

**Directorate for Mathematical and Physical Sciences (MPS) Advisory Committee Meeting
August 5-6, 2020 (all times EDT)
National Science Foundation
2415 Eisenhower Ave, Alexandria, VA
Room E2020**

Summary Minutes

Wednesday, August 5, 2020

Advisory Committee Members in Attendance (All Virtual):

Dr. David Awschalom	Dr. Robert Kirshner
Dr. Anna Balazs	Dr. Cornelia Lang
Dr. Susanne Brenner	Dr. Herbert Levine
Dr. Robert Bryant	Dr. Jennifer Lewis
Dr. Tabbetha Dobbins	Dr. Andrew Millis
Dr. Miguel Garcia-Garibay	Dr. Jill Pipher
Dr. Lynne Hillenbrand	Dr. William Tolman
Dr. Catherine Hunt	Dr. William Zajc

Call to order and official opening of meeting, FACA Briefing – Sean L. Jones, Acting Assistant Director, MPS; Kathleen McCloud, Staff Associate, MPS; Catherine Hunt, MPSAC Chair

The meeting was opened at 12:30 pm by Dr. Catherine Hunt and began with a briefing from Dr. Kathleen McCloud on the policies of the Federal Advisory Committee Act regarding conflicts of interest for AC members, as well as a reminder that the meeting was open to the public and occurring under the guidelines of FACA. Dr. Catherine Hunt asked for introductions around the room. The minutes previous meeting, held in October 2019, were approved unanimously by a motion introduced by Dr. Hunt.

Update: MPS – Sean L. Jones, Acting Assistant Director, MPS

Dr. Sean L. Jones, Acting Assistant Director for Mathematical and Physical Sciences, provided an update on the state of the MPS directorate. Discoveries were highlighted from Astronomy on the first photo of the surface of the sun from DKIST. Additional topics discussed included NSF's response to COVID-19, social unrest, recent MPS awards, the FY20 budget appropriations and FY21 president's request, staff changes in MPS including the appointment of Sean Jones as Acting Assistant Director and Tie Luo as Acting Deputy Assistant Director, and staff changes in NSF—appointment of new Director, Dr. Sethuraman Panchanathan.

CHE COV Report Presentation – Peter K. Dorhout, Vice President for Research, Kansas State University

Dr. Peter Dorhout, presented the final report of the 2019 Committee of Visitors (COV) to the Division of Chemistry (CHE).

- COV Chair – Peter Dorhout
- COV Co-Chairs – Robert Cave (Harvey Mudd College) and Malika Jeffries-El (Boston University)
- COV held June 1-3, 2020 via Zoom – fully virtual 3 day conference
- 168 Page Final Report – July 13, 2020
- COV focused on 3 themes for 13 programs – Quality of Review, Reviewer Selection, and Management Program

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- Main points:
 - CHE funds excellent science and is responsive to the community
 - CHE conducts the review process well. Panels are valued and provide excellent feedback. Reviewers are experts, capable of making sound judgments
 - Each program is managed well. Each program covers the sub-disciplines in their fields and are responsive to the emerging fields.
 - CHE made excellent responses to the previous COV
 - Ongoing questions exist with respect to Broader Impacts
 - Increasing diversity and inclusion is an ongoing challenge
 - Current funding is inadequate for the Division – forces difficult decisions on award size, collaborative awards, and award duration.
- Q1: The quality and significance of the results of the Division’s programmatic investments
 - Major focus on Intellectual Merit “metrics” in most reports
 - May need focus on defining goals, metrics, and success for PII(s) and CHE/NSF
 - Measuring/defining success for Broader Impacts is needed due to challenge for both PII and reviewer
 - Qualitative info was easier to extract from annual reports than quantitative data, but former is more time consuming
 - Post-award reporting on the impact of the award or experience on students would be valuable.
- Q2: The relationship between the portfolio and the Missions of the Division, the Directorate, and the Foundation
 - New initiative and investment – COV would encourage CHE have greater participation in these programs
 - Opportunities for Chemistry in the Inter-disciplinary Initiatives – A stronger linkage between the individual chemistry disciplines to the bigger initiatives is needed. Workshops will be helpful.
 - Balance between “New” initiatives and existing programs
 - How do these initiatives promote the broader image? – COV cautions that the initiatives, if not managed well, may actually limit the broader impact, because of the confined research scope.
 - Initiative impact by CHE – CHE division had held many workshops and office hours online due to COVID-19 pandemic and the attendance is good. Committee suggests this should be continued due to its cost effectiveness and to add social media to promote CHE participation in specialized opportunities.
- Q3: The Division’s engagement in, and prioritization of, research initiatives
 - Good job reaching the community through a lot of outreach
 - Suggests to do more outreach to junior faculty, PUIs, institutions that educate underserved population
 - Support mentoring of junior faculty (beyond CAREER workshops) and include more on panels
 - Promote new diversity initiatives
- CHE – Quality of Investments

