

CCST 2013 Annual Report

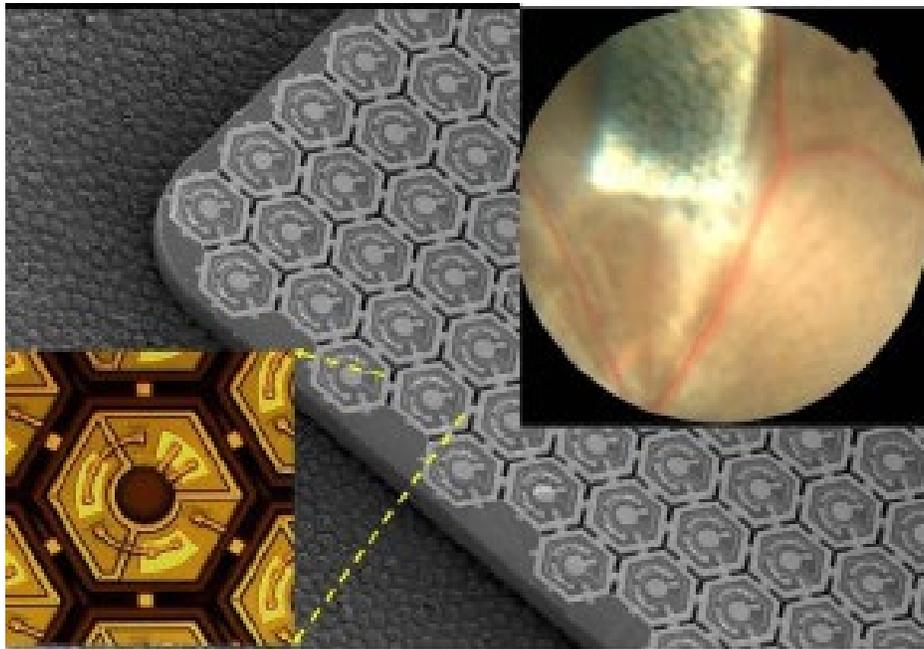
A POLICY FOR GROWTH



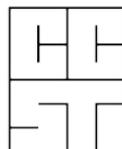


California Council  
on Science  
and Technology

2013  
ANNUAL REPORT



Solar-powered artificial retina developed at Stanford



SEPTEMBER 2013

CCST is a nonpartisan, impartial, not-for-profit 501(c)(3) corporation established via Assembly Concurrent Resolution (ACR 162) in 1988 by a unanimous vote of the California Legislature. It is designed to offer expert advice to the state government and to recommend solutions to science and technology-related public policy issues. CCST is modeled in part on the National Research Council, and has developed a close working relationship with the National Academies. More than half of CCST's members and senior fellows are members of the National Academies, and four are Nobel Laureates.

Since its creation, CCST has worked directly with the governor's office, state and federal legislators, and agencies to recommend policies that will maintain California's role as a leader in generating science and technology innovation and maintaining a vigorous economy.

### **Sustaining Institutions**

The strength of CCST lies in the support and resources provided by its sustaining institutions, the University of California system, the California State University system, California Institute of Technology, Stanford University, University of Southern California, and the California Community Colleges, as well as its affiliate members, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratory in California, SLAC National Accelerator Laboratory, and NASA Ames Research Center and Jet Propulsion Laboratory. CCST also has strong connections to industry through its membership.

### **Board and Council**

A board of directors and council members volunteer their time to govern and guide CCST. The board, which meets twice a year, is made up of 16 leaders from industry and academia. Karl S. Pister, UC's former vice president for educational outreach and chancellor emeritus of UC Santa Cruz, serves as CCST board chairman.

The council, which meets three times a year, currently includes 26 corporate leaders, academicians, scientists, engineers, and scholars of the highest distinction. Miriam E. John, former vice president, California Division, Sandia National Laboratories, is the chair, and Peter Cowhey, dean of the School of International Relations and Pacific Studies at the University of California, San Diego is the vice-chair.

The board establishes CCST's policies and provides oversight, while the council translates those directives into programs and projects that will ensure the state's science and technology leadership. The council is divided into subcommittees that manage and plan specific projects and studies.

### **Senior Fellows**

CCST senior fellows are a select group of distinguished scientists, engineers, and technical experts who volunteer their time to address specific projects or conduct reviews. CCST created the program in 1997; since then, CCST has appointed 130 senior fellows who are engaged in all aspects of CCST's work addressing important science and technology issues facing government, education, and industry.

