NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
ASSISTANT DIRECTOR
FOR ENGINEERING

MEMORANDUM

DATE: March 12, 2009

TO: Dr. Arden Bement, Jr., Director, NSF

FROM: Dr. Thomas W. Peterson, Assistant Director, ENG

SUBJECT: Report of the Committee of Visitors for the Division of Electrical, Communications and Cyber Systems

Attached please find the report of the Committees of Visitors (COV) for the Division of Electrical, Communications and Cyber Systems (ECCS). This report was discussed during the October 15-16, 2008 meeting of the Directorate for Engineering Advisory Committee. The report and our response documents are attached.

The COV consisted of fifteen members with broad expertise on science and engineering activities related to the ECCS programs. Ten of the committee members were male, five were female, and two were underrepresented minorities. Eleven of the committee members were from academia, three from industry, and one from a federal agency laboratory. The chair and co-chair of the COV served on the ENG Advisory Committee at the time of the COV meeting. The geographic balance had eight members from Eastern states, four from Central, one from Mountain, and two from Pacific. Seven of the fifteen COV members were not serving on any NSF Advisory Committee at the time of the COV meeting and had not been applicants to the programs under review for at least five years. None had proposals pending with ECCS during the COV meeting, and no real or apparent conflicts arose during the course of the meeting.

Attachments

cc:
Cora Marrett, OD
Thomas Cooley, BFA
Anthony Arnolie, IRM
Christine Boesz, OIG
Lance Haworth, OIA
James Lightbourne, OIA
Susanne Bolton, IRM

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
ASSISTANT DIRECTOR
FOR ENGINEERING

March 12, 2009

Dr. Margaret Murnane
JILA and Departments of Physics and ECE
University of Colorado at Boulder
Boulder, CO 80309-0440

Dear Dr. Murnane:

The Electrical, Communications and Cyber Systems (ECCS) Division's Committee of Visitors Report was previously transmitted by Dr. Cherri Pancake, Chair of the COV. We thank you and the COV members for their support of the NSF ECCS programs.

I have attached a response to the recommendations in the ECCS COV report that was prepared by Dr. Lawrence S. Goldberg, the Acting Director of the Electrical, Communications and Cyber Systems Division. I concur with this document and adopt it as the official response of the Directorate for Engineering.

I wish to express my appreciation to the individuals who participated in the COV review. This process is critical to the management of the Directorate, and will help to guide our future decision-making.

Sincerely,

Thomas W. Peterson
Assistant Director
Directorate for Engineering

MEMORANDUM

DATE: March 12, 2009

TO: Thomas W. Peterson, AD/ENG

FROM: Lawrence S. Goldberg, Acting DD/ECCS

SUBJECT: Division Report on Diversity, Independence, Geographic Balance, and Resolution of Conflicts for the ECCS COV

This report to you is on the diversity, independence, geographic balance, and resolution of conflicts of the Committee of Visitors (COV) for the Division of Electrical, Communications and Cyber Systems (ECCS), held June 16-18, 2008.

The COV, which was assembled to review the ECCS Division and whose report was presented to the Engineering Advisory Committee during the October 15-16, 2008 meeting, consisted of fifteen persons, of whom ten were male and five female. One of the members was African-American, one Hispanic, and one Asian. Each member represented individual states and the District of Columbia, including three EPSCoR states. The geographic balance had eight members from Eastern states, four from Central, one from Mountain, and two from Pacific.

Eleven of the COV members were from academia, three from industry, and one from Government. One of the academic members was from an Undergraduate Institution. The Chair of the COV was female and Professor of Electrical Engineering and Computer Science at Oregon State University, and was a member of the Engineering Advisory Committee at the time of the COV. The Co-Chair was Hispanic male and Dean of the College of Engineering at New Mexico State University, and was also a member of the Engineering Advisory Committee at the time of the COV. All of the members from academia were at the rank of Professor. Two were Deans, one a Department Chair, and one a Department Associate-Chair at their institutions. The three industry members were at the levels of Vice President for Research, Associate Director, and Chief Scientist. The government member was the Division Chief of a federal agency laboratory. Their backgrounds represented a variety of disciplines in science and engineering relevant to the three ECCS program areas under review. All invited COV members attended the meeting.

Seven of the fifteen members were not at the time serving on any NSF Advisory Committees and had not been applicants to the ECCS programs under review for at least five years. None had proposals pending with ECCS during the COV meeting. A conflict of interest briefing was held on the first day of the COV meeting. The absence of any conflict of interest was confirmed by asking all to complete the NSF Conflict of Interest form, none of whom disclosed any conflicts. Assignments were made to ensure that there would be no potential conflicts of interest. No real or apparent conflicts arose during the course of the meeting.

-----Original Message-----
From: murnane [mailto:murnane@jila.colorado.edu]
Sent: Friday, October 24, 2008 2:46 PM
To: Reischman, Michael M.
Cc: Pope, Shirah; Goldberg, Lawrence S.; murnane
Subject: ECCS COV Report

Dear Dr. Reischman (Mike),

I am formally transmitting the ECCS COV report for FY 2005-2007, which was discussed at the recent ENG AdCom meeting October 15-16.

Best Wishes, Margaret

--
Professor Margaret Murnane
University Distinguished Professor
JILA and Departments of Physics and ECE
University of Colorado at Boulder
Boulder, CO 80309-0440
Cell phone: (303) 210-0396
E-mail: murnane@jila.colorado.edu
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Directorate for Engineering Advisory Committee
Membership
Fall '08

Cynthia Barnhart Professor and Associate Dean for Academic Affairs Massachusetts Institute of Technology Room 1-235A 77 Massachusetts Avenue Cambridge, Massachusetts 02139 barnhart@mit.edu 617-253-3815 – Office *Term: Fall '07 – Spring '10*	Steven P. Castillo Dean, College of Engineering New Mexico State University P. O. Box 30001, MSC 3449 Las Cruces, New Mexico 88003-8001 scastill@nmsu.edu 505-646-7234 – Office 505-646-3115 – Department *Term: Fall '07 – Spring '10*
John C. Crittenden Richard Snell Presidential Chair of Civil and Environmental Engineering Ira A. Fulton School of Engineering Arizona State University PO Box 875306 Tempe, Arizona 85287-5306 j.crittenden@asu.edu 480-965-1289 - Office *Term: Fall '06 – Spring '09* *NSF ERE Liaison for ENG AC*	Wesley L. Harris Associate Provost for Faculty Equity Charles Stark Draper Professor of Aeronautics and Astronautics Massachusetts Institute of Technology Cambridge, MA 02139-4307 weslhar@MIT.EDU 617-258-7390 - Department 617-253-0911 - Office *Term: Fall '09 – Spring '10* *CEOSE Liaison for ENG AC*
Thomas Knight Invistics Corporation 5445 Triangle Parkway, Suite 300 Norcross, GA 30092 tknight@invistics.com 770-559-6386 *Term: Fall '09 – Spring '12* *SBIR/STTR Advisory Committee Chair*	Cato T. Laurencin Vice president for Health Affairs Dean, School of Medicine Univ of Connecticut Health Center Van Dusen Professor of Academic Medicine Distinguished Professor of Orthopaedic Surgery & Boimedical Engineering 263 Farmington Avenue Farmington, CT 06030-3800 laurencin@uchc.edu 860-679-2594 *Term: Fall '06 – Spring '09*
Arun Majumdar Almy and Agnes Maynard Chair Department of Mechanical Engineering University of California at Berkeley Berkeley, California 94720-1740 majumdar@me.berkeley.edu 510-643-8199 – Office *Term: Fall '06 – Spring '09* *Past Chair, Fall '07 – Spring '08*	Margaret Murnane Fellow at Joint Institute for Laboratory Astrophysics Department of Physics and Electrical and Computer Engineering University of Colorado at Boulder Boulder, Colorado 80309-0440 murnane@jila.colorado.edu 303-492-7839 – Office 303-210-0396 – Department *Term: Fall '06 – Spring '09* *Advisory Committee Chair, Fall '08 – Spring '09*

Alan Needleman Professor of Engineering Visiting Professor University of Texas Dept. of Materials Science and Engineering P. O. Box 305310 Denton, Texas 76203-5310 Alan_Needleman@brown.edu 401-863-2863 – Office *Term: Fall '06 – Spring '09*	Tresa M. Pollock L.H. and F.E. Van Vlack Professor Materials Science & Engineering University of Michigan 2300 Hayward St. HH Dow 2042 Ann Arbor, MI 48109 tresap@engin.umich.edu 734-615-5150 - Office *Term: Fall '08 – Spring '11*
Matthew Tirrell The Richard A. Auhll Professor and Dean College of Engineering University of California Santa Barbara Santa Barbara, California 93106 tirrell@engineering.ucsb.edu 805-893-3141-Office *Term: Fall '06 – Spring '09*	Gregory Washington Professor and Associate Dean of Research College of Engineering The Ohio State University 161 Hitchcock Hall 2070 Neil Ave Columbus, OH 43210-1275 washington.88@osu.edu (614) 292-2986 - Office *Term: Fall '07 – Spring '10*
William A. Wulf University Professor Dept. of Computer Science University of Virginia Charlottesville, Virginia 22901 wulf@virginia.edu 434-982-2223 Office *Term: Fall '07 – Spring '10*	

From: Buckius, Richard O.
Sent: Monday, May 05, 2008 2:43 PM
To: pancake@eecs.oregonstate.edu; scastill@nmsu.edu; sdallen@astate.edu; barmish@engr.wisc.edu; klbutler@ece.tamu.edu; cavin@src.org; gilbert.hawkins@kodak.com; ken.marko@etas.us; lmolter1@swarthmore.edu; carlo.montemagno@uc.edu; mpardavi@gwu.edu; schmidt@mtl.mit.edu; david.seiler@nist.gov; wang@ee.ucla.edu; Brian.Woerner@mail.wvu.edu
Cc: Reischman, Michael M.; Varshney, Usha; Culbertson, Joanne D.; Pope, Shirah
Subject: ECCS 2008 COV

DIRECTORATE FOR ENGINEERING

MEMORANDUM

DATE: May 5, 2008

TO: 2008 Electrical, Communications and Cyber Systems Committee of Visitors

CC: Dr. Arun Majumdar, Chair of the Engineering Advisory Committee
Dr. Michael Reischman, Deputy Assistant Director for Engineering
Dr. Usha Varshney, Division Director for Electrical, Communications and Cyber Systems

FROM: Dr. Richard Buckius, Assistant Director for Engineering

SUBJECT: Charge to the FY 2008 Electrical, Communications and Cyber Systems Committee of Visitors

Thank you for agreeing to serve on the Committee of Visitors (COV) for the Division of Electrical, Communications and Cyber Systems (ECCS) of the Directorate for Engineering at the National Science Foundation (NSF). By NSF policy, programs that award grants or cooperative agreements are reviewed at three-year intervals by a COV. The COV is an *ad hoc* subcommittee of the Advisory Committee for the Directorate for Engineering. Dr. Cherri Pancake and Dr. Steven P. Castillo are members of the Advisory Committee and who will serve as the COV Chair and Co-Chair, respectively. The COV reviews the proposal and award process, advises ENG on significant impacts and advances from ECCS investments, and identifies emerging challenges and opportunities.

