Trust and Accountability in Science: What Should CCST's Role Be?

Summary of Discussions from the California Council on Science and Technology (CCST) Pre-Council Meeting

October 18, 2010

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Introduction

On October 18, 2010, members of the California Council on Science and Technology (CCST), its Board, laboratory affiliates, and several guest speakers met to discuss CCST's potential role in addressing an urgent issue: the erosion of public trust in science and ways to address both real and perceived lapses in scientific accountability.

In his opening remarks, CCST Board and Council member Charles Kennel pointed out that issues of trust and accountability in science are both timely and long-standing. The experiences of Archimedes, Galileo, Darwin — to name a few — remind us that science is never free from its complex relationship with society, within which it must operate while maintaining a sense of independence and authority. It shouldn't come as a surprise that scientific authority is subject to questioning by the larger society, Dr. Kennel said, but when that authority is undermined — as illustrated by the "Climategate" scandal in 2009 — overall trust in scientific methods and recommendations can falter as well.

To set the stage for a discussion about CCST's role in these issues, meeting participants heard brief presentations designed to illustrate current issues and perspectives from many corners of the scientific enterprise: the climate debate, the National Academies, religious environmentalism, science and science policy, and the relationships between universities and both science and industry.

Throughout the day, the lively discussions yielded specific suggestions for how CCST could respond to national and global issues concerning trust and accountability in science. These suggestions are presented throughout the document, and summarized in a final section.

A full list of participants, as well as a meeting agenda, can be found in an appendix.

Perspectives from the Front Lines

The Climate Debate — Charles Kennel

Charles Kennel, *Ph.D., Council Chair, is Distinguished Professor of Atmospheric Science, Scripps Institution of Oceanography and Founding Director and Chairman, International Advisory Board, Environment and Sustainability Initiative, University of California, San Diego*

Dr. Kennel shared a historical overview of the science of global warming, using the twists and turns of this story to illustrate how the recent "Climategate" scandals reflect a collision between scientific methods and the public's profound lack of understanding about how these methods are used and applied.

Measuring Climate Change: The Origins of the Discipline of Earth Sciences

Dr. Kennel's timeline and story begin in 1957, when Charles David Keeling — soon to become the Director of the Scripps Institution of Oceanography — developed the first instrument to measure carbon dioxide (CO_2) in atmospheric samples and began collecting data.

Three years into his data collection, Dr. Keeling documented increasing levels of CO_2, consistent with the atmospheric input of burning fossil fuels. Despite these early results, it would be another 22 years before controversy over the quality of these measurements was resolved, in the form of a 1979 National Academy of Sciences report from a committee chaired by Massachusetts Institute of Technology meteorologist Jule Charney.

In the 1979 report, Dr. Charney and his colleagues predicted that if current rates of CO_2 emissions continued, we could expect an increase in temperatures to exceed natural climate fluctuations — i.e., global warming — by the year 2000. The report stimulated a great deal of scientific inquiry and activity, led in part by NASA, to better understand contemporary climate conditions and forecast changes in these conditions more accurately into the coming decades. These efforts became a new earth sciences discipline (and its offshoot, earth systems science), which together examined the ways that components of the earth, atmosphere, oceans and solar observations could be understood in terms of their implications for forecasting climate change.

The Intergovernmental Panel on Climate Change (IPCC)

At the same time, parallel efforts were underway at the international level to consolidate the data streaming in from different subdisciplines of earth science, in order to make more

reliable statements about the present and future climate. These efforts coalesced under the aegis of the Intergovernmental Panel on Climate Change (IPCC), convened by the United Nations, whose first report was released in 1988.

The IPCC's 1988 report took the stance that climate change accelerated by human activity was a plausible idea, consistent with the basic science, but that the evidence for this conclusion did not yet exist. The panel recommended areas of inquiry that could yield such evidence in the future, and recommended periodic assessments to continue to examine and document the issue. Nearly two decades later, the most recent of these assessments, released in 2007, pronounced the evidence for human causes of climate change "undeniable." (The next assessment and report, now underway, will be completed in 2012.)