### **California Teacher Advisory Council (Cal TAC)**

Cal TAC is a group of 12 outstanding K-14 science and math classroom teachers and is modeled after the successful National Teacher Advisory Council, established in 2002 by the National Academies. Cal TAC works to provide a valuable connection between the teaching community and the educational experts and policymakers who are shaping California's educational system. Brian Shay, Secondary mathematics teacher, Canyon Crest Academy is the chair and Heidi Haugen, science teacher, Florin High School is the vice-chair.

### **California Science and Technology Policy Fellows**

Each year, the California Science and Technology Policy Fellowships place ten professional scientists and engineers in the California State Legislature for one-year appointments. The S&T Policy Fellows work hands on with policymakers to develop solutions to complex scientific and technical issues facing California through their interaction with the legislative process.

### **Staff and Offices**

Susan Hackwood is CCST's executive director and provides overall day-to-day leadership; she also sits on the board and council. CCST has two offices. One is in Southern California adjacent to UC Riverside; another is one block from the State Capitol in Sacramento.

## A POLICY FOR GROWTH

California is a state built on ingenuity. In both the public and private sectors, we are trendsetters and national leaders. Despite years of serious state budget shortfalls, California still leads the nation in a number of innovation related indices, such as total research and development expenditure and patent registrations. In 2012, our state attracted over 53% of the nation's venture capital investment. Clearly California has many of the right conditions to encourage and sustain high-tech innovation and economic growth.

Long-term success depends on more than ingenuity, however. California cannot afford to be complacent, nor should we assume that its policy framework is ideal for encouraging the high-tech innovation the state depends upon so much. The breadth and depth of our research community gives us tremendous advantages, but we need to understand more about how to translate these advantages into lasting economic growth.

CCST has spent much of the past year examining the links between innovation and entrepreneurship, both within the boundaries of our state and beyond. This is, in part, the follow-through on our 2011 "Innovate 2 Innovation" (i2i) reports, in which we examined California's innovation 'ecosystem' at the behest of the State Legislature. We continue to pursue more in-depth analyses on how science and technology could impact the state's water infrastructure and digital education - two areas which the i2i reports called out for further attention.

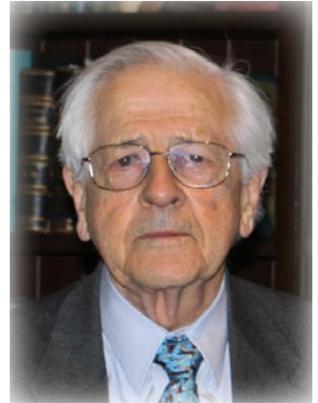
These elements of the State's infrastructure are pieces of a much larger mosaic: the state's whole is more than just the sum of its parts. California's culture of innovation has per-

sisted even in the face of a national economic downturn and significant financial issues in large part because of the connections between California's many science and technology resources, be they institutional, intellectual, entrepreneurial, or social.

CCST was founded to help foster and leverage such connections. Our mandate is to bring together every sector of the science and technology community, in order to offer the most comprehensive and valuable input to policymakers as they consider issues relevant to science and technology in California. CCST's ever growing body of experts from academia, industry, federal labs, teaching and public policy makes us a unique asset for California. We can and do bring an unparalleled breadth and depth of knowledge to focus on any aspect of science and technology that is important for our citizens.

As we mark CCST's 25th anniversary, the scope of our vision has become wider than ever. We are exploring important frameworks for policy discussion far beyond near-term needs, as with the recently concluded California's Energy Future series of projects, which looks at possible energy scenarios through 2050, and far beyond California's borders, such as our discussions of state policy in the context of partnerships with China.

CCST has been advising California about science and technology related issues for a quarter century. Much has changed in California since 1988, but the need for reliable, impartial S&T related input remains just as great. We look forward to another 25 years of growth, innovation, and expanding connections both within California and beyond.



Karl S. Pister  
Board Chair



Miriam E. John  
Council Chair



Peter F. Cowhey  
Council Vice-chair

## SEEKING CLARITY AMIDST CONFUSION



State governments need to balance a wide range of responsibilities, looking after the overall well-being of their populace, providing intelligent stewardship of resources and the environment, and economic growth. The latter is often considered the essential goal of most state policies and the primary metric by which they are deemed to succeed or fail. The full picture is vastly

more complex, however, and for California – the state with the largest population, a wide range of natural resources, and one of the largest economies in the world – the balancing act is both particularly pressing and complicated.

That California's success is due in large part to its science and technology sectors has long been known. Over the past fourteen years, since the publication of CCST's California Report on the Environment for Science and Technology (CREST), we have worked towards facilitating a more coherent strategic planning process for the state, by quantifying and analyzing the factors that contribute to the state's well-being and identifying ways to constructively support areas key to S&T. These include entrepreneurship, the state's physical infrastructure, physical resources and education.