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- CHE supports exciting, transformative science
- Portfolio covers wide range of chemistry practiced today
- CHE invests in young scientists
- Each program has impressive outcomes
- CCI supports extensive collaborative work on “big” problems
- MRI is a critical program for the work of chemists
- Switch to single submission per year diminished collaborative proposals
- CHE Funding – Stretched too far
 - Four year budget was constant
 - Excellent job of acquiring co-funding
 - Average award size has grown modestly over 4 years; at the expense of collaborating awards
 - Transformative science requires both funding sufficient for students and equipment. PIs are choosing between both
 - Important science goes unfunded each year
 - BudFinal Report Robert Cave (Harvey Mudd College) and Malika Jeffries-El (Boston University)
- COV Funding – Comments and Recommendations
 - CHE excellent steward of its budget
 - CHE diligent in establishing co-funding
 - CHE’s budget needs significant increase
 - Increase number of awards
 - Move to 4 year awards
 - Increase access to equipment in single investigator awards and MRI
 - Increase the number of CCIs in the portfolio
 - Extra funding needed for collaborative awards
 - Increase the budget for travel to conferences by POs, PIs and students
 - CHE budget needs to be increased
 - Review analysis details are excellent and it is recommended to add more in PO comments
 - Panels when possible
 - More community clarity on Broader Impacts
 - Enhance diversity and inclusion at all levels

Discussion and Vote on Acceptance of Chemistry COV Report

1. **Question asked by Miguel Angel Garcia – Garibay:** Is there an opportunity to convene a panel to talk about implicit bias? Was there any discussion of having panels about the subject of broader impacts?

Answer - Peter Dorhout: COV perspective – May 25, 2020 was a few days before the June 1st COV meeting. The COV was coming together and this was fresh on our minds. This was the catalyst to beginning the conversation about broader impacts and about diversity, the backgrounds of the PIs and the review process. COV recognized colossal success in CHE on

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diversity programs. It is time to have the conversation about how the division can move to broader impacts in the communities and having those difficult discussions. COV members will agree. Any COV member will say yes to be a participant on those panels.

2. **Question asked by Andrew Mills:** Are there structures set up to allow chemistry people to work with other scientists to make researches go better?

Answer - Peter Dorhout: There are opportunities in communicationg. The challenging aspect of this pandemic is that scientists cannot get together and collaborate as they would normally do. This is the biggest challenge of this pandemic.

3. **Question asked by Robert Kirshner:** Did the COV look at the breadth of people who apply for grants with who were selected for awards? Did the COV have access to that info? Was there a significant difference?

Answer - Peter Dorhout: Yes, we asked the questions and yes, we had access to the data. CHE was responsive to the requests. We had local examples in the written report and we acknowledged this as a challenge. The data supported the conclusion.

Answer - Sean Jones: The data about gender identity is only voluntary at this time.

4. **Question asked by Herbert Levine:** NIH offers bonuses for people who server on their panels. Did CHE think about adding sweetners to participate in the panel review process?

Answer – Peter Dorhout: COV is aware of other organizations that offer incentives for panels. There was conversation about ways to improve panel participation. We learned during the meeting how a fully virtual conference would work.

Answer- Sean Jones: CHE may review this in the future.

Dave Berkowitz spoke and thanked the COV Chair and Co-Chairs.

Sean Jones spoke and thanked the COV Chair and Co-Chairs.

Vote taken and the COV report was accepted by unanimous vote.

MPS and the Living World Discussion—Catherine Hunt, MPSAC Chair, University of Virginia, Linda Sapochak, MPS/DMR, and Jennifer Lewis, Subcommittee Liaison, Harvard University

MPS and the Living World Discussion – Katie Hunt introduced the Subcommittee members of the MPS Life Sciences (MPS-LSWG) Chair – Linda Sapochak (DD/DMR), Co-Charis: Jenifer Lewis (Harvard U) and herself.

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She started the collaborative discussion, mentioning Industries of the Future; Biotechnology; create a subcommittee to combine; broaden the charter MPS Living World Charge – Identify the Gaps and Transform the Future of Biotechnology; tasked to imagine the future. Need to bridge the gaps between the Present and the Future and how to get there – Visioning what steps to get there – across all Divisions in MPS – all virtual meetings

All five MPS DD's are on the subcommittee. Leadership Team Structure discussed: Strong Leadership; Good Communication; Credibility/Visibility; Bold Visionary; Understand/Enhance and value diversity

Introduction of Chair – Prof. Ka Yee Lee/U. of Chicago; Co Chairs: Prof. Chaitan Kosla/Stanford U. and Prof. Neal Woodbury/Arizona State U. – all expressed their excitement of being on this subcommittee.