Anticipating challenges to the IPCC's work and conclusions, the panel's founders went to great lengths to avoid the appearance of conflicts of interest. They recruited experts from the relevant fields, each of whom had a track record of peer-reviewed research and publications, but they tried to balance the composition of each panel with a diversity of views within the scientific subdisciplines in each field. Panelists were recruited from both oil-producing and oil-consuming nations, and turnover of individual panelists — to avoid accusations that they were permanent, vested (and therefore biased) IPCC members — was built in, with relatively few scientists serving continuously from one panel to the next.

The 2007 panel included 800 members, who labored for 2 years to produce the report that garnered them (with Al Gore) the Nobel Peace Prize that year. Thousands of peer-reviewed publications were reviewed rigorously, with strict rules about which of these passed scientific muster for inclusion.

Climate Change "Auditors" and "Denialists" Join the Fray

In retrospect, the Nobel Peace Prize represents a pinnacle from which climate change science soon plummeted, perhaps irrevocably. Vigorous opposition to the IPCC findings, which had been brewing during the report's release and attendant publicity, reached a crescendo as attention turned to the 2009 Copenhagen Conference on Climate Change. For the most part, those who objected to the IPCC's climate change conclusions did not pursue these arguments in the scientific, peer-reviewed literature, but instead turned to the public media.

In the public media, unlike the scientific literature, standards of ethics and fairness dictate a "hearing" for alternate points of view, even if the validity of each side's evidence or arguments may not be comparable. Certainly, the science underlying global models of climate change was (and remains) far from perfect, so individual strands of reasoning or particular conclusions were vulnerable to scrutiny and dissent.

Dr. Kennel noted that those who question particular aspects of the science in this way can be thought of as "auditors." Like the auditors of publicly held companies, they have enough training and skills to examine the scientific credibility underlying various conclusions. (However, they may not have the skills or capacity to judge the complexity and interactions of the systems involved in climate change.)

While the "auditors" challenged pieces of the climate change science from a scientific (or at least quasi-scientific) perspective, another group objected to the IPCC's conclusions for very different reasons. This group, the "denialists," would prefer that the problem of climate change did not exist (because they see the costs of intervention as unacceptably high, or do not believe in interfering with market forces, or hold similar philosophical and ideological beliefs). While the "auditors" might amplify a particular flaw or chain of evidence while ignoring the overall weight of the evidence and conclusions, the "denialists" would amplify any evidence that minimized the importance or very existence of climate change.

Together, the "auditors" and "denialists" were able to use the public media to sow doubt about the IPCC's conclusions and the implications of the scientists' work. In contrast to the scientific community, the court of public opinion — and many politicians — concluded that there was legitimate scientific controversy about the existence and degree of climate change.

Against this backdrop, the IPCC created a process — deliberately separate from its pristine, protected scientific bubble of analysis and conclusions — for translating its work from scientific language into the language of policymakers and decision makers. Line by line, representatives from the scientific and policymaking communities negotiated over the wording of the IPCC recommendations, with an eye toward preserving scientific integrity while making the science understandable to non-scientists. For example, to scientists, uncertainty is part and parcel of the scientific method and process. To policymakers, though, uncertainty might imply a lack of confidence in the likelihood of a particular outcome. To resolve these different perceptions of what uncertainty means, the "translated" terminology included terms such as "virtually certain."

The University of East Anglia e-mails

In 2009, before the Copenhagen Conference, hackers obtained internal e-mails among members of the Climate Science Group at the University of East Anglia. The e-mails, covering approximately 10 years of back-and-forth exchanges among the scientists and their colleagues, were selectively released — and made to look as if the scientists had manipulated data to fit their foregone conclusions about climate change.

Upon closer examination, Dr. Kennel said, the e-mails revealed something quite different, and more human than sinister. First, they demonstrated a high level of frustration and resentment as the scientists responded to repeated requests for data from various "auditors" questioning their work. Second, the scientists had deleted some data in which they had little confidence, which had altered the curve from what it would have been with the data included.

In the public press, the hacked e-mails were presented as evidence of unreliable and suppressed climate change data, leading to suspect conclusions.

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>
> *We have to imagine how the scientific community is viewed by people who will be affected by our statements. And we don't understand that well enough."*

In response, several panels were convened to investigate the accusations, including one within the British Parliament and others from within the university. The Parliamentary panel members said they were not equipped to judge the validity of the science, but did find that the university had not provided adequate support to the scientists dealing with a barrage of Freedom of Information Act (FOIA) requests for their data. (The university panel, which reached similar conclusions, was chaired by Lord Oxburgh, former CEO of Shell Oil, who was criticized for being biased because he already believed in the existence of the problem of climate change.)

