

REPORT



CALIFORNIA COUNCIL ON
SCIENCE AND TECHNOLOGY

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"CCST: Science and Technology in the State's Interest"
CCST is a nonprofit organization established in 1988 at
the request of the California State Government. It is sponsored
by the state's major postsecondary institutions and
anchored by leading private-sector firms.
CCST's mission is to improve S&T policy and application
in California by proposing programs, conducting analyses,
and recommending policies and initiatives
that will maintain a vigorous economy and
California's technological leadership.

CCST FELLOW RALPH CICERONE TO HEAD NATIONAL ACADEMY



Ralph J. Cicerone

The National Academy of Sciences has nominated Ralph J. Cicerone, chancellor of the University of California, Irvine and CCST fellow, as its next president.

"The importance of science and technology to the United States and the world has never been greater, and I look forward to serving if I am elected," said Cicerone following the announcement.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of scholars engaged in scientific and engineering research. It is dedicated to the furtherance of science and technology and their use for the good of society. Members and foreign associates of the Academy are elected in recognition of their distinguished

and continuing achievements in original research. The membership includes approximately 2,000 members and 350 foreign associates, of whom more than 190 have won Nobel Prizes. Together, the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council constitute the National Academies. There is substantial overlap between the National Academies and CCST: approximately one third of the members of the National Academies reside in California, and half of CCST members are also members of the National Academies.

The president of the National Academy of Sciences is a full-time employee of the organization at the Academy's headquarters in Washington, D.C., and also serves as the chair of the National Research Council.

"Ralph Cicerone is one of the world's most highly acclaimed atmospheric scientists, and this rise to the presidency of the National Academy of Sciences is a richly deserved

acknowledgment of his talents as scientist and leader," said University of California President Robert Dynes.

Under the Academy's bylaws, the nominating committee puts forward for the council's approval a single candidate for the presidency. Although the bylaws permit additional nominations from the membership, this mechanism has never been used. In the absence of another nomination, Cicerone's name will be presented to the full membership for formal ratification on December 15, 2004. That ballot, which will also contain the names of candidates for the Academy's vice presidency, will be completed in January 2005.

Cicerone succeeds outgoing president Bruce Alberts, who holds a position as professor of cellular biology on the faculty of University of California, San Francisco. Alberts' California roots,

"California remains the top science and technology state in the country, and CCST looks forward to continuing to work with the National Academies in the years to come."

C. Judson King
Council Chair
California Council on
Science and Technology

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as well as California's leading position as the nation's preeminent science and technology state, have contributed to the National Academy of Sciences paying close attention to science and technology issues in California, such as the discussion of science textbook criteria in March 2004. Cicerone's California background and connection with CCST will help continue the developing partnership that CCST and the National Academies formally initiated earlier this year.

"This multi-faceted collaboration will bring about new ways for CCST to leverage the considerable resources and expertise of the National Academies in a manner relevant and accessible to California policymakers," said CCST Chair C. Judson King. "The net result for California will be a level of science and technology policy knowledge and wisdom unparalleled at the state level."

The initiative has three major programmatic areas: collaboration between CCST and the National Academies; building expert capacity

to advise state leaders; and providing specific information and policy reports. Each of these three areas includes multiple projects, and is closely related and designed to complement and build on each other. The collaboration will provide technical knowledge and expertise in a relevant and usable format to policymakers, and allow CCST and the Academies to target new research based on the experience of working with policymakers.

"Engaging with CCST will enable the National Academies to gain a clearer perspective of the science and technology issues that are important at the state level, and enable CCST to continue expanding its ability to provide impartial and expert perspective on the politically contentious issues related to science, technology, and education in the state," said King. "California remains the top science and technology state in the country, and CCST looks forward to continuing to work with the National Academies in the years to come."

NATIONAL LAB PASSES FROM FELLOW TO FELLOW



Steven Chu

Nobel laureate and CCST Fellow Steven Chu, professor of physics and applied physics at Stanford University, has been named director of the Lawrence Berkeley National Laboratory (LBNL). Chu took office on August 1, succeeding retiring director and CCST Fellow Charles Shank.

"The opportunity to lead Lawrence Berkeley National Laboratory at this time is

an exciting prospect and a tremendous honor," said Chu, who will hold a joint appointment in UC Berkeley's Physics Department. "I hope it will strengthen UC's competitiveness for managing the lab. The lab has excellent people and its competitiveness depends on them."

The Lawrence Berkeley National Laboratory has been a leader in science and engineering research for more than 70 years. It is a U.S. Department of Energy (DOE) National Laboratory managed by the University of California, with an annual budget of nearly \$480 million and a staff of over 4,300, including more than a 1,000 students.