MPSAC Members: Liaison Jennifer Lewis: At Large Members – Herbert Levine and William Tolman spoke and expressed their excitement of being on this subcommittee

DD/DMR Linda Sapochak – MPS Life Sciences Working Group (LSWG) showed a slide with the word art and discussed the commonality across the Divisions.

Discussion of the Charge; Stand Up to Cancer; MPS Life Sciences Working group – two short term Action Items; and Listed the Membership – Co-chairs, Executive Secretary, MPS Program Directors and Ad-Hoc members of the LSWG. The main theme is that “We Are All In”.

There was a comment made, that Industry is important to be included in the partnership.

Q: MPSAC Lynne asked if there were any bounded by money or anything else?

A: By Chair Katie prefers to to partners and and then back to reality. It can be done. Can look to outside for experts. Virtual connectivity – low hanging ideas.

Sean stated that we already have strong base ties with BIO and ENG Directorate – we want to be better informed.

Herbert mentioned the complimentary Activity at NAS. PHY is focused and the process is going on and needs to be incorporated.

Industries of the Future: Quantum Information Sciences – Denise Caldwell, Division Director, MPS/PHY

-Denise Caldwell discussed the Industries of the Future Administration priority: Quantum Information Sciences

- she noted that QIS goes back many years

-awards come not just from MPS, but also from CISE and other areas at NSF

-Why now? Three reasons noted:

- (1) Advances in science and technology are enabling new opportunities for rapid advances (control quantum systems; not just observing behaviors)
- (2) International competition is extremely high
- (3) strong industrial and government interest.

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-Quantum Leap program was designed to be inherently multi-disciplinary in its approach; Convergence, Community, and Collaboration

-Quantum Leap: to build a convergent quantum community – started with foundational investments in QIS, then capacity building across disciplines, included a strong quantum workforce development (summer schools, faculty fellows, etc.), funded transformational collaborative research, and finally convergent quantum centers

-**National Quantum Initiative** was passed in December of 2018 prior to the launching of NSF's Centers; assigned NSF a specific roles: (1) basic research in QISE, and (2) create multi-disciplinary centers. NSF was ready with the Quantum Challenge Institute solicitations ready-to-go (QLCI). QLCI solicited large scale projects, defined by a cross-disciplinary teams to overcome a specific challenge in a 5 year period. Approaches were requested to be revolutionary. Institutes were also asked to foster connections with industry and also to have focused efforts on a well-trained workforce.

-Caldwell noted she was pleased to announce first three awards in this QLCI (and thanked the working group for their intensive year of review). Each award is not just to those listed on the slide, but includes many collaborators at other institutes. The awards address different key areas (quantum networking, quantum computing, quantum sensing).

-Is NSF ready to be part of the Industries of the Future?

-Denise noted the strong disciplinary programs, the QLCI (3 awards), and she said they just announced 3 days ago the award to an Engineering research center devoted to networking.

[Note one of her slides is missing; can it be corrected in .pptx version for the record?]

-FY21 budget request: includes a significant increase for QIS (~80M). Where do we go from here? How do we take from the basic research into industries of the future. Quantum is still largely in the domain of the physicist, but need to add more engineers and more computer scientists.

-need more potential partners (agencies, industry); how can NSF better partner?

-also think about the end-user communities? What are the possibilities for extending into sensing biology?

-How do we expand the workforce? Need a more focused effort and a larger workforce. New Q12 initiative noted (see www.q12.org; https://www.nsf.gov/news/special_reports/announcements/080520.jsp)

-also expanding outward – several DCLs for supplements for access to quantum computing from IBM, Amazon, and Microsoft; and Convergence Accelerator phases 1 – 2 are good for translation to the market sector

Discussion with Denise Caldwell

Q: (Tabbatha Dobbins; MPS AC)

There is still a technology gap and gap in access to computing facilities, etc., as highlighted during the pandemic. Now with the advent of this exciting project, what are the plans to ensure this gap does not persist with the K12 and beyond? She noted the gap was at K12 and University levels.

A: (Denise Caldwell; NSF)

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We are in good shape since we are just starting we can build this in from the very beginning. Reaching out to broader institutions who have capabilities or people who want to participate or make a contribution to make certain they have the option for doing so. So, she said we are in a good position as none of this exists and we can build in from day #1.

A: (Sean Jones; NSF)

Partnering with EHR to look specifically at these deficiencies, but to hone in and address.

Q: (Cornelia Lang; MPS AC)

She likes the link between workforce and grand challenges. She noted students are looking for this. She noted that we see a lot of similar things related to the ideas on the research front. But, do any of these projects have a curricular aspect? Oftentimes these programs focus on the research, but the curriculum development is left off.

