Sharing Our Insights after Serving as Rotators at the National Science Foundation

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Abstract: A panel co-hosted by the Divisions of ECE and CoED will focus on the reflections from the former National Science Foundation (NSF) Program Directors. The panelists and moderator served as rotating program directors across various directorates at NSF, all with a connection to engineering and computing education. They will reflect on their experiences at NSF and what they learned from the position and will share their insights about engineering and computing education programs at NSF.

Introduction

The National Science Foundation (NSF), an independent federal agency established in 1950, has eight directorates and five offices [1]. This paper will focus on several programs related to computing and engineering education within two directorates: The Directorate for STEM Education (EDU) and the Engineering Directorate (ENG).

NSF offers a chance for scientists, engineers, and educators to join the Foundation and work as program directors on a temporary basis. These temporary program directors are often called rotators [2]. There are two rotator programs: Visiting Scientist, Engineer, and Educator (VSEE) and the Intergovernmental Personnel Act (IPA). While rotators can come on temporary assignment as a VSEE for up to two years or as an IPA for up to four years, most rotating assignments last two to three years. Rotating program directors facilitate peer review; make recommendations about which proposals to fund; influence new directions in the fields of science, engineering, and education; participate in NSF-wide working groups to create new programs in cutting-edge areas such as semiconductors or quantum information science and support cutting-edge interdisciplinary research; and mentor early career researchers pursuing external funding.

Several former NSF rotators have shared their rotation experiences through various outlets [3-6]. However, to the best of our knowledge, a panel has never been held at the ASEE Annual Conference featuring former NSF rotators' reflections on their experiences at NSF, insights about NSF's rotator opportunities, and perspectives on funding opportunities through NSF's computing and engineering education programs. This panel intends to help participants learn more about the NSF computing and engineering education programs and the rotator program.

Panel goals

The aim of the panel discussion is two-fold. First, attendees will learn about serving as a rotating NSF program director and what the position can offer as a means of professional development. The panelists will share their roles and responsibilities at NSF, insights about what they learned that they apply in their academic roles, and reflections about the value of the experience for their own careers. Second, attendees will learn about NSF's engineering and computing education programs, what makes each unique, and how to begin developing a proposal for submission to these programs. This panel has the potential to help faculty who are

interested in serving as NSF program directors understand the two primary mechanisms for hiring rotating staff at NSF. Additionally, the panelists will suggest how prospective principal investigators can have the most productive meetings with NSF program directors. The panel will be interactive with ample time for questions and follow-up discussions.

Moderator and panelists

Moderator: Dr. Jill Nelson is the Associate Dean for Undergraduate Programs in the College of Engineering and Computing and an Associate Professor of Electrical and Computer Engineering at George Mason University. She received a BS in Electrical Engineering and a BA in Economics from Rice University and an MS and PhD in Electrical Engineering from the University of Illinois at Urbana-Champaign. Prior to taking the role of associate dean in 2023, she spent three years as a Program Director in the Division of Undergraduate Education at NSF where she managed programs that support innovation in STEM education, STEM education research, education research infrastructure, and the retention and graduation of STEM students. She was a co-lead of the NSF IUSE Program and represented EDU on the NSF Mid-Scale Research Infrastructure working group. Dr. Nelson's research and leadership efforts focus on improving STEM teaching and learning with particular emphasis on faculty development to support sustained use of evidence-based teaching practices. Her disciplinary research lies in statistical signal processing with application to sonar, target tracking, and physical layer communications. She was a 2010 recipient of the National Science Foundation (NSF) CAREER Award, the 2014 recipient of the Mac Van Valkenburg Early Career Teaching Award from the IEEE Education Society, and the inaugural (2017) recipient of the George Mason University John Toups Medal for Excellence in Teaching. She is a senior member of the Institute of IEEE and a Member at Large of the IEEE Education Society Board of Governors.

Fig.1. Dr. Jill Neslon

Panelists:

Dr. Alan Cheville is a Professor of the Department of Electrical and Computer Engineering at Bucknell University. Dr. Cheville received the BSEE degree and PhD degree both from Rice University in Houston, Texas. He started working at Oklahoma State University as a postdoctoral researcher and eventually became an Associate Professor in the School of Electrical and Computer Engineering. From 2010 to 2012, Dr. Cheville served as a Program Director at the NSF ENG EEC. In 2012, he became the Chair and a Professor of the Department of Electrical Engineering at Bucknell University. He splits his time between investigating applications of optoelectronically generated THz radiation and engineering education. In the field of ultrafast THz his research focuses on THz spectroscopy and imaging, particularly for sensing applications. In engineering education Dr. Cheville focuses on the engineering education systems and learning environments. Dr. Cheville is a member of the IEEE, ASEE, and sometimes the OSA.

