reconstruction of the horseshoe bat brain and identification of the neural substrate underlying audio-vocal behavior.'"

BOAZ COTTON

- Major: Biochemistry
- Level: Junior
- Faculty Mentor: Dr. Walter Metzner, Professor of Biology
- Personal Motto: Show compassion for human life and all animal life

Biochemistry major Boaz Cotton has used CAMP as "a way to jump ahead in my college career." He believes that his participation in the CAMP-UCR Summer Research Program is a vital component of his research base needed for academic advancement. In 1997 as a high school senior applying for the CAMP-UCR summer institute, he wrote, "I hear that my chosen major, biochemistry, is a difficult one, but I know from past experience that I can do whatever I put my mind and heart to." He has stayed focused and on track, and is

preparing to present his research findings at national and state meetings in 2000. "There are so many new discoveries waiting to be found, and I want to be part of that experience," Cotton says. Cotton feels that choosing a major has nothing to do with ethnicity. "This is a choice that needs to be made from genuine fascination," he says. Cotton is also a member of African Americans United in Science.

CAMP-UCR GRADUATE UPDATE

DENISE GENTLES

A UCR graduate in June 1999 and an active CAMP-er for four years, Denise Gentles is enrolled in the post-baccalaureate program at UC Irvine. The year-long program begins in summer with an intensive MCAT review.



Denise Gentles: "UCI is my first choice for medical school."

"You have to consider your overall goal," Gentles says about her decision to focus on strengthening her credentials for medical school. She emphasizes, "UCI is my first choice." She says the postbac program "gives you a sense of what you can call 'home' — it's enlightening." Gentles plans to enter family practice. She wants to work on the front line of underserved communities, and make decisions that will enhance their health care. "Medicine is constantly changing," she says. "It's imperative that you change with it."

CAMP-UCR PARENTS WRITE

Dear Dr. Bovell,

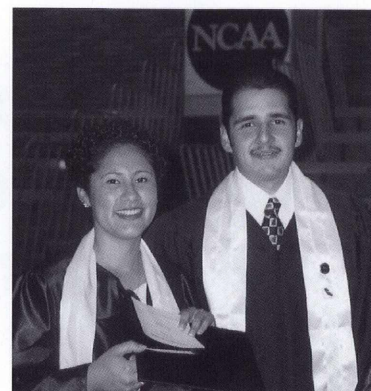
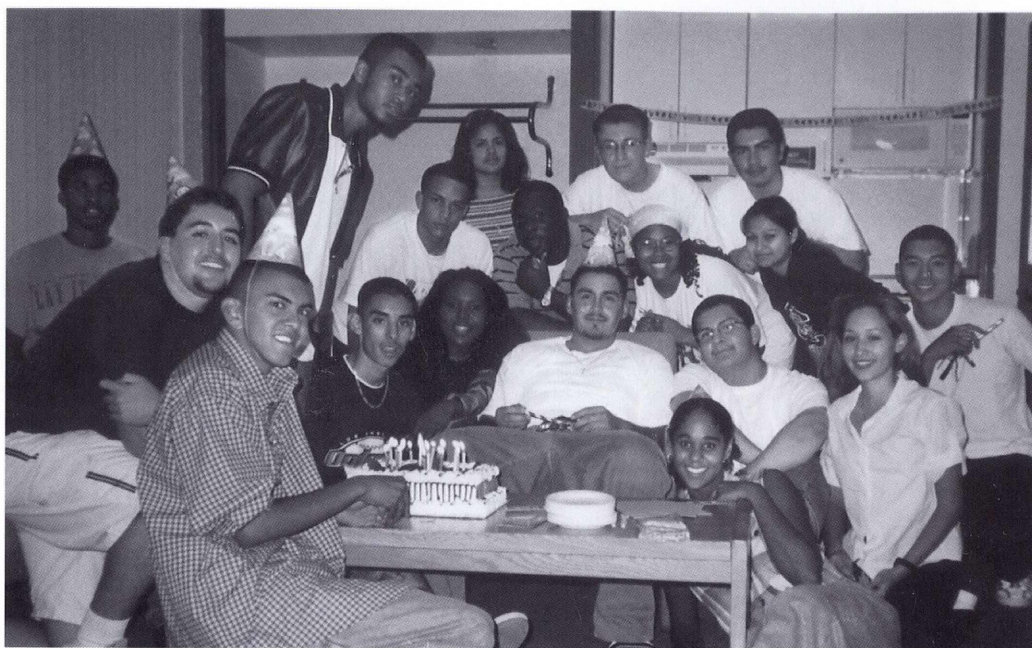
We feel very privileged to have had our son, Gamel, participate in the CAMP-UCR Summer Enrichment Program. It has offered Gamel a unique opportunity to take part in university activities prior to his formal enrollment in the fall. He now has a stronger sense of academic purpose and has gained a more mature attitude toward his education.

By actively being involved in classes over the summer he gained a better sense of appreciation of the opportunities that will be available to him. This program has been a tremendous benefit to Gamel and has given him an edge on being more comfortable with what a college education and life on campus is all about.

We thank you and your staff for all the help provided throughout the program to Gamel and to us as parents. Everyone has been very professional and helpful, and we hope to remain in contact with you and your staff in the future. We hope that there continues to be funding for this program. We feel that CAMP is a unique program and has been very effective for our son.

Sincerely,
Janice E. Johnson and Tony Johnson





CAMP graduates Adriana Aguayo and Miguel Gaeta (1999). Aguayo is working as a biochemistry lab technician and applying to optometry schools. Gaeta, a chemistry tutor for two years, is a first-year medical student at Charles R. Drew University. Above left, 1999 participants throw a late night birthday party for peer counselor and chemistry tutor Carlos Gaeta (center), a chemical engineering major. Carlos and Miguel are brothers.

CAMP PARTICIPANT RECOGNITION

HONORS & ACHIEVEMENTS:

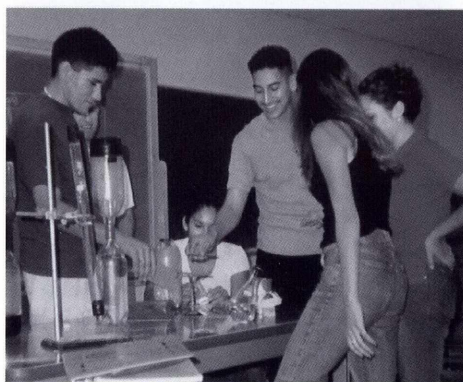
Tricia Bailey, American Chemical Society Scholar; Donny Dumani, elected to UCLA's Mortar Board Honor Society (Dumani has transferred to UCLA); LaKrecia Sanders, Distinction in Research Award, Physical Sciences, CAMP Statewide Undergraduate Research Symposium

1999 RESEARCH FELLOWS:

Boaz Cotton, Vincent Hernandez, and Monica Villarreal.