Painful Lessons — and New Questions

Although most of the investigative panels released their results quickly, within months of the Copenhagen Conference, the damage was done — and appears to be lasting. A Pew Center on Public Opinion poll tracking trust in scientists recorded a steep 25-point drop in the 3-month period following the Conference. The investigative panels may have reassured the scientific

community, Dr. Kennel noted, but they did not restore the public's trust in scientists.

Dr. Kennel worries that this undermining of public trust, already so damaging in the climate change debate, will now spread to other branches of science (and perhaps already has). "The scientific community," he said, "has a responsibility to understand how this happened." He continued, "Is there a better way to structure real dialogue between scientists, decision makers, and the public than we have had? . . . We have to imagine how the scientific community is viewed by people who will be affected by our statements. And we don't understand that well enough."

Meeting participants shared similar examples and frustrations from their own lines of work. Several were intrigued by the possibility of CCST developing one or more instructive **case studies** that would explore the different facets of a story like the global warming example, that could be used as a teaching tool in various settings (with media representatives, legislative staff, science and technology fellows, graduate students and faculty departments, and others).

Nuclear power, although smaller in scale as an issue, was suggested as another excellent case study topic, illustrating how scientific facts are distorted and lost in the debate.

The National Academies — Bruce Alberts

***Bruce Alberts**, Ph.D., a biochemist and CCST Board Member, serves as Editor-in-Chief of* Science *and as a United States Science Envoy. Dr. Alberts is also Professor Emeritus in the Department of Biochemistry and Biophysics at the University of California, San Francisco, to which he returned after serving two 6-year terms as the president of the National Academy of Sciences (NAS).*

Reflecting on the opposition that the IPCC has faced regarding its series of climate change reports, Dr. Alberts noted that the National Academies — which published over 200 reports between 1993 and 2005, when he served as NAS President — had been able to avoid similar controversy. In part, he said, this was due to an independent review process that has been in place since the early 1970s. While somewhat cumbersome and tilting NAS reports in a more conservative direction at times, Dr. Alberts said, the process has worked in terms of maintaining the public's trust in NAS publications.

One of Dr. Alberts's major initiatives — both during his tenure at NAS, and since then — has been to change the nature of science education at all levels. "I know most Americans don't have a clue about what science really is and how it works," he said, generating nods of agreement around the table.

Recently, in preparation for a third edition of a series of books NAS has published on science and creationism, NAS commissioned focus group research in an attempt to understand why these books — and other science education efforts — appeared to be so ineffective.

Behind a one-way glass mirror, just as if the subject at hand were the pros and cons of a new brand of soap, a professional moderator led groups of 10 college-educated adults (all of whom had at least some high school or college-level science education) in discussions that explored their beliefs about religion and science.

> *"Who cares if they understand orbitals, if they don't understand the basic issues?"*

Most striking, said Dr. Alberts, was the fact that many of the adults in these focus groups made no distinction between how scientists determine what is right, and how religious people do. According to the focus group participants, both scientific and religious "findings" are a kind of dogma — comparable but mutually exclusive dogma — and people are essentially free to choose one or the other. As one participant put it, "Science is revealed truth from scientists; religion is revealed truth from prophets."

These sentiments led Dr. Alberts to rethink what should be taught in first-year science courses, and how early in life science education might need to start. "My hope . . . " he said, "would be to start in kindergarten with making little scientists out of them, arguing about evidence." Great curricula are available; in the hands of skilled teachers, these could transform how the public understands concepts like uncertainty and disagreement in science — concepts that have been so misconstrued and misused in the climate change debate. "Who cares if they understand orbitals, if they don't understand the basic issues?" he asked.

Dr. Alberts's comments hit a chord with other participants. Steve Kang described the apparent success of computer game-based learning, which helps students work in teams to solve problems and sparks a keener interest in the task at hand than solving equations on a worksheet. (Susan Hackwood noted that CCST's California Teacher Advisory Council — Cal TAC — has selected digitally designed education, inside and outside classroom walls, as a focus for next year.)