A: (Denise Caldwell; NSF)

She noted that any of these challenge institutes have a strong REU component. No requirements are built in. She also noted in the Quantum workforce development working group; part of the charge for this group is to look at workforce across all levels. But, what do we need to put into the curriculum? Lots of discussion about adding quantum engineering; this has come up as a needed component. But, how much is needed as an engineer to contribute? Curriculum is intermixed with all these discussions. She said the working group would make the decision on whether there would be a specific solicitation.

Comment (David Awschalom)

1. He weighed in that it is hard to appreciate the true scope of the problem. And that more attention is needed; e.g. 20-30 graduate students cannot solve the problem. Look at community colleges and beyond.
2. Biology – this will be much more powerful for sensing and communication in the coming decade. Need to work together in ways that others have. The working model for quantum information needs to be revised.
3. Material science is not getting a lot of support. But, honestly compared to what Bell Labs, HP, etc. did in the past, it is very small compared to international investment. This is another area NSF could take a leadership role.
4. Great presentation – scope is terrific; but some concern that we don't want to do a little of everything; also want to do something big.

Q: (Andy Millis; MPS AC)

Material platforms on which all of this will exist is in area where not much has been stated.

A: (Sean; NSF)

First, addressing David's comments: NSF has called out attention of 2 year schools (skilled technical workforce); NSF will be building this aspect moving forward

A: (Sean; NSF)

Addressing Andy's comments – DMR is deeply involved – over to Linda

A: (Linda; NSF DMR)

Noted that NSF supported research in materials is very important. It was not fully discussed.

Comment (David Awschalom; MPS AC)

-This is an international competition right now. With other countries doing stunningly well. NSF has been very successful driving collaborative international work; QIS would be an area we could do that and we have a lot to learn from international partners.

-NSF has managed this quite well; consider large international centers?

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Comment (Bob Kirshner; MPS AC)

-has had a program in quantum materials at the Moore Foundation; about 95M over 6 years. Not gigantic, but sharply focused. Selected investigators, sharply focused. If public-private activities are important; we might discuss more.

Comment (Linda Sapochak; NSF)

She noted Moore visited earlier and that they would appreciate this again.

Comment (Sean Jones; NSF)

Noted that partnerships is a major theme for the Director and he will follow up on this in the future.

Preparation for Meeting with NSF Director and Chief Operating Officer

MPS update & DKIST update

- budget was in surprisingly good shape
- lots of personnel turnover (not necessarily concerning, but it is tricky to do it seamlessly)
- DKIST update is very exciting, also great to hear about all the awarded programs and the Waterman award
- members appreciated MPS's active response to the pandemic and civil unrest issues
- AC membership grew by 4 members
- facilities funding is unsustainable (NSB is well aware)

CHE COV

- quick summary of the executive summary (programs are managed well, BI and BP remain confusing challenges, and funding conflicts are a concern)
- broader impacts is a topic that is still confusing to reviewers and grant writers; evaluating them is a challenge

MPS and the Living World

- subcommittee is formed with chairs/co-chairs (providing a little historical context of the original SynBio group)
- is a unique mechanism to advance biotechnology (and advanced manufacturing)
- representation from industry will be included in the committee
- LSWG also formed just this June

IoT – QIS

- the NSF has been (historically) leading in funding this work, the research is now accelerating and NSF should be commended in continuing to support collaborative/interdisciplinary ideas
- workforce development is incredibly important here, as is international engagement
 - universities will suffer due to COVID, it will further damage the research ecosystem and academic workforce development. Couple this with restricted visas and k-12 struggles in STEM education and the outlook is sobering.

Promise & Perils report

- economic impact of COVID? Will the money run out (economic crash)? Going forward, what is the disaster management plan?

- speaking with BFA on Friday will help to educate members on this topic, AC could help MPS prioritize in a worst-case scenario

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- the pandemic will disproportionately impact URM, increasing the lack of support for black students and faculty

- how will university researchers be supported with extensions on funding? How will childcare be handled so that women PIs don't continue to slip behind? Increased flexibility in re-budgeting, extensions, and supplements could help blunt the difficulties caused by COVID.

Katie Hunt wants to address topics with the Director in this order:

1. Introduction of members
2. MPS update/highlight and the AC's impression
3. COVID19
4. CHE COV summary
5. MPS & the Living World
6. IotF/QIS
7. AI (getting discussed on Friday)
8. Comments on OLPA's slides
9. Comments from BFA

How will money for new initiatives be allocated from existing programs?

