The National Science Foundation
Directorate for Computer and Information Science and Engineering Advisory Committee (CISE AC)
Advisory Committee Meeting Minutes

October 19, 2007

The National Science Foundation's Directorate for Computer and Information Science and Engineering Advisory Committee (CISE AC) held their fall meeting at the National Science Foundation in Arlington, Virginia on October 19, 2007.

Opening Remarks

Dr. Richard Karp, Chair of the CISE AC, called the meeting to order at 8:00am. . The minutes from the May 11, 2007 CISE AC meeting were approved.

State of NSF and CISE

Dr. Jeannette Wing, Assistant Director, CISE, provided an overview on the state of NSF and CISE. The overview is available in Appendix I. Dr. Wing's CISE update covered: FY 2008 and 2009 budget outlooks; funding rate trends; workforce; new initiatives; AD activities; and engaging the research community.

Regarding community engagement, the AC suggested CISE survey potential applicants to determine what the barriers are for accepting NSF positions, to determine how to make positions more attractive and feasible. It was proposed that various employment strategies should be piloted to see what works best. Dr. Crawford said that NSF can try different things but noted that the AC discussion had focused on Intergovernmental Personnel Appointments (IPAs) that have up to four- year assignments, while if CISE gets an increase in staffing, it will be to recruit permanent full-time individuals. .

Dr. Wing noted that service for the community is not as embedded in the CISE culture as it is in other science and engineering cultures. Competition for really good people comes from many other directions. There has to be a desire to serve the community.

Dr. Wing provided specific ways that the CISE community can support CISE to include participation by the CISE AC members on several subcommittees:
- "Beating the Bushes" Subcommittee
- Education Subcommittee
- Broadening Participation Subcommittee
- International Subcommittee

Dr. Wing presented several ideas for engaging industry.

Next Generation Internet (GENI) Update

GENI Activity Progress Report
The Progress Report was presented by CISE's Deborah Crawford, Suzi Iacono, Ty Znati, and Gracie Narcho and is included in Appendix I.

Dr. Ellen Zegura, co-chair of the GENI Science Council (GSC) provided an update on GENI from the research community's perspective. Dr. Zegura said the job is very challenging for the scientific community. There are a lot of misconceptions about GENI. A Dear Colleague letter is planned to help remedy this. The GSC first met in February/March 2007 and has added some new members to provide breadth. The CISE research community has not pursued a project of this scale before and wisdom and patience are required as the council works to articulate a compelling rationale.

Dr. Zegura summarized the GSC's proposal for moving forward with more open and broad discussions of a network science and engineering research agenda (with appropriate framing). Working groups are being established with chairs from the GSC in core networking and distributed systems, other CISE areas, and interests from outside of CISE. Dr. Zegura requested feedback from the CISE AC on the plan for moving GENI forward.

Discussion:
- There was some concern that the research community views GENI as insiders in the networking community trying to get resources for their research. The CISE AC is hearing that this is not the case, but said it is important to clear this up and reach out to all of the research community which will take time to do.
- Dr. Wing said that since her arrival at NSF, she has been working with the GSC to develop compelling science arguments for GENI. There is also international awareness of GENI. NSF leadership is providing support as well.
- The scientific justification has not been clearly communicated and this needs to be done. The top 4-5 ideas that make GENI so compelling must be clearly articulated
- The challenge intellectually is how to design systems for future uncertainty. In addition, there are political, social, and regulatory constraints. How do we navigate this and learn from other large projects so GENI has a chance to make it?
- It was noted that the research plan can be improved, and that conversation of the intellectual objectives of the researchers had to occur more frequently, so that there is an intellectual story at the core that gets people excited. When, under what circumstances, and how do you tell that story? The trick is to get balance, breadth and a compelling way to tell the story.
- Dr. Zegura stated her support for the establishment of a chief architect – someone who can listen and say clearly what GENI is about. The GSC is asking for the best ideas and support.

Computing Community Consortium (CCC) Update

Sue Graham, updated the AC on CCC activities. An interim council was replaced with a permanent CCC Council on July 1, 2007.

The CCC is working to publicize their activities at professional meetings. Council members have also been giving individual talks when possible. They are establishing subcommittees, building international collaboration, and reviewing studies and reports to mine good research ideas. Several mechanisms for interacting with the community are being established (i.e. web site, wiki). At the November meeting, the CCC Council will discuss proposals and how to engage undergrads in long range challenges and transformative research. The CCC plans to meet bi-weekly with NSF, electronically.
Dr. Graham said further input from the CISE AC was welcome.

