COMMITTEE ON EQUAL OPPORTUNITIES IN SCIENCE AND ENGINEERING (CEOSE)
National Science Foundation

MEETING MINUTES
June 19-20, 2013

MEETING PARTICIPANTS

Members Present	Members Absent
Dr. Karl S. Booksh, University of Delaware, DE **Dr. Cecilia Conrad,** Pomona College, Claremont, CA **Dr. Ira Harkavy**, University of Pennsylvania, Philadelphia, PA **Dr. Charles Isbell**, Georgia Institute of Technology, GA **Dr. Robert Jones,** University at Albany, NY **Dr. George Middendorf,** Howard University, Washington, DC **Dr. Maria (Mia) Ong,** TERC, Cambridge, MA **Dr. Alexander Ramírez,** San Antonio, TX **Dr. Wendy Raymond,** Williams College, Williamstown, MA **Dr. Keivan G. Stassun,** Vanderbilt University, TN **Dr. Joseph A. Whittaker,** Morgan State University, MD	**Dr. Evelynn Hammonds,** Harvard University, Cambridge, MA **Dr. Gregory Cajete**, University of New Mexico, NM

Federal Agency Liaisons to CEOSE Present	Federal Agency Liaisons Absent
Dr. Lenell Allen, NASA **Dr. Katie E. Blanding,** United States Department of Education **Ms. Lisa Evans, J.D.,** National Institutes of Health **Dr. Meldon Hollis,** White House Initiative on Historically Black Colleges and Universities **Dr. James Johnson,** U.S. EPA **Ms. Shahin Nemazee,** Smithsonian Institution **Dr. Jacqueline Rousseau,** National Oceanic & Atmospheric Association **Dr. Donald Sweet,** US Geological Survey **Dr. Siva Sureshwaran**, USDA **Dr. Audrey A. Trotman,** National Oceanic and Atmospheric Association **Ms. Susan Heller-Zeisler,** NIST/IAAO	**Dr. Linda Gunderson,** United States Department of the Interior **Ms. Evelyn Kent,** United States Department of Defense **Dr. Sara Klucking,** United States Department of Homeland Security **Dr. Jeremy Lawson,** NIST **Dr. Era Marshall**, Smithsonian Institution **Dr. Muquarrab Qureshi,** United States Department of Agriculture

Non-Members Who Presented* or Attended at the Meeting	
Dr. Cora Marrett, NSF/OD **Dr. Jennifer Brooks*,** HHS **Dr. Laura House*,** PSA/OMB **Dr. Alan Blatecky***, NSF/CISE/ACI **Dr. Donna Ginther***, University of Kansas **Dr. Alexandria Medina-Borja***, NSF/OD/IIA **Dr. James Bell***, CAIRSE and ASTC **Dr. Richard Tankersley*,** NSF/EHR/DGE **Dr. Donaven McLaurin,** QEM/DEB **Dr. Susan Renoe*,** University of Missouri	**Dr. Jacquelina Falkenheim*,** NSF/SBE/NCSES **Dr. Farnam Jahanian*,** NSF/CISE **Dr. Paul Morris***, NSF/OD/IIA **Dr. Irelene Ricks,** AASW **Mr. David Wilson,** SACNAS **Ms. Dorian Davis,** QEM Intern **Dr. Tabbetha Dobbins,** Rowan University **Dr. John Falk,** CAISE **Dr. Donaven McLaurin,** QEM/DEB **Mr. Bertram Richardson,** QEM-DPP

Non-Members Who Presented or Attended at the Meeting (cont'd)	
Ms. Simona Gilbert, NSF/OD/IIA **Dr. Steve Meacham,** NSF/OD/IIA **Ms. Katherine Otts,** NSF/DAS **Dr. Sylvia James,** NSF/EHR/DRL **Dr. Marilyn Suiter**, NSF/EHR/HRD **Dr. Daniel Marin,** NSF/OD/IIA **Mr. Jessie Richardson**, NSF/BFA **Dr. Armanda Gonzalez**, NSF/CISE **Ms. Sallie Morse**, NSF/BFA **Ms. Deborah Britt**, NSF/CISE **Dr. Denise Barnes**, NSF/OD/IIA **Ms. Lena Alston**, NSF/CISE/CNS **Ms. Emily Kehne**, NSF/ENG/CMMI **Dr. Gail McClure**, NSF/EHR/OAD **Mr. Nick Sapp**, NSF/MCB	**Dr. Richard Duschl,** NSF/EHR/DRL **Dr. Kellina Craig-Henderson,** NSF/SBE/SES **Dr. Jose Munoz**, NSF/OD **Dr. Valerie Wilson,** NSF/EHR/DGE **Dr. Mark Leddy**, NSF/EHR/HRD **Dr. Harold Stolberg,** NSF/OD/IIA **Dr. Jermelina Tupas**, NSF/EHR/HRD **Ms. Shirley Watt**, NSF/BFA **Mr. Alonso Thelem**, NSF/EHR/HRD **Mr. James Morris**, NSF/OD/IIA **Ms. Kendra Pleasant**, NSF/CISE **Ms. Renee Wilkerson**, NSF/MPS/CHE **Dr. Gisele Muller Parker**, NSF/EHR/DGE **Dr. Kellina Criag-Henderson**, NSF/SBE/SES **Mr. Justin Kaye,** NSF/MCB