LBNL conducts unclassified research across a wide range of scientific disciplines with key efforts in fundamental studies of the universe; quantitative biology; nanoscience; new energy systems and environmental solutions; and the use of integrated computing as a tool for discovery. It is organized into 17 scientific divisions and hosts four DOE national user facilities.

Stanford President John Hennessy called Chu "an outstanding choice" to lead one of the nation's most prestigious research laboratories. "While we are sorry to see him move on, we understand that the directorship of the Lawrence Berkeley National Laboratory is a unique opportunity that presents itself once in a lifetime," Hennessy said in a press statement following the announcement.

Chu received a Ph.D. in Physics from UC Berkeley in 1976. He was a postdoctoral fellow, UC Berkeley, 1976-78; member of the Technical Staff, AT&T Bell Labs; head of the Quantum Electronic Dept., AT&T Bell Labs, 1983-87; and professor at Stanford, 1987-present. His many honors and awards include the American Physical Society Broida Prize for Laser Spectroscopy, 1987; the King Faisal International Prize for Science, 1993; the American Physical Society, Arthur Schawlow Prize for Laser Science, 1994; the Humboldt Senior Scientist Award, 1995; and the Nobel Prize in Physics. He is a fellow of the American Academy of Arts and Sciences, and a member of the National Academy of Sciences, Academia Sinica, the American Philosophical Society, and a foreign member of the Chinese Academy of Sciences and the Korean Academy of Sciences and Technology, 1998.

In 1997, he was awarded the Nobel Prize in Physics with Claude Cohen-Tannoudji and William D. Phillips for development of methods to cool and trap atoms with laser light.

Chu's appointment continues a tradition of maintaining CCST's strong connection with the federally funded laboratories located in California. CCST now numbers the leaders of the Lawrence Livermore National Laboratory, Sandia National Laboratory, NASA Ames Research Center, and Lawrence Berkeley National Laboratory among its active council members and fellows.



CALIFORNIA-MEXICO REPORT OFFERS FRAMEWORK FOR COLLABORATION

In June 2004, CCST presented its final report to the California-Mexico Commission on Education, Science and Technology identifying areas where joint investments could be pursued in research and education.

"Opportunities for Collaboration in High-tech Research and Teacher Professional Development" was initiated in March 2003 by the Commission, a binational high-level group dedicated to exploring mutual challenges related to science and technology policy areas. The Commission consists of leaders from the scientific communities in California and Mexico, and is jointly chaired by University of California President Robert Dynes and Jaime Parada Avila, the director of Consejo Nacional de Ciencia y Tecnología (CONACYT). Five participants among the nine-member California delegation are affiliated with CCST, including two council members, two fellows (including President Dynes) and Executive Director Susan Hackwood.

The Commission met in Riverside, California on June 15 and 16 to discuss CCST's report, as well as reports from working groups on education, agriculture, biotechnology and rural development. The meeting was hosted by the University of California Institute for Mexico and the United States (UC MEXUS).

"There are actually several common areas of concern between California and Mexico," said Roberto Sánchez-Rodríguez, director of UC MEXUS. "We share many mutual challenges in the areas of education and research." While California's research programs are much stronger than that of Mexico, both California and Mexico share poorly ranked elementary and high-school educational systems and produce inadequate numbers of skilled science and technology baccalaureates. In addition, Mexico is working to foster the establishment of high-tech industries in the face of emigration of top scientists, many of whom come to California.

The CCST report was actually conceived as two separate projects which were later combined into a single document. The first project was intended to develop a framework for high-tech research collaboration, matching top science and technology university programs in Mexico with programs in California using in part criteria established by the National Research Council. The second project was intended to increase the effectiveness and retention of science and math teachers by providing technology-based professional development capabilities in both California and Mexico.

To complete the project, CCST worked with the University of California and with officials from CONACYT, the Mexican Ministry of Education, the Mexican Academy of Sciences, and several leading Mexican universities.

"The problem is that there was no single resource with all the answers," said Hackwood. "Getting a clear picture of the strengths and opportunities in each system required not just going through the data, but talking to people who understand the system in Mexico."

While the limited scope of the project precluded a comprehensive index of programs in California and Mexico, "Opportunities for Collaboration" provided a matrix of potentially compatible current research doctorate programs and a list of technology-oriented professional development models.

"Our ambition is to bring high-level people from California and Mexico to look at areas of mutual opportunity and mutual concern. The next steps are to create venues to bring the right people together..."

Robert Dynes
President
University of California

The report concludes that the most effective way to encourage collaboration is to provide an infrastructure that enables it. Not only must data be gathered to expand upon the matrices assembled in this project, but an environment must be created in which the benefits of collaboration are reinforced.

"Our ambition is to bring high-level people from California and Mexico to look at areas of mutual opportunity and mutual concern," said University of California President Dynes following the meeting. "The next steps are to create venues to bring the right people together, and to identify funding sources and ways to leverage existing resources to support their efforts."