Discussion:
- Better communication about the CCC to academic faculty is important.
- Is the CCC a repository of information? There is a link from CRA to the CCC. The web site still needs work but is intended to be a repository of all kinds of documents, studies, etc.
- Communication for the CCC is a challenge. A blog that members of the research community would regularly check out has been discussed.
- The CCC has a cooperative agreement with NSF and CISE and wants to also work closely with the CISE AC.

Merit Review Process

Joanne Tornow, Chair of NSF's Impact of Proposal and Award Management Mechanisms (IPAMM) Working Group, shared the findings of the IPAMM report with the CISE AC. The IPAMM Report presentation can be found in Appendix I. The full report is on the NSF website at http://www.nsf.gov/od/ipamm/ipamm.jsp.

Discussion: The CISE AC requested data specific to CISE, especially responses to the survey question on whether the research community believes that NSF welcomes transformative research.

Broadening Participation

The AC received an update by Celeste Rolfing of MPS and Victor Santiago of EHR on the development of an NSF plan to broaden participation. The presentation may be found in Appendix I. Dr. Santiago summarized the six main recommendations in the report. The next steps are to get feedback from NSF senior management, and then solicit internal and external comments. The recommendations will be translated into an implementation schedule and an on-going assessment strategy.

Discussion:
- The AC asked to be notified when the full report was available for comment.
- They discussed the recommendation for increasing the diversity of the reviewer pool.
- It was noted that increasing the diversity of the reviewer pool would not necessarily result in enhanced diversity of funded PIs.
- Training programs on implicit bias need to be provided to everyone.
- Members cautioned CISE to not overtax minority individuals in the review process.

CISE New Action for Broadening Participation (BP) of Underrepresented Groups (UGs) in Computing

Drs. Timothy Pinkston and Janice Cuny described CISE's plans and accomplishments to broaden participation. Their presentation can be found in Appendix I.

Discussion:
The CISE AC discussed the proposed policy that departmental broadening participation plans be submitted with proposals. The following points were made:
- It would be important that the inclusion of the plan or lack of inclusion NOT be a factor in the proposal review. It should also not be mandatory for everyone that submits a proposal.
- It was noted that the purpose of the policy is to provide a way to equip, enable and facilitate efforts to make it easier for the PI to include broadening participation activities in the research. The PI may not be aware of a departmental plan. This also helps encourage departments to have awareness if they do not have a plan and inspire them to take ownership of this.
- It is important to help departments communicate among themselves to identify best practices. Even a large department might not understand what effective actions are
- Having supplemental funding easily available to PIs with interesting BP components would be helpful.
- Experience shows a handful of people who are passionate about BP have impact, but while many think it's a good thing, they don't see a role for themselves. We should empower those who care about it or try to encourage other people and convince them it is their role too. In general, the preference would be to empower the people who are really passionate and help them do their job.
- This proposed policy encourages institutional thinking about how to make it possible for people across all spectrums of enthusiasm to do SOMETHING. Supplements can be offered to help those highly motivated.
- Some individuals or minority institutions are included in a proposal as a token more often than not. A plan is not action. There should be evidence of working activities.

Breakout Sessions on Visioning and Report of Breakout Groups

The AC broke into four groups to discuss visioning and then reported back to the full committee.

Group 1
Rosalind Picard summarized the group's discussion . They identified a theme of: technology/new computing/new science to address solutions that will really help people (i.e. autistic, learning disabled, and aging).

Dr. Karp listed areas that facilitate desirable activities of humans where the interaction or ability to monitor behavior and provide feedback is needed:
- Learning and Education
- Health and Safety
- Communications (disadvantaged persons in particular)
- Providing Entertainment

- Ability to include individuals who would otherwise be excluded

Technologies involved:
- Provide monitoring and recognition (gesture/facial expression recognition in additional to speech recognition)
- Provide the ability to adapt to styles of individuals and communicate with them (i.e. education driver vs. laid back driver)
- Embedded in control systems with emphasis on sensing to too little on actuation.