CEOSE Designated Federal Officer – Executive Liaison
Dr. Wanda E. Ward, Office Head, Office of International & Integrative Activities, National Science Foundation (NSF)

CEOSE Executive Secretary
Dr. Bernice Anderson, Senior Advisor, Office of International & Integrative Activities, National Science Foundation (NSF)

CEOSE Scientific/Technical/Administrative Staff
Dr. Joan Burrelli, Science Resource Analyst
Mr. Steven Buhneing, IT Specialist, NSF
Ms. Victoria Fung, Program Analyst, NSF

Day One

Welcome, Introductions and Opening Remarks

Dr. Alexander Ramírez, CEOSE Vice Chair, called the meeting to order and welcomed CEOSE members and other meeting attendees. Following introductions, he provided an overview of the meeting agenda and pointed out several challenges (e.g., disparities in college enrollment and graduation rates) to be considered as the Committee provides advice to help NSF promote a diverse scientific workforce. Additionally, Dr. Ramirez reported on the Executive Meeting with Dr. Cora B. Marrett, Acting Director and Deputy Director/NSF, held June 5, 2013. Information discussed included an overview of the 2014 Budget Request and the revision of the summary table for broadening participation, no loss of jobs or furloughs due to sequestration, and the NSF involvement in two recent international research conferences in Berlin, Germany.

NSF Executive Liaison Report

Dr. Wanda E. Ward, CEOSE Executive Liaison and Head, Office of International and Integrative Activities (IIA), provided the Foundation-wide update on broadening participation concerns and activities. She recognized the NSF Summer Interns, pointing out that NSF offers these summer

internships through awards made to the Hispanic Association of Colleges and Universities (HACU), the Quality Education for Minorities Network (QEM), and the Washington Internships for Native Students (WINS). The Foundation continues to support this effort, believing that their exposure to science and engineering policy, research and education issues and programs will be a contributing factor in their decisions to stay in STEM careers.

She stated that the EPSCoR Track III – NSF 13-553, Building Diverse Communities, has a deadline of July 10, 2013. Each EPSCoR jurisdiction has been giving increased attention to both innovation and broadening participation. Continued progress can be catalyzed by this new effort designed to connect the multiple sectors of society to influence and/or benefit from the engagement of diverse communities in scientific discovery and economic development. The awards will be up to $750,000 for five years of support.

In April 2013, Dr. Ward provided a keynote address at the Broader Impacts Infrastructure Summit in MO. Her presentation focused on the intellectual framing of broader impacts (cutting-edge science research, talent development, integration of research and education and evaluation capability) and major observations related to the broader impacts criterion that are reported in the recent NSB Merit Review report. She also shared with CEOSE some of the proposal and award diversity trends from the recent Merit Review Report to the National Science Board. Noting that the 2012 gender, disability and ethnic or racial data were self-reported information, she indicated that while significantly fewer proposals were received from women than men, the success rate for female Principal Investigators (PIs) remained slightly higher than that for male PIs (26% vs. 24%). The success rate for PIs from underrepresented minority groups (22%) was slightly lower than the average success rate over all PIs (24%). She also stated that NSF received a low number of proposals from PIs from underrepresented minority groups. Additionally, the proportion of proposals from PIs with disabilities was low (1.5%) but the success rate for these proposals in FY 2012 was approximately 28%.

The Career-Life Balance (CLB) Initiative update focused on recently released Dear Colleague Letters (DCL): for CAREER CLB Supplements, for ADVANCE-IT Dual Career Supplements, and for GRFP Supplements. The Initiative expanded its dependent care support and included dual career support through the ADVANCE program. Additionally, the CLB Working Group developed a CLB module through the NSF Academy and held Town Halls about the various types of CLB support. Dr. Ward called attention to NSF discussions with other agencies regarding greater interagency collaboration toward harmonization of CLB language and policies.

She announced that the gender summit that was initiated in Europe in 2011 and held there for the first two years has expanded and that NSF is the lead agency for hosting the third summit. Gender Summit 3 – North America will be held in Washington, DC on November 13-15, 2013. NSF will co-host this summit in collaboration with Canada, Europe, and Mexico. The aim of the meeting is to interconnect all relevant stakeholders to a call to action to achieve positive change toward greater diversity in STEM workforce and leadership and greater inclusion of gender consideration in research content and process.