The Commission has now requested that CCST initiate a comparable project examining the roles and success of cooperative extension programs in California and Mexico. This project is scheduled to be completed in 2005.

VISA RESTRICTIONS BEGINNING TO IMPACT FOREIGN S&E STUDENTS

Science and engineering graduate programs, particularly in California, have for years included a significant percentage of foreign students; California schools award 30% of their S&E doctorates to non-resident aliens. However, following the September 11, 2001 terrorist attacks, efforts to increase national security tightened the requirements and the enforcement of entry procedures for foreign visitors. As a result, American colleges and universities are beginning to see sharp declines in the number of foreign students enrolling at all levels. The problem was predicted by educators following the passage of the Patriot Act in 2001, but the slow pace of implementation and significant logistical hurdles have taken time to affect the numbers. A June 2004 National Science Foundation InfoBrief observed a net gain in foreign graduate enrollment through the 2002-2003 academic year, although the distribution of students had shifted away from predominantly Muslim countries. However, a survey on fall 2004 admissions co-sponsored by NAFSA: Association of International Educators and the Council of Graduate Schools, showed a 32% decrease in the number of international graduate student submissions overall. The percentage was even higher in California: foreign undergraduate and graduate student applications to the University of California's nine campuses dropped 37.5% for fall 2004. The University of Southern California, for many years one of the nation's top destinations for foreign students, saw a decline of 31%.

In addition, science and engineering applicants are likely to face additional hurdles if their subject area falls on the government's Technology Alert list, which often leads to greater security checks under the Visa Mantis program, which is designed to protect against the transfer of sensitive technologies. Once Visa Mantis clearance is provided, it does remain in effect for 12 months for most foreign nationals, which facilitates re-entry; but obtaining the clearance in the first place can take several months. In the NAFSA survey, Stanford University administrators also reported a long list of admitted students who had been waiting more than six months for a visa to enter the country.

In May 2004, a coalition of 25 science, higher education, and engineering groups including the AAAS, the National Academy of Sciences, the National Academy of Engineering, and the Association of American Universities, sent a joint statement to the government stressing the need to address the issue and offering six recommendations for solving the current visa-processing crisis, by removing what the coalition called "unnecessary barriers." The recommendations include extending the validity of Visa Mantis security clearances for international students, scholars, and scientists and improving the transparency and efficiency of the visa process.

Partially in response to this effort, Senator Norman Coleman (MN) introduced bill S 2715 on July 21, "Improving access to graduate schools in the United States for international students and scholars." The bill was referred to the Senate Committee on the Judiciary.

CCST's mission is to focus California's science and technology talent on important policy issues facing the state. However, there is little communication back to the S&T community on what is happening in the legislative and executive branches of state government that could impact, or be impacted by science and technology. "Capitol Happenings" is a section of the CCST Report that provides a brief summary and update on what is going on in state government, be it new action from the Governor's Office, legislative committees or new legislation. Material for this article was contributed by Gus Koehler, principal consultant of Time Structures.

The Governor's California Performance Review (CPR) report has many recommendations for improving the strategic development, coordination and effective delivery of science and technology services in California to bolster the economy. The CPR proposes a strategic plan and coordinated approach to infrastructure related research involving highways, streets, bridges, mass transit, airports, water delivery systems, electric power generation and transmission, telecommunications, public buildings and housing. An office of Infrastructure Research and Development would be created within the Business, Transportation and Housing Agency or its successor. The functions and staff for the office would come from Caltrans and the California Energy Commission's research units, as well as the infrastructure research activities of the Integrated Waste Management Board, Seismic Safety Commission, State Water Resources Control Board and Caltrans' Division of Traffic Operations, Planning and Engineering Services. An Infrastructure Advisory Council – which would include representation from the California Council on Science and Technology – would be created to provide input on a strategic plan for infrastructure research and development. The office would partner with regional technology alliances and local economic development groups to review infrastructure research concepts for commercial potential, before and after research is completed. In addition, using the existing California Energy Commission or Caltrans websites and databases, the CPR proposes to connect all of the UC Technology Transfer offices' and the state's infrastructure research databases to make them available to the public. In preparing these recommendations, the CPR refers often to CCST's California Report on the Environment for Science and Technology (1999) and PIER Independent Panel Reviews (2000, 2001, and 2004).

However, the CPR does not assign responsibility for developing or implementing an overall science and technology policy or strategy for the state. The approach does address some key areas but in a piecemeal way; it does not recommend an institutional framework for managing a statewide long-term S&T strategy.

