



REPORT

Understanding California's Innovation Ecosystem

At the request of the State Legislature the California Council on Science and Technology (CCST) proposes to conduct a comprehensive assessment of California's "science and technology (S&T) innovation ecosystem," (specifically human capital, investment, and infrastructure), analyzing and reporting current global innovation systems, and recommending to the Legislature actions that should be taken to sustain the state's role as a global leader in science and technology.

"To help the state effectively address these risks and identify opportunities, we request that CCST undertake a comprehensive assessment of California's "science and technology (S&T) innovation infrastructure and ecosystem," analyzing and reporting current global innovation systems, and recommending to the Legislature actions that should be taken to sustain the state's role as a global leader in science and technology."
~ Assembly Member Portantino

Many leading organizations have issued reports e.g., *Rising Above the Gathering Storm*, *Innovate America*, etc., that cite three foundational building blocks to innovation -- Talent, Investment, and Infrastructure. A comprehensive approach to addressing these building blocks reflects an "innovation ecosystem." Today the term innovation is viewed as a central tenet to economic success globally and cited as "a fundamental issue of our time." California has long been known as an international leader in creativity and innovation, especially in science and technology. Whole industries -- biotechnology, computer hardware and software, semiconductors, wireless communication, and aerospace, to name a few -- were spawned from companies originating in California. These industries not only built a vibrant economy in the state, but also provided benefits to people across the U.S. and around the globe who now have vastly improved access to medical treatments, agriculture, automation, information and entertainment.

One of the most important catalysts for California's innovation ecosystem has been the state's investment in science, technology and higher education. No other region of the world has matched the quality of California's array of public and private colleges and



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universities, as well as federal research laboratories. Through state investments, and investments from federal and private sector sources, the state has provided exceptional preparation for its citizens to pursue careers in engineering and the sciences; attracted the most

talented students from around the world to study in California and remain in the state to launch new high tech companies; and create a culture in which university and laboratory faculty start businesses that employ thousands of citizens.

However, there is now a general sense that California's historic economic success and prominence through an S&T innovation ecosystem is at risk -- threatened by the potential erosion of the pre-eminent science, technology and education infrastructure that made the state great. Factors contributing to this perception include the state's disinvestment in its higher education institutions, and a diminished agility to respond to continuing and accelerating globalization of industry, the emergence of virtual campuses, and the evolving innovation process.

Given the fast paced evolution and globalization of the S&T innovation ecosystem and the impact to California's economic prosperity, CCST propose to undertake a comprehensive study to:

1. Assess the condition of California's S&T economy, describing the overall S&T innovation ecosystem in the current global economy; and,
2. Recommend actions for maintaining S&T leadership and competitiveness in an increasingly globalized economy, and facilitating new job opportunities through entrepreneurship and education.

This study will be a roadmap to guide California and other states' innovation ecosystem investment to further the nation's leading role in innovation and entrepreneurship.

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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, supported by California's federal laboratories and anchored by leading private-sector firms. CCST's mission is to improve science and technology policy and application in California by proposing programs, conducting analyses, and recommending policies and initiatives that will maintain a vigorous economy and ensure California's technological leadership.

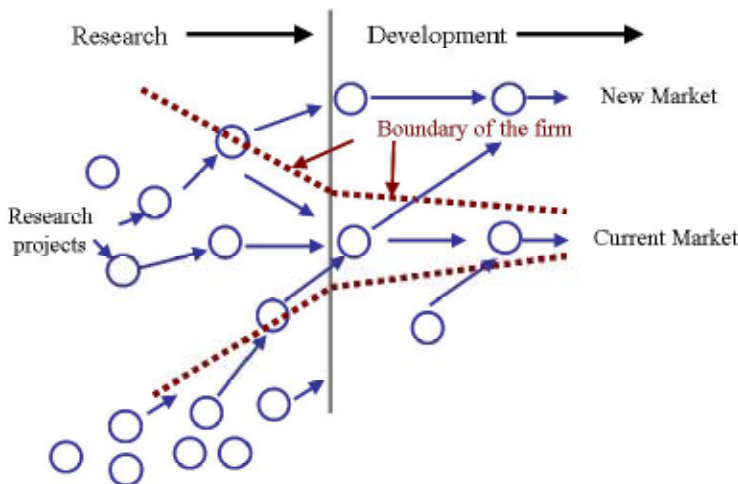
Changes in the Innovation Economy

At the February and May 2010 meetings, changes, threats and opportunities in California's innovation capacity were discussed.