Stephen Rockwood commented on his grandchildren's grade school science homework assignments, which teach science as a matter of faith — without the tools or encouragement to question assumptions and facts. "When they miss the questioning aspect of science," he said, "they don't grow up understanding that it's proper to challenge and question things."

Dr. Alberts agreed, connecting science education and scientific thinking to the future of democracy itself. "We don't have any data that differentiate between how people react to something like Climategate when they *do* understand how science works, versus when they don't," he said. Dr. Alberts suggestion is to encourage Pew and/or others to **fund research studies** that explore these types of attitudes and beliefs — as the NAS focus groups began to do — and begin building a solid evidence base that helps us understand these different views and reactions.

Susan Hackwood noted that these different ways of thinking — between scientists and nonscientists — were among the catalysts for starting CCST's new Science and Technology Fellows program, which places post-doctoral scientists in state legislators' offices for a one-year stint, with training and support along the way. The fellows, Dr. Hackwood reported, experienced a true culture shock as they tried to answer questions from policymakers and staff members.

The CCST fellows program is modeled on a national one created by AAAS that places science and engineering fellows in Congressional offices as well as federal agencies (such as the Department of State). Dr. Alberts noted that every state needs a similar program of science "translators." "Otherwise," he

said, "scientists can talk all they want and send their reports around, but their messages won't be received, because it will be as if they're speaking a different language."

Religious Environmentalism — Celia Deane-Drummond

***Celia Deane-Drummond**, Ph.D, PhD., is a professor of theology and biological sciences at the University of Chester in the United Kingdom and is Director of the Centre for Religion and the Biosciences. Her contributions to environmental ethics, science and religion and the new discipline of "ecotheology" reflect her early academic career in botany. Dr. Deane-Drummond is Vice Chair of the European Forum for the Study of Religion and Environment.*

"I'm trained as a scientist and know something about how scientists think," Dr. Deane-Drummond reassured her fellow meeting participants, "in case you have worries about theologians!"

Dr. Deane-Drummond sketched the recent history of religious environmentalism, which she described as an attempt by people of faith to connect with environmental concerns. In this form, religious environmentalism has been around for at least 40 years, starting as a largely grassroots and Christian movement, and more recently drawing academic theologians and other religious denominations as well.

The evangelical community, Dr. Deane-Drummond explained, has been slower than others to come on board, in part because of a reluctance to associate nature and God, and also because of long-standing pagan connotations of "worshipping" nature.

Religious leaders, including Pope John Paul II and Pope Benedict XVI, the ecumenical Orthodox Patriarchate Bartholomew I and other leaders from many different faiths, have made strong statements acknowledging the religious and moral case for environmental concern. Pope Paul II in official statements has promoted the idea of *ecological conversion*; pressing for a change in lifestyle that connects human, ecological and religious flourishing.

> *"If we want to find ways to encourage solidarity among different groups, we should draw upon the resources of religion."*

How does religious environmentalism connect specifically with environmental science? For one thing, Dr. Deane-Drummond said, it makes those who see themselves as primarily religious (as opposed to those who see themselves primarily as scientists) more open to learning about science and what it has to offer. Being concerned about the environment stimulates an interest in scientific issues and the natural world that may not have been there before — and that creates an opening for dialogue between scientists and religious believers. Religious environmentalism also has a strong ethical dimension, in which the

environment is seen as a human responsibility and the divine vocation of human beings is responsible stewardship of the earth.

Echoing the concerns of other speakers, Dr. Deane-Drummond noted that a loss of credibility in one area (such as climate change science) can undermine credibility in others (e.g., biodiversity). Dr. Deane-Drummond has seen some of this already in her interactions with different religious groups at the grass roots level.

When we talk about trust in science, Dr. Deane-Drummond said, we need to be very clear that we are not thinking of this as absolute trust, but rather trust in the validity of scientific methods — people affirming that the way science does its work can be trusted.

In 2009, Lord May, the President of the British Science Association — an atheist — made some remarks on the eve of the Association's annual meeting, calling for religious groups to pay more attention to environmental issues and climate change. Although his actual words (which seemed to suggest that if people believed in God as an all-powerful punisher, they might be more compelled to act) were somewhat misguided, in Dr. Deane-Drummond's view, she did find his comments interesting and potentially helpful to those who are calling for **a greater voice for religion in public policy debates.** "If we want to find ways to encourage solidarity among different groups," she suggested, "we should draw upon the resources of religion."