Each of these poses significant management and policy challenges. STEM education, for example, has long been a focus for CCST. We have looked in detail at the most important aspects of the system, including the overall rates of STEM graduation and

attrition (Critical Path Analysis, 2002), science and math teacher production (2005), and the preparation of elementary school teachers to teach science and math (2010). The situation has become more, not less, complicated: in the past five years, digitally enhanced education has become a major issue. Although researchers, educators, and policymakers recognize that digital instruction will be part of the educational landscape, there is little empirical data available to determine how the increased access to tools and information can be balanced with rigor, quality, and value for both teachers and learners.

The state's physical infrastructure is another area where it is difficult to know how to make good choices. California has set long-term goals for reducing its greenhouse gas emissions, but understanding how to achieve these goals is another matter. CCST has spent the last few years analyzing the potentials and limitations of energy related technologies, just to establish a baseline of what is possible to achieve. With seven reports published from 2011 through 2013, on subjects ranging from biofuels to nuclear power to transportation and more, the California's Energy Future project assessed technical scenarios in order to understand how each situation might help the state reach its emissions goals. The bottom line is, no single technology offers all the answers, and California will have to employ a shrewd balance of many approaches in order to meet its goals.

California's reality is that it is comprised of many regional economies, with different infrastructure, business, and workforce needs. Investments need to be targeted not only by sector but by region as well. The infrastructure, educational, and workforce issues

*“California employs over 786,000 people in science and engineering jobs - almost 14 percent of the nation's SE workforce - with three of the six largest high-tech industry clusters in the country.”*

facing the Bay Area are different than those facing the Inland Empire, for example. Workforce and infrastructure priorities for advanced manufacturing are different than those for the agricultural sector. Educational needs are different in San Diego than they are in Fresno.

Nevertheless a certain amount of consistency in the state's overall vision and strategies is necessary. For example, meeting the state's emissions goals will require an approach that integrates not only its approach to energy, but also water - a sector closely intertwined with energy, and which both consumes and produces large amounts of electricity. It will not be possible for the state to effectively manage these systems independently of one another, if it is to improve the efficiency and capability of both systems. This means consistency in policy and data management that is currently absent in many sectors. The state's growth in the past has led to many independent and overlapping sets of regional and sector-specific policies and institutions, causing conflict and confusion.

This is where CCST comes in. Our role for the past twenty-five years has been to function as a

catalyst and connector between the state's science and technology community and the State. It is also to bring together people and institutions that do not ordinarily interact, forging connections and dialogues beyond the scope of everyday business which serve to clarify mutual 'big-picture' needs and agendas. An important recent addition to our roster has been the California S&T Policy Fellows, a group of ten Ph.D. level professionals placed in offices of State legislators to help improve the interface between science and policy making. This program, now in its 5th year of operation, is the only one of its kind at the state level, and an important new way to connect policy discussions with S&T expertise and perspective. Note that more than 70% of the graduates from this program stay in public policy, mostly in Sacramento.

California is in some ways a victim of its own success: it has so many diverse S&T assets that they can clutter up the policy landscape, making it easy to miss the forest for the trees. CCST is working to help provide the state with a bigger picture, to enable an environment suitable for growth in every area.



Susan Hackwood  
*Executive Director*

## HIGHLIGHTS 2012-2013

### *S&T Legislative Policy Fellows*

The program, modeled after the 35-year old Congressional S&T Fellows Program administered by the American Association for the Advancement of Science (AAAS), placed the fourth group of fellows throughout legislative offices in Sacramento. A fifth group has been selected for the 2013-14 session. Funding has been obtained to extend the program past its initial five-year pilot period.

### *California's Energy Future*

CCST released the final three publications of the California's Energy Future (CEF) project, a broad study designed to help inform the decisions state and local governments must make in order to achieve California's ambitious goals of significantly reducing total greenhouse gas emissions over the next four decades. These included low-carbon technologies, building and industrial efficiency, and biofuels.

Following on the project, CCST has now begun the CEF Policy project, which was formed to address the policy implications of these technology analyses.

### *Science and Technology for California's Water Future*

This project, which follows on the Innovate 2 Innovation reports of 2011, is working to determine how innovations in science and technology can be used to improve California's integrated water management. CCST is working to identify innovative technology and/or system approaches that can be used in California within the next five to ten years to help address challenges in managing finite water resources in the face of future uncertainties.