Dr. Ward shared how NSF has been responsive to the 2009-2010 CEOSE Recommendations. A few of the actions were:

- The revised broadening participation table in the Budget Request has greater rigor and reports differential growth by category of program. NSF investments in programs to broaden

participation increased from $717M in 2009 to $866M in 2012.

- Co-funding from the research directorates has augmented MSI support. Although there is not a separate HSI Program, a Dear Colleague Letter, NSF 12-081, Announcement of Efforts to Increase Hispanic Participation in STEM Fields was issued.
- The Directorate for Social and Behavioral Sciences released the Dear Colleague Letter: Stimulating Research Related to the Science of Broadening Participation and has worked collaboratively with the Directorate for Education and Human Resources (EHR).
- The ADVANCE program has supported several projects to advance women of color in STEM. Also, the upcoming global gender summit will have a specific session on women of color.

She ended her report by pointing out that the Foundation continues to promote activities that are responsive to CEOSE recommendations and that BP News, which is still under development, will be designed to keep CEOSE more consistently aware of NSF BP efforts. Members were also reminded of the call for new CEOSE members.

CEOSE members very much appreciated the new budget table applauded the EPSCoR Track III, Building Diverse Community, pointing out that it is a novel approach for engaging underrepresented groups. NSF's catalytic role was highlighted as well as the importance of using evidence from these initial EPSCoR projects to inform future discussions about adaptability, scalability, and replication.

CEOSE also suggested that providing updates to CEOSE recommendations would be the appropriate driver for the inaugural BP News. The discussion also focused on 1) the need to move the needle 2) the need for an integrative approach for paradigm shifts that are game changers. Greater collaboration between majority and minority institutions was stressed, also. NSF was encouraged to continue to work with professional societies, use data mining techniques to help identify opportunities and gaps in the broadening participation agenda, and to share the success of individual awards in broadening participation. Members also wanted to become more aware of the new and/or successful STEM diversity programs in the other federal agencies.

Presentation: *NSF Strategic Plan*

Dr. Alan Blatecky, Division Director, Division of Advance Cyberinfrastruture (ACI)/Directorate for Computer & Information Science & Engineering (CISE) and Chair of the NSF Strategic Planning Group, provided a comprehensive overview of the strategic planning process and the status of the Foundation's new strategic plan.

Dr. Blatecky explained that NSF is required to develop a 5-year strategic plan every four years. The new plan will span 2014-2018. The prescribed components include: mission/vision, strategic goals and objectives, performance goals (including Agency Priority Goals), indicators, challenges/risks, strategies and means and program evaluations. The mission, vision, and strategy have been taken from the NSF Act of 1950. NSF employed several methods to get input from staff, such as holding town hall meetings, having a poster voting activity regarding the goals and objectives, requesting comments/feedback through IdeaShare. The draft plan with the following three strategic goals has been shared with the National Science Board:

- Goal 1: Transform the Frontiers of Science and Engineering
- Goal 2: Stimulate Innovation and Address Societal Needs through Science & Education

- Goal 3: Excel as a Scientific Agency

Broadening Participation is explicit in two objectives:

- Goal 1/Objective 2: Integrate education and research to produce a diverse STEM workforce with cutting-edge capabilities
- Goal 3/Objective 2: Build an increasingly diverse, engaged, and high-performing NSF workforce by fostering excellence in recruitment, training, leadership, and management of human capital

After reviewing a few more details about the timeline, Dr. Blatecky facilitated a discussion with CEOSE members to solicit their comments about the strategic goals and strategic objectives. CEOSE raised a few concerns and made suggestions/recommendations:

- Science of broadening participation is advancing the frontier of research and should be considered as part of the first strategic goal (as well as strategic goal 2).
- The plan should address the NSF impact on society through the global activities that are a part of the NSF science and engineering portfolio.
- Drop the word "stream" in G1/01 due to sensitivity issues and the term does not convey the need for significant advances that are disruptions to science and engineering or the need for shifts in paradigms within the scientific enterprise. Additionally, the context is science writ large, not NSF science. Consider changing the phase to invest in frontier research to ensure continuous and significant advances across science, engineering, and education.
- In discussing Goal 1, point out that a new paradigm includes creating situations where the current settings are substantially disrupted.
- Advancement in science is a societal need; we need to create new knowledge. However, the sentence structure of G2/O1 separates foundational research and societal need.
- Define societal need, noting that NSF was founded with a societal purpose in the face of crisis related to workforce and achievement.
- Stress that all citizens have responsibility for advancing science.
- Drop the word "business" in G3/01.
- For G3, focus on the workforce first, resulting in the current G3/O2 becoming G3/O1.
- Take NSF out of G1/O2; having an increasingly diverse, engaged and high-performing workforce does not need to be restricted to NSF.
- Continue to highlight the catalytic role of NSF.