The COV charge is to address:

The integrity, efficacy, and quality of the processes used to solicit and review proposals and documentation of funding decisions.

The quality of project management, monitoring, and evaluation of funded proposals.

The quality and significance of the results of the Division's programmatic investments in terms of the four NSF strategic goals.

Opportunities to realize more fully the potential of the current programs and future directions for the ECCS Division.

Any other issues you think are relevant to the review.

This ECCS COV shall use the NSF 2008 Core Questions and Report Template in preparing its report.

Decisions to award or decline grant proposals are based on the informed judgment of Program Directors and Division Director following merit review. Systematic examination of proposal files by qualified external parties provides an independent mechanism of monitoring and evaluating the quality and pertinence of proposal decisions. This examination is part of the responsibility of the COV. The review will assess the operations of the Division of Electrical, Communications and Cyber Systems in FY 2005, FY 2006, and FY 2007, as they support the Foundation's goals regarding Discovery, Learning, Infrastructure, and Stewardship. The COV will examine a sample of files for both awarded and declined proposals in each program.

The review of jackets for this COV will be accomplished through eJacket, and we would like all committee members to complete their review of the electronic jackets prior to coming to NSF. Detailed documentation regarding awards will be available as paper jackets during your onsite visit to NSF. We will shortly provide you with passwords and instructions on the use of e-Jacket. Graham Giovanetti and Calvin Zulick on the ECCS staff will be available to work with you to resolve any issues you have concerning the use of eJacket or the ECCS COV website.

The activities of the ECCS Division are organized into three programs: (1) Electronics, Photonics and Device Technologies, (2) Power, Controls and Adaptive Networks, and (3) Integrative, Hybrid and Complex Systems. The ECCS Division also has lead oversight responsibility for the National Nanotechnology Infrastructure Network (NNIN) and the Science and Technology Center on Nanobiotechnology at Cornell University. ECCS Program Directors serve as technical liaisons for Engineering Research Centers, Nanotechnology Science and Engineering Research Centers, Industry/University Cooperative Research Centers, the Center of Excellence for Learning in Education, Science, and Technology, and the Network for Computational Nanotechnology. ECCS actively participates in the development and management of cross-disciplinary programs, and provides significant support to the National Nanotechnology Initiative.

The meeting of the ECCS COV will take place Monday through Wednesday, June 16-18, 2008, at the National Science Foundation, located at 4201 Wilson Boulevard, Arlington, Virginia. The COV will convene at 8:30 am on Monday, June 16, 2008, in Room 375, Stafford I, and will adjourn at noon on Wednesday, June 18, 2008. It is expected that the COV will prepare a draft report before leaving on June 18, 2008. By July 18, 2008, the COV should transmit its report, to the Chair of the Engineering Advisory Committee (AdCom). This report will be discussed at the fall 2008 ENG AdCom meeting. The AdCom Chair will then forward the report to the Assistant Director for Engineering with any comments that the Engineering Advisory Committee may have. In accordance with NSF policy, the Directorate will provide a response to the report's major recommendations. Both the COV report and the Directorate response will be forwarded to the Director of the NSF and posted on the NSF web site.

A secure web site has been created for the ECCS COV at http://www.nsf.gov/eng/eccs/cov.jsp. The site includes links for the following documents:

- Meeting Agenda
- COV Timeline
- 2008 ECCS Committee of Visitors Members List

- COV Program Assignments
- 2008 ECCS COV Member Biographies
- Charge to the 2008 ECCS COV
- Subchapter 300-Committee of Visitors Reviews
- ECCS 2008 Division Plan
- Core Questions and Report Template for FY 2008 NSF Committee of Visitors (COV) Reviews
- 2005 ECS COV Report
- FY 2005 Response to the 2005 Report of the Committee of Visitors (COV) for the Electrical and Communications Systems (ECS) Division
- FY 2006 Implementation Status Addendum to the 2005 Committee of Visitors (COV) Report for the Electrical and Communications Systems (ECS) Division
- FY 2007 Implementation Status Addendum to the 2005 Committee of Visitors (COV) Report for the Electrical, Communications and Cyber Systems (ECCS) Division
- The American Competitiveness Initiative
- The NSF FY 2003-2008 Strategic Plan
- The NSF FY 2006-2011 Strategic Plan
- Conflict of Interest Form 1230P

The website contains both the FY 2003-2008 NSF Strategic Plan and the new FY 2006-2011 NSF Strategic Plan. In accordance with NSF policy, the ECCS COV will use the earlier plan, FY 2003-2008, in conjunction with the FY 2008 Core Questions and Report Template to prepare its report. However, the COV will use the new FY 2006-2011 NSF Strategic Plan when preparing any remarks about opportunities or future directions for the ECCS Division. More information about ECCS programs will be provided through on the ECCS COV website about six weeks prior to the COV meeting date.

We very much appreciate your service in this important NSF activity, and we hope that you will find the process both interesting and informative.

_____

Richard O. Buckius
Assistant Director
Directorate for Engineering
National Science Foundation
4201 Wilson Blvd.
Room 505
Arlington, VA 22230

National Science Foundation
Committee of Visitors (COV) for FY 2005-2007
Division of Electrical, Communications and Cyber Systems

June 16-18, 2008
Room 375, Stafford I

Agenda

Monday, June 16, 2008
Room 375, Stafford I

8:00 AM	***Registration and Refreshments***
8:30 AM	**Welcome, Introduction of COV Members** **Dr. Usha Varshney, Division Director**
8:45 AM	**Charge to COV** **Dr. Richard Buckius, Assistant Director for Engineering**
9:00 AM	**Overview of the Electrical, Communications and Cyber Systems Division** **Dr. Usha Varshney**
9:45 AM	**COV Subgroup Assignments** **Dr. Cherri Pancake, COV Chair** **Dr. Steven Castillo, COV Co-Chair**
10:00 AM	***Break***
10:15 AM	**Presentations by Program Directors of Electronics, Photonics and Device Technologies (EPDT) Program** **Dr. Rajinder Khosla** **Dr. Eric Johnson** **Dr. Pradeep Fulay**
11:00 AM	**Presentations by Program Directors of Power, Controls and Adaptive Networks (PCAN) Program** **Dr. Radhakisan Baheti** **Dr. Dagmar Niebur** **Dr. Paul Werbos**
11:45 AM	**Presentations by Program Directors of Integrative, Hybrid and Complex Systems (IHCS) Program** **Dr. Yogesh Gianchandani** **Dr. Scott Midkiff** **Dr. Andreas Weisshaar**

Monday, June 16, 2008 ECCS COV (Continued)

12:30 PM ***Working Lunch***
Jacket Review Procedure, Graham Giovanetti, Calvin Zulick
General Comments, Ms. Joanne Culbertson, Staff Associate for ENG

1:45 PM **The Government Performance and Results Act (GPRA) and Conflict-of-Interest (COI) Briefing**
National Nanotechnology Infrastructure Network (NNIN)
Dr. Lawrence Goldberg, Senior Engineering Advisor

2:00 PM **COI Declarations and COV Report Plan**
Dr. Cherri Pancake, COV Chair
Dr. Steven Castillo, COV Co-Chair

2:15 PM **Subgroup Discussions - Part B. Results of NSF Investments**
Outcome Goal for Discovery – Room 375
Outcome Goal for Learning – Room 630
Outcome Goal for Infrastructure – Room 680

3:15 PM **Reports from Breakouts and Review/Finalization of Comments on Part B; Relevant Comments for Part C**

4:15 PM ***Break***

4:30 PM **Review/Finalization of Comments on Part A.1 and A.2 (E-Jacket Review); Relevant Comments for Part C**

5:45 PM **Meet with Dr. Varshney for Questions and Requests for Further Info**

6:00 PM ***Adjourn for Group Dinner at Matsutake Restaurant***

Tuesday, June 17, 2008
Room 375, Stafford I

8:00 AM ***Refreshments***

8:30 AM **Subgroup Discussions – Part A-3 (Portfolio)**
Issues A.3.1-A.3.4 – Room 375
Issues A.3.5-A.3.8 – Room 630
Issues A.3.9-A.3.12 – Room 680

10:00 AM ***Break***

10:15 AM **Reports from Breakouts and Review/Finalization of Comments on Part A.3; Relevant Comments for Part C**

11:30 AM **Report Back by Dr. Varshney with Requested Information**
Posing of New Questions/Requests

12:00 PM	***Lunch***
1:00 PM	**Subgroup Discussions – Part A-4 (Management)** **Issues A.4.1 and 2 – Room 375** **Issue A.4.3 – Room 630** **Issue A.4.4 – Room 680**
2:00 PM	**Reports from Breakouts and Review/Finalization of Comments on Part A.4; Relevant Comments for Part C**
3:00 PM	***Break***
3:45 PM	**Review of Issues for Part C** **Preparation of Outbriefing**
5:00 PM	**ECCS Future Technologies Emphasis**
5:45 PM	**Report Back by Dr. Varshney with Requested Information**
6:00 PM	***Adjourn***

Wednesday, June 18, 2008

Room 375, Stafford I

8:00 AM	***Refreshments***
8:30 AM	**Finalization of Presentation for ENG Assistant Director**
9:00 AM	**Meeting of COV with Dr. Michael Reischman, Deputy Assistant Director for Engineering** **(representing Dr. Richard Buckius, Assistant Director for Engineering)**
9:30 AM	**Finalization of COV Report Details**
10:15 AM	***Break***
10:30 AM	**Presentation of COV findings to the ECCS Division Director and Program Directors**
11:30 AM	***COV Meeting Adjourns***