### *Publication: Digitally Enhanced Education in California: Educational Technology and Digital Media Use in California's Teacher Preparation Programs - A Status Report*

This paper was released in preparation for the October 2012 "Summit on the Integration of Digital Media into Teacher Preparation" about the status of California's teacher preparation programs, with regard to ensuring that teachers have the knowledge and skill to deliver a relevant 21st century curriculum to students.

### *California Teacher Advisory Council (Cal TAC)*

Cal TAC has continued to work on CCST's digital education initiative and is working with CCST on implementing a California Education Innovation Consortium. Cal TAC activities this year involved three meetings, including a symposium on the efficacy of digitally enhanced education in California.

### *Trip to Washington D.C.*

In January 2013, delegations from Cal TAC and the California's Water Future project traveled to the nation's capital to share updates on their respective projects with members of Congress, Congressional staffers, and other government personnel.

### *Trip to China*

In April 2013 Governor Jerry Brown led a 90-person delegation of business leaders, agricultural producers, legal experts and bankers on a multi-city, densely packed tour of China; CCST Executive Director Susan Hackwood was part of the delegation. The official tour included stops in Beijing, Shanghai and Guangzhou.

# THEN AND NOW

1988

2013

TECHNOLOGY



CARS



GOVERNMENT



ENTERTAINMENT



## SCIENCE AND TECHNOLOGY POLICY FELLOWS

The California Science and Technology Policy Fellowship program placed its fourth consecutive group of Fellows in the California State Legislature, continuing to build on a growing legacy of making S&T expertise available to lawmakers in a way most states do not have.

Each year, the program places ten professional scientists and engineers in yearlong appointments in the Legislature. It is designed to enable Fellows to work with policymakers in addressing issues that involve science or technology. The CCST program is modeled on a similar one run by AAAS in Congress for decades. Four years after its inception, the California S&T Policy Fellowship remains the only state-level program of its kind. The program has received funding to continue operating beyond its original five-year pilot period.

The first three groups of Fellows have been appreciated by legislators, receiving formal acknowledgments and thanks at the end of their terms from both houses.

The intersection of science, technology and policy can be challenging. Many issues, including those such as water management or greenhouse gas emissions, can involve considerable amounts of research and data. The Fellows are charged with using their analytical and research expertise to help policymakers navigate these data.

In order to be able to work most effectively with policymakers, S&T Policy Fellows begin their term each fall with a rigorous training regimen, during which they are introduced to the realities of working in the Legislature and the specialized skills

needed to be successful in their assigned Fellowship roles. They are placed in their legislative offices in early December to work under the guidance of mentors from the legislative staff.

Many previous fellows have continued employment in the public sector following the end of their appointments, with several obtaining jobs in the Legislative staff and executive agencies of California; one was recruited to work as staff to the President's Council of Advisors on Science and Technology in the White House.

The 2012-13 group of fellows is working in a range of appointments, including the Senate committees on Natural Resources and Water, Environmental Quality, Energy, Utilities and Communications, and Human Services, as well as the Senate Office of Research and the offices of five Assembly members. The 2013-14 class of fellows has been selected and will begin training this fall.

In addition, the William Hurt Foundation has provided funding to begin the S&T Fellows Alumni Program. Work began on this program during the summer. It will include the formation of a Fellows alumni steering committee, offering sustained and regular connections with other S&T Policy Fellowship program alumni; an annual conference among alumni and current Fellows, held in Sacramento each summer; and a networking database and internet portal. The Alumni group has already held one event by co-hosting a reception in the State Capitol on the occasion of passage of Senate Concurrent Resolution 46 which honored the National Academy of Sciences on its sesquicentennial.





2012-13 Science and Technology Policy Fellows  
(Left to right) Leonardo Scherer Alves, Annabelle Kleist, An-Chi Tsou, Neela Babu, Gregory Gambetta,  
Laura Feinstein, Mark Elsesser, Melanie Zauscher, Kyle Hiner, and Tepring Piquado

## Assembly Offices

**Neela Babu – Office of Assembly Member Skinner.** Neela received an M.S. and a Ph.D. in Civil and Environmental Engineering at Cornell University, and a B.S. in the same field from the UC Davis.

**Mark Elsesser - Office of Assembly Member Cooley.** Mark received a Ph.D. from the University of California, Santa Barbara and a B.S.E. from the University of Michigan, both in chemical engineering.

**Annabelle Kleist – Office of Assembly Member Nestande.** Annabelle received a Ph.D. in plant biology from the UC Davis and a B.A. with honors in biology from Carroll College.