Sean addresses Tabbitha's earlier question on how we will sustain a response on BP

- slides from the presentation with Panch highlight MPS-wide and division-specific *ongoing* activities (including supplements, EiR, PREM, etc)

- Initial ideas taken from COVs, listening sessions, and the BPWG include an MPS Ombudsman, a prestigious postdoctoral program linked to Centers/Facilities, sabbatical programs or summer pair program for MRS

Closing remarks and adjourning for the day

Friday, August 7, 2020

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Dr. Miguel Garcia-Garibay	Dr. Jill Pipher
Dr. Lynne Hillenbrand	Dr. William Tolman
Dr. Catherine Hunt	Dr. William Zajc

Call to Order, FACA Briefing, and Official Opening of the Second Day

The meeting was opened at 12:30pm by Dr. Catherine Hunt and began with a reminder from Dr. Kathleen McCloud on the policies of the Federal Advisory Committee Act from the previous day's briefing.

Industries of the Future: Artificial Intelligence—Erwin Gianchandani (CISE/OAD)

Discussion with Erwin Gianchandani

Current Events—COVID-19 and the Research Enterprise— Steve Meacham, (OD/OIA), NSF Recovery Task Force

- SARS-CoV-2 Virus and COVID-19 Disease
- RAPID Response to COVID-19
 - COVID-19 RAPIDs (NSF 20-052)
 - Provisioning Advanced Cyberinfrastructure (NSF 20-055)
 - • SBIR/STTR Phase I Proposals (NSF 20-065)
- CARES Act: \$75 million
- • By June 25th, NSF had made over 630 awards totaling over \$100 million

- ❖ COVID-19 RAPIDs – Examples
 - Biophysical Characterization of the Native SARS-CoV-2 Virion by Atomistic Simulations
 - Coronavirus Persistence, Transmission, and Circulation in the Environmen
 - Fine-grained, privacy-responding contact traceback for COVID-19 epidemiology
 - On-mask Chemical Modulation of Respiratory Droplets
 - Uncertain Risk and Stressful Future: A National Study of the COVID-2019 Outbreak in the U.S.
- ❖ Learning: Preparing for the Next Pandemic
 - From reactive to predictive; segmented to interdisciplinary and coordinated

- Guidance and Flexibility for NSF Grantees: www.NSF.gov/coronavirus

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- Research Recovery Planning COVID-19 pandemic – a major disruptor
- We welcome your input! Email **Steve Meacham** @ smeach@nsf.gov and/or **Sylvia James** @ sjames@nsf.gov

Discussion with Steve Meacham

- Tabbetha: You mention there will be impacts on some institutions of the budget crises associated to the pandemic. Do you plan to give additional attention to HBCU and other minority serving institutions who are supporting the pandemic and may not have the necessary fundings like other larger institutions?
- Steve: Great question. It is something very much on our mind. One of the things that Congress has done is recognize the challenges HBCU has faced and it has provided significant amount of funding by Department of Education. We are constrained by our mission. We support research and researchers. It's difficult for NSF to make its resources available to one institution.
- Bill: Severe slowdown in research due to social distancing. With less to do about money, and more having to do with policies and procedures, is the NSF thinking about adopting any changes in their policies and procedures to help faculties deal with this extreme slow down? There is a lot about their next grant renewals, grant applications and reports. With the pressure of having to provide a report, we look back and see we are really way behind due to the limit amount of faculties and staff allowed to enter.
- Steve: Excellent point to bring up. We have close engagement with Jean Coleman who is very much tune and receptive to Universities in ways to change our policies and procedures. I encourage you if you have ideas to reach out to your research office, because they can get in touch with Jean and share your ideas. All Program Officers understand the limitation due to the current situation. If there is a dialogue between the researcher and the Program Director during the time of reporting, then the Program Director can better explain the situation and be as flexible as possible with the awardees.
- Cornelia: This has been a tough summer. Has the NSF been thinking about this disproportional effect on research productivity for female researchers? Especially for those researchers who are parents. Is NSF thinking about particular initiatives or programs that could very specifically support, especially junior women researchers?
- Steve: This is an active discussion inside NSF. I think there are some things that we can explore, but we have to be really careful. It is difficult for the NSF to create a program that targets a gender specifically, but that does not mean there are not a number of useful things that we can do. We have programs that could try to address these things alongside other issues such as people of color, parents, and other issues. It will take a partnership between the NSF and the institutions.