National Science Foundation
Committee of Visitors (COV) for FY 2005-2007
Division of Electrical, Communications and Cyber Systems

June 16-18, 2008
Room 375, Stafford I

ECCS COV Members		***Program focus***
1.	**Pancake, Cherri (Chair)** Professor and Intel Faculty Fellow School of Electrical Engineering & Computer Science Oregon State University 1148 Kelley Engineering Center, Corvallis, OR 97331-5501 Email: pancake@eecs.oregonstate.edu Phone:(541) 737-2109 Webpage: http://web.engr.oregonstate.edu/~pancake/ *Software Tools for Virtual Collaborations	**IHCS**
2.	**Castillo, Steven (Co-Chair)** Dean and Regents Professor College of Engineering New Mexico State University MSC 3449, Box 30001, Las Cruces, NM 88003 USA E-mail: scastill@nmsu.edu Phone: (545) 646-7234 Webpage: http://www.ece.nmsu.edu/people/castillo.html *****Electromagnetic Theory	**PCAN**
3.	**Allen, Susan** Distinguished Professor Director, Arkansas Center for Laser Applications and Science Department of Physics and Chemistry Arkansas State University PO Box 419, State University, AR 72467 Email: sdallen@astate.edu Phone: 870-972-2406 Webpage: http://chemistryandphysics.astate.edu/directory.htm *Optoelectronics	**EPDT**
4.	**Barmish, B. Ross** Professor Department of Electrical and Computer Engineering University of Wisconsin-Madison 3613 Engineering Hall, 1415 Engineering Drive, Madison, WI 53706-1691 Email: barmish@engr.wisc.edu Phone: (608)-262-1080 Webpage: http://www.engr.wisc.edu/ece/faculty/barmish_ross.html *Control Theory	**PCAN**

5. **Butler-Purry, Karen** **PCAN**
Associate Head of Electrical and Computer Engineering Department
Professor
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Texas A&M University
214 Zachry Engineering Center, College Station, Texas 77843-3128
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Webpage: http://www.ece.tamu.edu/People/bios/bbutlerl.html
*Power and Energy Systems

6. **Cavin, Ralph** **EPDT**
Vice President for Research Operations, Emeritus
The Semiconductor Research Corporation
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Webpage: http://www.ee.virginia.edu/deptinfo/profiles/cavin.php
*Semiconductor Circuits and Devices

7. **Hawkins, Gilbert A.** **EPDT**
Associate Director
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Rochester, NY 14650-0505
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*MEMS

8. **Marko, Kenneth** **PCAN**
Chief Scientist
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ETAS Inc.
3021 Miller Road, Ann Arbor, MI 48104
Email: ken.marko@etas.us
Phone: (734) 272-1720
*Neural Networks

9. **Molter, Lynne** **EPDT**
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*Optoelectronics

10. **Montemagno, Carlo** **EPDT**
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*Bioelectronics

11. **Pardavi-Horvath, Martha** **EPDT**
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Email: mpardavi@gwu.edu
Phone: (202) 994-8591
Webpage: http://www.ece.gwu.edu/people/martha.htm
*Magnetics

12. **Schmidt, Martin** **IHCS**
Professor and Director of Microsystems Technology Laboratories
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77 Massachusetts Avenue, 39-521, Cambridge, MA 02139
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Phone: (617) 253-7817
Webpage: http://eecsfacweb.mit.edu/facpages/schmidt.html
*Nano and Microsystems

13. **Seiler, David** **IHCS**
Chief
Semiconductor Electronics Division
National Institute of Standards and Technology
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Email: david.seiler@nist.gov
Phone: (301) 975-2074
Webpage: http://www.eeel.nist.gov/812/dgs.htm
*Nanosystems

14. **Wang, Kang** **EPDT**
Raytheon Chair Professor
Electrical Engineering Department
University of California, Los Angeles
420 Westwood Plaza, 66-147B Engr. IV, Los Angeles, CA 90095
Email: wang@ee.ucla.edu
Phone: (310) 825-1609
Webpage: http://www.ee.ucla.edu/faculty-kang-wang.htm
*Organic and Nanoelectronics

15. Woerner, Brian **IHCS**

Lane Professor and Department Chair
Lane Department of Computer Science and Electrical Engineering
West Virginia University
P.O. Box 6109, Morgantown, WV 26506-6109
Email: Brian.Woerner@mail.wvu.edu
Phone: (304) 293-5263 x2551
Webpage: http://www.lcsee.cemr.wvu.edu/faculty/faculty-detail.php?id=465&type=faculty
*Communications Systems

Acronyms:

Electronics, Photonics and Device Technologies (EPDT) program
Power, Controls and Adaptive Networks (PCAN) program
Integrative, Hybrid and Complex Systems (IHCS) program

Diversity Statistics for Proposed FY 2008 ECCS COV Members

Allen, Susan	**White Female**
Barmish, B. Ross	**White Male**
Butler-Purry, Karen	**African American Female**
Castillo, Steven (Co-Chair)	**Hispanic Male**
Cavin, Ralph	**White Male**
Hawkins, Gilbert	**White Male**
Marco, Kenneth	**White Male**
Molter, Lynne	**White Female**
Montemagno, Carlo	**White Male**
Pancake, Cherri (Chair)	**White Female**
Pardavi-Horvath, Martha	**White Female**
Schmidt, Martin	**White Male**
Seiler, David	**White Male**
Wang, Kang	**Asian Male**
Woerner, Brian	**White Male**

5 Females **- 1 African American**
- 4 White

10 Males **- 1 Asian**
- 1 Hispanic
- 8 White

Diversity Statistics for Proposed FY 2008 ECCS COV Members

(Continued)

47% of the proposed COV membership includes qualified individuals who are not currently serving on any NSF Advisory Committees and have not been applicants to the ECCS programs under review for at least five years. These members are:

1) Susan Allen
2) Gilbert Hawkins
3) Kenneth Marco
4) Lynne Molter
5) Carlo Montemagno
6) Martin Schmidt
7) David Seiler

Geographic Diversity

COV member distribution by Geographic Zone is as follows:

- Eastern – 8 Members
- Central – 4 Members
- Mountain – 1 Members
- Pacific – 2 Members

3 EPSCoR states are represented: Arkansas, New Mexico, and West Virginia.

Institutional Diversity

COV members are from the following institutions:

- 11 Members from Academic Institutions
- 3 Members from Industry
- 1 Member from Government
- 1 Member from an Undergraduate Institution

School of Electrical Engineering and Computer Science
Oregon State University, 1148 Kelley Engineering Center, Corvallis, OR 97331-5501
Phone 541-737-3617 | http://eecs.oregonstate.edu

July 1, 2008

Dr. Margaret Murnane
Chair, ENG Advisory Committee
Department of Physics and Electrical and Computer Engineering
University of Colorado at Boulder
Boulder, Colorado 80309

Dear Dr. Murnane:

As Chair of the Committee of Visitors (COV) for the Electrical, Communications and Cyber Systems (ECCS) Division in the Directorate for Engineering, it is my pleasure to submit the attached report based on the COV visit to ECCS on June 16-18, 2008.

The COV members judged the ECCS Division to be highly successful in all aspects of performance. The portfolio of awards managed by the Division is effective in addressing Directorate, Foundation, and National priorities as well as furthering NSF's targeted outcome goals of discovery, learning, and research infrastructure. The Division Director, Dr. Usha Varshney, skillfully managed the recent Division reorganization. The ECCS program officers work together well under her leadership and have developed a well-balanced portfolio of awards. All Division personnel clearly are committed to meeting NSF guidelines and requirements, and a number of mechanisms were introduced since the previous COV (in 2005) to improve the efficiency and effectiveness of internal processes. The Division has been exemplary in achieving an average dwell time for proposals of just 4.78 months; its record of time-to-decision (under 6 months for 98% of all proposals) has ranked first and second NSF-wide for the past two years.

We are concerned, however that the funding situation in ECCS is having deleterious effects on disciplinary research, and is poised to worsen. Annual award size already lags significantly behind research costs – and behind the corresponding averages in ENG and NSF-wide. As many as 85% of PIs are required to cut their budgets prior to receiving awards; this undermines the effectiveness of research in our disciplines. The ripple effect will be felt by increasingly broader audiences as interdisciplinary coalitions address the new NSF target areas of SEBML (Science & Engineering Beyond Moore's Law, WATER (Dynamics of Water Processes in the Environment), AST (Adaptive Systems Technology), CDI (Cyber-Enabled Discovery & Innovation), and NNI (National Nanotechnology Initiative), where ECCS-originated technologies will be critical.

The previous COV pointed out this problem in 2005, when it was still incipient. It has now become a pressing need to increase the uncommitted funds available for ECCS awards. We urge the Directorate to consider the implications of its planned ECCS allocations. If ENG does not increase uncommitted funds s, we believe that ECCS has no choice but to reduce funding rates. The community simply can't afford

to subsidize underfunded projects, nor can ECCS ignore the impact of underfunding on research effectiveness.

We commend and thank Dr. Varshney, Dr. Lawrence Goldberg, and the Program Officers (Drs. Radhakisan Baheti, Pradeep Fulay, Yogesh Gianchandani, Eric Johnson, Rajinder Khosla, Scott Midkiff, Dagmar Niebur, Andreas Weisshaar, and Paul Werbos) not only for their responsiveness to our requests, but also for their openness to our comments and suggestions. We would also like to thank the Science Assistants and other Division staff for their support during the entire process.

Please let me know if you require any additional information or clarification. It was a pleasure to be part of this important process for ECCS and the National Science Foundation.

Sincerely,

Cherri M. Pancake
Chair, ECCS COV

Cc: Dr. Usha Varshney
Dr. Richard Buckius, ENG AD

EXECUTIVE SUMMARY

The Committee of Visitors (COV) met on June 16-18, 2008 to review programs in the Electrical, Communications, and Cyber Systems Division (ECCS) in the Directorate for Engineering. The review covered the three years FY05-FY07.

During the review, the COV evaluated 186 jackets (proposal actions) that were randomly selected over the three-year time period. Oral presentations of the programs and processes were provided by the Division Director and Program Officers. The 2008 ECCS Division Plan, the 2005 COV report, and annual updates on responses to that COV were also provided, and we were given access to a wide range of statistical information and summaries.