The February meeting initiated a dialog on the changing context of innovation in S&T. Excellence in science and engineering is not enough to be a world leader - we need to be more creative, and look to radical innovations using social and cultural advantages as seen with Google, YouTube, eBay, and Yahoo. We also need new kinds of scientists and engineers with communications skills, multicultural understanding and foreign languages.

From Closed to Open Innovation

Henry Chesbrough, Haas School of Business, UC Berkeley, observed that the traditional closed innovation model, which has provided great successes in the past for industries such as Edison, GE, Rockefeller, and Standard Oil, has shifted due to five 'erosion factors,' including increasingly mobile trained workers; more capable universities; diminished U.S hegemony; the erosion of oligopoly market positions; and an enormous increase in venture capital. "The open innovation model involves a lot more external technology insourcing and spinoffs," said Chesbrough. "Good ideas are widely distributed today. Companies need to recognize that not all of the smart people in the world work for them, and that industrial R&D has become a distributed system."



Open Innovation Model of R&D, Henry Chesbrough, Executive Director, Center for Open Innovation, Haas School of Business, UC Berkeley

Key S&T areas with most change:

- **Communications** – spread of the Internet, ubiquitous 24/7 access, wireless devices
- **Healthcare** – opportunities resulting from human genomic, growth of medical technologies, big pharma challenges
- **Education systems** – support of higher education eroding, contrasting trends of amazing technology being created and failing K-12 system
- **Federal Laboratories** – change in perspective of the importance and new roles

What Has Changed in Healthcare

David W. Martin, Jr., M.D., Chairman and CEO of AvidBiotics Corporation, noted that the volume and complexity of data available has changed tremendously. "This offers the opportunity

for deeper personalization in healthcare," he said, "along with more interventional options. However, it also has led to accelerating costs." It will take a generation to effectively retrain physicians to use these data effectively, as well as other healthcare workers and patients. "The rate of innovation in healthcare has been outstanding," said Martin. "However, we must innovate the processes of applied care in order to capture the output of all the innovation."

California's Research Universities

George Blumenthal, Chancellor, UC Santa Cruz, gave an overview of the University of California's role in publicly funded research from 1998 to 2007. "Since 1997, UC total R&D expenditures have exceeded 9% of all expenditures at U.S institutions," Blumenthal noted. "However, we need to adapt to changing financial models as a way of preserving excellence while meeting the needs of California." The state-funded operating budget for UC was reduced by 20% in the 2009-10 fiscal year, and although the next budget has promised to restore over \$300 million, "we need to face up to the issue of privatization if public funds are not forthcoming," according to Blumenthal.

Sectors of Change

The May 2010 CCST meeting continued the innovation ecosystem dialogue begun in February. The discussion focused on four critical changing sectors in California: aerospace, federal laboratories, virtual campus, and energy. In each sector, infrastructure, human capital, and investment were addressed. The prevailing crosscutting themes cited a critical need for attracting and retaining talent; fostering a climate of new and innovative ideas and research; and sustaining investment.

Major General Thomas Taverney (USAF, Ret.), Sr. Vice President/ Executive Staff Space Operations, SAIC, suggested to the Council members the importance of looking at the past as we envision the future. Citing three seminal game changers which served as driving forces for the United States innovation economy:

- 1) WWII transformed a nation with 15 million servicemen and women into students entering institutions of higher education through the GI Bill which enabled educational access for ordinary people; this opportunity and influx of a new generation of students not only created a new education culture, but a new cadre of innovators and entrepreneurs.
- 2) The launch of Sputnik served as a competition between two super-powers; this translated into a wake up call for US leaders to invest in science and technology and the resultant discoveries and job creation.
- 3) The Apollo program focused 400 thousand engineers on great inspiration -- seeding engineering and innovation including the creation of land grant universities with a Return On Investment of \$1 Trillion.

Each of these game changers shared three pivotal components that fostered innovation intelligent people, financial commitment, and inspiration for innovation. Nurturing this century's innovation ecosystem must be seeded with these three components.

