

**Office of the President
May 8, 2002**

TO MEMBERS OF THE COMMITTEE ON EDUCATIONAL POLICY:

ITEM FOR DISCUSSION

For Meeting of May 15, 2002

REPORT ON CALIFORNIA STATE SUMMER SCHOOL FOR MATHEMATICS AND SCIENCE (COSMOS)

In the summer of 2000, the California State Summer School for Mathematics and Science (COSMOS) opened its doors to the first cohort of 304 academically advanced high school students at UC Irvine and UC Santa Cruz for a month-long residential experience. Modeled after the successful California State Summer School for the Arts, COSMOS conducts a university-based residential program for talented and motivated students who are completing grades 8-12. The COSMOS mission is to motivate the most creative minds of the new generation of prospective scientists, engineers, and mathematicians who will become leaders for California and the nation, and to foster a community of scholars engaged in intensive academic experience delivered by distinguished educators, scientists, and researchers.

For COSMOS students, academic course work, laboratory time, distinguished lectures, and field experiences are organized into “subject matter clusters” that address topics not traditionally taught in high school. These may include astronomy, computer science, physics, mechanical engineering, wetlands ecology, ocean science, robotics, biology/neuroscience, cognitive science, game theory, and volcanology. Courses are taught by distinguished university faculty with support from outstanding TransAmerica Teaching Fellows selected from public and private high schools. Graduate and undergraduate students also participate as assistants, mentors, and dormitory supervisors.

With permanent annual state funding for the program set at \$2 million, the COSMOS leadership must raise the remaining funds from private sources to support 25% to 50% of the cost of operations, scholarships, and teacher support. In 2001 and 2002, private donors contributed approximately \$805,000 for student scholarships, Teaching Fellowships, special equipment purchases, and other support. In addition, the Nobel Prize Centennial Celebration events last October in California “adopted” COSMOS as a model youth program and contributed from the fundraising proceeds to COSMOS for establishment of a Nobel Legacy Scholarship endowment of \$327,000.

During summer 2001, the COSMOS program expanded to a third campus based on a competitive review of applications submitted by several campuses. UC Davis was selected.

A total of 313 students attended one of three UC campuses: Davis, Irvine, and Santa Cruz. COSMOS attendees are almost evenly divided between male and female, hail from 40 counties in the state, and are ethnically very diverse. COSMOS increased target enrollment to 400 students across the three campuses for summer 2002. As of mid-April, the number of applications received approached 600.

At the May 15 meeting of The Regents, the COSMOS presentation will be introduced by Robert Polkinghorn, Jr., Assistant Vice President, Educational Outreach, followed by the comments from Peter Rock, Dean of Mathematics and Physical Sciences, UC Davis, and Mrs. Gayle Wilson, former First Lady of California, representing the COSMOS Advisory Board. The presentation will provide an overview of the COSMOS endeavor, with unique perspectives on the goals, accomplishments, and the potentials of this outstanding academic program.

Attached are background materials related to this presentation. [And article on the Internet](#)

(Attachments [Facts About COSMOS](#); [COSMOS](#); [Statistics](#))

COSMOS Reaches for the Stars

Stellar High School Math and Science Students Thrive in Summer Program at Three UC Campuses BY FRANCINE TYLER



Photo: Debbie Aldridge/UC Davis

Charles Park, left, and Nicholas Ong compare robots they've built and programmed at UC Davis.

Sara Al-Beaini, 17, dismantled a 1997 Nissan Sentra this summer.

But she wasn't part of an auto shop class. Instead, Al-Beaini participated in a course in automotive engineering at the [California State Summer School for Mathematics and Science](#) (COSMOS).

More than 300 students attended the month-long academic enrichment program hosted by [UC Irvine](#), [UC Davis](#), and [UC Santa Cruz](#).

The COSMOS program gives students completing grades eight through 12 an opportunity to focus on one or two advanced

science or math subject "clusters" in a college setting.

At Irvine, Al-Beaini helped 12 other students remove doors, strip seats and seat belts, and disconnect the catalytic converter and headlights as part of a lesson in the application of mechanical engineering theory.

"We performed experiments and studied the parts and the motor, asking why each part worked and trying to relate the motion and mechanism of each part with their jobs," says Al-Beaini, a high school senior from Orange. Students scrutinized wire connections, headlamp design and the braking system.

In addition to the automotive engineering course, academic offerings at COSMOS ranged from neuroscience to computational physics and from algebra, geometry and topology to environmental toxicology and conservation biology.

Students learned more about science and math by, among other things, building robots, launching rockets, peering through telescopes and dissecting cow eyeballs. Lectures and field trips rounded out the program.

"Our hope is that students joining COSMOS will develop lasting relationships with other students excelling in science and math, and with UC faculty, high school teachers, and out-of-state and international visitors," says Robert Polkinghorn, assistant vice president for educational outreach at UC's Office of the President.



Photo: Lisa Hunter/Center for Adaptive Optics
Sara Al-Beaini takes measurements on a pendulum at UC Irvine.

Established by the California legislature in 1998 ([AB 2536](#)) and administered by the University of California, the \$2 million COSMOS program is supported by the Legislature and individual, foundation and corporate donors (see "[Nobel Cause](#)") UC Santa Cruz and UC Irvine have hosted the COSMOS program since the summer of 2000, and UC Davis began hosting the program on its campus this past summer.

State Sen. Charles Poochigian (R, Fresno) authored the COSMOS legislation to create an academic enrichment program for gifted students. It has become that and more: According to an evaluation of COSMOS carried out last summer, student participants in 2001 were both gifted and reflective of the state's diverse population.