The COV's responses follow the prescribed template for FY08 COV Reviews. Part A covers the integrity and efficiency of the Division's processes and management; Part B the results of NSF investments; and Part C other comments on program performance, areas for improvement, and feedback on the COV process itself.

The COV found that the ECCS Division has been highly successful in meeting its program goals and objectives, and that Division processes are carried out with care and integrity. The program areas covered by ECCS have become even more important to the Foundation – and the Nation – over the past few years. All of NSF's targeted challenges (Science & Engineering beyond Moore's Law, Dynamics of Water Processes in the Environment, Adaptive Systems Technology, Cyber-Enabled Discovery & Innovation, and National Nanotechnology Initiative) will require groundbreaking technological developments in electronics, photonics, controls, adaptive networks, complex systems, and/or low-cost power. ECCS not only funds basic research in these areas, but has been the origin of many novel interdisciplinary efforts (e.g., the intersection of biological systems and nanotechnology) that have laid the groundwork for addressing those challenges. ECCS-funded research will play a similar instrumental role in addressing many of NAE's Grand Challenges.

However, the COV also identified some areas of concern, summarized below. We believe the situation is already beginning to undermine the effectiveness of the research areas for which ECCS is responsible, and that vigorous action by ENG and NSF to improve the funding levels for ECCS.

- **Limited funding means the ECCS program is not very deep in its coverage of topics.** The impact of the ECCS portfolio is substantial, addressing problems of national importance that are clearly relevant to the missions of NSF and the Nation. If funding limitations cannot be addressed, there is a serious risk for emerging areas that could contribute significantly to NSF's new initiatives and NAE's Grand Challenges.
- **Award size lags behind research costs.** The average annual award size is small compared to other ENG Divisions – and ENG, in turn, is small compared to the Foundation as a whole. In FY07, the NSF annual mean for research grants was $144K, ENG's was $116K, and ECCS' only $107K. This constrains the effectiveness of PIs, and we are very concerned about the long-term detrimental effects on disciplinary research. It is imperative that funding amounts be increased, at least to the extent of keeping up with rising costs of research.
- **Most proposal budgets are renegotiated prior to funding.** The average annual award size already lagged well behind both ENG and NSF rates at the time of the last COV, which criticized both award size and the rate of funding. In response to upper management's emphasis on funding rate, the Division made a concerted effort to improve its records and this was successful. However, because the budget did not increase proportionately, ECCS has found it necessary to institute a widespread practice of "budget renegotiation," which results in reductions of up to 40% in 80-85% of new awards. This is especially troubling in

experimental areas, where the impact of a project may depend upon the availability of expensive equipment and facilities. We are worried that this practice undermines the effectiveness of ECCS PIs.

- **ECCS must take prompt action.** We unanimously support the need to increase uncommitted funds for ECCS. Without that funding, our disciplines will fall behind in terms of technological advances at the very time when their importance to national priorities is becoming clear. If uncommitted funds are not increased, ECCS must still take action to address the dangerously low levels of research awards. We believe there will be no choice but to scale back on acceptance rates. Continuing the current practice of underfunding research will erode the effectiveness of ECCS awards.

FY 2008 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: June 16-18, 2008
Program/Cluster/Section: Electronics, Photonics and Device Technologies; Power, Controls and Adaptive Networks; Integrative, Hybrid and Complex Systems
Division: Electrical, Communications and Cyber Systems (ECCS)
Directorate: Engineering (ENG)
Number of actions reviewed: **Awards:** 136 **Declinations:** 50 **Other:**
Total number of actions within Program/Cluster/Division during period under review: **Awards:** 768 **Declinations:** 3260 **Other:** 37
Manner in which reviewed actions were selected: Random Sampling

PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

A.1 Questions about the quality and effectiveness of the program's use of merit review process. Provide comments in the space below the question**.** Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? During FY05-FY07, approximately 1,400 proposals were received annually by the Division. Of these, some 93-95% were evaluated through panel review and 3-4% using mail reviews; the remaining 3% were not externally reviewed. The COV commends ECCS for achieving this level of panel review. Panel review works well for large numbers of proposals in similar areas. The process seems appropriate and well-managed. Proposals are reviewed by 3-4 independent reviewers and then discussed by a larger review panel. The panels are well organized and as thorough as the skills of the participants allow (i.e., there is adequate time for discussion and each participant is able to fully contribute). The documents indicate that each proposal is discussed and evaluated thoroughly. Overall, the process is timely and effective. Further, the COV notes that panels play a role beyond proposal assessment by improving consistency among the community of reviewers. Mail review is appropriate when only a small number of proposals are received in a particular area. The statistics show that this method is used only rarely, and the examples we saw seemed appropriate.	Yes
2. Are both merit review criteria addressed a) In individual reviews? According to the statistics, 96% of reviews over the past two years have addressed both merit review criteria. The COV found this to be upheld by the individual jackets we reviewed.	Yes

b) In panel summaries? The panels typically summarize the information on merit review criteria covered by the reviews. c) In Program Officer review analyses? The Program Officers clearly understand the criteria and adhere to them in making decisions.	Yes Yes
3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals? In general, the individual reviewers take care to justify their opinions and provide substantive comments. The level of detail is sometimes greater in borderline proposals than in those recommended for funding; this practice is highly appropriate because it gives unsuccessful proposers detailed feedback on the issues that need to be addressed in future submissions. Overall, the independent reviews provided by individual reviewers were reasonably consistent in their overall ratings of proposals, with few instances of one reviewer rating a proposal Excellent or Very Good and another rating it only Fair. The relative consistency of the independent reviews is a testimony to a process that generally works.	Yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Consensus appears always to be reached (since there are no dissenting opinions in the summaries) but it is not always clear how that occurs. We saw more instances of panels discussing proposals that had garnered borderline ratings by some reviewers and improving their status to the point that they were recommended for funding, than the reverse. This is an appropriate function of the review panels, where during discussions individual reviewer questions/doubts can be addressed by other panelists with knowledge of the proposal areas. It needs to be documented, however. The fact that debate occurs is important feedback. Some panel reviews are simply compilations of reviewers' reports and do not reflect the content of broader discussions. Further, there were instances where the panel consensus differed significantly from the individual reviewers' ratings (e.g., a proposal with ratings of G, G, VG, VG/E ultimately being recommended for funding). In those cases where the panel discussion significantly changes the perceptions of the individual reviewers, the panel summaries should provide a clearer rationale for decisions. The COV suggests that it might be of value to have panelists assess themselves as "highly knowledgeable," "knowledgeable," or "not so knowledgeable" for each reviewed proposal.	Could be improved

5. Does the documentation in the jacket provide the rationale for the award/decline decision? In general, the combination of reviews, panel summary, review analysis, context statement, and PO comments provide adequate documentation for the award/declination decision. The Program Officer summarizes the results in a review analysis and presents the final results to the PI in a fairly detailed context statement.	Yes
6. Does the documentation to PI provide the rationale for the award/decline decision? In general, the documentation provided to the PI provides sufficient rationale for the decision, with the Program Officer's context statement typically providing the most complete information.	Yes
7. Is the time to decision appropriate? Throughout recent years, the Division has exceeded NSF's stated goal of informing applicants within 6 months of proposal deadline in 70% of cases. In the last two years, performance has been stellar in this regard, with time-to-decision of less than 6 months for 98% of all proposals. ECCS scored the best Foundation-wide in this regard in FY06, and second in FY07. Moreover, the average dwell time for ECCS proposals was just 4.78 months in FY07. The COV commends ECCS on these achievements.	Yes

8. Additional comments on the quality and effectiveness of the program's use of merit review process:

<u>Review types:</u> The COV notes that panel reviews are especially useful for interdisciplinary proposals, as area experts for each aspect of the proposal can be present at the discussion and misunderstandings cleared up. There are two difficulties with panel review, of course: (a) the decision of the panel depends on its expertise and how well panelists know the field of research; and (b) for a panel to review 18 or more proposals, the expertise of each reviewer cannot always be well targeted. We suggest that there may be some cases where a real-time "help-line" to relevant subject experts might add depth to discussions.

<u>Merit review criteria:</u> We note that broader impacts are not addressed adequately in many individual reviews, especially with regard to educational impacts. Most discussion is on intellectual merit (not surprising as more background information is usually needed to explain both the strengths and weaknesses of the proposal). In several jackets only one reviewer really assessed the broader impacts and subsequent summaries simply reflected his/her opinion. In others, reviewers praised the broader impact components more for style than for content, which should be discouraged. Still other reviewers included comments ostensibly about broader impact, but which really were not related to the merit criterion. We suggest that reviewers and panelists be given specific examples (good and bad) of what broader impacts

they should be looking for and how to comment on this aspect of proposals. They also should be cautioned not to take it upon themselves to identify the potential impact of proposals (i.e., filling this in for the PIs), but to comment only on the content of the proposal.

Individual reviews: We encourage POs to provide guidance to reviewers about the appropriate level of detail; this is another case where a few examples (good and bad) could help reviewers understand what's needed. In some cases, reviewers offer little information content in their comments or do not justify their assessments (i.e., comments don't appear to match the ranking). A few reviews were extremely short and there were also cases where comments simply referred to "the premier team" or made other reference to the PIs being well-known in the field. On occasion, deficiencies in the proposal were noted but seemingly excused because of who the PIs were, or the reviewer neglected to include any comments at all. There is little that ECCS can do about that, other than to keep track of which reviewers consistently do not provide substantive feedback and not invite them again.

There are cases, especially in high risk, high reward proposals, where the rationale for optimism or pessimism is terse. It is not clear that in such cases more elaboration would help, but exposing such cases to thorough discussions using the entire panel and noting these occurrences in the summaries would provide additional feedback.