The membership applauded the work of the strategic planning group and the work of the Foundation in promoting an inclusive workforce nationally in STEM and at NSF.

Discussion: *CEOSE 2011-2012 Biennial Report to NSF and Congress*

Dr. Wendy Raymond, Chair of the Report Sub-committee led the discussion with an overview of the report content: an overview of the status of underrepresented groups in science and engineering, a summary of NSF's broadening participation activities, brief highlights of CEOSE activities, and a recommendation section of advice to NSF to increase its capacity for broadening participation. After acknowledging the hard work of CEOSE members and NSF staff, she facilitated a working session for the recommendation section of the report.

Key considerations included having a balanced focus on replication vs. innovation, leveraging

existing mechanisms of support that have proven to be successful (e.g., CENTERS funding structure of support for a major effort addressing frontier questions with major funding that is partnership-driven), and being broad and bold in scope ranging from low hanging fruit to transformative change. Members pointed out that increasing the number of scientists from underrepresented groups is a solvable problem and that NSF needs a holistic approach that addresses all aspects of the underrepresentation challenge. It was also pointed out that NSF not only be accountable for broadening participation but be willing to be pioneering in terms of moving the needle by having accountability metrics for higher education. Additionally, the discussion emphasized that NSF's work must be far reaching and that NSF should enable risk and transformative investments in broadening participation for global impact, in addition to meeting national talent development needs. Appropriate qualitative and quantitative metrics were noted as critical to accountability concerns related to accomplishments and success. Evaluation at the institutional level was suggested, noting that it is important to learn from failure and success. With an institutional approach, the challenges noted were how to motivate institutions to do better and how to reward institutions with tremendous progress (e.g., accomplishment-based awards).

There was consensus that even with the current level of progress of successful projects and programs, the current broadening participation challenges are outstripping current actions. CEOSE envisioned a game changer because "the progress made is insufficient to the problem at hand that keeps accelerating beyond the current action." For example, NSF's connection of broadening participation to transformation and frontier science is strongly encouraged but the resources to support this conceptualization of BP are insufficient. Additionally, colleges and universities receive most of NSF funding but CEOSE members pointed that higher education is not promoting the cutting-edge BP partnerships that cover all of schooling/learning—PK-20+ BP partnerships. Such partnerships should include direct support for students and support for research on the underrepresentation problem(s). Members agreed that NSF can be the catalyst to help higher education to take greater responsibility for a diverse STEM workforce, transforming STEM at levels and educating STEM domestic talent that reflects and represent the US population.

Members also supported greater coordination and less fragmentation of federal funding across agencies. The Federal Liaisons commented on the importance of working together from a coordinating perspective and stressed the importance of sharing research and best practice to inform future efforts. The future work that is being recommended by CEOSE has to be a coordinated effort that addresses "the political climate of the time, the institutional goals and priorities, and thirdly the current demand."

Discussion: *Committee Reports by CEOSE Liaisons to NSF Advisory Committees*

CEOSE Liaisons discussed their engagement with NSF Advisory Committees (AC) with an emphasis on the major broadening participation issues discussed at recent AC meetings. Dr. Keivan Stassun, recently appointed CEOSE Liaison to the MPS, made a presentation to the MPS AC about CEOSE. His presentation included raising awareness of issues being discussed by CEOSE such as the misuse of standardized test scores like GRE and the suppression of diversity data.
Some highlights from other reports were:

- ISE is having discussions about lowering barriers to international collaborations.
- GEO's leadership emphasized diversity as a priority and the CEOSE Liaison to the AC, Dr. Joseph Whittaker, was named Chair of the Diversity and Education Sub-committee. GEO is

revisiting its Strategic Diversity Plan to include an international emphasis as well as strategies to address the general lack of awareness and engagement in the geosciences among minorities and individuals with disabilities.

- In addition to addressing public perceptions of the credibility/value of basic social science research, SBE has a Subcommittee on the Practice and Science of Broadening Participation to analyze data related to broadening participation and to plan a workshop, pending the availability of funding. Dr. Mia Ong, CEOSE Liaison to SBE AC (and member of SBE AC), is the Subcommittee Chair.
- The Broadening Participation Subcommittee of BIO is focusing on how to track the BIO BP investment. BIO is placing a strong emphasis on Broader Impacts.
- CISE has recently posted its Strategic Plan for Broadening Participation in Computing. CISE is rethinking Post Docs in Computing, driven by the doubling of postdoctoral researchers in computer science in recent years.

Links to the strategic broadening participation plans will be placed on the CEOSE website. Another suggestion was to invite the Directorates to discuss the implementation status of their plans at a future CEOSE meeting.