What is the fate of state agencies that are involved in state research and development or science based regulatory activity? The CPR identifies 37 such agencies, and proposes eliminating 29 of them. The functions of these agencies would be moved to one of 13 new departments. For the rest, three agencies and their functions would continue under new departments, and four would be abolished altogether (Business, Transportation and Housing Agency, Commission for Economic Development, Health Policy Advisory Commission, and the Heart Disease and Stroke Prevention and Treatment Task Force). Only one of these 37 agencies would remain unaffected. The CPR offers organizational charts for each new department, showing where most (though not all) of the transferred functions would reside. The transferred functions would need to be combined into new organizational entities; their goals and objectives would need to be defined and aligned with CPR's stated goals; their current statutory requirement aligned with the new functions; and activities coordinated with other agencies that may not have worked closely together in the past.

The CPR also identifies the need to strongly link workforce training with emerging business trends. Priority is given to strengthening the California Community Colleges' Economic and Workforce Development Program, although the need to coordinate such resources across the CSU and UC systems is not addressed. Science and technology is mentioned in the economic development and labor training portions of the report. Additional attention could be given to science education and training per se to attract and prepare students. Technology issues are narrowly defined, mostly dealing with the needs of e-government. Articles and other materials cited in the CPR could provide a foundation for an overall science and technology strategy and science training initiative.

Federal grants are important to carrying out research. The CPR does identify several ways to maximize federal grants, but does not include increasing the number of federal research grants that the state receives as a goal. Finally, State General Fund financing for the California Science Centers would be eliminated.

2004 S&T LEGISLATION

Workforce

SB 1452 (Figueroa) died in Senate Appropriations Committee. The bill would have prohibited the state from contracting with any individual or entity that employs persons or subcontractors outside of the U.S. in order to perform and complete that state contract.

SB 1453 (Figueroa) died in Assembly Appropriations Committee. This bill would have required any employer that outsources jobs to give written notice of the contract to the EDD and the employees based in CA whose jobs would be affected by the outsourcing.

AB 1127 (Horton) enrolled and to the Governor. This bill was amended to protect whistleblowers. This bill requires the California Workforce Investment Board to develop an education and job training report card program.

AB 1829 (Liu) enrolled and to the Governor. This bill prohibits a state or local agency from spending funds for job training of foreign workers, or contracting for services, unless that contractor/subcontractor certifies that the services will be performed solely with workers within the U.S.

AB 1885 (Corbett) vetoed by the Governor. This bill would have established the East Bay Biotechnology Center on the campus of the California State University at Hayward.

AB 2429 (Chavez) enrolled and to the Governor. This bill was amended to provide a health care providers' bill of rights. Originally the bill would have required vendor certification that state funded work is performed in the U.S.

Manufacturing

SB 1554 (Karnette) died in Senate Revenue and Taxation Committee. The bill would have continued tax credits for manufacturing related R&D.

Intellectual Property

AB 1616 (Montanez) died in Senate Judiciary Committee. This bill would amend the California Intellectual Property Rights Act, which is in the public domain.

AB 2319 (Mullin) died in Senate Judiciary Committee. This bill would require the Governor and the Legislature to report to the people on how the state spends on state contracts, grants, and agreements. It was referred to the Senate.

Technology

SB 1457 (Murray) enrolled and sent to the Governor. This bill would require any software containing adware or spyware to provide recipients with a notice that the software collects personal financial information, as well as a way to download adware or spyware.

SB 1834 (Bowen) died in Assembly Business and Professions Committee. This bill would require Radio Frequency Identification Systems. It would require that RFID tags attached to consumer products or services be labeled with information that could be used to identify an individual under certain conditions.

AB 2787 (Leslie) died in Senate Judiciary Committee. This bill would prohibit any person or entity from deceptive commercial e-mail advertising or doing so.

More information available at [www.ccst.org](#)

CALIFORNIA PERFORMANCE REVIEW CITES CCST

The California Performance Review (CPR) cites CCST at least ten times in its discussion of the state's research and development agencies, indicating that CCST and its projects have been having a measurable impact in Sacramento.

The CPR notes that California's state government lacks a standard policy on how and when it should commercialize research results, and lists CCST as a viable model capable of providing "one-stop shopping" for entrepreneurs seeking research and development data and analyses. It also recommends the establishment of an advisory council to provide input and advice to the Office of Infrastructure Research and Development on a strategic plan which should include representatives from CCST, along with representatives from the California Energy Commission, Caltrans' research and development advisory group, infrastructure division chiefs, resources departments,

and regional technology and economic development groups.

While many CCST reports were consulted in the preparation of the CPR, the documents cited most frequently were the "California Report on the Environment for Science and Technology" (1999) and the "Independent PIER Review Panel Report" (both 2000 and 2004 versions), all of which contain recommendations for streamlining the state's approach to research and development.

The complete California Performance Review report can be downloaded at <http://www.report.cpr.ca.gov/>.