Threats to the University and Science — Gary Marchant

***Gary Marchant**, J.D., Ph.D., is an Associate Professor of Law at Arizona State University, where he also serves as the Executive Director of the Center for the Study of Law, Science, and Technology. Prior to joining the ASU faculty in 1999, he was a partner at the Washington, D.C. office of the law firm of Kirkland & Ellis, where his practice focused on environmental and administrative law. Dr. Marchant's research and teaching interests include environmental law, risk analysis, genetics and the law, and law, science and technology.*

Dr. Marchant took his audience on a whirlwind tour of several categories of threats to the university and science, noting the overlap among many of these:

- **Funding**. Although science remains a significant part of the federal budget, a relative flat lining of these expenditures translates into a decrease, since the volume of topics warranting scientific research and investment far exceeds the funds available. Recently, Dr. Marchant heard NIH Director Francis Collins discuss how for several years running, NIH has been able to fund only 20% of research proposals submitted — suggesting that many worthy ideas are left behind.

- **Political interference**. Congressional offices hunt for research studies that have made it through a scientific peer-review process, yet contradict someone's notions of what is politically or morally legitimate — and attack the research on that basis. In Virginia, the state Attorney General has subpoenaed a researcher whose climate change research put him in the legal and political crosshairs. E-mails between the researcher and his colleagues related to a state grant are the subject of the subpoena, even though the grant itself had nothing to do with climate change — and the researcher is no longer in the state. According to the Washington *Post*, the legal queries are allegedly seeking instances of fraud in a $200,000 study, forcing the University of Virginia to spend $300,000 to defend itself.

- A related issue is **ideologically driven research** — research conducted not to find an answer to a scientific question, but to support a particular point of view.

- **Corporate influence**. Dr. Marchant noted that this would be the subject of a talk later in the day, so he would defer to that discussion.

- **Secrecy and intellectual property rights**. Research results are not as readily available or shared as easily as they once were, Dr. Marchant noted — and

in this area, the issue of the military's role arises. Good research has emanated from defense work, which is an important source of funding in many universities, but it raises contentious issues about secrecy and whether classified research should be conducted at universities.

- **Following a business model**. As more universities and departments follow a bottom-line, return-on-investment approach, there are potential long-term impacts on scientific merit, with less financially lucrative or viable research potentially becoming less of a priority.

- **Activist organizations**. In many cases, activist organizations have become a disruptive influence on scientific research in university settings. The classic example is animal rights groups, but in both the United States and Europe, campuses, laboratories, and faculty have been exposed to terrorist destructions of property and research by those who oppose biotechnology, genetically modified foods, and other lines of inquiry.

- **Unchallengeable orthodoxies**. The scientific community is vulnerable to adopting overly zealous points of view and avoiding alternative views. But where does one draw the line when "orthodoxies" are questioned, yet the dissent itself appears to violate some standards of science and fact-finding (e.g., creationism, 9/11 denials)?

- **Irrelevancy**. Dr. Marchant sees this as potentially the biggest threat. Following the global warming debate, for example, he noted that it almost doesn't matter what science is saying — and that being from an Ivy League institution becomes a blemish against you, instead of a respected credential. This is a retrenchment from enlightenment, when the science that the university generates becomes irrelevant to societal decision-making.

The University and Industry — Beth Burnside

Beth Burnside, Ph.D., is the former Vice Chancellor for Research and Professor of Molecular and Cell Biology at the University of California, Berkeley. As Vice Chancellor for Research, she was responsible for university/ industry relations, research compliance, research communications and research support for the Berkeley campus. Her administrative portfolio included management of 40 campus research units, 12 research museums and remote field stations, and the Offices of Sponsored Projects, Technology Licensing, and Lab Animal Care.

Dr. Burnside opened her remarks by noting the many positive aspects of relationships between universities and industry in the United States. "The history of focusing research and of government-funded research in U.S. universities is a very important part of the extraordinary innovation and juggernaut of creativity that has gone on in this country," she said.