Group 2
Randy Bryant summarized the discussion which. Known priorities that continue to be important include dealing with masses of information and trustworthy systems/software quality. Citizen scientists and non-standard input devices were talked about as an important aspect of science in the future.

The group talked about creating new social systems (i.e., Facebook/Web) which often happens without understanding what we are creating or what the effects are. There should be more connections between the Social, Behavioral and Economics (SBE) Directorate and CISE.

In the discussion one question that arose was: How can we push fundamental principles down to lower levels (like kindergarten)?

Computer systems today embody more and more rules/regulations/processes which don't have a formal definition – they may be legal or social. How do we make sure they are compliant when we don't have a formal definition? The group thinks research will move toward human-centric science where there aren't crisp mathematical definitions for what is wanted but computer science concepts are needed.

Group 3
Alan Kay summarized "Grand Challenges for Computing:"
- "Moore's Law SW" (3 to n orders of magnitude) improvements in software expression.
- "Computing from Early Childhood On" – it's as important as writing, math, science.
- Information technology as the great equalizer.
- A Teacher for Every Learner – an interface that can help users learn.
- Highly adaptable and adaptive user interfaces.
- Multi-terabyte personal storage, 100 CPIs, etc. How to use it – what does it mean for a world where all this is available – what do we do with it that is worth doing? Is it malicious? Information ownership/information sharing, etc. In 2012, 8 terabyte disks will be on sale. Real stuff will be happening. What is research doing to address this?
- Hardware is Software Crystallized Early – radical HW-SW synergies. Ability to do architecture (build computer right on desk).
- Molecular Biology of Computing – comprehensive synthesis of our field for beginners. An example is "The Molecular Biology of the Cell," an introduction to a field for anyone who is interested. Anyone can write this – is anyone interested who can commit themselves to doing this?

Group 4
Richard Ladner presented highlights of the group discussion:
- There should be a compelling and inexpensive telepresence anywhere in the world.
- Technology in the developing world that would help in education, commerce, etc. but use very low power and be inexpensive.
- Data centers and server farms in the US will consume 25% of the power. Is there a newer/better technology?
- Video/multimedia is expensive to process. Is there a better way to do this?
- Supply-chain coordination – movement of goods and services around the world – ability for processing and communications – allowed bypassing of certain bottlenecks that existed in the past.
- Online communities (i.e., FaceBook). Can they do something productive/creative to make the world better?
- Infrastructure to use the internet in productive ways through a materials-secured internet with reliable availability, integrity control, etc.

Additional Topics

The CISE AC was asked to list any additional topics to consider in the CISE visioning exercise:

- How can we build computer system memory to function like brain system memory
- Accurate and predictable computation models of life and living things need to be injected into science areas (e.g. how populations evolve).
- Medicine and health science hasn't been a specialty within the CISE community. NIH supports translational medicine which uses data mining for clinical data.
- There will be issues around ownership of personal information structures. There is scattered personal data everywhere and no way to know who has what. A privacy framework is needed around this.
- Removing geographical separation.

Dr. Wing thanked everyone for their input and asked each group to submit 2-3 pages on the visions presented and names associated with each topic. She hopes the visioning exercise will be part of a longer process.

Discussions with NSF Director and Deputy Director

Drs. Arden Bement, Jr. and Kathie Olsen met with the AC. .

Dr. Bement briefly discussed budget issues, then remarked that NSF brought Dr. Wing into CISE as the AD to bring excitement to the field, help it move to the frontier, and to attract top talent. She is making tremendous progress and led the CDI solicitation effort which is a great template for transformative research and bringing in international and industry participation.

Proposal Success Rates: While the AC was impressed with the extensiveness of the IPAMM report, there were concerns about the appropriate metric to understand if NSF and CISE in particular are investing optimally. Is funding rate the right metric or is it the proportion of qualified investigators funded or enough funds for promising research? The AC would like to see other dimensions of the problem explored and a more precise definition of what success would mean. Data by directorate and divisions will be available for the Spring AC meetings. NSF is also looking at ways to streamline the process of resubmission of proposals that were rated highly, but funding was not available. This may help reduce the workload. Dr. Bement added that in doing research at the frontier, exciting ideas will grow faster than the NSF budget. The community is growing and reprioritization is needed

CISE Visioning: CISE is funding activities to stimulate transformative research through solicitations like Expeditions and CDI. The CISE AC also has an active visioning activity and general themes include:

- Computing in a social environment/examining effects of distributed computing on social structures in society
- Dealing with truly massive data sets
- Inclusiveness – broadening participation, bringing in disadvantaged individuals

Dr. Bement said the themes are all in the right direction. Computing is coupled more and more with human cognition and advances in neuroscience and paradigms of the human machine. There are massive data sets and more effort should be given to determining what data is worth saving, what is needed now vs. later, and how to evaluate it on the fly. As distributed sensor arrays and the opportunities to collect data increase, the costs of collecting data tend to decrease. Where should we be on the spectrum of just in time vs. just in case? More effort is needed in this area.