Presentation: *Big DATA*

Dr. Farnam Jahanian, Assistant Director of the Directorate for Computer and Information Science and Engineering (CISE), discussed the importance of Big Data for accelerating discovery and solving national challenges. His presentation covered a conceptual context as well as an update of CISE's work with Big Data involving various directorates. He shared that the convergence of technology and policy and social issues brought Big Data to the forefront of scientific discovery and engineering animation and that data represent a motivating influence on the profound transformation on the culture and conduct of scientific research. This area is helping to transform data into knowledge that then spurs discovery. Big Data have been used in disaster research and recovery. Other areas of promise are the transformation of education, especially the virtual classroom, innovation in assessment and evaluation, and an enhanced networked society. Dr. Jahanian cited various ways very large, heterogeneous datasets are used for decision-making for societal benefits, such as prediction of the onset of diseases, reduction in traffic congestion, prediction of disasters like hurricanes and tornadoes; modeling analysis for deploying life-saving measures, etc. Other points made were:

- Big Data is more than just volume of data being generated, given that 90% of the data in today's world were created in the last two years. It is about the velocity, heterogeneity and complexity of the data that confronts us.
- This area is creating opportunities in new markets, driving the creation of IT products and services to boost productivity.
- As the transformative new currency for science and engineering, there is evidence of transformative, cultural, data-intensive science that is promoting collaboration and community building.
- There is a great need to develop the next generation of workforce with skills to analyze, understand, and make decisions based on data.
- Research for improving teaching and learning will be enabled by new kinds of questions to be asked with new sources of data and new technologies
- Four components make up NSF's Big Data Initiative:
    - Foundational research to develop new techniques and technologies to drive

knowledge from data and to understand how domain sciences can benefit from access to data mining techniques and data analytics
- New cyber infrastructure for data management
- New approaches for education and workforce development to address the needs of the nation in data science
- Building of communities of researchers that work on data intensive problems

CEOSE members discussed the following issues with Dr. Jahanian: broader access to technology, content delivery and how people learn, CISE's next generation of a diverse workforce, and inclusive research opportunities to analyze big data. CEOSE members asked questions about ethical and privacy issues as well as the use of data for broadening participation research and the limited resources of so many MSIs for a state-of-the art cyber infrastructure. Another major challenge discussed was public and cyber security. Additionally, Dr. Jahanian stated that in general, the field is confronted with the underproduction of degrees, the underrepresentation challenge, and the lack of presence in K-12.

Panel Discussion: ***Evidence, Evaluation and Performance Measurement***

Dr. Laura House of Pretrial Services Agency and a former Detailee to the Office of Management and Budget (OMB) stressed the need to link performance management and evaluation. She provided an overview of GPRA (Government Performance and Results Act) and highlighted the perspective of the current Administration; including goal setting, frequent measurement, on-going analysis, and use of evidence. The current Administration is expecting federal agencies to utilize evidence to set priorities and find effective and cost-effective practices. She also discussed the importance of strategic objective annual review in the context of decision-making, improving outcomes, and enhancing productivity. The barriers and challenges to the integration of performance measurement and evaluation that Dr. House discussed were in four categories: cultural (e.g., compliance mindset and lack of incentives), structural (e.g., funding and strong silos and independence), process (e.g., Paperwork Reduction Act, procurement issues) and data-related (e.g., accessible and timely data and attribution issues). She emphasized the following actions to strengthen the use and integration of performance measurement and effective decision-making:

- Address the structural issues within organizations
- Build capacity and resources
- Strengthen coordination and planning among essential areas
- Increase awareness of the complementary and mutually beneficial roles
- Enhance knowledge-sharing within and across agencies

Dr. Jennifer Brooks of Administration for Children and Families, Department of Health and Human Services (HHS) emphasized that the integration of data systems and pointed out that different kinds of studies require different kinds of methods. She offered a cautionary note about narrowing the field of evidence and encouraged the use of evaluation for multiple purposes and that it should not become a compliance burden. The presentation pointed out the importance of formative evaluation, especially when what may work in one setting may not work as well in another setting. It was also noted that the evaluation should be guided by the questions which should inform the data needs. Emphasis was placed on improving the quality of programs through the use of evidence and data. Evidence-based decision making was described as using the best available evidence in designing, implementing, and monitoring all aspects of a federal program (e.g., basic science, national or descriptive surveys, process evaluation, evidence of impact, evidence of heterogeneity of

effects/implementation science, and management and performance data). Dr. Brooks stated that performance and management data and research and evaluation data/findings can be complementary and ideally should be used synergistically. The integration of the data sources are recommended because of the limitations of each. Performance measures will not provide a perfect measure of performance and research and/or evaluation will never be able to speak to all the individual, contextual, historical circumstances that affect program implementation and effectiveness.

Both indicated that broadening participation issues need to be considered in the evaluation process, especially involving practitioners in helping to frame the important questions or understanding the conditions of the people involved in the research. CEOSE members also discussed RCT or randomized trials as tools and not the end game for evaluation.