The collaborative nature of this relationship drives university-funded research to interact with and be responsive to industry needs, ultimately leading to products that are influential and beneficial to the public. As a result, she said, the health and well-being of this relationship is crucial to the country's creativity and competitiveness.

Global competitiveness provides its own benefits to university communities, giving faculty and students continuous feedback about current and emerging issues and about which areas are most useful to society. However, this feedback loop also has some downsides and has undergone some changes, especially in the wake of the Bayh-Dole Act of 1980, which gave universities rights to intellectual property arising from government-funded research. The Act made interactions between universities and industry "lively," Dr. Burnside said, adding that "the lively interactions, especially in medicine, progressed a little more aggressively than the mechanisms to evaluate their effectiveness or manage the conflicts of interest that arise."

Individual Conflicts of Interest

Industry-funded research creates close relationships between those conducting the research and those who fund it (and/or expect to commercialize the results). Because researchers stand to benefit financially from commercialization, a *perception* of conflict of interest arises — whether or not actual misdeeds have occurred. (As Dr. Burnside noted, it is also true that actual misdeeds occur as well, when researchers make decisions based solely on financial gain and violate their professional ethics in the process.)

Both the perception of conflict of interest and the examples of actual misdeeds cause enormous damage to the public's trust in scientists and researchers. One response has been to push for disclosure of any financial conflicts of interest, but "it's really important to realize that disclosure is not enough," Dr. Burnside emphasized. "Disclosure does not prove that there is no wrongdoing."

Another problem arises when pharmaceutical companies and others hire ghost authors to present academic research findings and manipulate how and when research results are released. Universities have been more aggressive about setting limits on this type of behavior, Dr. Burnside said, but faculty can still be complicit in helping funders delay publication for financial reasons.

In terms of product development, Dr. Burnside noted that university-industry collaborations seem most productive and crucial — and least vulnerable to conflicts of interest — at the earliest stages of product development. The closer a product moves toward financial or commercial viability, the more problematic these relationships become, in terms of conflicts of interest. Within the University of California system, faculty participation in product assessments is restricted, which is a special problem for clinical trials. Clinical trials are very dependent on the expertise of medical practitioners working in academic medical centers, and one wouldn't want to exclude that input to the outcomes of clinical trials — yet conflicts of interest create a real conundrum.

Conflicts of interest also affect students, especially if their graduate training is supported by industry sponsors. (This is a subset of a larger topic: gifts from the pharmaceutical industry to the medical profession.) In some situations, a faculty member's laboratory may have been involved in a start-up company, which later funds additional research in the same lab. This, too, may have a constraining effect on graduate students.

Institutional Conflicts of Interest

Beyond individual conflicts of interest, institutions can experience them as well. As universities and medical schools become more and more financially dependent on industry sponsorship, Dr. Burnside noted, this cannot help but influence decision making.

> *"Some in the public sector have questioned whether commercial concerns are improperly influencing research directions, and whether the really fundamental questions in a given field are being addressed."*

When universities hold equity in start-up companies (in the wake of the Bayh-Dole Act), this too can create further conflicts of interest for the institution as a whole. After all, Dr. Burnside pointed out, universities do hold licenses and patents — and these may influence which ones the institution pursues next. Both actual and

potential conflicts of interest exist, yet the mechanisms for evaluating whether and how well these are being addressed are poor.

Potential Solutions

Who might be potential agents of change for influencing conflicts of interest within universities, and what are some possible mechanisms for doing so? Dr. Burnside had several suggestions, which were augmented by meeting participants:

- In 2009, **the Institute of Medicine (IOM) released a report on conflict of interest** (*Conflict of Interest in Medical Research, Education, and Practice*), which includes **16 recommendations.** As Dr. Burnside pointed out, universities tend to have extremely variable conflict of interest policies. The variability undermines their credibility and also makes it difficult for faculty to collaborate across campuses. Widespread discussion and adoption of consistent principles or guidelines, similar to those in the IOM report, could help reduce variability.

- The participation of **professional societies** also was recommended as a way of increasing awareness and adoption of common standards. Other candidates include leaders within the associations for American universities and academic medical centers, and within universities themselves.

- **Within universities**, Dr. Burnside recommended adoption of more consistent policies by involving the faculty and faculty senate in the adoption, promotion and implementation of these standards, all the way to individual researchers and faculty.