**An-Chi Tsou - Office of Assembly Member Bonta.** An-Chi received her Ph.D. in Bioengineering from the UC Berkeley-UCSF Bioengineering Graduate Program and her B.S. in Engineering Science from Smith College.

**Melanie Zauscher – Office of Assembly Member Stone.** Melanie received a Ph.D. in mechanical engineering from the UC San Diego. Her undergraduate degree is a B.S. in environmental chemistry.

## Senate Offices

**Leonardo Scherer Alves – Senate Natural Resources and Water Committee.** Leonardo received his Ph.D. in biomedical sciences from the UC Irvine. His research focused on the role of mitochondria in human adaptation and disease. He obtained his undergraduate degree in Zoology from the University of Oklahoma.

**Laura Feinstein – Senate Environmental Quality Committee.** Laura holds a Ph.D. from the UC Davis in Ecology.

**Gregory Gambetta – Senate Office of Research.** Gregory received a Ph.D. in plant biology from UC Davis and a M.S. in biology from CSU Sacramento.

**Kyle Hiner – Senate Energy, Utilities and Communications Committee.** Kyle received a Ph.D. in physics from the UC Riverside and a B.S. in physics from California State Polytechnic University, Pomona.

**Tepring Piquado – Senate Health and Human Service Committee.** Tepring received a Ph.D. in neuroscience from Brandeis University and a B.S. in computer science from Georgetown University.

## AFTER THE FELLOWSHIP WHERE DID THEY GO?

- State Senate – 6
- State Assembly – 6
- State Agencies – 4
- Public Health Officer – 1
- White House – 1
- Federal Energy Laboratory – 1
- Industry – 2
- Non-profits – 4
- Academia – 2



## CALIFORNIA'S ENERGY FUTURE

CCST released the final three publications from the California's Energy Future (CEF) project, a study designed to help inform the decisions state and local governments must make in order to achieve California's ambitious goals of significantly reducing total greenhouse gas emissions over the next four decades.

“Portraits of Energy Systems for Meeting Greenhouse Gas Reduction Targets”, released in September 2012, examines a variety of scenarios for reducing greenhouse gas (GHG) emissions. The report documents two sets of portraits, detailed in the two main report sections: those that can reduce GHG emissions to 60% below the 1990 level by 2050, and those that can contribute toward reducing emissions all the way to the 80% reduction level, and beyond.

The document uses modeling and scenario building to explore combinations of technological approaches offering the best potential to reduce emissions. These approaches include energy efficiency, electrification, low-carbon electricity (from sources such as renewables, natural gas with carbon sequestration, or nuclear power) and low-carbon fuels derived, for example, from biomass. The authors identify a mix of strategies that can reduce the state's GHG emissions by 60%, and then calculate the impacts of ten additional individual strategies that could provide the extra 20% reduction the state needs to get to 80% reduction in emissions.

In “Building and Industrial Efficiency”, released in November 2012, CCST explores both the maximum technical potential and the projected realistic potential of increasing building and industrial efficiencies through phasing in new buildings and equipment and retrofitting older ones.

Because population and economic growth are projected in the business-as-usual case to roughly double the total demand for energy services by 2050, achieving 80% GHG reduction from 1990 levels actually requires a 90% reduction from projected 2050 emission levels. The study concludes that a 90% reduction in energy use is technically possible, but unrealistically demanding, for the residential and commercial buildings sector. Further, a 90% reduction is not technically feasible for the industry or transportation sectors. Consequently, it is not possible to meet the 2050 emission goals solely through efficiency and electrification gains, according to the report. However, substantial levels of GHG savings are still possible through these actions.

The final report in the series, “The Potential for Biofuels” (released in May 2013) assesses the potential for fuels produced from renewable biological resources to contribute to the energy needs of California, particularly for transportation. Biofuels can be produced using agricultural wastes, forest thinnings and harvest residues, municipal wastes, and purpose-grown energy crops such as perennial grasses and short rotation woody crops

which do not require fertilizer or irrigation. Under a reduced future demand scenario, in which the state focuses on high efficiency and electrification, biofuels could help reduce emissions by 50–85%, assuming that feedstocks are not limited. If demand continues to rise however, in a “business-as-usual” scenario without increased efficiency measures, then the amount of biomass available is likely to be insufficient to meet total fuel demand.

With the completion of the last subject-specific report in the first California’s Energy Future Series series, CCST’s focus has turned to policy and implementation. The CEF Policy committee was formed to address the policy implications of the

technology analyses produced as part of the CEF project. During its first year, with funding from the Cummings Foundation, the study used a series of committee meetings to develop policy questions that could be addressed.