INTELLECTUAL PROPERTY RESOLUTION PASSED

The California Legislature has unanimously passed a resolution requesting that CCST undertake a special study group to develop recommendations on how the state should treat intellectual property (IP) created under state contracts, grants and agreements. Among other things, Assembly Concurrent Resolution 252 asks CCST to consider promoting the utilization of intellectual property arising from state supported agreements, and requests CCST to work with specified entities in completing the study.

The resolution requests that CCST provide guidance to the state on streamlining intellectual property policy for state-supported contracts, grants, and agreements, and collaboration between commercial concerns and nonprofit organizations, including universities. It also requests guidance on ensuring that intellectual

property produced by nonprofit organizations and small business firms is used in a manner that promotes free competition and enterprise. CCST is responsible for obtaining funding for the study group.

The IP resolution originated as Assembly Bill 2319, proposed by Assembly Member Gene Mullin. AB 2319 passed the Assembly with unanimous support, but was amended in the Senate to specify that CCST be asked to work with the State Department of General Services as well as state and federal government experts in contract and licensing, research and development practitioners, experts in technology transfer, and individuals representing the public interest. The project is scheduled for completion in 2005.

LEGISLATION UPDATE

Energy Committee. The bill would have enacted the bill which would place state owned intellectual property

Energy Committee. The bill was amended to address the bill to develop recommendations to the state on how the state should treat intellectual property created under state supported agreements, and requests CCST to work with specified entities in completing the study.

Governor. This bill requires providers of software and services with a privacy policy and prohibits spyware and e-mails and webpages that automatically

and Professions Committee. The bill involves the bill to develop recommendations to the state on how the state should treat intellectual property created under state supported agreements, and requests CCST to work with specified entities in completing the study.

Committee. This bill would have prohibited a person from advertising and under certain conditions levy a fine

www.leginfo.ca.gov/bilinfo.html

Energy

SB 888 (Dunn) enrolled and sent to Governor. The bill requires that Homeland Security related work be performed in the U.S. The bill no longer would enact the Repeal of Electricity Deregulation Act of 2003 and set specific goals and planning requirements.

AB 808 (Authors: Canciamilla and Richman; Coauthors: Members Diaz and Levine) died in Senate Energy, Utilities and Communications Committee. The bill would have established the Energy Agency under the administration of the Secretary of Energy to be responsible for the planning, development, and implementation of all state energy policies.

Environment

SB 512 (Figueroa) enrolled and sent to the Governor. The bill requires that the state be represented on the federal Pacific Fishery Management Council by persons knowledgeable about fisheries.

AB 2631 (Wolk) died in Senate Appropriations Committee. The bill would have established the Invasive Species Council, to advise the Governor and state agencies on invasive species and to manage the prevention, regulation, and control of nonnative and invasive species.

Science and Technology Bills Chaptered into Law this Session

AB 1551 (Kehoe, Horton, Plescia, Wyland, and Vargas and Senators Alpert, Ducheny, and Scott) recognizes the shortage of biotechnology workers and establishes the San Diego Multiuse Biotechnology Training Center.

AB 1220 (Berg) creates the Heart Disease and Stroke Prevention and Treatment Task Force within the Department of Health Services.

AB 1360 (Steinberg) requires the Office of Environmental Health Hazard Assessment to continue to develop and maintain a system of environmental indicators.

CSU EXPLORES NEW DIRECTION FOR MASTER'S DEGREES

The California State University (CSU) system is exploring the feasibility of implementing a new class of master's degrees systemwide, in a bid to boost the state's science and technology workforce. Professional science master's (PSM) degree programs have been steadily growing nationwide over the past decade, but this is the first time a state university has considered implementing the programs on a systemwide basis.

PSM programs differ from typical science master's degree programs in that they attempt to better prepare students for employment in the business environment, usually by incorporating business coursework into a more traditional science curriculum. The programs are generally open to bachelor's degree holders in the sciences, mathematics, or engineering. These programs consist of two years of training in an emerging or interdisciplinary area. Many include internships and "cross-training" in business and communications.

The Alfred P. Sloan Foundation initiated a program in 1997 to promote development of these programs, and has since provided over \$12 million in seed grants at programs throughout the country. Today, largely as a result of the Sloan initiative, PSM degrees are offered in at least 45 institutions around the country, including UC Los Angeles, the University of Southern California, Stanford University, CSU Fresno, and the Keck Graduate Institute of Applied Life Sciences. Subject areas range from biosciences management to physics for business applications. However, these programs are not numerous or large enough to produce a

significant number of graduates yet – only 400 PSM graduates have been produced nationwide since 2000 (compared to over 24,000 S&E master's degrees issued during the same period in California alone).