Fig.2. Dr. Alan Cheville

Dr. Vinod Lohani is a Professor of Engineering Education and an adjunct faculty in Civil & Environmental Engineering department at Virginia Tech (VT). He received his undergraduate engineering degree in India, M.S. at the Asian Institute of Technology, Thailand and Ph.D. in civil engineering from VT. His research interests are in the areas of computer-supported research and learning systems, engineering education, graduate STEM education, hydrology and water resources, and international/interdisciplinary collaboration. Dr. Lohani secured the first two NSF projects in 2003 and 2004 in collaboration with his engineering and education colleagues that established the culture of sponsored research in engineering education within the College of Engineering at VT. He has participated in $8.4M in sponsored research, published over 100 peer-reviewed publications, delivered 34 invited talks nationally and internationally, and mentored 10 Ph.D., 12 M.S., and 40+ undergraduate researchers. He is founding director of an interdisciplinary lab called Learning Enhanced Watershed Assessment System (LEWAS) at VT. VT's Board of Visitors awarded Dr. Lohani the W.S. "Pete" White Chair for Innovation in Engineering Education for 2018-20. Also, VT nominated Dr. Lohani three times for the

Outstanding Faculty Award of the State Council of Higher Education in Virginia. During 2016-19, Dr. Lohani served as the Director (Education and Global Initiatives) at VT's Institute for Critical Technology and Applied Science (ICTAS) and directed ICTAS' doctoral scholars program and developed and implemented seed funding activities to promote interdisciplinary undergraduate research activities. He served as a Program Director in the Division of Graduate Education at NSF from Jan. '20 – Jan. '24, worked on the NSF Research Traineeship (NRT) and Innovation in Graduate Education (IGE) programs and led DGE's CAREER program for 3 years. He collaborated on various NSF-wide working groups on Quantum Information Science and Engineering (QISE), Semiconductors, and collaboration between the NOAA and NSF. Overall, he made 60+ awards in various priority areas of national interest including advanced manufacturing and materials, robotics, food, energy and water systems, biotechnology, AI, and QISE worth ~$100M. He received NSF Director's Commendable Service Award in September 2023. Dr. Lohani is a member of the ASEE and ASCE.

Fig.3. Dr. Vinod K. Lohani

Dr. Huihui Wang is a Full Teaching Professor and Director of Computing Programs of Khoury College of Computer Sciences at Northeastern University in Arlington VA. She was a Program Director of the NSF EDU DUE and was on detail with the NSF TIP ITE [7]. She received her Ph.D. from the Electrical and Computer Engineering Department at the University of Virginia. Her current research interests focus on 1) Artificial Intelligence for Cybersecurity, 2) Cyber-Physical Systems/Internet of Things, 3) Computing and Engineering Education research. She has published over 100 peer reviewed journal and conference papers and published four patents. She is a senior member of the Institute of Electrical and Electronics Engineers (IEEE), a member of Board of Governors of IEEE Education Society and a member of IEEE Educational Activities Board (EAB). Dr. Wang is a member of Association for Computing Machinery and American Society of Engineering Education (ASEE). She was the Chair of the ASEE Electrical and Computer Engineering Division and Chair of the Faculty Resources Committee of IEEE EAB. Dr. Wang is a program evaluator under both Engineering Accreditation Commission and Computing Accreditation Commission of Accreditation Board for Engineering and Technology.

Fig.4. Dr. Huihui Wang

NSF programs of computing and engineering education

Engineering education programs from the division of engineering education (EEC) [8]

The EEC supports engineering education research through five main programs: RFE, CAREER, RIEF, RED and BPE. The Research in the Formation of Engineers (RFE) program supports research on the professional formation of engineers and the design and development of new approaches to engineering education and training. RFE PIs have existing expertise in education or social science research. This program has no deadline. CAREER projects may be submitted to the RFE program using the guidelines and deadline provided in the solicitation. The PFE: Research Initiation in Engineering Formation (PFE: RIEF) program supports engineering faculty that aim to develop expertise in conducting research on engineering education through a mentored research project. Principal Investigators are expected to have limited experience conducting education or social science research. The IUSE/PFE: Revolutionizing Engineering Departments (RED) program supports the design of new approaches to engineering and engineering technology education in the middle two years. The Broadening Participation in Engineering (BPE) program supports broadening participation and equity in engineering through research, planning and conference grants; mentoring hubs; and centers serving K-12, higher education, nonprofit and industry communities.

SEM education programs from the division of undergraduate education (DUE) [9]

Improving Undergraduate STEM Education: Directorate for STEM Education (IUSE: EDU) program supports projects to improve STEM teaching and learning for undergraduate students, including studying what works and for whom and how to transform institutions to adopt successful practices in STEM education. NSF Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) program supports institutions of higher education to fund scholarships for academically talented low-income students and to study and implement a program of activities that support their recruitment, retention and graduation in STEM. Scholarships in STEM Network (S-STEM-Net) program supports both the creation of a resource

and evaluation center for the national S-STEM community and research hubs to study the conditions for the success of low-income undergraduate and graduate STEM students.

Programs from the division of graduate education (DGE) [10]

There are four DGE programs that are related to engineering education. The goal of the NSF Research Traineeship program (NRT) is to encourage the development and implementation of new and potentially transformative models for STEM graduate education and training. The Innovations in Graduate Education (IGE) projects are intended to generate the knowledge required for customization, implementation, and broader adoption of models for graduate education training. The IGE program also supports CAREER proposals. The goal of the Graduate Research Fellowship program (GRFP) is to help ensure the vitality and diversity of the STEM workforce through the award of three-year fellowships for graduate study. As the oldest federal fellowship program, GRFP provides a graduate student stipend and covers tuition. The CyberCorps Scholarship for Service program (SFS) offers scholarships to students enrolled in cybersecurity programs to increase the production of quality cybersecurity professionals.

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