Other suggestions included helping the **media and individual journalists** understand these issues so that they are better equipped to assess scientific claims — such as those sometimes advanced by advocacy groups or others — and that play a role in undermining trust in science and scientists. **Government agencies and regulations** also were noted as influential players — in pushing back at standard reporting requests, to regulating some conflicts of interest or other behaviors (with the caveat that regulations shouldn't go so far that beneficial research can no longer be conducted).

In response to a question about balancing statutory or regulatory approaches with those that aim to change human behavior in ways that cause people to act with greater integrity, Dr. Burnside noted that the IOM report on conflicts of interest addresses both. It includes some technical measures for catching people if they break rules, but also sets forth strong, clear professional standards. That's why it becomes so important to make sure these standards are more widely known and endorsed, Dr. Burnside said.

"When trust disappears, process multiplies!"
- Charles Kennel

Meeting participants discussed the pros and cons of **ethics courses** as a mechanism for teaching and promoting more ethical behavior. Dr. Alberts described a successful course at UCSF, which was voluntary and held over several consecutive Saturdays. Faculty members shared letters or other requests asking them to do things that weren't right, and then discussed these with students in the form of mini-case studies, exploring what the students might have done in each situation and what actually happened. These discussions were combined with posters on ethical behavior that were prominently displayed.

Stephen Rockwood described the ethics training courses at SAIC, which covered topics such as government contracting, the Foreign Corrupt Practices Act, workplace ethics, and sexual harassment. Employees were expected to complete a written and online test on these topics following the training. A Board of Directors subcommittee then reviewed compliance quarterly; the message that this was an important and closely monitored aspect of working at SAIC was communicated in no uncertain terms. Dr. Rockwood's point was that regardless of the course or content, faculty and department chairs would have to take some degree of ownership to communicate that it is taken seriously within the organization.

Gerard Mannion noted that trust is earned (rather than bestowed) — and that one of the best ways to do so is create a genuine culture of accountability. Unfortunately, he observed, the broader culture appears to promote ways to *avoid* accountability, all under the pretense of promoting accountability. Examples would be courses billed as "ethics" courses, but that, as he put it, are really designed instead to teach people "how to cover their legal hide."

"The broader culture appears to promote ways to *avoid* accountability, all under the pretense of promoting accountability"

He suggested **engaging some volunteers or fellows in an exploration of ethics issues through CCST-sponsored workshops** (perhaps incorporating ethics into the case studies described above). These volunteers or fellows would then return to their home institutions with the tools and knowledge to create a stronger culture of accountability within their own work environments, becoming "beacons of integrity" who create a "virtuous circle" that builds accountability, instead of diminishing it.

"Beacons of integrity who create a "virtuous circle" that builds accountability, instead of diminishing it."

CCST's Role in Building Trust and Strengthening Accountability

This section compiles the suggestions made during the discussions summarized above, as well as some others that were made in response to all the presentations.

- Develop one or more instructive **case studies** that would explore a scientific issue in which trust in scientific conclusions has been eroded or undermined (such as climate change or nuclear power). These could be used as a teaching tool in various settings (with media representatives, legislative staff, science and technology fellows, graduate students and faculty departments, and others).

- Encourage Pew and/or others to **fund research studies that explore different types of attitudes and beliefs about science and scientific thinking** — as the NAS focus groups began to do — and begin building a solid evidence base that helps us understand these different views and reactions and respond to them more effectively.

    - In addition to focus groups of non-scientists to explore their views, it would be interesting to convene groups of scientists and non-scientists together and prompt a guided discussion about a particular topic (e.g., climate change) as a way of understanding different points of view, misunderstandings, etc. (e.g., Working with viewpoint learning through their "choice dialog process")

- Make lessons learned from **CCST's Science and Technology Fellows** program available to other states to place more scientists in a "translating" role across the cultural divide between scientists and policy/decision makers within state legislative chambers.

- Consider ways in which emerging movements such as religious environmentalism can be used to open a dialogue between scientists and those who see the world from a more religious perspective, to open a space for **a greater voice for religion in public policy debates.**

- Explore ways to "push" the recommendations from the 2009 **Institute of Medicine (IOM) report on conflict of interest** (*Conflict of Interest in Medical Research, Education, and Practice*) to key audiences: within universities, professional societies, and associations of universities and academic medical centers.