Hubble 3D – A Journey Into the Universe

On May 25, 2010, CCST and the California Space Authority (CSA) jointly sponsored a special viewing of the newly released Hubble 3D movie at Sacramento's IMAX Theater. Approximately 300 CCST & CSA members and guests (including California Legislators and other senior officials and their families) experienced the mesmerizing story of the Hubble Space telescope as well as a pre-viewing reception. A welcome and introductory remarks were provided by co-hosts Andrea Seastrand, Executive Director, CSA, and Charles Kennel, CCST Council Chair followed by Assembly Member Anthony Portantino's charge to CCST to conduct a comprehensive assessment of California's "science and technology (S&T) innovation ecosystem," and recommending actions that should be taken to sustain the state's role as a global leader in science and technology.

Assembly Member Portantino's closing remarks reminded us not only of Hubble's past accomplishments, but also the future promise. "The Hubble 3D movie we are about to see captures the innovation ecosystem -- science, wonder, innovation, world renowned, unimagined, unsurpassed. Scientists, engineers, educators, administrators, and others in this theater tonight have worked on the Hubble Space Telescope program in many different dimensions in California and throughout the country. Yet I want to address my closing to the children and their parents here tonight.

A New Way of Doing Business – in Space

This first jointly sponsored CCST and the California Space Authority (CSA) meeting created an opportunity to generate awareness of the burgeoning commercial aerospace industry resident in the Mojave under the auspices of the California Space Port. CSA is a member based enterprise association working closely with stakeholders to facilitate California's competitiveness and space enterprise vitality representing over 370,000 jobs statewide. "The space industry is a \$76 billion per year industry," said CCST Executive Director Susan Hackwood. "Together, California firms represent 40 percent of the national market in this field. It makes sense to focus on this sector, which is highly dependent upon innovation, as we explore the state of California's innovation ecosystem."

Moderated by CSA's Andrea Seastrand, "The Future of Space and Aerospace Industries in California" panel provided a comprehensive insight into the challenges and opportunities present in the space and aerospace sectors. Jet Propulsion Laboratory (JPL) Director Charles Elachi proffered that three essential elements: "education, access to capital, and a great place to live" are what "made California the powerhouse it is".

You children are the future; you are the innovators; you will be the explorers and discoverers in so many different realms -- the only limitation is your imagination; hard work, education, perseverance, and excitement about everything you do. You could be the engineer to design the next Hubble, or the architect of space colonies, or the next Steve Jobs. You parents have the ability to encourage and support your children in being successful in their studies, imagining possibilities, experiencing, learning, and guiding them to be the innovators and leaders for our state and our nation."



Hubble 3D captured the essence of the innovation ecosystem. Narrated by Leonardo DiCaprio, Hubble 3D allowed viewers to journey through distant galaxies to explore the mysteries and beauty of celestial surroundings while accompanying spacewalking astronauts in their servicing of the Hubble Space Telescope. The film provided an inspiring and unique insider's view into the Hubble's remarkable legacy while highlighting its profound impact on the way we view the universe and ourselves. A tribute to American ingenuity, innovation and a can-do spirit, Hubble 3D is a must see.

For more information, go to <http://www.imax.com/hubble/>

Yet California cannot live in its past glory days -- just look at California's near bottom rankings in education and business environment. Presenter SAIC Major General Thomas Taverney's, overview set the historical context of innovation with respect to aerospace ranging from the GI Bill, to Sputnik, to Apollo and how three ingredients (intelligent people, investment, and inspiration) are still critical elements for fostering innovation and creativity. While Dean Mohammad Noori, from Cal Poly San Luis Obispo's College of Engineering emphasized the decreasing number of students entering engineering due to the state's financial limitations, he also cited positive engagement of aerospace companies in basic support and loaned executives. Finally, Enrico Palermo, Operations Executive, The SpaceShip Company, shared the excitement and the possibilities of the evolving commercial space sector. Calling the Mojave the "oasis of innovation", Palermo also noted challenges facing California namely the competitive market from other states like New Mexico willing to invest \$200 Million in their spaceport, strategic partnerships e.g. Boeing in Charleston, South Carolina, and more favorable corporate tax rates in other states. "California has a good legacy to build on yet it needs to seize the opportunities."



CAPITOL HAPPENINGS

Science and Technology Legislation Updates

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.

Climate Change and Complying with AB 32

Climate change related legislation has been a major focus in Sacramento. Numerous climate change and energy related bills are under consideration in the Legislature, including a Joint Resolution recommending that Congress "establish a comprehensive framework, including dedicated funding, for adapting our nation's wildlife, habitats, coasts, watersheds, rivers, and other natural resources and ecosystems to the impacts of climate change" (AJR 26 - Chesbro). The state is considering how to balance its present and future energy needs, the emissions control targets mandated by AB 32 (Global Warming Solutions Act of 2006), and the state's ongoing budget crisis.