Presentation: ***Race, Ethnicity and NIH Awards: A Case Study in Administrative Data to Knowledge (AD2K)***

Dr. Donna Ginther, Professor of Economics and Director, Center for Science Technology and Economics Policy at the University of Kansas, shared how her research team has mined NIH administrative data and revealed disparities in research funding. She described research findings as well as policy changes at NIH as a result of the research. Administrative and other data sources included: NIH IMPAC II (information for Management, Planning, Analysis, and Coordination), Survey of Earned Doctorate, AAMC Faculty Roster, IPEDS (Integrated Postsecondary Education Data System) and Thomson Reuters' *Web of Science* and journal citation reports. Regarding award probability, the major finding was that there is a significant difference in R01 award probability for PhD scientists by race and ethnicity with Blacks having the lowest award probability. The resubmission data revealed that Blacks, Asians, and Hispanics are significantly less likely to resubmit unfunded grant proposals compared to Whites. She also reported that compared to Whites, Blacks are less likely to work at research organizations and the top 30 NIH funded organizations.
Dr. Ginther stated that serving on review committees helps with getting an award, and publications can cut the funding gap in half but Blacks are co-authors of fewer publications.

She shared that the Advisory Committee to the Director Working Group on Diversity in the Biomedical Research Workforce has made some recommendations. NIH actions have included a Chief Diversity Officer; an internal NIH Steering Committee on Diversity; a national research mentoring network designed to connect students, postdocs and faculty to experienced mentors; implicit bias training for review panels, and increased support for biomedical undergraduates through the new NIH BUILD (Building Infrastructure Leading to Diversity) program. Dr. Ginther stressed that access to and linking data sets will be critical to answering research and policy questions of interest to CEOSE. She concluded that in the past, economists made assumptions, appealed to theory or resorted to complicated estimation techniques to do their research but now and in the future, careful research designs using big data and administrative data will yield new insights and inform policy.

Presentation: ***Women, Minorities and Persons with Disabilities in Science and Engineering: 2013***

Dr. Jaquelina Falkenheim, Senior Science Resources Analyst of the National Center for Science and Engineering Statistics (NCSES/NSF) provided an overview of the report "Women, Minorities, and Persons with Disabilities in Science and Engineering", a biennial report that was first published in

1982 in response to the Science and Engineering Equal Opportunities Act. The report's Digest has key statistics in areas like enrollment, field of the degree, employment status, occupation, and academic appointment. She also provided a demonstration of how to use the NCSES datasets and access the web-based source of data for the women, minorities, and persons with disability report. This resource has approximately 110 tables and members were shown how to export data as an Excel chart or PowerPoint image. Additionally, tables that are accessed in the Excel version can be tailored to a particular group. The website has previous biennial reports; however, Dr. Falkenheim emphasized paying close attention to the notes at the bottom of tables because the data questions and collections and table numbers have changed in recent years. She also highlighted the various info briefs that are accessible, as well as the link to the *Science Indicators*.

CEOSE commented on the timeliness and value of the 2013 report. CEOSE expressed interested in WebCASPAR and NCSES data for the next CEOSE biennial report. Dr. Falkenheim encouraged CEOSE to provide feedback/suggestions for improving the NCSES biennial report, *Women, Minorities, and Persons with Disabilities in Science and Engineering,* by August 31, 2013. Questions to consider regarding the overall approach, coverage and tone of the report included: Are there any key missing data in the tables of the report? Are the major elements and trends in the digest conveyed clearly? Is the information in the digest presented in a fair and balanced way? Feedback from the users and expert reviewers will be considered in the production of the next edition that will be published on January 2015.

Day One adjourned at 5:35 pm. A brief discussion before adjournment recapped some of CEOSE concerns and possible topics to discuss with the Acting Director. The issues covered were: shifting of many great ideas for $100M of new money for broadening participation to a bold recommendation to tap into and impact NSF's $7 billion STEM investment, increased attention to Native Americans and persons with disabilities in STEM to help do better science and have a more diverse workforce, greater attention to the contributions of HBCUs; promotion of the pathway approach that is PK-20+ to counter the widening gap between K-12 and the university, and the STEM infrastructure needs of MSIs.

Day Two

Opening Remarks and Introductions

Dr. Ramirez, CEOSE Vice Chair opened the meeting and Dr. Conrad, CEOSE Chair, joined the meeting virtually. The brainstorm of possible topics for discussion with Dr. Cora Marrett included: discussion of CEOSE recommendation(s); workforce issues related to better science linked to a more diverse scientific workforce; IHEs in PK-20+ partnerships; socio-economic impacts of broadening participation, including the limited resources/infrastructure of MSIs; transformation of the scientific enterprise through the science of collaboration, including corporate partners; access to NSF administrative data; recruitment and preparation of undergraduates as STEM teachers; and models of interagency with an emphasis on interagency coordination that leverages best practices and promote integrative approaches for broader national impact. The potential topics were narrowed to five: leadership transition, CEOSE biennial report, access to GRFP data, interagency cooperation, and the balanced approach between studying the science of broadening participation and providing support directly for implementation of broadening participation programs.