Panel summaries: We offer four suggestions. (1) The panel summary typically repeats comments from the individual reviewer(s) who held the consensus opinion. This is fine as long as additional information that came out in the discussion is also included (e.g., references to other people's work in related areas), but there was a lot of variability in this aspect. In particular, it would seem that proposals which were obviously not going to get funded did not get much other information in the panel summary. The rationale is often found in the Program Officer's comments, where the process used by the panel is often explained, but it should be part of the panel summary as well. (2) In cases where a proposal is declined and reviews are very weak, in particular, the panel summary should include sufficiently strong wording. That is, if a proposal is clearly "unfixable," the panel should make it clear that the investigator should not submit a revised version. In some cases, the PI may be getting the erroneous impression that the proposal will be seen more favorably if revised. It might be possible to call more attention to both these issues when the panel begins its deliberations. (3) The summaries written by reviewers who also provided an individual review tended to be dominated by comments from his/her write-up; reviewers who had not provided a review were much better in capturing the panel consensus. We suggest that the Directorate consider adopting an informal policy that summaries be written by panelists who did not serve as original reviewers for the proposal. (4) Some panels divide proposals into three categories (Highly Recommend, Recommend, and Not Recommend), while some panels use just two (Recommend and Not Recommend). It is not clear under what circumstances two categories or three categories might have been used for specific panels, but we suggest they be standardized to three categories.

Rationale for award/decline decision: The statements of merit in reviews are often very generic. For an award process as selective as ECCS', it would seem appropriate for individual reviews to elaborate on the distinguishing features leading to high rankings (e.g., "these were the compelling parts" rather than just "great"). The panel summaries also could be clearer in this regard. Where the reviewers all agree a proposal is strong (e.g., more E than V), it is easy to understand why it merits funding, but a clearer explanation of acceptance is in order when there are no E ratings. We note that if a decision is very close, it may not be appropriate to give detailed reasons – just let the reviews speak for themselves.

The COV also found instances of e-jackets where the Program Officer neglected to justify why he chose to override the panel decisions (seemed to copy the panel's positive comments and ignore or invert the negatives, then reverse the decision). We don't question the right of a PO to make this decision, but remind all POs that the rationale needs to be clearly laid out in the jacket.

A.2 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? As far as could be determined, reviewers typically had appropriate expertise and qualifications. Their comments on the proposals were, in general, cogent and to the point. The Division seems to do its best to bring together a proper group of reviewers, although given the broad range of topics, some proposals might not get the most relevant qualified reviewers.	Yes
2. Did the program use reviewers balanced with respect to characteristics such as geography, type of institution, and underrepresented groups? The COV notes that participating in the review process is an important part of educating future PIs. We were pleased to see that the number of first-time panelists has been increasing and is now almost 40%. We were unable to consistently identify the demographics of reviewers from individual jackets. Our comments are based on the EIS summary statistics. To the extent revealed by summaries – which reflect only 55% of reviewers – there appears to be a mix of gender and underrepresented groups that generally reflects the field. If, as we suspect, most of the 45% who did not report demographics are males, the numbers are not in fact representative and need to be improved (see additional comments below).	Yes
3. Did the program recognize and resolve conflicts of interest when appropriate? While some e-jackets explicitly address that there were no conflicts of interest at the panel level, most do not. Nor does there appear to be direct mention when panel members recuse themselves from discussion of particular proposals because of conflicts. The COV suggests that conflicts be explicitly addressed in each jacket, indicating which panel member(s) was recused or stating that there were no conflicts.	Not entirely clear
4. Additional comments on reviewer selection: <u>Reviewer expertise:</u> Reviewers can be very knowledgeable, yet still be at the margins of their experience when asked to comment on new ideas. The COV notes that the pool could be expanded by utilizing more reviewers from national laboratories, industrial research centers (but not the manufacturing sector), and government agencies like ONR and NIST. When such	

individuals can be found, they bring a uniquely valuable perspective to the review process. The statistics presented by the Division Director showed increasing participation of such representatives; we encourage ECCS to make this a regular practice.

Some panels had two representatives from the same institution. The COV questions the wisdom of this, even if they are not from the same department.

Geographic balance: It is not surprising that the West is under-represented (less than 35% of reviewers are from the western two-thirds of the country), given the distance and time involved in traveling to NSF. We suggest that ECCS consider holding panel reviews in major Midwestern/western cities (as some other directorates have done). Now that wireless and laptops are ubiquitous, this is perfectly feasible.

We noted that in some of the jackets we reviewed, a significant majority of the reviewers were from just a couple of states (e.g., 7 of 10 from just 3 states). This is a problem and needs to be addressed.

Reviewer diversity: With one exception, the number of women on panels we reviewed varied from 0-3 (out of 9-13) panelists. We recognize that this is a difficult problem, but it is essential that panels include more diversity if the community is to change. We suggest two things: (1) ECCS could contact all potential reviewers, remind them of the importance of having demographics available, in order to provide an accurate assessment of the overall quality of decision-making, and provide quick instructions on how to provide the information. Then ECCS could adopt the informal policy of selecting panelists so that at least 70% are of known demographics (this also would raise the bar for the rest of the Directorate). (2) Set the goal for ECCS that every panel will demonstrate geographic, ethnic, and gender diversity. Note that holding panels outside DC will help reach the broader pool of participants that will be needed.

A.3 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, or DATA NOT AVAILABLE
1. Overall quality of the research and/or education projects supported by the program. Overall, the quality of the projects funded appears to be high, with research awards resulting in many quality publications. The funding supported the careers of well-qualified researchers and graduate students. The COV notes that it is difficult to judge project quality based on the materials furnished to NSF by PIs (annual and final reports). One measure of quality is the general consistency of the independent reviews. Another is the level of productivity shown in the yearly reports that have been submitted to date; however, since they often just list publication and presentation titles, they are not necessarily good indicators of quality. What is clear from the jacket review is that competition for ECCS awards is stiff, and in a number of cases even those proposals not recommended for funding were described as worthy of support.	Yes
2. Does the program portfolio promote the integration of research and education? While most proposals addressed to some extent the integration of research with education, the weight placed on this issue in the award process is unclear – except for CAREER proposals. In many of the funded proposals, the relationship between research and education relates primarily to the education of the project's graduate students. We did find a number of instances where reviewers and panelists gave particular recognition to researchers for their consideration in addressing education and broader impacts. For most single PI proposals the primary educational impact is on the training of a small number of graduate students, but there are some large programs that have broad and creative educational impacts. Section B addresses this further.	Yes
3. Are awards appropriate in size and duration for the scope of the projects? Typical projects are three years in duration, which is reasonably consistent with Ph.D. programs. The COV is concerned, however, that the average	Not completely satisfactory

annual award size is small compared to other ENG Divisions (and ENG, in turn, is small compared to the Foundation as a whole). The COV notes that the previous COV – and Directorate and Foundation management – recommended increasing award rates and that this is ECCS' way of responding, absent significant budget increases. However, we believe it is risky to under-fund projects, even when that is the only way to achieve higher acceptance rates. Section C addresses this in more detail.	
4. Does the program portfolio have an appropriate balance of innovative/potentially transformative projects? The COV believes the ECCS program portfolio contains an appropriate mix of innovative and evolutionary projects. We note that the CAREER, SGER, and NER programs play particularly important roles in potentially transformative research. Further, SGER plays a role in incentivizing program managers by providing them the ability to shape their programs. The COV commends ECCS for addressing previously low funding rates for CAREER awards – which increased from 11.6% in FY05 to 19% in FY08.	Yes
5. Does the program portfolio have an appropriate balance of inter- and multi-disciplinary projects? The program portfolio has an appropriate balance of inter- and multi-disciplinary projects. Of 259 awards in 2007, funding was contributed by other programs in 44 cases. In the same year, ECCS contributed funds to 75 awards made through other programs in ENG, other Directorates, and other agencies. This proportion is an indicator of a high rate of interdisciplinary research proposals co-funded by ECCS.	Yes
6. Does the program portfolio have an appropriate balance considering, for example, award size, single and multiple investigator awards, or other characteristics as appropriate for the program? Award size balance seems to be reasonable. Awards range in size from $30K to just over $1.5M, with annual funding just over $100K per investigator for most research awards (see Section C.2 for further discussion of award size). The balance of single and multiple investigator awards is also good, with 111 of the 259 total awards in 2007 being multi-investigator. The long term trend in the Directorate has been away from single investigator awards (79% in 1990 to 42% in 2008) and toward multi-investigator awards. We encourage ECCS to continue its strong support of single investigator awards, but also note that it needs to address the problem that award size should be commensurate with the number of investigators (i.e., average award size should be markedly larger for multi-investigator awards).	Yes

7. Does the program portfolio have an appropriate balance of awards to new investigators? In FY07, 31% of all awards went to new investigators, with a funding rate of 16.94%. The fact that this is somewhat less than the overall funding rate (18.4%) is to be expected. We commend ECCS on its efforts to make a significant percentage of awards to new investigators.	Yes
8. Does the program portfolio have an appropriate balance of geographical distribution of Principal Investigators? The COV believes that the geographic distribution of awards is appropriate. From FY05 through FY07, proposals were received from every state, and awards were made to investigators from every state with the exception of Idaho, Vermont, and Wyoming. There was a generally good match between the population distribution and the award distribution for most states. For states large enough to have a statistically significant number of awards, the % of awards is usually well-matched to the states' percentage of the US distribution. The states that seem to have an unusually high proportion of awards for their population are places with an unusual concentration of research institutions (Massachusetts, D.C., Connecticut); the states with an unusually low proportion are largely EPSCoR states and Puerto Rico. The proposal success rate for investigators from west of the Mississippi river was 19.2%, while the success rate for investigators from east of the Mississippi was 19.0%, so although the reviewers are drawn disproportionately from the eastern portion of the country, this does not appear to have affected the outcome of the review process.	Yes
9. Does the program portfolio have an appropriate balance of institutional types? ECCS in general appears to have an appropriate balance of institutional types. The Division has achieved or exceeded the award rates reported as ENG- and NSF-wide statistics over the last three years, with one exception. The exception is 2-year institutions, where ECCS has not succeeded in attracting proposals. The COV expects that the recent extension of RET eligibility to 2-year institutions will encourage the kinds of partnerships that can lead to future proposals from this source.	Yes
10. Does the program portfolio have an appropriate balance across disciplines and subdisciplines of the activity?	Yes