Complicating the situation is a new ballot initiative that has recently been qualified for the November elections. Earlier this year, the Legislative Analyst's Office (LAO) was asked to analyze the net impact on jobs in California from the implementation of AB 32. In March, the LAO responded by asserting that the initial assessment of the economic impact of AB 32 provided by the California Air Resources Board (CARB) may not have provided an accurate estimate of the job impacts over time. In contrast with CARB's assessment, which indicated a modest growth in jobs, the LAO analysis indicated that the near-term impact would result in minor job losses, while the long-term impact remains unknown.

Partially in response to the LAO analysis, a coalition of oil companies and taxpayer groups mounted a campaign to place an initiative on the ballot that would place a hold on implementing compliance with AB 32. In May 2010, the coalition submitted over 800,000 signatures to the Registrar of Voters, qualifying the initiative for the ballot.

The potential impact of the initiative on other climate change related legislation is not clear at this time.

Climate Change/Energy Bills

SB 722 (Simitian, Kehoe, and Steinberg): Renewable Energy Resources. This bill would extend the current Renewable Portfolio Standard (RPS) from 20% by 2010 to 33% by 2012. Last year, the Governor vetoed similar legislation and required the California Air Resources Board to implement a renewable energy program to achieve the 33% target by 2020. It is expected that the legislature will pass a similar bill again this year, and will try to work with the Governor to codify the targets in statute.

SB 1006 (Pavley): Strategic Growth Council. Existing law requires the Strategic Growth Council to coordinate programs to improve air and water quality, improve natural resource protection, increase the availability of affordable housing, and improve transportation, among other things. SB 1006 would expand the scope of the Council to include addressing climate change impacts and would give it a direct role in awarding financial assistance to other agencies and programs.

SB1340 (Kehoe): Alternative Fuels and Vehicle Technologies. The bill would expand the Alternative and Renewable Fuel and Vehicle Technology Program, administered by the State Energy Resources Conservation and Development Commission, include a cost-effective program to provide funding for homeowners who purchase an electric vehicle to offset costs associated with modifying electrical sources to include an in-home residential plug-in electric vehicle charging station.

AB 2514 (Skinner): Energy Storage Systems. California often experiences high electricity demand at certain times of the day. Traditional electricity generation in CA often cannot produce enough electricity to meet demand. Fossil-fuel burning "peaker" plants are constructed to meet this demand. Renewable energy resources are becoming an integral component of California's electrical portfolio, but often produce energy intermittently; only during the day in the case of solar energy, or often at night in the case of wind. By incorporating energy storage systems into the electrical grid, excess renewable energy may be temporarily sequestered for later use. This strategy allows for a greater incorporation of renewable energy sources into California's electrical grid, while offsetting the need to build new fossil fuel peaker plants. This bill would require the Public Utilities Commission (CPUC), by 2011, to establish procurement targets for each electrical corporation for viable and cost-effective energy storage systems.

AB 2329 (Ruskin and Chesbro): Climate Action Team. This bill would create the Climate Action Team (CAT), under the direction of the Secretary for Environmental Protection a consisting of representatives from specified state agencies, that would be responsible for coordinating the state's overall climate policy, identifying and reviewing activities and funding programs, recommending policies, investment strategies, and priorities, and providing information to local governments and regional agencies.

Healthcare Information Bill

As the discussion of wider implementation of Healthcare Information Technology continues, an ongoing legislative focus has been the privacy of medical records.



AB 2028 (Hernandez): Disclosure of Medical Information, would facilitate the sharing of information indicating abuse or neglect by amending the Confidentiality of Medical Information Act, authorizing a healthcare provider or a healthcare service plan to disclose information relevant to the incident of child abuse or neglect, or to the incident of elder or dependent adult abuse, to investigators from an agency investigating the case.

Legislature Considers State Biotech Recruitment/Retention Position

The Assembly Appropriations Committee weighed a bill that would create a new state government position aimed at retaining biotechnology employers in California, and attracting additional life sciences employers to the state.