PAST RESEARCH FELLOWS:

Adriana Rubalcaba, Joshua Gallegos, Donny Dumani, and Carlos Melgar, who has entered a master's program in mathematics at CSU Long Beach. Melgar is also teaching high school algebra and geometry. (Juniors and seniors maintaining a 3.0 gpa or better are eligible for summer and term research opportunities with faculty. They report their findings at local, regional and national meetings.)



Students participate in a physics experiment during a faculty seminar with Dr. Robert Wild, Professor Emeritus of Physics.

TEACHER PREP FELLOWS:

Adriana Aguayo, Awilda Jimenez, Silvia Palacios, and Adriana Rubalcaba. Palacios is pursuing a masters degree in education and a teaching credential at Claremont Graduate School. (Teacher preparation activities are linked with Project Athena, directed by Dr. Pamela Clute, and funded by NSF)

PEER COUNSELORS & TUTORS:

Carlos Melgar, Vincent Hernandez, Marisa Garcia, Donny Dumani, Tricia Bailey, Enrique Rodriguez, and LaKrecia Sanders. (A UCR-CAMP

peer counselor is a Big Brother or Sister who is available for his or her CAMP-er, to advise on campus procedures and facilities and to alert faculty advisors or mentors of academic issues.)

RESEARCH AT OTHER INSTITUTIONS:

Tricia Bailey, UC Santa Barbara; Awilda Jimenez, University of Colorado, Boulder; Carlos Melgar, Cornell University; Adriana Rubalcaba, University of Michigan (1999), University of Colorado, Boulder (1998), UCLA (1997).

BEST OF
THE BEST

UCLA'S KARLA N. MUNOZ Wins Medtronic Scholar Award, Shines at SACNAS



“The best way to predict the future is to invent it.”

This quote has a special message for Karla N. Muñoz, UCLA-CAMP participant majoring in biochemistry, who saw it one day while working in the UCLA pharmacology department. She pondered the meaning and how it applied to her own life. “These words inspire me to continue

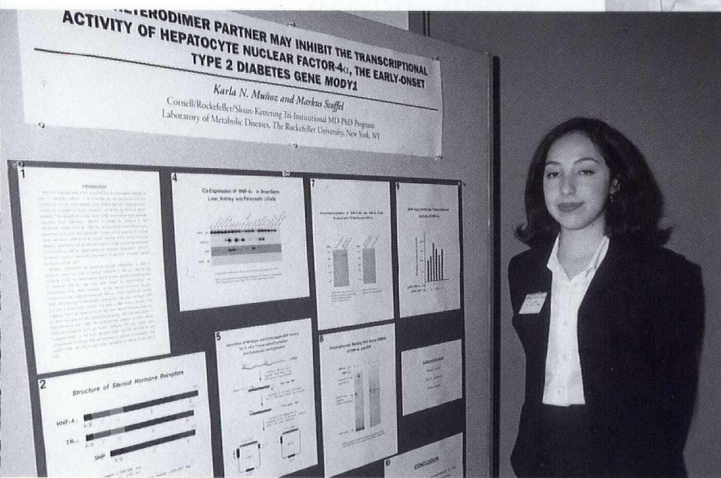
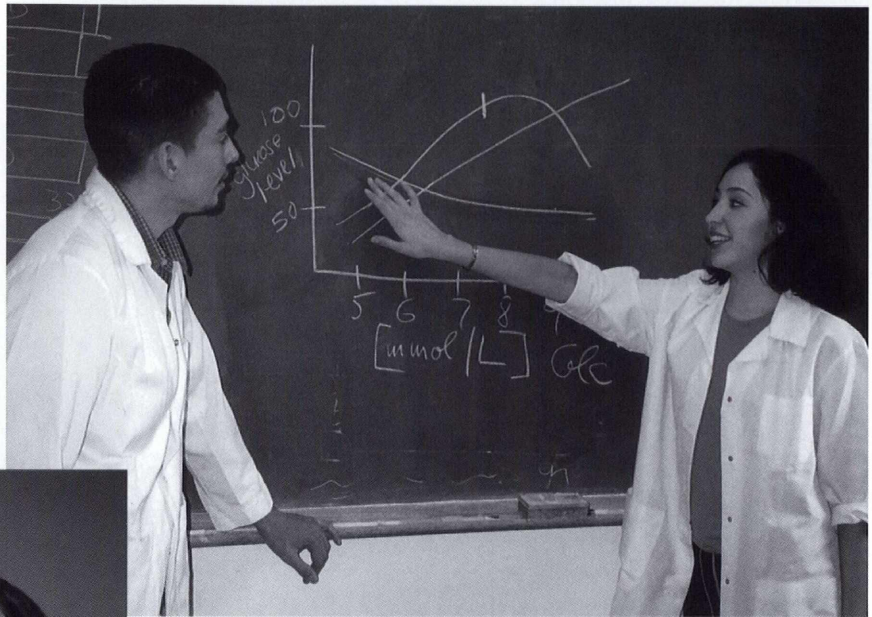
striving for my current and future academic and career goals,” Muñoz says. The quote reminds her of the overall purpose of working hard to become a research doctor. Immediate goals include developing investigative and analytical skills, and to become a well-rounded individual.

Besides oncology and cardiovascular research, she is interested in immunology, specifically autoimmune diseases. A junior with a resume that reads like a graduate student, Muñoz has developed her research skills in the laboratories of

Dr. Nora Sarvetnick, Scripps Research Institute (for two summers), Dr. Dan Kaufman, UCLA, and Dr. Markus Stoffel, Rockefeller University.

Muñoz was a *Gateways to the Laboratory* student who spent ten weeks conducting independent research at Rockefeller University. She is a participant in the UCLA CARE (Center for Academic Research and Excellence) program—supported by CAMP-NSF. *Gateways* pools the resources of the Cornell/Rockefeller/Sloan-Kettering Tri-

Karla Muñoz says her strengths are perseverance, determination, and a strong work ethic. She has an “inquisitive mind” as well as an interest in teaching, qualities she brought to the program. Shown with Muñoz is Efrain Talamantes, also a Gateways student from UCLA and the CARE program.



“Research projects are valuable because it is a challenge to begin from scratch and develop a method to perform the experiment,” Muñoz says. She believes that “students end up gaining more knowledge because they learn from their mistakes, which is the key to all research.”

Institutional MD-PhD program. Every aspect of the program prepares participants for careers as biomedical scientists. Students come from throughout the country to New York City’s Upper East Side to be immersed in a research environment tuned to the future.