Broadening Participation: The AC is in general agreement with CISE's proposal to request departmental plans for broadening participation in submitted proposals in some CISE programs. Dr. Olsen noted that the Chemistry Division did this already in their instrumentation program.

Discussion:

- The AC affirms Dr. Wing's interest in revitalizing education through various aspects of computing. Early introduction to science, math and computing ideas is critical. The challenge is how to make this available in K-12 and part of standard requirements? Dr. Bement said there are several issues. How early in the child development cycle should computational thinking and information technology be introduced? What can be done with tools and knowledge to augment teacher's backgrounds? What should we be providing in college and universities in terms of teaching/pre-service career development to understand the use of IT?

- The weighting of pedagogy to content knowledge is skewed more toward pedagogy. One program NSF has as a resource for teachers is the GK-12 program which provides a fellowship for graduate students to spend time working with teachers/children in science and engineering. The program is a win-win situation because the graduate student has to learn how to communicate what they learned in course work to students.
- Dr. Bement reiterated to the AC that NSF is a research foundation. NSF relies on its academic and other partners to take promising new concepts to scale and to ensure sustainability where that makes sense.
- The AC discussed the challenges in recruiting people into CISE and why it may be harder in CISE than in other directorates. It may be advantageous to allow Program Directors to work remotely to attract more highly qualified individuals to NSF. The AC suggested piloting an experiment to see if this could be a successful way to staff some positions. Dr. Bement announced that next year will be the "year of IT" for NSF. The agency will empower directorates to use IT in new ways for doing their work and to develop virtual communities in a much more innovative and effective way. The research community should recognize the value of having top people at NSF in Program Director or Division Director positions. The quality of work NSF does affect the community in many ways. Dr. Bement challenged the AC to think broadly about who would benefit from having that kind of exposure. The AC believes the hurdle in recruitment has to do with being physically present in Washington in two career situations and for family situations. The AC hopes the "year of IT" will lead to experiments with remote hires that will teach us how to do this effectively. Dr. Bement said there is a way to get the full benefit of experience at NSF and at the same time, stay connected with family/colleagues.
- CISE is understaffed. Dr. Bement said NSF knows this and CISE has been given high priority for additional FTEs. The NSF Salaries and Expenses (S&E) account for FY 2007 was frozen at FY 2006 levels which was a strain for all of NSF.

Dr. Karp thanked Dr. Bement for meeting with them.

Wrap Up

The CISE AC thanked Dr. Karp and Dr. Wing for providing the opportunity for the visioning exercise and suggested gathering input from the wider community with a wiki or some other type of mechanisms. The idea of extending meetings to more than one full day will help as well.

Dr. Karp requested the lead for each breakout group send a summary to him. Dr. Wing thanked everyone for their participation. With no further discussion, the meeting was adjourned at 3:35 p.m.

The spring CISE AC meeting will be two days and the fall meeting will be one full day (ending at 5:30). The spring meeting will be held on May 1-2, 2008 at NSF. The fall meeting will be held at NSF on October 17, 2008.

Summary of October 19, 2007Action Items
- CISE to ensure that all AC members are on the Dear Colleagues distribution list.
- CISE to explore surveying the research community to determine barriers for employment with NSF.
- AC members interested in volunteering for the "Beating the Bushes" subcommittee should notify Dr. Karp or Dr. Wing.
- The AC requested data specific to CISE from the IPAMM report, especially responses to the survey question on NSF welcoming transformative research. They also requested demographic data from the survey respondents.
- The AC requested to be notified when the full report on Broadening Participation is available for comment.
- Anyone who would like to be involved in CISE Strategic Planning for Education and Research or ways the AC as a whole can be involved, should contact Dr. Cuny.
- Dr. Zegura asked the CISE AC members to provide more feedback on the GENI Science Plan and to contact her directly.
- The CISE AC suggested gathering input on visioning from the wider community with a Wiki or some other type of mechanisms.
- Dr. Karp requested that the lead for each breakout group send a summary to him.