AB 1733, introduced by Assembly Member Hill and coauthored by Assembly Members Ammiano, Anderson, Block, Caballero, Coto, Fletcher, Fong, Galgiani, Harkey, Hayashi, Audra Strickland, Swanson, Torlakson, and Villines, along with Senator Wyland, called for the state to hire a director of California biotechnology retention and recruitment within the office of the governor. The bill required the director to be “responsible for serving as an informational resource for biotechnology, life science, and medical companies, as specified.” The position would cost an estimated \$300,000 to support a high level staff member conversant in biotechnology generally and life science regulatory affairs specifically, as well as a half-time support staff and a travel budget to support out-of-state travel.

The bill follows on a series of hearings conducted by the Assembly Select Committee on Biotechnology during

2009 and 2010, which found that California biotechnology companies need assistance with complying with regulatory requirements imposed by state and local governments. The hearings also revealed that California biotechnology companies are locating satellite facilities and manufacturing facilities outside of California, because other states are providing incentives and assistance that California does not provide. According to a survey released by the California Healthcare Institute in January 2010, two-thirds of executives at California biomedical companies indicated they expected to expand their out-of-state manufacturing operations over the next two years. Only 30 percent of executives anticipated expanding manufacturing within the state.

AB 1733 passed the state Assembly’s health, and business and professions committees, but it did not make it out of appropriations. However, interest in facilitating biotech recruitment at the state level is manifest and further follow up to the Assembly Select Committee on Biotechnology hearings is possible.

UCSF Publishes Nanotechnology Policy Recommendations

The Program on Reproductive Health and the Environment (PRHE) at the University of California, San Francisco (UCSF) recently published a draft of a report entitled “A Nanotechnology Policy Framework: Policy Recommendations for Addressing Potential Health Risks from Nanomaterials in California.” The draft nanotechnology policy framework will be presented to Cal/EPA’s Office of Environmental Health Hazard Assessment, once finalized, to “better inform . . . risk assessment recommendations for decision makers and

risk managers.” The report was designed to provide the state “with an overview of nanotechnology materials and their potential exposures and human health risks, and proposes a selection of policy options for addressing potential hazards and risks from nanotechnology.”

There are few states with overall policies on the regulation of nanotechnology. California has traditionally been ahead of the curve in its regulatory approach to nanotech. In January 2010, CCST presented information to the Presidential Council of Advisors on Science and Technology (PCAST) on the history of nanotechnology policy in California, including the launch of the “California Nanotechnology Initiative” by the Department of Toxic Substances Control (DTSC) in 2006. (CCST had previously prepared a comprehensive overview of nanoscience and nanotechnology opportunities and challenges in the state in 2004 for the Joint Committee on Preparing California for the 21st Century.)

The PRHE’s stated mission is “to create a healthier environment for human reproduction and development through advancing scientific inquiry, clinical care and health policies that prevent exposures to harmful chemicals in our environment.” The draft nanotechnology policy framework the PRHE has produced highlights difficulties presented by the potential regulation of nanotechnology (or lack thereof) in California, including a disconnect between science, existing regulations, and policy recommendations. The report offers 15 recommendations, including mandatory pre-market testing of consumer products containing nanoscale components and labeling of these products.

A public meeting was held on May 5 for discussion of the draft, which is due to be presented to Cal EPA later this year.



CCST Policy Fellows Look to Opportunities in Federal Laboratories

The inaugural group of CCST Policy Fellows, who continue to connect with the broader S&T community, met with senior personnel from several federal funded laboratories on May 7th as part of an ongoing seminar series covering topics ranging from water and budget to state agency employment options.

“This was a terrific opportunity to connect the Policy Fellows with the expertise and opportunities offered by California’s federal laboratories,” said Lora Lee Martin, Director, CCST Science & Technology Policy Fellows.

CCST is running weekly Friday training seminars for the Fellows that cover a range of policy issues of interest to the State. In addition, recent seminars have included an introduction to state agency employment options (hosted by Toby Ewing, Director of the California Research Bureau) and career opportunities with the federal laboratories.

At the federal laboratories seminar, presentations were made by representatives from Sandia National

Laboratories – California, NASA Ames Research Center, the Lawrence Berkeley National Laboratory, and the Lawrence Livermore National Laboratory, covering the primary missions and scope of each institution.

“We work to address national needs by engaging the Lab on the greatest scientific and technical challenges of our times,” said Bill Singh, of Lawrence Berkeley. “In order to do so, our challenge is to foster and harness the creativity of outstanding individuals, working collectively across disciplines and boundaries to find solutions. The Policy Fellows represent exactly the sort of people we are interested in.”