Based on the presentations by Program Officers and review of e-jackets, the Division appears to be achieving balance among disciplines and subdisciplines through its management of unsolicited and solicited proposal review. The COV notes that "appropriate balance" is a moving target, changing over time and with emerging Directorate, Foundation, and national priorities.	
11. Does the program portfolio have appropriate participation of underrepresented groups? It is difficult to provide a definitive answer to this question because PIs are not required to report demographic information. 10% of the total competitive awards made by ECCS over the last three years were made to PIs from underrepresented groups, a number that is somewhat less than the national average for percent of faculty from underrepresented groups in Electrical Engineering. However, we note that the award rate was 18.98% and 18.79% over the same period (for women and minority investigators, respectively) – very close to the ECCS award rate overall. For competitive awards, the success rate for proposals submitted by women averages 19% for the last three years, a number approximately equal to the overall average funding rate. A similar statement can be made for minorities. That is, although submission rates are significantly lower for minorities (7%) and women (18%), their success rate is similar to other PIs.	Not completely clear
12. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. The ECCS program is highly relevant to national priorities, NAE's Grand Challenges, the American Competitiveness Initiative and America Competes Act, the NSF strategic plan, relevant fields, and other constituent needs. The ECCS 2008 Division Plan identifies national and NSF priorities and allocates resources accordingly.	Yes
13. Additional comments on the quality of the projects or the balance of the portfolio: <u>Award size:</u> The COV is concerned with the common practice of budget renegotiation and the associated change of scope. It appears that as many as 85% of proposed budgets are reduced prior to the award. A reduction may necessitate a change in project scope which is inconsistent with the understanding under which the panel recommended funding. The situation was especially troubling to the COV in experimental areas where panel recommendations may be predicated upon the availability of certain equipment and facilities. To provide two extreme examples, a highly-rated 2-investigator award had a proposed budget of $690,000 but was renegotiated to $240,000, while the budget for another was reduced from $636,956 to $300,000. In such cases, it is natural to ask whether the panel recommendation would have been the same had it been known *a priori* that a significant reduction of scope would occur. The COV recommends that in situations where a budget reduction will likely be requested, the panel be asked to comment on which projects will/won't downscale effectively.	

Participation of underrepresented groups: Award rates for underrepresented groups are somewhat higher for the ENG Directorate as a whole (21% for women and 16% for minorities) and Foundation-wide (26% and 23%, respectively). We suggest that ECCS Program Officers become more proactive with potential PIs from these communities, setting an internal goal of achieving the levels of first ENG and then the Foundation.

Other aspects of balance: Although the COV template does not refer to portfolio balance in terms of PI career status, we thought it germane to determine if there was an appropriate distribution of awards throughout the career lifecycle (as opposed to, for example, many awards to senior faculty near the ends of their careers). At our request, ECCS staff pulled statistics on submissions and funding rate based on the year of the PI's doctorate. We found a remarkable level of consistency across the board, with senior PIs (degrees from 1965-1979) achieving similar funding rates to mid-career (1980-1994) and junior PIs (1995-2007). We commend ECCS on this evidence of even-handedness, which we attribute at least in part to the Division's concerted attempt to increase the award rate for CAREER and new investigator proposals since the last COV.

A.4 Management of the program under review. Please comment on:

1. Management of the program.

The ECCS Division is well managed. In particular, the COV commends the Division Director on the thoroughness with which she oversaw the reorganization of the Division. She has developed a fine sense of teamwork among the Program Officers, who in turn have clearly worked hard to ensure all programs are efficient and successful. We also support Dr. Varshney's decisions to add two science assistants and realign support staff.

2. Responsiveness of the program to emerging research and education opportunities.

The ECCS Division has been proactive in identifying and responding to both changing and emerging opportunities. As a result, Division activities are well aligned to NSF initiatives, emerging trends in the disciplinary community, the American Competitiveness Initiative, America Competes Act, and NAE's recent Engineering Grand Challenges.

The Division is to be complimented for its management of the Foundation-wide NNIN and NCN interdisciplinary programs, all of which foster unique combinations of emerging research and education. The COV also commends ECCS for its creativity in initiating Graduate Research Supplements, which began as a joint program with CBET in 2005 to fund underrepresented groups and has now been adopted by the Directorate as a whole (and we hope Foundation-wide in the future).

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

ECCS program planning and prioritization processes are inclusive and effective, resulting in a portfolio that is highly responsive to national and agency priorities. Program Directors identify emerging theme areas and organize workshops to identify opportunities and funding challenges. Sources for the theme areas include recognized national entities (such as NAE and NAS) and national programs (e.g., American Competiveness Initiative and America Competes Act). This process results in the formation of intellectual communities and is implemented via new program areas within ECCS and/or program solicitations. The priorities help guide the selection of unsolicited proposals, which still retain enough flexibility to fund previously unidentified areas. In a sense, this approach represents a shared management with the intellectual community.

The COV also observes that ECCS is actively involved in leveraging investments through joint programs with other agencies to accelerate the rate of progress in promising research areas of national need.

4. Responsiveness of program to previous COV comments and recommendations.

The Division has addressed all six key issues identified in the 2005 COV report in an effective and fully satisfactory manner. ECCS provided annual responses for each of the last three years documenting their progress in responding to each issue.

(1) *Impact of program outcomes.* ECCS moved aggressively to address the low funding rates

for new investigators criticized by the 2005 COV. As noted earlier in this report, they now achieve impressive award rates for both CAREER (19%) and new investigators (31%).

(2) *Appropriate use and support of innovative projects.* The Division addressed the concerns about SGER awards addressed in the 2005 COV report (classification of awards in the SGER category for unjustified reasons and insufficient budget to produce significant impact) by thoroughly revamping the SGER process.

(3) *Breadth of research program.* ECCS has made significant organizational and portfolio changes to address this concern. Presentations, the Division website, and other dissemination emphasize this disciplinary breadth.

(4) *Understanding and use of NSF Merit Review Criterion 2.* The Division has made a concerted effort to raise the level of awareness of reviewers to the Broader Impacts evaluation criterion. Nevertheless, the COV notes that ECCS – and indeed, all of NSF – still has work to do in this area, as the criteria remains a point of confusion and inconsistency among reviewers.

(5) *Diversity of reviewer base.* ECCS has taken significant strides in increasing the diversity of its reviewer base. Where available, the statistics reflect national proportions.

(6) *Follow-up on GOALI awards.* The Division has made significant progress in increasing the level of follow-up for GOALI awards, as well as increasing its level of collaboration with the national laboratories.

5. Additional comments on program management:

<u>Management:</u> The reorganization of the Division into three programs – Integrative, Hybrid and Complex Systems (IHCS), Power, Controls and Adaptive Networks (PCAN) and Electronics, Photonics and Device Technologies (EPDT) – and the reassignment of Program Officers to reflect the workload in the three programs is in line with NSF and ENG initiatives and the previous COV report, and has resulted in efficient program management. Program Officers have used the new structure and improvements in NSF's information infrastructure to streamline proposal processing. The addition of two science assistants and realignment of support staff also has helped to streamline the review and other processes. With 98% of proposals handled within 6 months, ECCS was first in the Foundation in turnaround time for proposals in FY06 and second in FY07, another indication of effective use of resources.

<u>Responsiveness to emerging opportunities</u>: Particular attention was paid to the American Competitiveness Initiative, NAE Grand Challenges, and National Nanotechnology Initiative – all programs with significant overlap with ECCS. NSF initiatives with which ECCS was particularly aligned include: Cyberinfrastructure, ADVANCE, Active Nanostructures and Nanosystems, DNDO/NSF Academic Research Initiative, CLEANER/WATERS Network, Explosives and Related Threats, and Sensors and Sensors Networks. Program Officers have appropriately funded proposals in these areas.

Response to previous COV: The 2005 COV identified a strong concern that the ECCS discretionary budget is too small, identifying the particular concern that new investigators in the field are not supported, as indicated by a drop in funding rates for CAREER award proposals from 29% in 2002 to only 16% in 2004 and 11.6% in 2005. ECCS management has aggressively addressed this problem by increasing the proportion of funding devoted to CAREER grants. The average total grant size for unsolicited proposals has increased by 43%

from $210K in 2004 to $300K for FY 2007. ECCS also increased the acceptance rate of CAREER awards from 11.6% in 2005 to 19% in 2008, which represents a dramatic improvement. However, the Division's average annual grant size has only increased from $101K in FY 2004 to $107K in 2007, which trails the Engineering and NSF averages. The COV believes that increased funding may be required to further address grant size (see Section C), but that ECCS management has been responsive to this concern within the constraints of their current budget.

The 2005 COV expressed concerns that some SGER awards may have been classified in that category for unjustified reasons, and that the SGER budget was insufficient to produce a significant impact. In response to this concern, ECCS took steps to increase the documentation of SGER awards. In 2007, a policy was implemented to have two program officers review each SGER award. SGER now constitute 3.4% of core programs. Although a small proportion of the total awards, it appears that SGERs are now appropriately used to shape emerging research directions.

The 2005 COV was also concerned about representation of some research areas within the ECCS program. In particular, they expressed concern that there was not enough emphasis on signal processing, algorithms and system theory; that there should be increased emphasis on emerging areas of communications including intra-chip, teraherz and UWB communications; and that the Division should take a proactive role in bioelectronic devices and systems biology. In response, ECCS has organized its programs into the three major areas already cited. IHCS and PCAN have created a renewed emphasis on signal processing, algorithms and systems theory, while ECCS has developed an advanced communications thrust by hiring a program director with expertise in communications and creating an initiative in "Technology Challenges in Hybrid Communication Systems" (Solicitation 06-547). EPDT and IHCS have resulted in increased investments in bioelectronic devices and systems as well.

Members of the 2005 COV observed that the ECCS proposal review process had almost 100% compliance with the requirement to consider "Broader Impacts" of the proposal, but that there was still wide variance in the manner in which individual review panels applied this criteria. Over the last three years, ECCS has made a concerted effort to address this concern, including increased emphasis on uniform interpretation of this criterion by review panels and Program Directors; the results are reflected in award jackets. However, this merit criterion remains a point of confusion and inconsistency among reviewers. Because this is a Foundation-wide problem, we refer to it again in Part C.

The 2005 COV urged ECCS to strive to continue to increase the diversity of the reviewer base. The Division Director has made this a point of emphasis to Program Officers. In FY07, there was an increase in (reported) African American reviewers of 70%; Asian reviewers, 18%; Hispanic reviewers, 15%; and American Indian reviewers, 9%. There was also an increase in the number of reviewers from HBCU and HACU institutions. It is difficult to evaluate this area more fully because the system does not require reviewers to provide complete and accurate data. Again, this is a Foundation problem referred to in Part C.