“Karla is the best summer student out of three different tri-institutional programs who has worked with me.

Even among this select group, Karla stands out as one of the brightest and best students,” says Dr. Markus Stoffel, Head, Laboratory of Metabolic Diseases, Rockefeller University.

Her research mentor notes that in a very short time, Muñoz broadened her repertoire of molecular and genetic laboratory techniques. She also developed into “an independent experimentalist and thinker” who

plans her experiments and analyzes her results carefully. For her superb performance in the lab, her mock professional school interview, journal club presentation and written report contributed to her selection to win the prestigious Medtronic Scholar Award, given annually to three Gateways students for outstanding achievements in science.

She presented her research at

“There is no doubt that Karla is a truly outstanding student. She is absolutely dedicated to a career in biomedical science.” –Markus Stoffel, MD-PhD

SACNAS, and swept the awards, winning the Vigil Poster Presentation Award, the Endocrine Society Award, and the SACNAS-Eli Lilly Scholarship. Out of 232 student poster presentations, four were recognized with the Vigil award.

With her peers in *Gateways*, Muñoz also learned MCAT study tips and how to write a scientific curriculum vitae. She presented her research in a poster format. Social activities included trips to

the Apollo Theatre, Bronx Zoo, Concerts in the Park, New York Mets baseball game, and a taping of the Late Show with David Letterman.

Muñoz feels it is important that *Gateways* seeks underrepresented students interested in medical school because “it will spark us to reach the MD-PhD level and be a significant factor in motivating students to pursue a career in biomedical research.”

Gateways to the Laboratory Cornell/Rockefeller/Sloan- Kettering Tri-Institutional MD-PhD Program

First offered in 1993, *Gateways* provides underrepresented minority students with experience in research laboratories and clinical settings, and helps prepare them for the rigors of applying to and completing MD-PhD programs throughout the U.S.. *Gateways* is offered to students in their freshman or sophomore year who are considering careers as biomedical scientists. Accepted students are selected to work in a laboratory at Weill Medical College of Cornell University (formerly Cornell University Medical College), The Rockefeller University, or the Sloan-Kettering Institute. Close proximity of the partners (all are across the street from each other) allows for optimal collaboration between laboratories and institutions. It also gives students more than 300 laboratories from which to choose. The Tri-Institutional MD-PhD Program is one of a select number of programs that receives a large portion of funding from the National Institutes of Health (NIH). It has received high praise for its success in training physician-scientists. The program includes weekly seminars, journal clubs and career development seminars. Each *Gateways* student is assigned a current MD-PhD student as his/her Big Brother/Big Sister. The application process includes a personal statement, official transcript, and letters of recommendation.

Application deadline is February 1

E-mail: mdphd@mail.med.cornell.edu
www.med.cornell.edu/mdphd



When did you first become interested in chemistry—particularly in chemistry/materials?

My freshman introductory class was where I first fell in love with chemistry. I had never taken any chemistry before. I was initially exposed to materials in my first research experience with Professor Baugh, where we dealt with hydrogen termination of silicon surfaces. I was introduced to surface science, spectroscopy and other aspects of physical chemistry. I also had a chance to learn the role chemistry plays in technology at large. Chemistry/materials play a major role in the foundation for applications in, for example, materials engineering and biotechnology. The vast array of applications is what calls me to the field.

Where did you go to high school and who or what prepared you for UCLA?

I graduated from Mountain View High School in El Monte, CA. Surprisingly, it was senior English that prepared me the most for my science major. My teacher emphasized critical thinking and maintain-

UCLA's Norma Sosa



ing a broad perspective. I found this to be applicable to science and research. I attended the Freshman Summer Program, where I took two college-level classes and began to better understand the university work load.

What would you have liked to have done better to get a smoother start—or did things go easily once enrolled?

To make both my first and second years at UCLA a lot smoother, I wish I would have taken math and physics—and not try to go easy on myself.

How easy or difficult was it to get involved in research? How did you find out about the opportunities?

Fortunately, for me it was very easy to get involved in research. It was during an orientation for first-year UCLA science students (sponsored by CARE—Center for Academic and Research Excellence) that I had the chance to chat with Dr. Baugh. He suggested I stop by his lab and

take part in the Student Research Program. I worked in Professor Baugh's laboratory with CARE/CAMP funding for a year. Then I went on to a neurobiochemistry group for the summer, and remained during my second year—which is when I realized I wanted to pursue a career in the physical sciences.

Have other opportunities influenced you?

Atending a MAES conference was influential—hearing various professional and student research presentations. Also lots of reading. Last summer I participated in the summer research program (CARE Scholars) doing research in the neurobiochemistry lab. In summer '99 I was accepted to the program again, but now I am working in a chemistry laboratory where materials science is an important part of the research.

Would you summarize your current research?

I am part of the Kaner group. We work with a polymer called polyaniline. One of the uses of this polymer is for enantiomer separa-

tions. Separating enantiomers from racemic mixtures is very important in the pharmaceutical industry because most drugs come in a racemic mixture but usually only one enantiomer is beneficial and the other can be either inert or can cause undesirable side-effects. I am working with a graduate student and a post-doc towards obtaining a linear standard curve to be used as reference for quantifying the level of enantiomeric separation.

What is your career goal and where do you see yourself making a contribution?

I would like to be a specialist of some kind, perhaps in engineering. I want to be part of a project with a team-effort approach. Ideally I would like to take part in building a piece of high-tech equipment or device and testing its reliance and broadening its applications.

Do you have a dream job?

Combining ingenuity, simplicity, technology, science and team work/collaboration among disciplines and perhaps cultures to fulfil a project's goals.



1999-2000 UCI CAMP- TOSHIBA SCHOLARS

DORA C. CASTANEDA

Major: Biology

Goal: *M.D./Ph.D. with specialty in pediatric neurology*

A junior at UCI, Castaneda says she is getting good at juggling “the complex pieces of this jigsaw puzzle called college.” A double major in biological sciences and psychology, she is doing research in neuropharmacology. Additionally, she tutors. Her work with autistic children through the UCI School of Social Ecology led to her decision to pursue pediatric medicine. After graduation she plans to pursue an M.D./Ph.D. Her faculty mentor is Dr. Frances Leslie. In summer '99, she conducted research at Stanford University with Professors Russell Fernald and Audrey Ettinger.

Castaneda is winner of a \$20,000 NIH Undergraduate Scholarship.