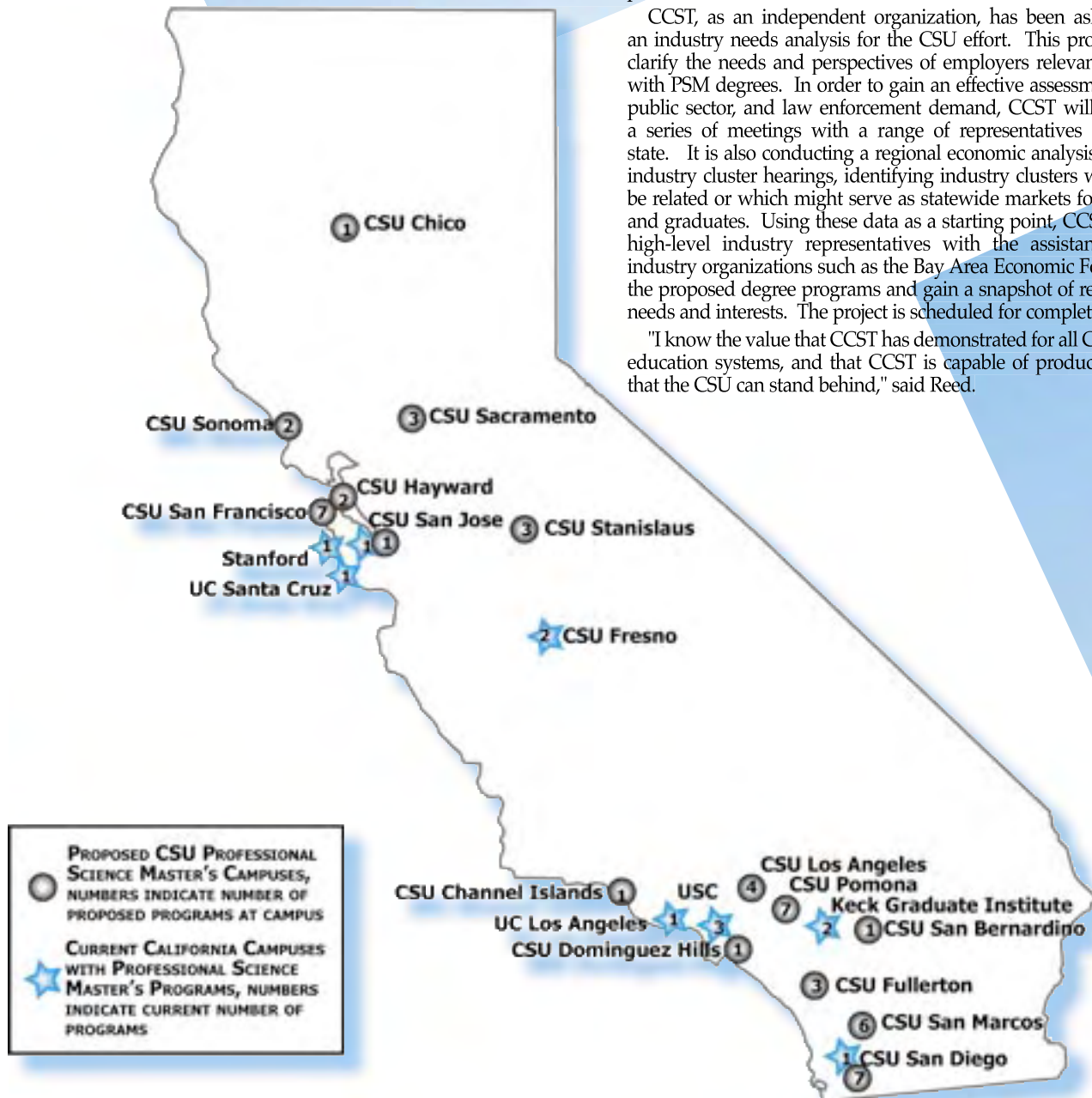
"California's shortage of qualified science and technology graduates has been well documented by CCST and is an ongoing concern for the California State University System," said CSU Chancellor Charles Reed in a letter to CCST. "All the components of California's higher education system need to take steps to enhance the quality and quantity of the science and technology graduates we contribute to California's workforce. As the state's largest four-year university system, we take this responsibility seriously."

Chancellor Reed has requested that CCST assist a consortium of 15 CSU campuses which has obtained a planning grant from the Sloan Foundation to establish whether and how PSM programs could be established in participating campuses. This marks the first time the Sloan Foundation has considered investing in programs throughout an entire university system. In order for the programs to be viable, however, the CSU system will also need to provide support. To date, there has been no federal support for PSM programs or PSM students.

California is considered an attractive venue to consider such a program because it has, and continues to attract, emerging high-tech industries, as well as established industries in environmental measurement and regulation and water resources and regulation in both the public and private sectors.