The 2005 COV expressed concern that the effectiveness of the GOALI program was diminished by a low level of follow-up. ECCS has continued to expand this program, with increased investments in each of the last three years, and has taken steps to improve the level of follow-up. GOALI grantee workshops were organized in 2006 to assess collaboration with industrial partners in active grants. The FY07 GOALI solicitation was restructured to extend the availability of postdoctoral fellowships as a means of ensuring transfer of project results and to increase the level of collaboration with national labs. We recommend that future GOALI grant recipients be

required to demonstrate and report efforts to disseminate and commercialize results.

PART B. RESULTS OF NSF INVESTMENTS

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The NSF mission is to:

- promote the progress of science;
- advance national health, prosperity, and welfare; and
- secure the national defense.

To fulfill this mission, NSF has identified four strategic outcome goals: Discovery, Learning, Research Infrastructure, and Stewardship. The COV should look carefully at and comment on (1) noteworthy achievements based on NSF awards; (2) ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcome goals; and (3) expectations for future performance based on the current set of awards.

NSF investments produce results that appear over time. Consequently, the COV review may include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made.

To assist the COV, NSF staff will provide award "highlights" as well as information about the program and its award portfolio as it relates to the three outcome goals of Discovery, Learning, and Research Infrastructure. The COV is not asked to review accomplishments under Stewardship, as that goal is represented by several annual performance goals and measures that are monitored by internal working groups that report to NSF senior management.

B. Please provide comments on the activity as it relates to NSF's Strategic Outcome Goals. Provide examples of outcomes ("highlights") as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.

B.1 OUTCOME GOAL for Discovery: "*Foster research that will advance the frontier of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering.*"

The discovery mission of NSF is well-addressed by the research programs of the Division. Each program can point to a number of excellent examples that not only have strong discovery content but also relate well to the Grand Challenges recently articulated by the National Academy of Engineering. It also is clear that ECCS research is responsive to overall NSF goals in this regard. In many of the randomly-selected highlights we reviewed, we noted that interdisciplinary research was involved (e.g., the intersection of nanoelectronics and biological systems). Examples of discovery research in energy, communication systems, medical applications, control systems, nanoelectronics, sensors, networks, etc. were identified. Below, we highlight a few examples of innovative ideas that the COV viewed as representative of the many creative projects underway in ECCS.

Highlighted Examples

The goal of award 0622228 ("Nuclear Magnetic Resonance Spectroscopy on a Chip"; Axel Scherer, Caltech, and Mladen Barbic, California State University at Long Beach) is to enable Nuclear Magnetic Resonance (NMR) on a chip scale. Such miniaturization and implementation of NMR systems on a micro-fluidic platform will lead to the highly parallel chemical analysis of smaller volumes of bio-chemically important solutions with significantly greater sensitivity than previously possible. The project involves the innovative design and fabrication of (a) components for application of large gradient magnetic fields, (b) permanent magnet-based devices that provide high local fields, and (c) micro/nanometer scale electro-magnetic coils that will significantly improve the sensitivity and resolution of NMR and MRI. This research will offer new tools for the study of individual cells, enabling both spectroscopic and imaging observation of changes in cell metabolism triggered by the micro-fluidic controlled environmental changes. The results will make low-cost, highly sensitive NMR available in the mass market. Affordability will have a profound impact on the understanding of cell biology and medical diagnosis and will make possible new discoveries of the science that can enable better, affordable, personalized health care.

For his CAREER Award (0547057), Rizwan Bashirullah of the University of Florida is developing ultra-low power, silicon-based passive microsystems for deep in-body communications. This comprehensive effort aims to develop key enabling technologies including optimized circuits and passives, modeling capability, and experimental systems for validation. Recently, Bashirullah's group demonstrated an antenna made from a biodegradable ink which is patterned directly on the surface of a capsule. They are also actively developing miniature battery-less transceivers. Ultimately, these technologies will have impact as inexpensive systems for patient monitoring, including medication compliance monitoring.

P. Bhattacharya at the University of Michigan (0754367) is developing a "Magneto-Opto-Electronic Integrated Circuit." Spin-based ferromagnet/semiconductor heterojunction devices are particularly attractive, compared to all-metal spintronic devices, due to the versatility and long spin coherence time of semiconductors. The objective of this research is to realize high-temperature spintronic devices with InP-based heterostructures grown by molecular beam epitaxy. InP-based heterostructures are used for high frequency transistors, for fiber-optic communication, and even for future CMOS-based VLSI, but very little is known experimentally about spin injection in InP-based alloys. The project is creating three types of devices: spin valves for the study of spin injection, transport and detection; semiconductor-ferromagnet based memory devices; and spin lasers and their modulation with spin torque devices. The research is interdisciplinary in nature and will have broad impact on science and society, well beyond its technical merits. The economic impact will be felt as the proposed devices – utilizing not only the electronic charge of the electrons but also their spins, combined with optical elements in the same circuit – will complement or selectively replace traditional microelectronics.

Joseph Benstman of UIUC is leading an integrative systems award to address "Energy-Efficient, Multi-Scale, Biologically-Inspired Mobile Sensor Networks with Real-Time Observation Adaptability" (0501407). The work focuses on the cooperative propulsion of hydrodynamically-coupled, biomimetic underwater vehicles. The superiority of the approach hinges on the integration of flow sensing into the closed-loop control of vehicle-wake interactions. The investigators have constructed a fish-like robot that responds in real time to ambient flows, estimated using micro-machined hair cells distributed along the vehicle's sides. Analytical and computational models have been derived to clarify the principles by which fish exploit ambient flows for efficient swimming, focusing on schooling behavior, and applied as feedback control laws for efficient robotic locomotion through unsteady flows. This award has both near and far term impacts and represents the kind of forward thinking research that NSF has a reputation for funding. Through the creation of analytical and computational tools and sensing technology, the investigators are developing engineered systems that will enable schools of vehicles to exploit principles of unsteady flow to achieve energy

efficient locomotion and maneuvering for adaptive sensing. This most fundamental investigation will help establish an initial science basis for the development of autonomous mobile sensor arrays that could be deployed over extensive distances. More importantly, it provides a rigorous mathematical foundation for harnessing the many forms of information that exist in the natural environment. Developments in this area are absolutely critical if we are ever to engineer systems that exhibit the multi-scale emergent functionality that is attributed to living systems.

B.2 OUTCOME GOAL for Learning: "*Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.*"

The ECCS Division is investing in a broad scope of learning programs, ranging from teacher training to K-12 to general outreach to programs addressing undergraduate and graduate education, some of them targeted at underrepresented groups. All the programs are designed to increase the scientific and technology literacy of the populace at large, either directly (via outreach efforts) or indirectly (via education of undergraduates, graduate students, and K-12 teachers).

Highlighted Examples

Nanooze is a children's webzine on Nanotechnology produced by the National Nanotechnology Infrastructure Network (0335765; PI Sandip Tiwari). It provided a big boost to more than 50,000 kids engaged in the First Lego League Competition in 2006, which was about nanotechnology. The staff at Nanooze put together a special edition devoted to the Lego mission, giving elementary school students insight into areas such as carbon nanotubes, atom manipulation and stain-resistant pants. They also answered more than 150 individual inquiries from children through the website. Nanooze was initiated in 2005 and has articles, interviews, the latest in science discoveries and even games. It is published in English, Spanish, and Portuguese and has a world-wide readership.

The CAREER Award "Embedded Sensors for Remote Water Quality Monitoring," (064451), awarded to Cindy K. Harnett at the University of Louisville, investigates the use of wireless nodes for water-quality monitoring. The goal is to overcome problems associated with radio propagation through water by combining underwater sensors with above-water wireless nodes. The project combines both undergraduate and graduate education and incorporated a 2007 Research Experience for Undergraduates (REU) for a student from Eastern Kentucky University, who helped design, build, and test the waterproof sensor housing.

The CAREER Award "Encouraging Native American Children's Interest in Engineering" (Award 0348637), awarded to Rafael Fierro of Oklahoma State University, encourages children's interest in engineering by developing a set of robotic games that allow them to interact with a group of robots. This project particularly aims to engage Native Americans, a cultural group with historically low enrollment rates in engineering.

The Nanoscale Interdisciplinary Research Team led by Y. Fainman at UCSD (0403589) focuses on Nanophotonics for Optical Delay Engineering. The NODE program has established a continuing mentoring and outreach program targeted at K-12 teachers and students in grades 6-12. Teachers are given the opportunity to participate in scientific research in optics, photonics, and radio-frequency engineering. Students from two local schools – one on the UCSD campus that targets students in grades 6-12 from disadvantaged households (with no college graduates) and a high tech high school in San Diego. The project has enriched the science and engineering curriculum by exploring new project-oriented education methods and developing experiments that use soft lithography and introductory experiments explaining optics through visual concepts.

Efrain O-Neill-Carillo at the University of Puerto Rico Mayaguez (0134021) used his CAREER Award to create a new Power Quality and Energy Studies Laboratory that serves over 30 Hispanic students per semester participating in undergraduate and graduate research. The program represents a new way to teach power engineers, through the integration of research, teaching, and service. Its impact has been tremendous, reaching over 1,000 Hispanic professionals and over 500 students during the last 5 years. NSF's support was essential in transforming the local program into one of the top power programs in the US in terms of producing undergraduate degrees in power, thus leading to greater energy independence in the future.

B.3 OUTCOME GOAL for Research Infrastructure: "*Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure and experimental tools.*"

NSF's goal of building the nation's research capability through critical investments in advanced instrumentation, facilities, cyber-infrastructure, and experimental tools has been met with a high degree of success, particularly through the large scale facility networks that ECCS manages: NNIN, NCN, and PTAP. In addition, the Major Research Instrumentation program – in which ECCS invests approximately $4M each year – is targeted specifically at improving the experimental and educational infrastructure at academic and research institutions (including undergraduate institutions), so every MRI grant can be considered to focus on this outcome goal.

The COV also reviewed a random selection of one-page reports submitted by ECCS awardees. Of these, most were addressed at "Discovery" rather than proposing enhancements to "Research Infrastructure." Since the time available to us was insufficient to review the complete portfolio of projects intended to satisfy this criterion, we chose to focus on the larger programs that propose to develop research infrastructure in direct and significant ways. We note, however, that many smaller funded proposals, while not having infrastructure as a principal focus, appear to be laying the grounds for later infrastructure development (e.g., award 0608863 has provided early devices for sub-optical wavelength characterization of cells that could be developed into advanced instrumentation, as discussed below.)