GERMAN “ALEX” CORTEZ

Major: Biology/Chemistry

Goal: *Ph.D. in biology and chemistry*

Cortez, a junior, calls his first year at UCI a mind-opening experience. He was invited to join the honors general chemistry course and he “fell in love with chemistry.” He says that CAMP has opened the door

The Fourth Annual Scholarship Awards, a collaboration between Toshiba America Electronic Components Inc., and CAMP Statewide Office, provided \$10,000 in scholarships for the 1999-2000 academic year to support educational expenses at UCI. This year, two additional scholarships were supported by UCI CAMP, for a total of seven \$2,000 scholarships. At the presentations, Nicolaos Alexopoulos, Dean, UCI School of Engineering and CAMP P.I. and Toshiba representative Farhad Mafie gave recipients a “moment in the spotlight.” Recipients are highly competitive and self motivated undergraduates majoring in science, engineering and mathematics.

to him to conduct summer research at Stanford. Last summer, he participated in the Summer Honors Undergraduate Research Program at Harvard. Cortez has presented at AAAS and SACNAS as well as won the award for “Exceptional Achievement in Research” at the 1999 CAMP Statewide Undergraduate Research Symposium, at Santa Barbara. His faculty mentor is Dr. Larry Overman.

ERICK M. FERRAN

Major: Biology/Criminology

Goal: *To master a subject with deep understanding*

Ferran, a junior, is a creative writer as well as an aspiring scientist. He sees himself as a Jedi Knight, and

admits to have almost fallen to the “Dark Side” – away from science and a commitment to serious study. Fortunately, in summer 1998 he went to Stanford for his first taste of working in a real laboratory setting, and that changed his life. He knows where he wants to go. Like a Jedi, he says he “needs more training,” and the mastery of the subject is what motivates him. In summer 1999, he did research at Cornell University with Professor Lisa Denzin. A Regents’ Scholar, Ferran completed his sophomore year with a 3.5 gpa. He is a SACNAS 1999 Eli Lilly scholarship recipient and a Summer 1999 Cornell Outstanding Researcher.

THELMA Y. GAMBOA

Major: Biological Sciences

Goal: *To pursue interdisciplinary applications in public health*

A senior at UCI, Thelma Gamboa is a transfer student who has what she calls "an amalgamation of interests" pursued by taking an interdisciplinary approach to learning and problem solving. In addition to biological sciences, she is adding three minors – in epidemiology and public health, psychology and social behavior, and in Women's Studies. Gamboa has received training in a neuroscience research laboratory with Dr. James McGaugh. She has presented at three conferences and experienced an NIH-sponsored internship in Madrid last summer. She conducted psychobiology research under Professor Maria De La Cruz Del Cerro, neurobiologist from Universidad Nacional de Educacion a Distancia. She feels that CAMP has been an instrumental resource in her scholastic and personal development.

HAZEM H. HOSIEM

Major: Biology

Goal: *To become a physician and assist underserved communities*

Hosiem is a 4.0 student who is Phi Beta Kappa and has received the Golden Key National Honor Society Scholarship. He is proud to know so many people who want him to succeed. He has participated in CAMP research seminars, and joined Dr. Cotman's research group at the Institute for Brain Aging and Dementia, and he trained under the supervision of Dr. Anderson. For two years he has worked on a project concerning spinal cord injuries and published an abstract in the Society for Neuroscience Abstracts. He is a future physician who has been involved with the Flying Samaritans, providing free medical relief to villagers in Mexico. His mentor, Dr. Jhong Kim, organic chemistry, is especially proud that Hosiem is now a first year medical student at UCI.

GENAE JEFFERSON

Major: Physics

Goal: *To earn a Ph.D. and become an experimental physicist*

Genae Jefferson has a passionate interest in astrophysics within the areas of plasma physics, particle physics and high-energy physics. Her ultimate goal is a Ph.D., and she hopes to become an experimental physicist. Recently she attended the American Physical Society Centennial Celebration, which she calls a "profound experience." Jefferson was thrilled to have attended a lecture by Stephen Hawking, which further inspired her. She completed a summer 1999 internship at the Naval Research Laboratory in Washington, D.C., a ten-week program, under Dr. John Rosendahl. Jefferson was interviewed by the Time Magazine reporter who visited UCI for a July 5, 1999 feature on minority student success.

ANDRES NAVA

Major: Computer Science

Goal: *To become an "admirable force" in the Internet industry*

Andres Nava has presented his computer design projects at a number of conferences, and has gained a reputation for presenting sophisticated software requirements for cost/benefit analysis. He says that being part of a research team has given him a desire to pursue graduate education. With a fellow student, he has undertaken web site development, and he hopes some day to become an "admirable force" in the Internet industry. Nava says that the CAMP Summer Science Scholars program stands out as the leverage he received to accomplish his goals. He has completed two different CAMP sponsored research projects and has had many opportunities to build his resume. His faculty mentor is Dr. Debra Richardson.



The 1999-2000 UCI CAMP-Toshiba Scholars: (back row) Andres Nava, Thelma Gamboa, Dora Castaneda, Hazem Hosiem; (front row) "Alex" Cortez and Erick Ferran. Not shown is Genae Jefferson.

UC SANTA BARBARA'S

SIMS: Summer Institute in Mathematics & Science

Collaboration with the Engineering Summer Program fosters intellectual community

BY XOCHITL CASTANEDA AND STEPHANIE ROBINSON

The Summer Institute in Mathematics and Science (SIMS) is a rigorous three-week program for 30 newly admitted freshmen at UCSB. Priority is given to CAMP eligible students with the highest SAT scores. The first two weeks of the program are in conjunction with EOP Summer Transitional Enrichment Program (STEP) which provides a general campus orientation to 200 incoming freshmen. The SIMS students stay on for a third week of more intensive academic preparation and exposure to the sciences. They attend writing, chemistry and mathematics intensive courses in which their exams and other work is evaluated against UC standards. They also attend several special laboratory courses. UCSB faculty volunteer their time for the SIMS events, including a night out with a small group of participants for dinners where the students get a rare opportunity to interact informally with their professor hosts. They are also exposed to the natural diversity of Santa Barbara on several field trips.