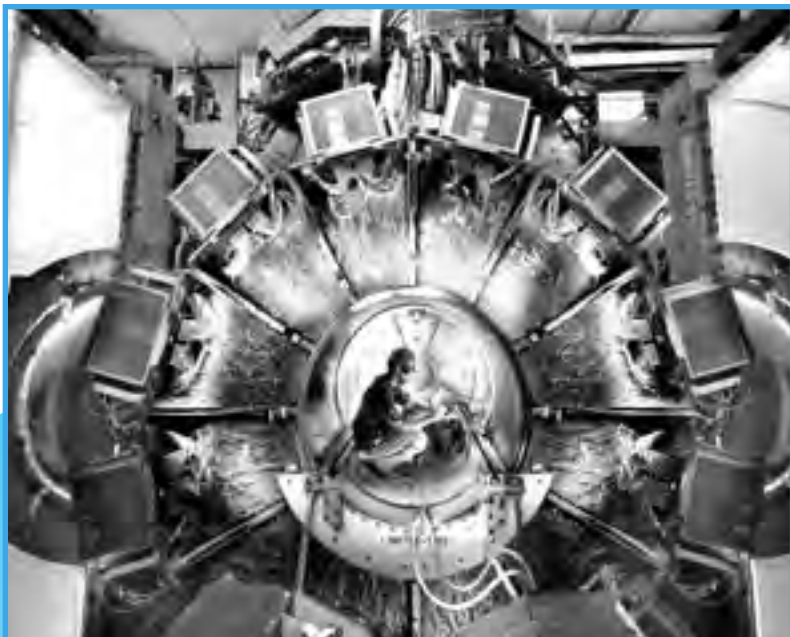
CCST, as an independent organization, has been asked to conduct an industry needs analysis for the CSU effort. This project will aim to clarify the needs and perspectives of employers relevant to employees with PSM degrees. In order to gain an effective assessment of industry, public sector, and law enforcement demand, CCST will be conducting a series of meetings with a range of representatives throughout the state. It is also conducting a regional economic analysis to support the industry cluster hearings, identifying industry clusters which appear to be related or which might serve as statewide markets for PSM students and graduates. Using these data as a starting point, CCST is convening high-level industry representatives with the assistance of regional industry organizations such as the Bay Area Economic Forum to discuss the proposed degree programs and gain a snapshot of relevant industry needs and interests. The project is scheduled for completion in late 2004.

"I know the value that CCST has demonstrated for all California higher education systems, and that CCST is capable of producing an analysis that the CSU can stand behind," said Reed.



California is a leader in technological innovation. In this section, CCST Report focuses on how California's major industries and universities are working to maintain cutting-edge research programs, and encourage student interest in science and technology.

STANFORD LINEAR ACCELERATOR UNEARTH'S ANTIMATTER SECRETS



BaBar detector at Stanford Linear Accelerator Center. (Photo Courtesy of Stanford Linear Accelerator Center)

When the mysterious "Project M" was conceived in 1956, the idea of a two-mile linear accelerator was just a dream. But once the Atomic Energy Commission and Stanford University signed the Stanford Linear Accelerator Center (SLAC) into existence five years later, construction began on a unique facility that would continue conducting high-energy physics research for decades, generating three Nobel prizes along the way and continuing to break new ground over forty years later.

In August, physicists at SLAC announced new results demonstrating a dramatic difference in the behavior of matter and antimatter. The BaBar experiment, conducted at SLAC's "B-Factory" facility, collided electrons and their antimatter counterparts, positrons, to produce an abundance of exotic heavy particle and anti-

particle pairs known as B and anti-B mesons. These rare forms of matter and antimatter are short-lived, decaying in turn to other lighter subatomic particles, such as kaons and pions, which are observed in the BaBar experiment.

"If there were no difference between matter and antimatter, both the B meson and the anti-B meson would exhibit exactly

the same pattern of decays," said BaBar spokesman Marcello Giorgi, a physicist at the Istituto Nazionale di Fisica Nucleare (INFN) and

the University of Pisa. "However, our new measurement shows an example of a large difference in decay rates instead."

In fact, BaBar experimenters have found striking matter-antimatter asymmetry, with over 23% more of recorded B mesons decaying than anti-B mesons. While BaBar and other experiments have found behavioral asymmetries before, this is the first difference obtained by simply counting up the number of matter and antimatter decays, a phenomenon known as direct charge parity violation.

Understanding differences in the behavior of matter and antimatter is important to scientists because it is key to building a coherent picture of the earliest moments of the universe.

"When the universe began with the Big Bang, matter and antimatter were present in equal amounts," said Giorgi. "But all observations indicate that we live in a universe made only of matter. So what happened to the antimatter? With experiments such as this, we are beginning to come up with possible explanations."