A series of projects is underway which include:

- Electricity pricing
- Carbon capture and storage
- Tools for choosing an emission-free electricity portfolio

The California’s Energy Future (CEF) project was undertaken to help inform California state and local governments how to reach the state’s goals of significantly reducing total greenhouse gas (GHG) emissions by 2050. These goals were mandated by the California’s Global Warming Solutions Act of 2006 (AB32) and Executive Order S-3-05. In order to comply, California needs to reduce its GHG emissions to 80% below 1990 levels by 2050 while accommodating projected growth in its economy and population.



Of the strategies explored to lower California’s emissions beyond the 60% reduction level, three appear capable of meeting the 80% reduction target on their own (doubled biomass supply, biomass and coal with carbon capture and sequestration (CCS) to make fuels, and biomass with CCS to make fuels), while the remaining strategies would have to be deployed in combination



## CALIFORNIA'S WATER FUTURE

“Science and Technology for California’s Water Future” is a project to determine how innovations in science and technology can be used to improve California’s integrated water management.

In “Innovate 2 Innovation” (i2i), an overall assessment of California’s innovation ‘ecosystem’ in 2011, CCST identified long-term management of California’s water systems as a serious challenge to California’s ability to remain a competitive environment for innovation in the future.

The importance of the water infrastructure is well understood in California, which has developed one of the most sophisticated water management systems in the world. The state already possesses a long-term strategic water plan, looking ahead to 2050, which is updated every five years by the California Department of Water Resources (DWR). However, California faces an increasingly complex range of challenges from the inter-related issues of water, energy, agriculture, urban needs, climate change, and environmental stewardship. The i2i study found that there is no consensus on how to simultaneously maintain water supply reliability, balance changes in

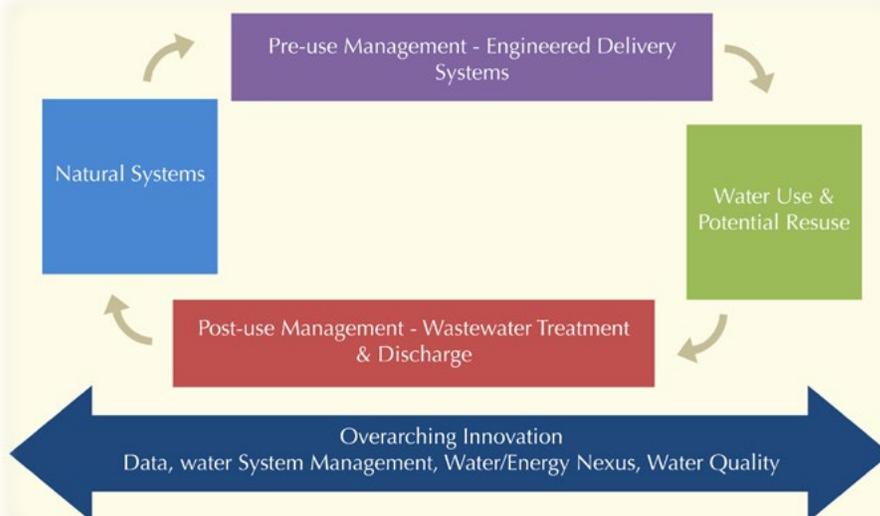
water supply with demand and protect the environment; consequently it recommended that, in order to implement a more integrated water resource management strategy, a science and technology based ‘roadmap’ be developed with a framework of key issues where science and technology could “have the most positive impact in contributing to a sustainable, long-term water policy for the state.”

The California’s Water Future project is working to identify innovative technology and/or system approaches that can be used in California within the next five to ten years to help address challenges in managing finite water resources in the face of future uncertainties such as population growth, changing development patterns, more water dedicated to the environment, and climate change. CCST is approaching the task through the use of an on-line survey, focus groups comprised of subject matter experts, and the DWR Water Technology Caucus.

The report, scheduled to be released at the end of 2013, is being structured to present an overview of water management in California, identifying specific areas where science, policy, and technology innova-

tion can help achieve a more integrated water resource management system. The project plan was developed in collaboration with DWR and the project results will inform the work of the Water Technology Caucus as it provides input to the California Water Plan Update 2013.

The water use cycle can broadly be divided into four ‘top tier’ categories: the natural systems (the sources of water); the engineered delivery systems (the infrastructure used to deliver the water throughout the state); the water users; and the post-use management (wastewater treatment, etc.). CCST is exploring innovations which affect each of these categories, as well as some ‘overarching’ technologies which affect the entire cycle.