ATTENDEES

Members Present:
Professor Richard M. Karp, Chair, Electrical Engineering & Computer Science, Univ. of California at Berkeley, CA
Professor Andrea C. Arpaci-Dusseau, Computer Science Department, University of Wisconsin, Madison, WI
Professor Brian Blake, Department of Computer Science, Georgetown University, Washington, DC
Professor Randal Bryant, Computer Science, Carnegie Mellon University, Pittsburgh, PA
Professor David Clark, Computer Science & Artificial Intelligence, MA Institute of Technology, Cambridge, MA
Professor Jorge Diaz-Herrera, Computing & Information Sciences, Rochester Institute of Technology, Rochester, MN
Dr. Stuart Feldman, Vice President, Engineering, Google, New York, NY (ACCI liaison)
Professor Stephanie Forrest, Department of Computer Science, University of New Mexico, Albuquerque, NM
Dr. Alan Kay, President, Viewpoints Research Institute, Glendale, CA
Professor John L. King, University of Michigan, School of Information, Ann Arbor, MI
Dr. Richard Ladner, Department of Computer Science, University of Washington, Seattle, WA
Professor Antonio Lopez, Dept. of Computer Sciences & Computer Engineering, Xavier University, New Orleans, LA
Henrique Malvar, Director of Research, Microsoft Corporation, Redmond, WA
Professor Rosalind W. Picard, Affective Computing Research, M.I.T. Media Lab, Cambridge, MA
Professor Martha E. Pollack, College of Engineering, University of Michigan, Ann Arbor, MI
Professor Marc Snir, Department of Computer Science, University of Illinois Urbana-Champaign, Urbana, IL
Dr. David Tennenhouse, New Venture Partners
Professor Ellen W. Zegura, College of Computing, Georgia Institute of Technology, Atlanta, GA

Members Absent:
Professor Alfred V. Aho, Department of Computer Science, Columbia University, New York, NY
Professor Annie Anton, North Carolina State University College of Engineering, Raleigh, NC
*Professor Douglas Arnold, Director, Institute for Mathematics and Applications, Univ. of Minnesota, Minneapolis, MN (MPS AC liaison)
Dr. Vinton Cerf, Chief Internet Evangelist, Google, Herndon, VA
Dr. Andrew A. Chien, Vice President, Corporate Technology Group, Intel Research, Hillsboro, OR
Dr. William J. Dally, Computer Systems Laboratory, Stanford University, Palo Alto, CA
Professor David J. Farber, Computer Science & Public Policy, Carnegie Mellon University, Pittsburgh, PA
Professor Yolanda Gil, Information Sciences Institute, University of Southern California, Marina del Rey, CA
Mr. Dwight Gourneau, President, NAMTech, Inc., Rochester, MN
Professor Robin R. Murphy, Cognitive and Neural Sciences, University of South Florida, Tampa, FL
Professor Melissa O'Neill, Computer Science, Harvey Mudd College, Claremont, CA
*Professor Cherri Pancake, School of Electrical Engineering & Computer Science, Oregon State Unviersity, Corvallis, OR (ENG AC liaison)
Professor Margaret Wright, Computer Science Department, New York University, New York, NY

* Liaisons from Other NSF Advisory Committees

CISE Staff Present:
Dr. Jeanette Wing, Assistant Director (Designate), CISE
Dr. Deborah Crawford, Deputy Assistant Director, CISE
Dr. Michael Foster, Division Director, Computing and Communication Foundations (CCF)
Dr. Suzi Iacono, Senior Science Advisor
Rita Koch, Staff Associate
Richard Sheehey, Jr. Project Specialist

Invited Guests:
Dr. Ed Lazowska, Council Chair, Computing Community Consortium (via phone)
Dr. Susan Graham, Vice Chair, Computing Community Consortium (via phone)

APPENDIX I

State of NSF and CISE

GENI Update

IPAMM Report

Development of an NSF Plan to Broaden Participation

CISE New Action for Broadening Participation of Underrepresented Groups in Computing