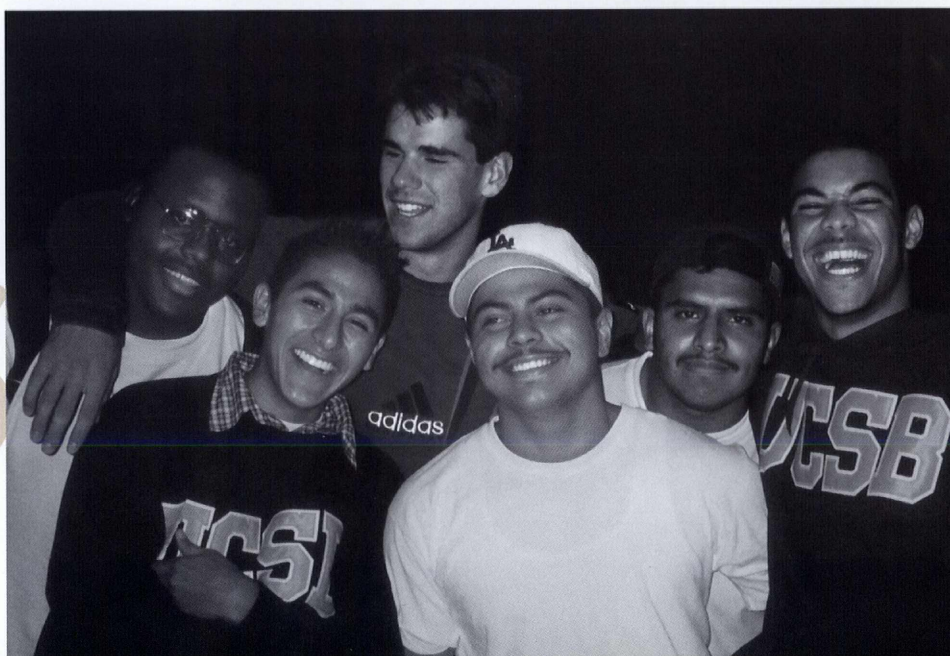
A tour of Sedgewick Ranch, a natural reserve in the UC System, is a highlight among the field experiences. The students hiked through the ranch on tours led by the Associate Director Wayne Ferren and Faculty Manager Frank Davis. The trip was a rigorous workout of both body and mind. Students described the trip as "fun, but exhausting." Included was a visit to a grove of live

oaks which had recently burned by an uncontrolled fire. Wayne Ferren gave a thorough description of the life cycle of fire-germinated plants and the unusual geology of the Los Padres Mountains where the reserve is located.

UCSB marine biology undergraduates, Sonia Campos, Lupe Hernandez and Esayas Fikre and alumni Mauricio Gomez led sunset tidepool tours at UCSB's Coal Oil Point. Participants did more than



Sunset tidepool excursion at Coal Oil Point, named for its natural oil seep.



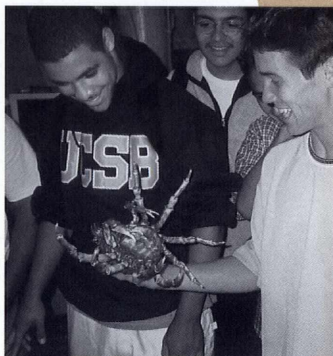
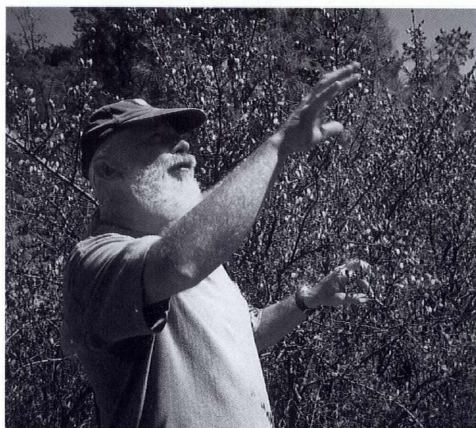
just learn about the organisms and ecology of the tide pools, they experienced an unusual geological phenomenon known to all UCSB students. Coal Oil Point is named for its natural oil seep. Tar flows from below the Pacific Plate to the ocean surface, where it is washed up on the beach and often on the feet of unwary pedestrians. SIMS students were initiated into UCSB by a natural tar bath. Many students said this was their favorite part of the program. This unusual environment is a choice spot of surfers and beach-combers alike.

The real strength of SIMS lies in

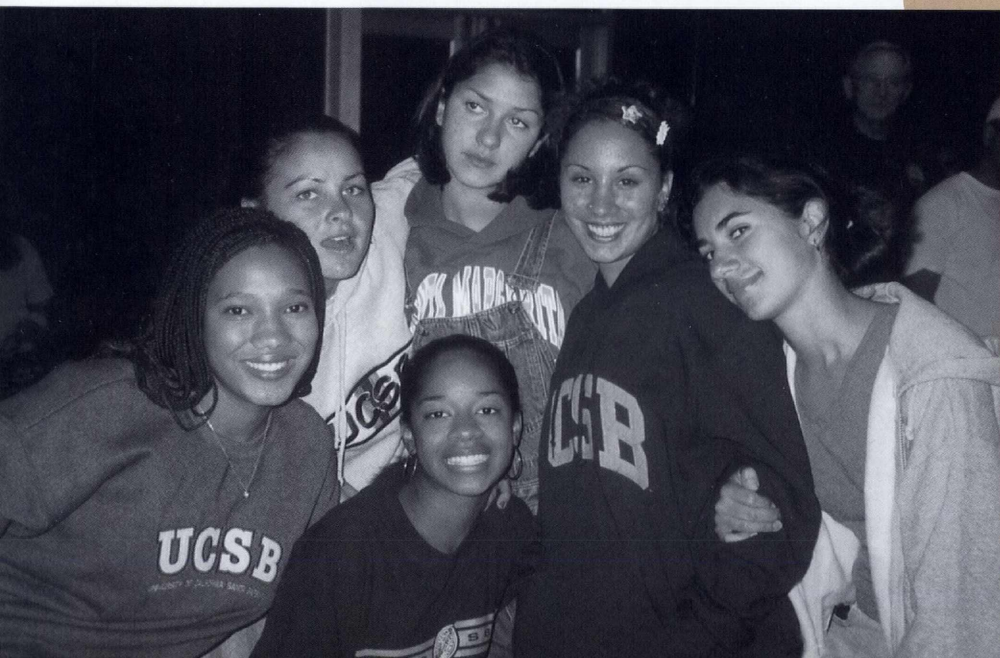
the relationships built during the program. This is a time where strong faculty relationships and life long friendships are developed. The program closed with an awards luncheon attended by parents and university leaders. For the students the real closing ceremony was the night before, when the students gathered in a tight circle led by student staff member, Adam Sanjurjo. Each participant, in turn, passed a ball of yarn to someone who had made an impact on them. Eventually the tight circle became a web of yarn representing the close ties that had formed. SIMS is best

summarized by this student quote: "Everything was great. I think what stands out though, was the fact that no matter what the activity was, everyone gave their full effort. It's a great feeling to know that everyone cares and wants to get ahead."

The Santa Barbara campus now has a Math and Science Teaching Fellowship program that includes students at Westmont College and Santa Barbara City College. It is anticipated that Ventura College, Allan Hancock College and Oxnard City College will join the partnership. A total of 60 fellows is expected.