## CALIFORNIA TEACHER ADVISORY COUNCIL

“Classroom practitioners are the ones with firsthand experience of how digitally enhanced education methods are changing the ways in which students learn. It is important that we use their knowledge to evaluate the use of these technologies and understand how they are helping to promote students’ critical thinking and problem solving skills.”

Cal TAC was formed by CCST in 2005 as a means for bringing real world classroom experience – the wisdom of practice – to policy makers and others whose decisions affect the quality of science and math education in California schools. Cal TAC is comprised of a carefully selected group of award winning, highly accomplished teachers from across the state.

Cal TAC is working closely with CCST to facilitate the implementation of the Digital Education Initiative, a partnership including the California STEM Learning Network designed to ensure that California’s 21st century learning environments are grounded in digital learning. The group’s current work has grown out of the 2011 CCST report Innovate 2 Innovation, which identified digital teaching and learning as significant challenges for California to address in order to remain a competitive engine of innovation in the years to come.

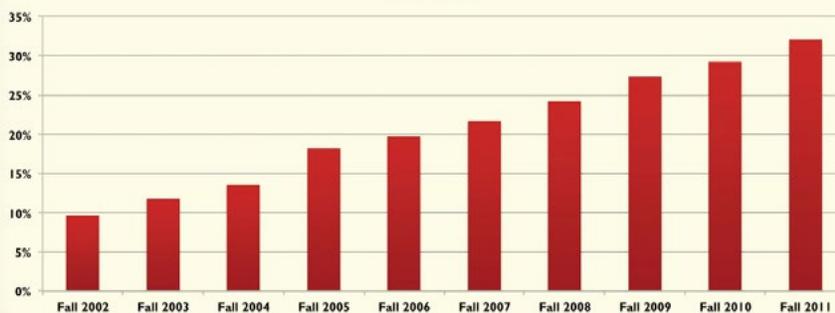
Over the past year, Cal TAC has met three times. The white paper “Digitally Enhanced Education in California: Educational Technology and Digital Media Use in California’s Teacher Preparation

Programs – A Status Report” was released in 2012; an overview of the summit, “Creating a Vision for Integrating Digital Media into California’s Teacher Preparation Programs”, was released last fall. A summary of the May 2013 meeting on the efficacy of digitally enhanced education in California is being prepared.

In January 2013 a Cal TAC delegation spent three days in Washington, D.C. introducing Cal TAC as an organization dedicated to strengthening STEM teaching and learning throughout California, and briefing Senate staff and Congressional members about their current work on digitally enhanced education.

The group met with staff from the offices of Senator Barbara Boxer, Congresswoman Lois Capps, Congressman Mike Honda, Congressman Duncan Hunter, and Congressman Mark Takano; Congressman John Garamendi and Congressman George Miller met directly with the Cal TAC delegation as well. The group also met with representatives from the National Academies of Science and the U.S. Department of Education.

**Online Enrollment as a Percent of Total Enrollment: Fall 2002 - Fall 2011**



From 2002-2011, the number of higher education students taking at least one online course rose from just under ten percent to over thirty two percent. With the rising number of MOOCs (massive open online courses) being offered by institutions of higher education throughout the country – including, this past year, Stanford and San Jose State University – this number is likely to rise further in coming years. (Source: The Sloan Consortium, 2013.)



## COUNCIL MEETING SUMMARIES

### Innovation and Entrepreneurship in a Research Institution

October 2012

The October 2012 meeting focused on the relationships between innovation in research institution settings and entrepreneurship outside the institution, including direct spin-off companies and the innovation system overall. It included an overview of the collaborative patterns in the Bay Area Innovation System, which involves a complex network of relationships between the research institutions (academic, federal, and state), established high-tech industries, entrepreneurs, start-up companies, and venture capital.

AnnaLee Saxenian was the dinner speaker at the meeting. She is Dean and Professor in the School of Information and professor in the Department of City and Regional Planning at the University of California, Berkeley.

### Innovation and Entrepreneurship in California

February 2013

The February meeting focused on the culture of innovation and best practices for technology transfer, including both policy and private sector perspectives. The government perspectives included input from the Governor's Office of Business and Economic Development, an overview of the Governor's plan for community college reform focusing on an approach designed to provide regionally focused workforce development, and the introduction of massive open online courses (MOOCs) to the California higher education system by San Jose State. Discussion also included public-private partnerships developed by Lawrence Livermore National Laboratory, such as HPC4energy, an incubator for energy technology innovation, the Network Security Innovation Center, the High-Performance Computing Innovation Center, and more.