Presentation: ***NSF Evaluation Capability***

Dr. Alexandria Medina-Borja, Interim Head of Evaluation & Assessment, described that the NSF Evaluation and Assessment Capability, housed in OIIA, is currently using existing expertise within the Foundation in helping with evidence-based decision making. NSF has an integrated approach to agency evaluation, involving the integration of rigorous data analysis and external evaluation with business intelligence tools and performance measurement. She emphasized relevance, transparency, and independence as core principles of the evaluation effort. Additionally, the integrated system of evaluation, decision-making and innovation has three areas of major responsibility: leadership for evaluation; data collection, study design and management; and directorate/office evaluation capacity. After outlining the roles of organizational units in implementing these responsibilities, she shared the results of a recent inventory of evaluation and assessment activities at NSF: 19% baseline studies; 9% design/feasibility studies; 9% formative evaluations; 11% portfolio analysis; 8% output monitoring and assessment; 28% outcome monitoring and evaluation, and 16% impact studies. After providing a detailed description of the program evaluation continuum, she framed provided the status of specific examples of NSF's evaluation efforts in three investment categories: investments in fundamental science and engineering (e.g., SEES), investments in people (e.g., GRFP), and strategic investments (e.g., I-Corps). The evaluation of EFRI was also highlighted, using a logic model to study a research portfolio that is not a traditional intervention but is an investment in high risk research.

Dr. Paul Morris, Staff Associate, IIA/OD/NSF, provided an overview of NSF text mining tools that are being developed in OIIA. The context for this work included: NSF has stored electronic records from 1990 to present. NSF is receiving approximately 50, 000 proposals each year. Additionally, Principal Investigators must submit an annual and a final report. With millions of documents, how can NSF apply mathematical algorithms and text analytics to find information hidden in NSF research documents that is efficient? Dr. Morris then demonstrated text mining of NSF proposals with the equal opportunities emphasis and the use of filters in conducting various queries. He suggested that text clustering and similarity maps could be created to investigate the impact of CEOSE recommendations on NSF research proposals. Clustering techniques could also be used to show the high relevancy of broadening participation topics and themes. He encouraged the membership to use the proposal search engine tool on www.Research.gov to explore some diversity queries and create visuals of themes and topics.

CEOSE members expressed their appreciation for both presentations. They expressed interest in wanting to know where diversity data show gaps in knowledge, how longitudinal studies and/or cluster analyses can give insights about trending of research for broadening participation, and how to have access to the program logic models.

Panel: ***Broader Impacts Infrastructure/Evaluating Broader Impacts***

Dr. Susan Renoe, Director of the Broader Impacts Network at University of Missouri, provided an institutional approach to broader impacts. She shared how the University of Missouri is taking responsibility for helping their researchers understand and leverage broader impacts. The institution has established a broader impacts infrastructure that offers annual training to help Principal Investigators understand broader impacts and how to document implementation and share results of broader impacts plans. Additionally, one-on-one assistance is provided to potential Principal

Investigators and monthly Broader Impacts Network (BIN) brown bag lunch sessions are conducted. Topics have included public outreach and the media, excellence characteristics of K-12 outreach, and broadening participation. For example, in promoting broadening participation, BIN is partnering with minority serving institutions, targeting high schools with high minority populations, encouraging collaboration among STEM diversity programs on campus, providing early research experiences to underrepresented groups, and making labs accessible to people with disabilities. BIN is also focused on leveraging campus expertise in evaluation as well as external evaluation firms to provide support in designing and/or assessing broader impacts activities/plans. The university is piloting an impact database, designed to capture the range of broader impact activities as well as demographic information about the participants. It is anticipated that this work will be instrumental in developing a system level evaluation of broader impacts that is at an institutional/campus level. She stressed the need to share best practices and tools to advance the network nationally.

Dr. Richard Tankersley, Program Director, Integrative Graduate Education and Research Traineeship Program (IGERT)/Division of Graduate Education (DGE)/Directorate for Education and Human Resources (EHR)/NSF, shared his experience as a practitioner of broader impacts and as a broader impacts advocate. After providing a brief historical overview of the NSF Broader Impacts criterion, he provided solutions to address the problems that scientists are often perplexed about, e.g., how to address, review, and/or assess broader impacts in proposals and funded projects. Important messages conveyed were: Scientists should no longer think of broader impacts as being outside the technical aspects of their research. The recent review and revision of the merit review criteria raised the prominence of broader impacts. The new view of broader impacts in relationship to intellectual merit is that the two are integrated and should be interdependent. He called attention to the following guidance from NSF: "Broader impacts may be accomplished through the research itself, thorough the activities that are directly related to the specific research projects, or through activities that are supported by, but are complementary to the project." More specifically, Dr. Tankersley focused on how the geoscientists in the Centers for Ocean Science Education Excellence (COSEE) are being supported to think about the broader impacts of their research. These scientists are being trained to think of broader impacts as an opportunity for creativity and not view the requirement as a burden. Broader Impacts criterion is pointed out as being more than educational outreach and that broadening participation is not a separate activity but is embedded in the research process as contributions to societal needs, policy and economy. COSEE has developed a series of broader impacts workshops, conducted intense training clinics, engaged in broader impacts brokering and is now working on metrics for evaluating broader impacts.