Wayne Ferren describes the life cycle of fire-germinated plants, above left. Marley Kellar, above right, holds crab at an academic outing. Happy faces, below, reflect their success in capturing 3rd place in the scavenger hunt—but not as pleased with themselves as the team with the big smiles (opposite page, bottom). Social activities like this bring students together in community, and go a long way in building a sense of belonging to the campus.



PARTICIPANTS KEEP IN TOUCH

Hello Xochitl,

"I'd like to thank you for all the work you did making SIMS such an enjoyable experience. Now that school has started, I'm beginning to truly appreciate the program, and realizing how lucky I was to have been allowed to participate. . . . I got B's on my midterms in Calculus (Math 3A) and Chemistry (1A), so I've been studying in hopes of bumping them up to A's on the next round of tests. I've been trying to think of what I should major in, which has been pretty difficult because I'm interested in just about every field that's offered here. I'm going to try for a double major in Mathematics and Physics. With a solid foundation in both of those subjects, I should be able to branch off into whatever direction the wind blows."

—Marley Kellar

UC Santa Cruz-CAMP Symposium Captures Essence of Research

BY MARLENE ROBINSON,
CAMP COORDINATOR



Fourteen undergraduates who received CAMP support for eight weeks of summer research presented their findings October 1, 1999 at the third annual CAMP Summer Undergraduate Research Symposium. Leveraging of resources expanded opportunities to a total of 31 funded researchers. Dr. David Kliger, Dean of Natural Sciences, welcomed faculty and students to the collaborative event that convened participants from several other programs. Dr. A. Russell Flegal, CAMP Regional Director, addressed the summer researchers in his opening remarks.

"I take pleasure in welcoming you to the third annual CAMP Summer Undergraduate Research Symposium," Flegal said. He noted, "All of the science and engineering academic departments enthusiastically encourage undergraduate research participation."

Flegal emphasized that the structure of research laboratories on the Santa Cruz campus is "such that many advanced undergraduates are able to pursue research alongside faculty, postdoctorals, graduate students, research staff and other undergraduates."

Dear Natural Science Students, Faculty and Guests,

It is my pleasure to welcome you to the Third Annual CAMP Undergraduate Research Symposium. The undergraduate research experience in the Natural Sciences at UCSC provides students the rare opportunity to engage in the supervised research and learn in a dynamic environment of discovery from professors who are leaders in their fields.

As you take the opportunity today to view the work that has been done by the student participants, I am certain you will be impressed by the sophistication of the projects and by the accomplishments of our undergraduate students. This facet of undergraduate education is one that exemplifies the commitment to excellence in teaching and research that characterizes undergraduate education at UCSC.

To the student participants: I am extremely proud of you and the scholarly work you have undertaken. For those of you who plan to continue your academic careers in graduate school, I hope this event will provide you with the valuable experience of presenting your work in a professional scientific forum. For those who plan to enter the non-academic world, your participation in this event will be a significant addition to your resume. My congratulations to each of you.

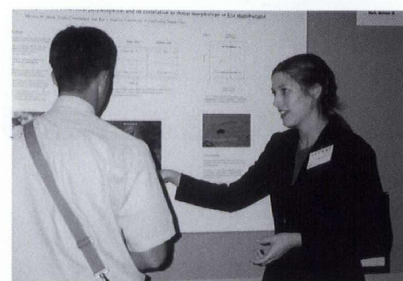
My sincere thanks to Professor A. Russell Flegal, the Faculty Chair of the Symposium. Also, I would like to take this opportunity to thank my faculty colleagues in the Division of Natural Sciences, whose dedication to academic excellence has been made evident by the number and quality of the projects displayed here today.

Sincerely,

David S. Kliger
Dean, Division of Natural Sciences, UC Santa Cruz

"For those of you who plan to continue your academic careers in graduate school, I hope this event will provide you with the valuable experience of presenting your work in a professional scientific forum."

—David S. Kliger, Dean of Natural Sciences



Above, conveying one's findings to others is an important part of the research process. Left, presenters enjoy being feted at awards luncheon in their honor. The event marked the third annual CAMP symposium at UCSC.

"Congratulations to each of the undergraduate students who are presenting at this tremendous event!" —Dr. A. Russell Flegal, CAMP Regional Director

UNDERGRADUATE RESEARCH SYMPOSIUM PRESENTERS

OSCAR ALVIZO
Biochemistry and Molecular Biology
Functional Comparison of Two Organic Cation

ERIKA ANGEL
Biochemistry
Insights on the Expression, Purification and Activity Assays of Soybean Lipoygenase in Escherichia coli

CHRISTOPHER BLACK
Biochemistry
Kinetics of Manganese Oxidation and Reduction in Human Whole Blood

KENDALL BOUTTÉ*
Information Systems Management
Gene Expression Viewer

KATESHIA BROOKS*
MCD Biology
Light Isotopic Variations of San Francisco Bay Sediments

COLESON R. BRUCE
Biology
Phylogenetic Relationship of Northern Coastal Populations of California Roach (Hesperoleucus Synometricus)

BILL CASHER
Biochemistry
Investigation of Marine Sponge Agelas maurifiana

SARAH DIANA CORDOVA*
MCD Biology
The Role of MAC1 in Yeast Differentiation of Physiological and Toxic Levels of Copper

ANGELO J. CORVINO
Chemistry
A Chemical Investigation of the Phylum Porifera, Genus Hyrrios SP

PATRICIA DIAZ*
Chemistry
The Manganese Preparation Method of Nitroxides for Living Free Radical Polymerization

JACQUELINE EPPS
Biochemistry
Evaluation of the Disposition of the Anti-inflammatory Opioid Sinomenine

ELIZABETH ESPINOZA
Chemistry
Characterization of Carotenoids from Dunaliella Salina

DAVID GARCIA*
Biology
Characterization of Salivary Gland Gene Expression in Drosophila Melanogaster

BRENTNEYE GONZALES
Biology
Molecular Systematics of Species Among Populations of the Red Alga Agarophyte Gracilaria (Gracilariales)

DOMINIC GONZALES
Biochemistry
Time Resolved Studies of All-Trans-Retinal in Dodecyl-b-D-Maltoside

MARICELA GONZALEZ
Biochemistry
Effect of Metals on Growth of Strains with functioning VS. Defective V-ATPase

JENNIFER KEELING
Biochemistry and Molecular Biology
Electron Spin Resonance

XOCHITL LOPEZ*
Electrical Engineering
Investigation of Wireless Data Communication Over Long Distance Using LEDs without Fiber Optic Connection