## S&T Policy in the Brown Administration

June 2013



The June meeting focused on R&D partnerships with China, following on Governor Jerry Brown's trip to China with a 90-person delegation from California's high-tech community, a delegation which included CCST. Examples of specific partnerships included the Lawrence Berkeley National Laboratory's partnership with the China Energy Group and the US-China Clean Energy Research Center for Buildings Energy Efficiency.

The speaker at the June 2013 CCST Council meeting was Tai Ming Cheung, director of the Institute on Global Conflict and Cooperation (IGCC) located at the University of California, San Diego. He also leads the institute's Study of Technology and Innovation (SITC) project. A key component of SITC is a U.S. Defense Department Minerva Initiative project on "The Evolving Relationship Between Technology and National Security in China."

## Reception in Honor of the Sesquicentennial of the National Academy of Sciences

June 2013

In June the California Legislature passed Senate Concurrent Resolution 46, co-authored by Senators Jerry Hill and Steve Knight and Assembly Members Beth Gaines and Bill Quirk, honoring the National Academy of Sciences "for its 150 years of commitment to providing unbiased, peer-reviewed advice on science, technology, and medicine to our nation". The California Science Technology & Policy Fellows co-hosted a reception with Senator Jerry Hill for the representatives from the National Academies who came to Sacramento for the presentation of the resolution.



## CONNECTIONS

CCST is an organization founded on the value of connectivity. It was established during a period of heightened concern about California's future, when competition from abroad - other states and other countries - was threatening the state's leadership in areas such as aerospace and energy production. Despite California's many inherent advantages - the number and quality of its research institutions, its legacy of high-tech business innovation, its thriving economy - it seemed to be losing ground, because it was not making effective use of these advantages. CCST was designed to bridge the gap between the disparate sectors of the state's science and technology community, providing an avenue for impartial perspective and analysis that brought together the expertise and know-how of both the business and the higher education sectors. CCST was designed, in other words, to foster connections within the state, so as to better leverage the collective knowledge base of the state.

A quarter century later, connectivity is still at the core of CCST's mission. However, the focus is not just on California anymore. Intra-California connections remain an essential part of CCST's story: the past twenty-five years have included significant development and enrichment of the working relationships between CCST's educational sustaining institutions, and the addition of the federal funded laboratories as affiliate members. CCST has successfully served as interpreter and intermediary between vital work by the National Academies and the California legislature. It has identified and highlighted billing incompatibilities between state and federal entities, enabling California's agencies to contract with the federal labs and NASA for the first time. It has created successful state versions of the National Teacher Advisory Council and the AAAS Congressional Fellowships - making California the first state in the nation to benefit from the input and expertise of such state-level organizations.

But the focus today is not restricted to California because the world is interconnected in ways that were nearly inconceivable twenty-five years ago. Today California brings in a greater share of the nation's venture capital than ever before (53% in 2012, compared to 34% fifteen years ago) and still brings in over twenty percent of the nation's federal research dollars. Other states and countries, however, have not been idle in recent years. California once ranked as the world's sixth highest economy; now it ranks no higher than ninth. This is partly because the recession hit California harder than the rest of the nation, so our state has more ground to make up. Partly, however, it is due to the fact that many developing nations have invested heavily in economic growth, particularly in science and technology. California is affected not only by what happens in Washington D.C., but in Asia, Europe, and South America as well.

The nature of high-tech research has changed as well. With the advent of high-speed internet, cross-border collaboration, both domestic and international, has become the norm rather than the exception. For instance, the Lawrence Berkeley laboratory heads the U.S. half of an international collaboration with China on energy efficiency. The joint R&D effort, funded by the U.S. Department of Energy and China's Ministry of Science and Technology, involves five federal research institutions across the United States and a coalition of universities in China. It also, importantly, involves a wide range of industrial partners in both countries. By embedding these partners in the innovative process, it is much easier to develop the R&D into marketable products that can both prove economically viable and further the energy efficiency goals of the countries. It is the potential of collaborations such as this that brought Governor Brown to China earlier this year. He brought a large group of industry and research people along for an extended tour - including representation from CCST.

The high-tech landscape has changed significantly since 1988. California remains a world leader and well-positioned to remain so, but needs to do so as a member of a broader global research and economic community. CCST has been working to guide the state and facilitate intra- and inter-institutional connections for the past twenty-five years, in preparation for the next twenty-five.



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Sandra Vargas-De La Torre, Layout and Design

Wendy Brown, Cover Design



California Council on Science  
and Technology

1130 K Street, Suite 280  
Sacramento, CA 95814  
(916) 492-0996

5005 La Mart Drive, Suite 200  
Riverside, CA 92507  
(951) 682-8701

<http://ccst.us/>  
[ccst@ccst.us](mailto:ccst@ccst.us)