Highlighted Examples

The National Nanotechnology Infrastructure Network (NNIN; 0649215) is an integrated partnership of thirteen user facilities offering unparalleled opportunities for nanoscience and nanotechnology research. The network provides extensive support in nanoscale fabrication, synthesis, characterization, modeling, design, computation and training, in an open, hands-on environment, available to all qualified users. NNIN builds upon the base of activities and user support provided by the former National Nanofabrication Users Network, expanding to broadly support research and technology development in all areas of nanoscience. Usage has increased from about 2,500 participants at its inception in 2004 to over 4,500 users in 2006, truly remarkable statistics that attest to the correctly identified need for – and the satisfaction with the execution of – this complex task. The distribution of users comprises 67% on-site universities and colleges, 16% non-site universities and colleges, 16% large and small companies, and 1% state and federal governments. The NNIN infrastructure includes both the combined physical infrastructures and the diverse scientific know-how of the thirteen member facilities, as well as a user network administration supporting device run flow and characterization across all facilities. Such diverse and coordinated workflow simply is not available elsewhere.

The Photonics Technology Access Program (PTAP) provides pre-commercial, state-of-the-art photonic devices to universities for teaching and research. The rationale behind PTAP is that in a

rapidly changing technical field, if researchers have to acquire devices on the commercial market, the devices are one or two generations behind by the time their research is completed and published. By providing researchers access to devices before they are available on the market, the quality and timeliness of their research product is improved. Furthermore, students gain hands-on experience with leading-edge technology, which in turn enhances the quality of their academic experience. Lastly, the program creates and strengthens relationships between faculty and industry. PTAP compensates industry for the devices that they supply to the program and allocates government-funded devices to researchers based on brief proposals that are evaluated competitively. Alternatively, researchers may request devices and pay for them with other funds. Cosponsored by NSF and DARPA, PTAP is administered by the Optoelectronics Industry Development Association, which acts as the broker between industry and the universities. PTAP has realized all the important features of a program aimed at creating a useful infrastructure for technology development. The program addressed the needs of the academic, governmental and industrial partners by creating a facility in which all could participate for relatively modest fees and access state-of-the-art methods to demonstrate proof-of-concept. Properly organized (and sponsored), the strategy enables technology to be made broadly available, or commercially controlled on the basis of a sensible fee structure. In addressing the infrastructure issue in this manner, PTAP also finesses the issue of education by providing its users the opportunity to complete requirements for degree programs that are otherwise unachievable.

The Network for Computational Nanotechnology (NCN) aims to connect experiment, theory, and computation through three-year projects having clear objectives to advance research in nanoelectronics, nanoelectromechanical systems, and nano-bioelectronics. Projects must be ready for “a coordinated, multi-disciplinary attack” to be selected; that is, sufficient science must have been done to identify significant new technologies. They are staffed by teams of experts with complementary skills to address outstanding scientific questions as well as important technological issues. Each project includes significant computational challenges addressed by applied mathematicians or computer scientists to advance the field and develop simulation tools that will allow engineers to design new nanoelectronic and NEMS technologies. Infrastructure development includes design and deployment of CAD tools made available to experimentalists and to system designers so that those with problems to solve can do the simulations themselves. To that end, NCN develops and provides simulation services remotely through the WWW, allowing users to access computer programs, run simulations, and view results via standard Web browsers. The on-line infrastructure provides courses, tutorials, debates and discussions, and collaborative services as well.

Yeshaiahu Fainman of UCSD is leading a project (0608863) to develop an optoplasmonic nanoscope that will obtain lateral resolution better than 100 nanometers. This would be a major improvement that greatly extends the capabilities of existing optical light microscopes and would make it possible to investigate live cell dynamics and single-molecule protein reactions. Thus, although the primary outcome of the project is Discovery, development of a new infrastructure will be a key byproduct. A breakthrough on the problem of diffraction-limited resolution will not only advance opto-plasmonics and nanoscale modeling but also enable future biological and medical applications.

PART C. OTHER TOPICS

C.1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

In general, the COV finds that the ECCS programs are very strong and include coverage of most topics within the ECCS domain of expertise. We also believe the impact of these programs is substantial. The portfolio addresses problems of national importance that are clearly relevant to the missions of the Foundation and the Nation. One characteristic, driven by limited funding, is that the program is sometimes not very deep in its coverage of topics. The COV cautions that ENG faces a serious risk, particularly in terms of emerging areas that could contribute significantly to NSF's new initiatives and NAE's Grand Challenges.

C.2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

The COV is extremely concerned by the fact that ECCS has a pattern of funding research grants at levels significantly below the ENG and Foundation averages. In FY07, for example, the annual mean for research grants in ECCS was just $107K, as compared to $116K for ENG and $144K Foundation-wide. This is a significant discrepancy that puts at risk the effectiveness of disciplinary contributions – just at the time they are becoming essential to major national initiatives (such as the new NSF priorities and the NAE Grand Challenges).

We investigated this situation thoroughly during the visit. ECCS already lagged well behind the ENG and NSF averages at the time of the last COV, which criticized both award size and the rate of funding (in the latter case, particularly for CAREER and other new investigator awards). We recognize that it can be extremely difficult to balance award size and funding rate when budgets are tight. Because of upper management's emphasis on funding rates (see question C.3), the Division shifted its priority to that aspect. Budget increases did not materialize to support the increased rate of funding, however, and at the same time ECCS was increasingly "taxed" in terms of the proportion of committed funds (discussed under A.4.2 above). We understand why ECCS felt it imperative to institute a widespread practice of "budget renegotiation" that has effectively passed the tax on to PIs (discussed under A.3.3 and A.3.13). Nonetheless, the COV was unanimous in its concern about the long-term detrimental effects of this practice on disciplinary research. It is imperative that funding rates be increased, at least to the extent of keeping up with rising costs of research.

C.3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

We must note that the statistics on gender, underrepresented minorities, and persons with disabilities are impossible to interpret with any confidence, given that only about 55% of PIs report this information. Our analysis for this report had to assume that the reported data is proportional to the actual pool – and we know that is not the case. We recognize that this is a difficult issue and that the Foundation cannot require the information from PIs. We suggest, however, that if Fastlane were to record demographics separately for reviewers/panelists – that is, entering data for a review panel would not be tantamount to entering it for all future proposals – it would be possible to require this information at least for reviews/panels.

At the very least, the COV urges ECCS and ENG to maintain their own, separate records on reviewers/panelists so that at least some portion of COV distribution analyses can be accurate.

Realistic evaluation of the broader impact merit criterion continues to be problematical, Foundation-wide. The COV suggests that ENG, at least, develop specific examples (both good and bad) of what constitutes appropriate review and panel comments on broader impact. In addition, reviewers/panelists should be cautioned against "adding to" the broader impacts identified by the PI; they should evaluate the proposal in meaningful ways, not insert their own interpretations of the project's potential impacts.

Similarly, we know from our own panel experiences that individual reviewers Foundation-wide have a tendency to rate proposals on the basis of their perception of the PI's or institution's reputation. We recommend that all reviewers and panelists be explicitly reminded that emphasis in both reading and rating proposals should be on proposal content, not just on what they might know personally about the PI or his/her institution.

C.4. Please provide comments on any other issues the COV feels are relevant.

The previous COV made it clear that the award rate had to be increased – and from what we were able to determine, Directorate and Foundation management have also taken that stance. ECCS has done an excellent job of responding to that direction, with clear trends over the past three years.

Why then, we question, has the ECCS budget actually decreased in terms of discretionary funds (those not pre-committed to Foundation or Directorate programs) over the same period? Discretionary funds for FY07, for example, accounted for just 42% of the ECCS budget.

We also note that the proposed budgetary increase for ECCS in FY09 is less than half that planned for CMMI, and only a third of that for CBET. The COV cautions ENG that ECCS is already seriously under-funded, and that the planned budget simply compounds the problem. If the Directorate is serious about raising its award rates, ECCS needs to be given sufficient discretionary funds to recover from the past couple of years, reduce its "renegotiated" budgets to a small fraction of awards, and catch up to the annual award rates of other Divisions.

If the budgetary constraints are not alleviated, we urge ECCS to cut back on its award rates, rather than continuing to underfund. To do otherwise will undermine the effectiveness of the projects that ECCS does fund.

C.5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

The COV compliments the ECCS Division Director on the thoroughness of her preparations for the visit and her willingness to allow the Chair (who had already chaired a COV several years ago) to experiment with a new format. We also commend the Foundation on making award jackets available via the web (an important enabler; see below). We recommend four changes, based on "lessons learned" from our attempts to streamline and clarify the COV process.

(1) Require that each COV member complete his/her jacket review in advance, electronically, and send initial comments addressing parts A-1 and A-2 to the Chair; this allows the Chair to collate the remarks, identify pending questions/issues to be addressed using the physical jacket folders, and distribute written drafts before the meeting actually begins. Without that "head

start," we would not have had the time to discuss the other parts in depth. (Indeed, our previous experience had been that COVs spend up to 60% of their meeting time in jacket reviews.)

(2) Rather than subdividing the COV to reflect program areas within the Division, we suggest basing breakout discussions on major sections of the report (e.g., overall portfolio, program management, results of investment) and purposely intermingling committee members from different disciplinary areas and institution type/size. We believe this approach allowed a more balanced discussion of each section of the report – as well as resulting in some creative ways of looking at statistics (see A.3.8 and A.3.13 for examples).

(3) The nomenclature and variety of statistics from EIS can be quite confusing for COV members. Given the number of COVs convened Foundation-wide each year, we suggest that there be a specific effort made to create a "template" for pulling the EIS summaries most relevant to each section of the COV report. If these are provided to the COV as Excel files that correspond exactly to the report sections (i.e., a file for Part A-1, with individual sheets containing the statistics typically needed to answer each question), it would represent a huge timesaving for COV members. We experimented with this: ECCS and the Chair collaborated to create files of EIS statistics, organized according to the report format.

(4) We suggest that NSF consider including at least one member of the previous COV in the group. There were a number of times when the ability to answer a question about the prior review would have saved us time, enabling us to focus attention on more critical aspects.

SIGNATURE BLOCK:

For the 2008 ECCS COV
Cherri M. Pancake
Chair

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