LAURA MACIAS*
Biochemistry and Molecular Biology
Isolation and Characterization of a Symbiotic RNA Gene from Azorhizobium Caulinodans

HARVEY MAGAÑA
Agronomy
Vesicle Formation and Encapsulation by Amphiphiles in Carbonaceous Meteorites

MELISSA MARIE MARK*
Biology
The Existence of an Exploratory Behavioral Polymorphism and its Correlation to Throat Morphotype in Uta Stansburiana

YIDNEKACHEW MITIKU*
Computer Science
Jini and Embedded Systems

Faculty Mentors

Manuel Ares Jr.
Steven Beckendorf
Giacomo Bernardi
Roberto Bogomolni
Barry Bowman
Rebecca Braslau
Phil Crews
Jennifer Burns
David Deamer
A. Russell Flegal
Lynda Goff
Scott Grover
Theodore Holman
Douglas Kellogg
David Kliger
Robert Ludwiz
Charles McDowell
Glenn Millhauser
Alex Pang
Steven Petersen
Barry Sinervo
Donald Smith
William Sullivan
W. Todd Wipke
Zhiwu Zhu
Martha Zuñiga

List of presenters continues next page

**UCSC SUMMER
UNDERGRADUATE RESEARCH
SYMPOSIUM PRESENTERS**
continues from previous page

MALIKA MOUTAWAKKIL

Chemistry

*Uncovering the Secrets of the Agelas SP
Sponge*

EDNA PEREZ

MCD Biology

Do Centrosomes Organize Actin Caps?

FRANK RIVERA

Chemistry

New Examples of Chemical Ligation

MARINA RIVERA*

MCD Biology

*Composition of Muscle Tissue from
Pacific Walrus (Odobenus Rosmarus)*

RUDDY RIVERA*

*Biochemistry and Molecular Biology
Mutagenesis, Expression and Purifica-
tion of Recombinant of Phosphoenol
Pyruvate Carboxylase (PEPc)*

MARIBEL ROMERO

Biology

*Site-Directed Mutagenesis of the H2KB,
Class 1 Major Histocompatibility
Complex (MHC) Gene, by the Poly-
merase Chain Reaction (PCR)*

KASSANDRA ROSSITER

Genetics

*Investigation of Bioactive Natural
Products Found in the Marine Sponge
Jaspis cf. Coriacea*

*JOHN SALAZAR

Biology

*Investigative Protein Sequence Com-
parison of RNA Helicase in Human
Homolog of
Bacterial RNASE
III.*

ERIK SAMAYOA

Biochemistry and
Molecular Biology

*Use of a Genetic
Approach to
Identify Proteins
that Interact with
Nap1*

YADIRA VILLA*

Chemistry

*Determining
Potential Drug
Carriers by
Studying the Active
Site of Proteins*

*CAMP-NSF funded
summer researchers.

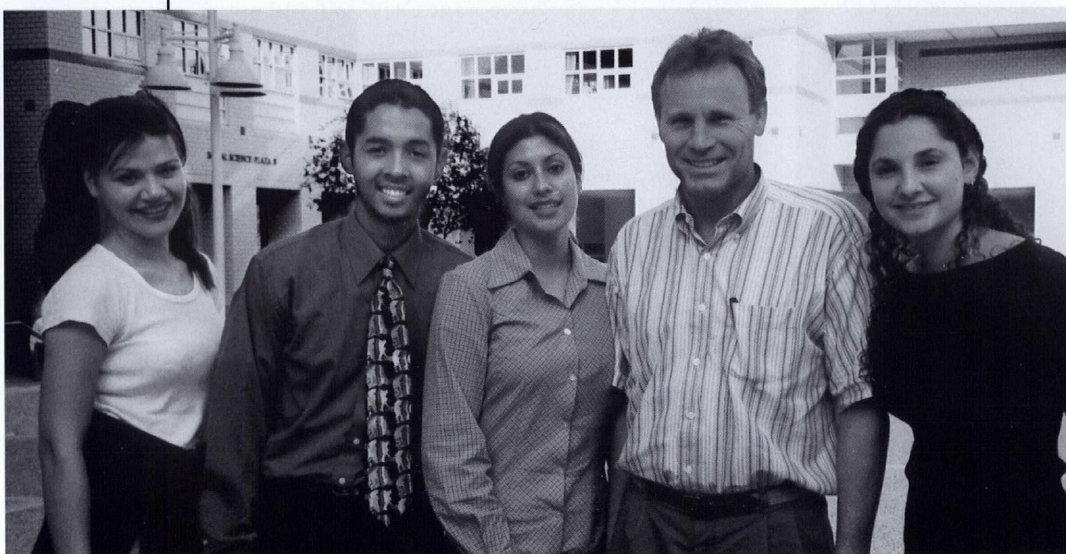
All research was
conducted at UC
Santa Cruz except
for that of David
Garcia, which was
done at UC Berkeley.

CAMP@UCI HOLDS STUDENT SYMPOSIUM

Undergraduates Present Faculty-Mentored Research

Nineteen undergraduates engaged in summer research through the UCI-CAMP Summer Scholars Program participated in a half-day symposium in fall quarter. The technology-based presentations covered topics from carbon monoxide hazards to reducing malaria transmission to microfluidics. Students delivered their presentations with professionalism and flair, making good use of sound effects and visual aids. The CAMP Scholars demonstrated a commitment to the project and a level of understanding and proficiency that comes with an intensive research experience.

Dr. Derek Dunn-Rankin, Professor of Mechanical and Aerospace Engineering and CAMP-UCI Regional Director (please refer to his article on faculty mentored research, page 9), gave the opening remarks. Recogniz-



Raquel Gulas (senior, ICS), Richard Silva (sophomore, biology), Helen Rueda (sophomore, chemistry), Professor Donald Blake, and Leticia Ayala (junior, chemistry) pause before reception following an afternoon of presentations at UCI. Dr. Blake mentors Rueda and Ayala.

ing that many of the students are preparing for graduate school, he said, "Students like yourselves with early training in research will make better-prepared graduate students." He added, "From experiences like your presentations today, you will be ready right away to contribute to the research enterprise."

Some Scholars were seasoned presenters, full of confidence. Others were first time presenters, full of the jitters. For example, Briz Garcia explained his research on reducing friction and air leakage in a robotic arm with a strong sense of authority and ownership. Raquel Gulas, a "first timer," captured the audience's

heart with her plea, "Bear with me, I need love." Since that first time at the podium, she has nailed down her presentation, "Using Clustering Algorithm Analysis to Observe Gene Expression Patterns." Both students have been invited to present their research to the CAMP Statewide Advisory Board, January 2000.