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- Lynn: One thing that's important for us all to keep in mind while we deal with this, both personally and professionally, is to never waste a good crisis to make a needed positive changes in the way we do business is done and that's something we're all doing in education. I think having virtual panels and conference online for discussions will allow less travel and some good will come out of this. The work recovery plan is being used. I think only some things need to be recovered, but it is also an opportunity to find new models of doing business going forward. NSF should be adapting to the new world of doing business. In terms of research, we are all operating under local regulations, from city to city, county to county, state to state. I think it will be hard for the federal government and NSF in particular to have new policies that will apply equally all across the board. So, this is just something that needs to be kept in mind when making policies and regulation changes. Final thing I wanted to note is on the COVID research related grants. No complaints about how it is being done, but just curious as to how this goes with the NSF philosophy of feeding new research and discoveries of the future versus with addressing today's problems. How much of what you are doing now will help guide us from what we may face ten years from now.
- Steve: Very good points. In some ways, the COVID-19 pandemic has opened our eyes and is now helping us to check on how we can come up with better ways to do the things that we have always done. Offline if you would like to email suggestions on what you think is worth following up on, this will be more than welcomed. We are not trying to duplicate what NIH is doing. We are trying have ideas and knowledge that can be the bases of new fundamental research activities that might produce results directly related to COVID-19.
- Bill (Chat Question): Will it be possible for POs during their spare time to reach out to a PI just to see if there was something NSF can do to help?
- Response in the Chat: POs are already doing that. They are reaching out to the PIs by writing letters and calling the PIs. They are even providing cost extensions.

Legislative and Public Affairs that Affect MPS- Amanda Greenwell, Office of Legislative and Public Affairs (OD/OLPA)

Amanda expresses NSF's roll of funding research and people and explains to the committee how NSF support helps to drive the economy, strengthens our security, and helps to keep us a global leader. Amanda further explained how OLPA supports NSF mission through strategic communications by publicizing NSF success stories by growing NSF brand recognition, leveraging NSF ambassador expertise and by communicating NSF investment in discovery that are vital to national priorities that drive our economy and global leadership. Expressing to the committed that, "we all know science matters", but at OLPA we are serving NSF by communicating the value of that science to our stakeholders and to the general public.

Amanda explains that Panch's pillars are maintaining global leadership, ensuring accessibility and inclusivity, and advancing research into the future.

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One of the defining challenges with communications and communicating why science matters is that the communication landscape is constantly evolving explaining that we are seeing that with virtual communications as it relates to the pandemic and while we are adapting in the short term, we are trying to be strategic about the changes that happen over time.

Amada states that OLPA must evolve as well, she responds to her own question asking how OLPA is evolving by stating that out of 340 government agencies on Twitter, in terms of engagement and followers, NSF is ranked in the top 10. Amanda further cites that one year after Anniversary of the image of the EHT image of the Black Hole that NSF announced after Joseph Pesce Program Director for Astronomy took over the Twitter account to answer questions on Black Hole's that takeover reached over 53 Million accounts alone. Amada cited this data as a measure of success.

Amanda expressed that most importantly OLPA has been facilitating engagement by "hearing and sharing" stories about NSF supported discoveries. Amanda expressed to committee that by sharing graphic stores like the story of NSF ICorp (s) participant Iona (sp) Howard recounting for the committee how Iona (sp) launched a start-up to develop technology for children with different abilities.

Amanda at this point in her presentation reiterated inclusivity and how you are not going to reach every corner of society through academia or by using scientific jargon. She talked about the use of meme's (people referring to the pictures of the sun taken by the Inouye Telescope looking similar to that of popcorn). Amanda spoke of this as an example of engaging all types of audiences. It starts a conversation....

In conclusion of her presentation Amanda shares with the committee that NSF's 70th year legacy is that discovery begins at NSF and by working together to communicate that story it is where discovery will continue.

The committee asked the following questions:

AC: Dr. Jill Pipher, stating that she believed in the past five or 10 years that University research community and professional societies have really awoken to the importance of science communication in order to be appreciated, valued you know we need to tell the story and University's put out news stories and research magazines. They are training their faculties and communications has really stepped up. So, its clear that now at least NSF OLPA is really leading the charge and, I am wondering if there's opportunities for even more creative collaboration with professional society's who also bring their researchers from University's whether there is opportunities for collaboration with University news and communications offices who also have resources to be leveraged and know the people who can really speak about thoughtful and with dynamic interests about science so maybe if you already thought about this, you have clearly thought about so much

MPS Answer: Amanda responded, there are a couple of things that I would like to say regarding your question, we have our current research news which is exactly what you had mentioned, taking the releases that come from University's, we look for quotes within NSF to make sure there is a clear tie to the NSF funding and we are putting out probably on average eight to sometimes up to 15 of those a week so that has been a really great way to again in a quick manner get out some really great science that University's are doing. The other thing is that I quickly just touched on the OLPA reorganization and a big part of that

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Room E2020**

was the government affairs branch so that used to be the congressional team, what we did was broadened that so that it could include inter-governmental so making sure we focus on local officials as well as exactly what you just said making sure we are being more strategic about the outreach to scientific society and the Universities. This is something that we have really stepped up on. Amanda stated that she feels there is a lot more that she feels could be done, but that we are in a much better place to be able to do that in a more proactive way.