The Policy Fellows are professional scientists and engineers placed in various offices in the California State Legislature for one-year appointments. These professional development opportunities enable Fellows to work hands on with policy-makers to help develop solutions to complex scientific and technical issues facing California through their interaction with the legislative

process. Five are in the State Assembly and five in the State Senate. Some are working in members’ offices and some as committee staff. In addition to learning about the legislative process, their work includes participating in the development of bill ideas, analyzing bills, and writing reports for the Legislature.

“It was a good opportunity not only for the Fellows to see what opportunities exist within the labs, but also for them to understand the role that the labs play on a regular basis in assisting California,” said Susan Hackwood, Executive Director of CCST, “The more information the Fellows are exposed to about the resources and infrastructure the labs have to offer, the more they can share with the legislators and staffers with whom they are placed this year.” Some of the projects underway at the laboratories include Homeland Security and Defense work (Sandia) and other emergency service support, such as airborne observation for regional disasters such as wildfires (NASA Ames).

pHIT Study Appoints Ontology Panel

CCST’s Personalized Healthcare Information Technology (pHIT) Task Force has assembled a panel of clinical oncologists as part of its pilot study to develop a scalable prototype healthcare decision support system designed to integrate de-identified patient records with genetic/genomic test results. This system will be built upon an expertly developed personalized clinical ontology for breast cancer patients and integrated with an existing electronic medical record (EMR) system designed to support decision making by the healthcare provider and individual patient.



The Task Force opted to select breast cancer as the target disease as at least two genetic/genomic tests are currently used by physicians as standard of care. The Ontology Development Panel has been convened to work with the study’s data

management partner, CentriHealth, in building out the decision support model.

Emerging genetic/genomic tests and diagnostic tools provide new opportunities for truly personalized medicine. Information technology resources such as clinical decision support systems can facilitate meaningful use of genetic and genomic information in the course of patient care.

The pilot study retrospectively evaluates de-identified breast cancer patient records (from CalPERS via Anthem Blue Cross (Well Point)), and genetic/genomic test results provided by Genomic Health, Inc. and Myriad Genetic Laboratories, Inc., integrating them in a decision support IT platform provided by CentriHealth.

Next steps toward full implementation of the one-year pilot project include data integration of the product(s) resulting from ontology development, and system infrastructure development.

Staying The (New) Course: NASA's New Approach

On April 15, at the Kennedy Space Center in Florida, President Obama outlined a strategy for human spaceflight that increases NASA's budget by \$6 billion over the next five years. His plan represents an ambitious effort to foster the development of path-breaking technologies; increase the number, scope, and pace of manned and unmanned space missions; make human spaceflight safer and more efficient; and help create thousands of jobs. It also represents a departure from the direction taken by the previous administration, cancelling the Constellation human spaceflight program and changing the next manned mission target from the moon to an asteroid.

The new focus for NASA has received criticism from some, but in large part reflects the recommendations of the Review of U.S. Human Space Flight Plans Committee, presented last fall.

"We concluded that, in order to conduct a meaningful human spaceflight program beyond low earth orbit, we would need to spend an additional \$3 billion a year," said CCST Council Chair Charles Kennel, Distinguished Professor of Atmospheric Science, Scripps Institution of Oceanography, who served on the committee. "The President made a fateful decision when he outright canceled the program of record, the so-called 'Constellation' program. Had NASA received additional funding as promised, it might have been possible to complete the Constellation program on schedule. That funding never materialized, and the President chose not to make up what had become a large difference."

The President's new plan modifies President Bush's Vision for Space Exploration (VSE) by changing the approach to crew and cargo transportation

to low Earth orbit (LEO). In the previous plan, NASA was to develop its own crew transportation system, comprised of two different rockets and a crew capsule, to send astronauts to LEO, including to the International Space Station (ISS). The capsule component would be augmented over time to provide deep space transportation capability. Simultaneously, commercial transportation capabilities would be allowed to evolve, eventually taking over responsibility for crew transportation to LEO. The plan announced by President Obama makes reliance on commercial transportation of crew to LEO the primary plan, while retaining a secondary NASA-developed crew capability, and investing in technology to enable the creation of a large heavy lift vehicle capable of exploration beyond low earth orbit.