Of the 313 students who participated, more than 50 percent were girls and students from underrepresented ethnic groups. They came from across California, representing 40 of the state's 58 counties.

Close to half the students received full or partial financial aid to pay their COSMOS tuition, \$1,050 for last summer's session.

"State funding and financial aid guarantees the ability to provide for students from across California, and to give all economic, ethnic and cultural groups an equal opportunity to discover the very best in themselves, and not have socioeconomic status determine who can participate," says Juan Francisco Lara, director of the [Center for Educational Partnerships](#) at UC Irvine.

Xiomara Iraheta, a high school junior from downtown Los Angeles, says coming to UC Santa Cruz's COSMOS program made it possible for her to explore her love for chemistry in a way that wasn't possible back home.

"There are so many students in our high school classes, and our classrooms are crowded," says Iraheta, 16. "All the experiments I've done here, I wouldn't be able to do if I were home. I've done a lot of hands-on stuff being here."

Admission to COSMOS is based on an application process that includes standardized test scores, grade point averages, achievement in science projects or competitions, recommendations from teachers, and examples of motivation, leadership and community service.

"These are very motivated, very bright students, and our faculty has really responded to them with enthusiasm," says Abigail Thompson, co-director of UC Davis' COSMOS program and a professor of mathematics.

At Davis, students chose from six course clusters ranging from earth and atmosphere to materials science. Students investigated geothermal geysers, built and programmed robots and calculated the effect of environment on the growth of plants.

Dave Woodbury, 14, saw how scientific concepts learned in the classroom translate to a research environment during visits to [Lawrence Livermore National Laboratory](#).

As a student in Davis' optical science cluster, Woodbury heard from scientists about their current research, toured the Livermore facilities and isolated a protein using modern research techniques.

"It was an amazing experience," says Woodbury, from Chico. "COSMOS inspired me to pursue a scientific career."

Students like Woodbury weren't the only ones to benefit from COSMOS. Twenty high school teachers participated as TransAmerica Fellows, a new feature of the program this past summer. These teachers assisted UC faculty, graduate students and others with developing each campus' academic offerings for COSMOS and helped translate those ideas into the classroom setting.

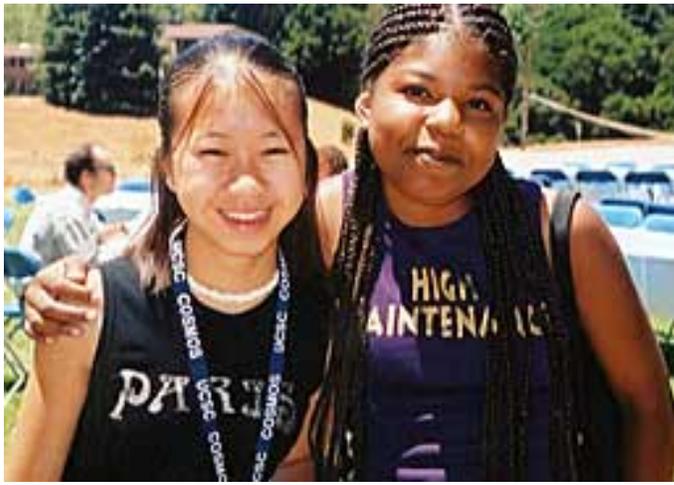
The high school teacher fellows received a stipend for their assistance and, more importantly, came away with new ideas for lesson plans, laboratory experiments and teaching methods. Teachers also formed collaborative relationships that will benefit them in the future.

Ruth Herradora, a teacher from Watsonville High School, will have help in her classroom during the academic year, thanks to a relationship forged at UC Santa Cruz's COSMOS program.

UCSC professor Bakthan Singaram offered to send graduate students to Herradora's classroom to help the chemistry teacher carry out some of the laboratories performed at COSMOS.

"I have 34 students, and labs can be difficult to run without some help," Herradora says.

Fostering partnerships such as the one between Herradora and Singaram is one of the many goals of COSMOS. Program organizers want COSMOS to make a lasting difference in education, and ultimately in students' lives.



Santa Teresa High School freshmen Hylan Vo, left, and Melissa Stevens, enjoy COSMOS opening day at UC Santa Cruz

With that goal in mind, the management council and advisory board that guide COSMOS statewide are discussing ways for the program to continue to support students' interest in science and math long after their summer experience has ended.

"The COSMOS mission is to build a community of young scholars who will become the nation's future leaders in mathematics and science, with interests in both research and applied fields," says UC's Polkinghorn, "so we'd like to see COSMOS evolve into much more of a lifelong venture."

According to Polkinghorn, in the future COSMOS could nurture participants' interest in science and math with the goal of smoothing their path to undergraduate and graduate educations and careers in science and math fields.

Internships during the school year, professional conferences and advising for students and parents on how to apply for college or obtain financial aid could all be part of how COSMOS supports these students in the future, he says.

This past summer, COSMOS started offering college scholarships to a select number of participants at each host campus through [CHELA Financial](#) (California Higher Education Loan Association), a not-for-profit student education finance company. The scholarships, ranging from \$1,000 to \$3,000, will help support the students when they enter higher education-whether at UC or elsewhere.

Al-Beaini was one of four scholarship winners from UC Irvine. The \$1,500 scholarship, plus her summertime experience studying and living on a university campus, has made her feel better prepared for college, she says.

"Going through dorm life, living on campus and experiencing what college is going to be, that was really exciting for me," says Al-Beaini. "The fact that we are all math and science students just made it that much better."

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