Dr. James Bell, Director of the Center for Advancement of Informal Science Education (CAISE) and Project Director/Association of Science-Technology Centers (ASTC), discussed the nexus of formal and informal education in the context of broader impacts. The emphasis was on meaningful innovation strategies that are greater than just education and outreach but involve connecting cultures to science. Sharing statistics about STEM engagement and learning in informal environments, Dr, Bell reinforced that broader impacts can involve the development and testing of a variety of models with the level of intellectual rigor comparable to scientific research being conducted. For example, he emphasized how the Center for Advancement of Informal Science Education (CAISE) is pursuing connections between practice and research in the field of informal science education, underscoring the importance of designing informal experiences to be relevant to people's lives and exploring different ways of communicating the significance of the research to a given community as well as the nation. CEOSE was encouraged to visit http://caise.inscie.org to learn more about inclusive resources and to become a part of the community engaged in discussions about Broader Impacts learning goals. He briefly described three of CAISE's broader impacts

efforts: catalyzing and supporting collaborations between 5 NSF Centers for Chemical Innovations and Informal Science Education Partners; providing education evaluation support and resources to the NSF Material Research Science and Engineering Centers (MRSEC) Directors of Education and Outreach; and supporting initiatives to integrate university-wide approaches to Broader Impact at Oregon State University and University of Utah. All three efforts are helping universities to take a more integrated approach to addressing broader impacts.

CEOSE discussed with the presenters various strategies for promoting broader impacts, especially the integrative approach to Broader Impacts. There was general consensus that the best proposals will be those that have exceptional intellectual merit and exceptional broader impacts. The discussion also pointed out the importance of broader impacts for helping scientists to communicate more effectively the benefits of the research they are doing to people outside the research community.

Meeting with NSF Acting Director

Dr. Cora B. Marrett, Acting Director and Deputy Director of NSF expressed deep gratitude for CEOSE's work. She has been the Acting Director of the Foundation since March 22, 2013. She shared that the AD Retreat was framed around the NSF motto—*Where Discoveries Begin*. Attention was also given to communication, evaluation and workplace morale. She stated that three of the Directorates have new leadership since the last meeting: Dr. Pramod Khargonekar in Engineering, Dr. Roger Wakimoto in Geosciences, and Dr. Fleming Crim in Mathematical and Physical Sciences.

NSF did experience a budget cut due to sequestration but did not have furloughs. Funding cuts impacted the number of new awards. NSF is now preparing its 2015 budget and the budget request for FY 2014 is $7.6 billion.

In response to the pressure for the Director to recommend awards in the political science program, Dr. Marrett commented that the political science proposals will go through the usual merit review process; the panel would also provide input about whether the proposals foster national security and economic interest of the US. Then she briefly highlighted: the five areas of the 5-year strategic plan of CoSTEM, of which one is to better serve groups historically underrepresented in STEM., the two topics of the Global Research Council (i.e., open access and integrity in the research supported by agencies), and NSF's recent public-private partnerships with Intel and GE.

After a brief discussion of the 2011-2012 CEOSE report, members pointed out that since broadening participation is a core value, nothing less than a comprehensive strategy of bringing together evidence/data and PK-20 partnerships to advance the science and the development of diverse human capital is needed at this time. Sustainable collaborations have to include involvement with other federal agencies, including the sharing and supporting of the best ideas for the development and advancement of inclusive talent in STEM. Developing knowledge for an inclusive scientific enterprise is importance and can be generated in the conduct of implementation research. Other areas discussed included institutional transformation, knowledge development connected with international engagement, the need to leverage small numbers to make a profound difference in STEM diversity, and the interagency context and implications of CEOSE discussions and recommendations.

Announcements, Final Remarks

The Chair, Dr. Conrad thanked the Vice Chair, Dr. Ramirez, for a well-run meeting. CEOSE members who participated virtually applauded the use of WebEx. Dr. Ramirez thanked everyone for a productive meeting and reminded them to begin thinking about the next biennial report. The next meeting will be a virtual meeting in late October 2013. The Committed agreed that the four-hour virtual meeting would be two hours before a lunch break and then two hours after the break.

The Vice Chair adjourned the meeting.