- Partnering with the Royal Society, the National Academies, and/or others to work in concert on this issue.
- Related to this would be commissioning or compiling research on what differentiates scientific thinking and ethical behavior — from the perspective of sociologists and behavioral scientists (i.e., which factors undermine ethical behavior, and which ones reinforce it?).
- Additional research/explorations could examine the evidence for changing behavior through non-regulatory means.

- Develop stronger, more effective **ethics courses** and assess their role in promoting more ethical behavior — and thus earning more trust for scientists.
- Consider some type of **third-party certification** of ethical behavior.
- Award **prizes** to commend and promote ethical behavior, and/or **rankings** for universities.

In summary, Dr. Kennel noted that the discussion had raised several questions about trust and accountability — about what the general public and decision makers hear when scientists speak out on controversial topics.

First, what can CCST and its constituent groups do over the long term to improve the public's and decision makers' **understanding of the scientific process** — about what it really means when scientists make statements?

Second, how can scientists use their internal educational processes to internalize a sense of responsibility towards **clear, sensible communication with decision makers and the public?**

Gerard Mannion suggested focusing on some distinct goals: namely, equipping people to react well when confronted with a moral dilemma. This would require obtaining some evidence about the existing lack of trust, and then designing and paying for the training that equips people to react well. He sees the ethics of individual scientists, groups of scientists, professional ethics, research implications, and wider implications of unethical conduct on the part of individual scientists as distinct strands that should be addressed separately; collapsing them together might cause the group to lose focus.

The pre-Council meeting ended with Susan Hackwood noting that she, Dr. Kennel, and Dr. Deane-Drummond would be adding these ideas to a proposal for moving forward.

Appendix: Pre-Council Meeting Participants and Agenda

CCST Board

1. Karl Pister CCST Board Chair
2. Bruce Alberts CCST Board
3. Warren Baker CCST Board
4. Beth Burnside CCST Board
5. Corey Goodman CCST Council
6. Susan Hackwood CCST Board/Council
8. Charles Kennel CCST Council Chair
9. Steve Kang CCST Council
11. Fairborz Maseeh CCST Council
12. Steve Rockwood CCST Council
13. Soroosh Sorooshian CCST Council

14. Ron Cochran CCST Lab Affiliate
15. Karen Scott CCST Lab Affiliate

16. Amber Hartman CCST S&T Policy Fellow
17. Jessica Westbrook CCST S&T Policy Fellow
18. Ryan McCarthy CCST S&T Policy Fellow

Guests

Celia Deane-Drummand - Theology and science University of Chester (UK)
http://www.chester.ac.uk/departments/trs/staff/deane-drummond

Gary Marchant - Ethics and Law Arizona State University
https://webapp4.asu.edu/directory/person/228973

Gerard Mannion - Ethics, science and theology University of San Diego
http://www.toepfer-fvs.de/mannion.html

Writer/recorder	Nicole Lenzin
Staff	Doug Brown
	Lora Lee Martin
	Donna King
	Sandra Vargas

Agenda

Pre-Council Meeting on Trust and Accountability in Science

Board Room The Arnold and Mabel Beckman Center of the National Academies

Irvine, California

Time: 11:00 AM – 3:00 PM

*Note, the agenda will be fairly unstructured to allow participant discussion.

11:00 AM	Welcome and Introductions	Charlie Kennel
11:15 AM	Council meeting agenda	Susan Hackwood

- Scope the Issues
- What Modeling of Complex Systems Can and Cannot Tell Us
- The Science of Trust
- From the Cosmos to the Legislative Chambers

11:30 AM Perspectives from the front line – discussions leads

The Climate Debate	Charlie Kennel
The National Academies	Bruce Alberts
Religious Environmentalism	Celia Dean-Drummond
Science and Science Policy	Corey Goodman
Threats to the University and Science	Gary Marchant
The University and Industry	Beth Burnside

12:30 PM Lunch and informal discussion

1:30 PM Group discussion on bridging gulfs and promoting dialog — Charlie Kennel

- Amongst scientists
- Between scientists and the public
- Between scientists and policy makers

2:30 PM Next steps - what should we do?