The establishment of a base on the Moon would no longer be considered the primary near- to medium-term objective of the American human spaceflight program. Instead, President Obama has made rendezvous with and landing on an asteroid in 2025 the next major goal for NASA. From there, NASA will continue with further deep space exploration, leading to a human mission to orbit Mars in the mid 2030s, with a landing to follow at some point thereafter.

Despite the continued focus on human spaceflight, the cancellation of the Constellation program, which has already cost billions, has generated opposition.

"There is a very large problem with Congress' reception of the budget for human spaceflight," said Kennel. "One could have predicted that cancelling the Constellation program would be politically controversial, but I for one did not anticipate the firestorm of opposition from

members of Congress whose districts are affected by the cuts."

It is worth weathering the opposition because, according to Kennel, there are many positive things about the proposed budget for NASA, and there is good evidence that the commercial and international partnerships cited by the Obama administration can work.

"Aside from the space station itself, the most valuable asset produced by the ISS project has been the proven and tested working-level relationships among the partners," said Kennel. "This partnership has weathered budget problems, changes in governments, lapses in commitments, and the Columbia tragedy. It could evolve into the global partnerships that will be needed for human exploration beyond low Earth orbit, to asteroids, the moons of Mars, and eventually Mars itself."

In many ways the new budget is a good one for NASA, providing an overall increase of a billion dollars per year with improved funding for aeronautics and for a long-needed advanced technology development program. No science program is taking a funding cut, and some, especially earth science, are increased, a welcome change from the trends of recent years.

"Space exploration connects with the global public, and NASA's leadership in space promotes American leadership in the world," added Kennel. "Let us hope the budget disputes can be settled soon, lest the other good things in the NASA budget languish."



"The international partnership that has driven the ISS is one of the most valuable assets produced by the project, weathering budget problems, changes in governments, and lapses in commitments. These relationships could evolve into the partnerships that will be needed for human exploration beyond Earth orbit." Image courtesy of NASA.

Upcoming CCST Events

October 18-19, 2010

Irvine
Board and Council meeting
and dinner program.

February 2011

Sacramento
Board and Council meeting
and dinner program.

CCST Senior Fellow Francisco Ayala Awarded Templeton Prize



Photo Credit: Mark Finkstaedt

Francisco Ayala, UC Irvine professor of ecology and evolutionary biology and a CCST senior fellow, has won the 2010 Templeton Prize, which is awarded to a living person who has made an "exceptional contribution to affirming life's spiritual dimension."

"Professor Ayala has earned a very distinctive honor that recognizes the broader significance of science," said CCST Council Chair Charles Kennel. "We are tremendously pleased for him."

The Templeton Prize was announced on March 25 at a news conference at the National Academy of Sciences in Washington, D.C., by the John Templeton Foundation, which has awarded it since 1973. Valued at one million pounds sterling (about \$1.53 million), the Prize honors a living person who has made exceptional contributions to affirming life's spiritual dimension. HRH Prince Philip, the Duke of Edinburgh, awarded the Prize at a private ceremony at Buckingham Palace on May 5.

Ayala, one of the nation's leading biologists and one of the original CCST Senior Fellows, is the Donald Bren Professor of Biological Sciences, Professor of Philosophy and Director of the Bren Fellows Program at the University of California, Irvine. He has pioneered the use of molecular biology methods in the investigation of evolutionary processes; his research has led to a new understanding of the origin of species, the pervasiveness of genetic diversity, and rates of evolution, among other concepts.

He has also devoted more than 30 years to speaking about issues concerning science and society, ethics and religion, asserting that both

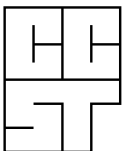
science and faith are damaged when either invades the proper domain of the other. Besides holding professorships in biology, philosophy, logic, and philosophy of biology (a field he helped establish), Ayala is also University Professor, the highest rank within the California university system and the only person with that title at UCI.

CCST council member Susan Bryant, UCI's vice chancellor of research, stated that Ayala, with his passion for science, his deeply religious roots, and his profound understanding of evolution, has filled an important niche at the intersection of science, philosophy and religion. "The Templeton Prize is a great honor and a very fitting recognition of Professor Ayala's multidimensional contributions to science and society," said Bryant.

The *CCST Report* focuses on CCST activities and highlights innovative science and technology research and applications in California. The Report is edited by Danny DeCillis, who welcomes information from readers about science and technology at work in the private, public, and education sectors. Layout and graphics by Sandra Vargas. 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 contact us at:

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