1999 UC IRVINE CAMP SUMMER SCHOLARS

ROGELIO ARREOLA

Ebola Hemorrhagic Fever and Its Affects on a Population: What Factors Overwhelmingly Contribute to the Spread of the Disease?

Professor Carlos Castillo-Chavez
Mathematics, Cornell University

LETICIA AYALA

Atmospheric Carbon Monoxide-Potential Health Hazard

Professor Donald Blake
Chemistry, UCI

DORA CASTAÑEDA

Cloning of Cellular Retinoic Acid Binding Protein (CRABP): A Putative Amacrine Cell Marker in the Haplochromis Burteni Retina

Professors Russell Fernald and Audrey Ettinger
Biological Sciences, Stanford University

ALEX CORTEZ

Role of the Transcription Factor Mesenchymal Forkhead 1 (MFH-1) During Heart Development of Chicken Embryos

Professor Thomas M. Schultheiss
Biological Sciences, Harvard University

ERICK FERRAN

Immunoisolation and Analysis of Pala Cell MHC Class II-Enriched Compartments (MIIC)

Professor Lisa Denzin
Biological Sciences, Cornell University

KAREN FLEMING

Producing Genetically-Engineered Mosquitoes to Control Malaria Transmission

Professor Anthony James
Molecular Biology/Biochemistry, UCI

SAUL FRANCO-GONZALEZ

Dynamics of a Two-Dimensional Discrete-Time SIS Model

Professor Carlos Castillo-Chavez
Mathematics, Cornell University

BRIZ GARCIA

Reducing Friction and Air Leakage in a Pneumatic Robot Arm

Professor James E. Bobrow
Mechanical & Aerospace Engineering, UCI

SERGIO GARCIA

Microfluidics

Professor Guann-Pyng Li
Electrical & Computer Engineering, UCI

FERNANDO GONZALEZ

Optical Characterization of Biomedical Microfluidic Devices

Professor Guann-Pyng Li
Electrical & Computer Engineering, UCI

RAQUEL GULAS

Using Clustering Algorithm Analysis to Observe Gene Expression Patterns

Professor Raymond Klefstad
Information & Computer Science, UCI

FANTA HAIRSTON

Enzyme Catalyzed Methyl Halide Emissions from Agricultural Crops

Chancellor Ralph J. Cicerone
Earth Systems Science, UCI

CARLOS HERRERA

Trion Model Simulations

Professor Gordon Shaw
Physics & Astronomy, UCI

LUIS JANSEN

Digital Equalizer for Sound

Professor Rui De Figueiredo
Electrical & Computer Engineering, UCI

LUIS PEREZ

A Susceptible-Infected-Susceptible Model of Streptococcal Disease with an Extra Class of Beta-Hemolytic Carriers

Professor Carlos Castillo-Chavez
Mathematics, Cornell University

LIZA REBAZA

Synthesis of Precursors of Anticancer Compounds

Professor Fillmore Freeman
Chemistry, UCI

HELEN RUEDA

Impact of Urban Methane Emissions on Local and Regional Scales

Professor Donald Blake
Chemistry, UCI

NOEL RUIZ

Bionet Network Architecture

Professor Tatsuya Suda
Information & Computer Science, UCI

RICHARD SILVA

Expression of Recombinant Rat CD30 and Detection with an Anti-Peptide Antibody

Professor Olivia M. Martinez
Biological Sciences, Stanford University

graduate research process should not be different. It is likely, however, that undergraduates will benefit from closer mentoring as they learn the culture and methods of the research. It is important, therefore, that undergraduates have access to several individuals who can provide research guidance. The key point here is to provide access to advice in a timely manner. A busy faculty member can easily derail an undergraduate's research if there is no



Dunn-Rankin's colleague, Dr. Debra Richardson, center, mentors several CAMP-Toshiba Scholars, including Aaron Soto and Brian McCurtis. Their partner in research, Andres Nava, appears on page 37. Also see page 43 for results of mentored research.

alternative source for answers and suggestions. Not only does access to more than one mentor (including graduate students, post-docs, and other research staff) help provide technical feedback, it also enhances socialization into the research culture. A team of researchers, including undergraduates, can lead to spectacular results.

One final advantage to faculty engaging undergraduates in research is the opportunity to witness student academic growth. All teachers do their job in part because they actually get to see a person learn. Imagine the satisfaction of working with a first grade student who at the start of the year can only recognize letters and at the end is able to read! Most college undergraduate teaching cannot offer this kind of reward because the students are with you for only one class in one quarter before they pass on to colleagues. Undergraduate research mentoring has the potential to provide this satisfaction.

The costs of providing undergraduate research oppor-

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tunities are high; there is no denying that proper guidance of undergraduates takes time and laboratory resources. In addition, the payoffs for research are variable and often longer term. Nevertheless, the educational benefits to the students are compelling. Furthermore, the unique educational potential of the research university for creating and supporting inquiry among undergraduates through research is undeniable.

“A team of researchers, including undergraduates, can lead to spectacular results.”

1999-2000 Academic Year

Special Events Calendar 2000

Jan. 18-22 MAES 2000
25TH INTERNATIONAL SYMPOSIUM
Santa Clara, California - www.maesy2k.org

Jan. 19 CAMP ADVISORY BOARD MEETING
UC Irvine, Beckman Center of the National Academies

Feb. 10-11 FELICE FRANKEL,
CHANCELLOR'S DISTINGUISHED
LECTURER, CAMP STUDENT SEMINAR
Beckman Center, UCI

Feb. 17-22 AAAS CONFERENCE
Washington, D.C. - www.aaas.org

Feb. 20-26 NATIONAL
ENGINEERS WEEK
www.eweek.org

Mar. 7 MARIA GOEPPERT-MAYER SYMPOSIUM
San Diego Supercomputer Center, UC San Diego

Mar. 22-26 NSBE CONFERENCE
Charlotte, North Carolina - www.nsbe.org

Mar. 26-30 AMERICAN CHEMICAL SOCIETY
NATIONAL MEETING
San Francisco, California - www.acs.org/meetings/washington2000/

Apr. 7-9 CAMP STATEWIDE UNDERGRADUATE
RESEARCH SYMPOSIUM
UC San Diego

June 27-July 1 SOCIETY OF WOMEN ENGINEERS
NATIONAL CONFERENCE
Washington, D.C. - www.hadron.com/swe-bws/2000conf/2000conf.html

Oct. 12-15 SACNAS
Atlanta, Georgia - www.sacnas.org

Nov. 8-11 NATIONAL MINORITY RESEARCH SYMPOSIUM
Washington, D.C. - www.ols.net/users/nmrs/index.htm



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