Subtle differences between the behavior of matter and antimatter must be responsible for the imbalance that developed in our universe, but our current knowledge of these differences is incomplete and insufficient to account for the observed matter domination. Charge parity violation such as the one observed at SLAC is one of the three theoretical conditions outlined to account for this observed imbalance.

The B-Factory facility was opened in 1999 as a collaborative project between SLAC, the Lawrence Berkeley National Laboratory, and the Lawrence Livermore National Laboratory. CCST played an important role in bringing the \$177 million B-Factory to California.

"Very early on, [CCST] gave the project high priority and brought it prominently to the attention of the Governor's Office and the California Congressional Delegation, whose strong support was essential to our success," said Burton Richter, SLAC director emeritus and CCST fellow.

"This is another great scientific achievement for SLAC," said Raymond Orbach, director of the Department of Energy's Office of Science and a former CCST fellow. "The new result from BaBar, and related measurements at other accelerators around the world, continue to improve our understanding and may ultimately tell us why the visible universe is only matter."

"The new result[s] from BaBar...continue to improve our understanding and may ultimately tell us why the visible universe is only matter."

Raymond Orbach
Director, Office of Science
Department of Energy

UPCOMING CCST EVENTS

SEPTEMBER 28 – 29, 2004. Irvine, CA

Board and Council meeting and dinner program.
Dinner speaker is University of California, Irvine
Chancellor Ralph J. Cicerone.

FEBRUARY 9 – 10, 2005. Sacramento, CA

Board and Council meeting and dinner program.

MAY 4 – 5, 2005. Sacramento, CA

Council meeting and dinner program.

CCST FELLOW GIVES \$14.5 MILLION TO SDSU

CCST Fellow Irwin Jacobs, co-founder and CEO of QUALCOMM, announced a \$14.5 million gift to San Diego State University, the largest single donation in SDSU's history.

"We see education as the most powerful tool to enable success for our community, both socially and economically," said Jacobs. "Partnering with SDSU, a university with a reputation for community development and educational excellence, will ensure that these educational initiatives will have a far-reaching effect throughout San Diego County."

The gift will establish the QUALCOMM Institute for Innovation and Success, whose goal will be to identify and address major issues critical to the long-term prosperity of the San Diego region. The QUALCOMM Institute will support professional development for teachers, curriculum improvement and institutional transformation in schools throughout San Diego and other parts of the country. The goal is to improve the level of instruction across the educational continuum – supporting teachers and students at K-12 schools, universities and beyond.

CCST identified education as a principal concern for the state's science and engineering community in 2002 with its "Critical Path

Analysis of California's Science and Technology Education System." The comprehensive approach of the QUALCOMM Institute, addressing science and math education issues from K-12 through postgraduate school, reflects the systemic approach recommended by the Critical Path Analysis. Such constructive support for science and math education is particularly important at a time when state funding is limited.

"The QUALCOMM Institute will develop a new strategic plan for education in San Diego, one that broadens the traditional scope of literacy to include a much higher level of mathematical and technical skills," said Stephen Weber, president of SDSU. "These skill sets are essential for San Diego to thrive and prosper, because virtually all professional fields, from business to health care to education, are becoming more dependent on mathematics and technology."

Jacobs was an associate professor of electrical engineering at MIT, and a staff member of the Research Laboratory of Electronics. He was a NASA Resident Research Fellow at the Jet Propulsion Laboratory and is currently a fellow of the Institute of Electrical and Electronics Engineers. He also serves on the National Academy of Engineering Industry Advisory Board. In 1994, he received the

United States National Medal of Technology, the highest award bestowed by the President, "for extraordinary achievements in the commercialization of technology or the development of human resources that foster technology commercialization."

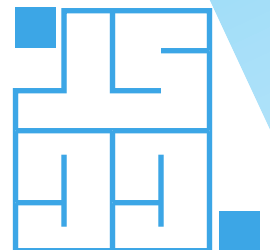
"This partnership represents a true collaboration," said Jacobs. "We're combining our strengths and resources to make a sustainable difference in our region's educational system. It's the only way things are going to change for the better."



Irwin M. Jacobs

The CCST Report focuses on CCST activities and highlights innovative science and technology research and applications in California. The Report is written by Danny DeCillis, who welcomes information from readers about science and technology at work in the private, public, and education sectors. The Report thanks CCST members for their generous assistance in providing material for this issue. If you would like more information about CCST initiatives, please e-mail the request to ccst@ccst.us, or visit CCST's website at <http://www.ccst.us>. Fax requests to (916) 492-0999 or telephone (916) 492-0996.

CALIFORNIA COUNCIL ON
SCIENCE AND TECHNOLOGY
5005 La Mar Dr, Ste 105
Riverside, CA 92507



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