- **AC follow-up question:** by Dr. Jill Pipher, stating that she was curious on how the governmental affairs office being involved/included. Jill asked Amanda if there was anything else, she could share with the committee regarding the governmental affairs office suggesting perhaps from a legislative perspective with regarding to challenges or opportunities that OLPA is dealing with.
- **MPS Answer:** Amanda responded that the branch is headed up by Robert Mueller, and that he and the team have been doing an amazing job with the relationship that we know are important speaking to these relationships being really important now as we work through the challenges of COVID-19. Amanda emphasized that her group has been fielding a lot of incoming questions, legislative pieces they are working on. Amanda expressed how the hill has been very appreciated on her group's responsiveness stating that she felt her team's responsiveness played a big part regarding NSF being included in the CARES Act. Amanda replied that is it something that continue to work on, and that obviously there are a lot of different legislative pieces on the house and senate side that are focused on NSF, explaining how there has been a lot of informal technical drafting assistance requests and her group is fielding other information that the hill has been asking for to make sure that we are on the same page for things that we are already doing working other opportunities that need to be maintained that can be addressed in legislation including problematic areas. Amanda emphasized with all that was going on over the last few months one of the biggest things on OLPA's plate was making sure that we got the current director in and through the confirmation process, Panch having a great reputation, both sides of the isle supported this confirmation, turning it around quickly while being in a difficult environment (COVID-19).

AC: Dr. Robert Bryant, stating that there is a lot of resources Robert mentioned that along with the resources given, he wanted to also mention the National Academy as somebody that OLPA could collaborate with stating that they sponsor some great talks and things like that, reiterating to the committee that it would be good to touch base with them. Robert asked the following, we heard yesterday (over air), about these coherent approach to the big questions, particularly in quantum research within biology and on the physical side. Robert stated that the knows this is much harder to get across, saying if you focus on just the results we are getting that is great because people love results, but to try to communicate the overall research strategy and the need for support for a broad based development of quantum capabilities for quantum information technology and quantum biology how could you guys tell that story in such a way that Congress can understand noting that there is an enormous opportunity here that we really need to be investing in

MPS: Amada spoke about how they just had a few of the quantum experts across the agency attend the OLPA staff meeting yesterday. OLPA used this opportunity to pick their brain letting the committee

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know that OLPA has been working very closely with that team. The quantum team has been amazing coming up with a lot of the releases that the agency has put out. Amanda expressed to the committee that what OLPA is really focusing on now is the long term communications plan for quantum overall reiterating what Robert mentioned with regard to their being so many pieces, OLPA is working on breaking it down in a way that science folks know there is so much more on the horizon but how much more work is still needed to be done on the basis research side to get to that point. Amanda further explained that we have the right experts within the agency to be able to do that, and to be more front and center, but this is still a work in progress, but expressed confidently that we are going to see a lot of great things to come out of that.

- **AC:** Dr. Catherine Hunt wanted to follow-up on Robert discussion, Katie mentioned that she gave a talk once and the students came up afterwards and said “that is so fantastic”, because she didn’t just tell us everything you had done, you told us all the things that haven’t been done yet. Explaining to the committee how the parents of these students have been trying to talk them out of going into Chemistry because they told us there is nothing left to be done. Katie used this example to reiterate to the committee the importance of communicating out the things that we do not know.
- **MPS:** Amanda agreed with Dr. Catherine Hunt’s example stating that there is so much out there so how do we get folks especially the people that aren’t quite interested in science or who don’t have a background in science interested, how do we get their attention first? We know there is so much that we can talk about, how do we layer that to look at the different audiences, what are they going to respond to, this is what OLPA is trying to refine. Amanda explained how NSF has a whole wealth of information that we can share expressing how OLPA is trying to package this wealth of information correctly which includes having the right speakers which makes a big difference on how people respond resonate to the material.

AC: For the final question, Dr. Catherine Hunt asked Amanda what she would like us to do more of? Would you like us to put more NSF stories out there, or would you like us to be.... what kinds of things would you ask us to do?

MPS: Amanda replied, for sure on the stories, adding that any content we can post to our website is number one. Amanda, stated that we are only as good as the great content that we get in. Amanda also stated, sharing expertise, and sharing networks within the community where we can talk about the importance of making that connection. For example, if somebody when they put something out follows up by saying something like, “I discovered this regarding the science”, or this is or could be “potentially leading to this”. Amanda emphasized, if folks on the hill cannot that connection to say it was because of the federal government and or NSF that made that grant or made that science possible, nobody is going to know about it. So, she stated that it is really about making sure we keep communicating those same messages and the importance of federal government investment not just for the scientist but for the benefit of the society Amanda and her team think is key. Amanda also stated that we need to keep focusing on the big picture and how the expertise and networks of the community out there can help to keep moving the mission of NSF forward especially within our current societal challenging times.

Amanda closed her session by thanking MPS sharing with the committee that working with MPS has been one of the easiest directorates to work with because as she shared, MPS has so many examples to share of amazing discoveries and research that has been done and research that is ongoing. Amanda commented on how the director of MPS has done a great job working with her and her team, giving them

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a heads-up so she and her team can efficiently plan to bring attention to some of the amazing things that MPS and the agency has done and is doing.

NSF Budget Process-- Caitlyn Fife, Budget Division, Office of Budget, Finance, and Award Management (BFA/BD)

- Caitlyn (BD): My first appearance at the MPS AC. Want to make sure this is a useful conversation. Budget conversations could go in a lot of directions, providing some facts and figures.
- Budget Process
 - Dealing with multiple FYs at once. Currently spending down FY 2020 funds. Then will go through financial audit in late CY 2020. For FY21, delivered PBR/CJ in February, now in open negotiations with House Science committee and appropriations committees. Due to logistical difficulties with leadership transitions and COVID, haven't had a briefing this year. House has issued their bill, seeing some movement, hoping for legislation before 10/1. FY22 budget planning is ongoing – leadership has done strategic planning retreats, engagement with NSB prior to OMB request, agency request submitted after Labor Day, then Administration negotiations until Thanksgiving. Once numbers are locked, go into CJ prep followed by Congressional engagement.
- Current Year Update (FY20)
 - 6 accounts: R&RA, EHR, MREFC are program accounts, proportion to total stays roughly the same. AOAM, NSB, and OIG are administrative accounts. AOAM is nebulous, pays for all fed staff cost and travels, rent, etc. IPA staff are paid out of program accounts. FY20 Request at \$7.066B level, were appropriated significantly more – ongoing challenge to manage.
 - AIP budget graphics: NSF changes by account, NSF as opposed to other agencies. NSF budget not growing as much as other agencies, looking for better ways to communicate compelling ROI stories.
 - CARES Act: NSF received \$76M in supplemental funding. Narrow purpose, mostly for R&RA, some was actually transferred for EHR for virtual learning research. Funding was available through end of FY21, all but \$700 has been obligated, has been pushed out the door! \$76M isn't the whole story, we also leverage our base resources for COVID-19 effort (~\$62M so far).
- Budget Year Update (FY21)
 - FY21 Request = \$7.7B. Highest for this administration, hard to stack against what we receive from appropriations. Request higher than FY20, but still below FY20 CP and FY19 Actuals.
 - House has passed their bill (\$8.5B, major increase), waiting on Senate and conference. House has been our high-water mark. Working on plans for potential funding differential.
- What's Next?
 - Watching for additional COVID appropriations
 - Waiting on FY21 appropriations, potential long CR in election year?
 - FY22 budget preparation

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- Tabbetha (AC): Planning retreats – if there is a collapse, and NSF doesn't get anywhere near Request level in future years due to COVID, what is the strategy for the portfolio/prioritization?
 - Caitlyn (BD): Talking about a more than a \$1.5B swing, perhaps if making up for deficit. NSF did internally look at significant cut scenarios (25% or more) – not a pretty picture, hard to make those trade-offs. From a planning perspective, try to take an NSF-wide approach, ADs are at the table, important for everyone to understand impacts.
 - Tabbetha: You answered it, looking for process.
 - Caitlyn: NSF does things in an inclusive way; new Director is an inclusive leader.
- Lynne (AC): No questions. Usual story. NSF insiders need the help of the community for budget situation to change. At some point, think about how the articulated funding priorities (IotF), former Director's testimony to Congress, will affect budgets. Not a question.
 - Caitlyn: We have new Board members, one asked me about whether NSF is doing 5-year planning. It is interesting to think about planning scenarios in addition to what we're currently doing. Sometimes annual context doesn't tell the full story. How can we be prepared for alternate scenarios? Worth thinking about. Open to views on budget planning processes.
- Tabbetha (AC): Want to understand the process of educating scientists/others about the budget process. I learned from professional societies, well into my career. Do you take any part in this? (Educating community at large.)
 - Caitlyn: I present at NSF's grants conference. I am open to presenting elsewhere. GAO has good resources. Have to know where to go, federal budget is not the most enticing topic to some!
 - Sean: At professional society meetings, we have small portions on federal budget. Can do more of this!
- Robert K. (AC): Fascinating subject. Looks like you're flying blind with ~10% uncertainty. How does Congress know what the right things are to put in that additional slice? Where do they get that information?
 - Caitlyn: We're in dialogue, do DIR-by-DIR briefings. Respond to technical assistance requests. Look for opportunities to have things ready to go in informational briefings (recent one on quantum). Part of it's continuing to tell the story, and also providing direct technical assistance. Try to have flat, factual Request documents, but there are places where we state, "this is a scalable investment." Internally, we are constantly preparing for that opportunity, don't want to be caught without an answer to, "what would you do with \$xx extra funds?"
 - Robert: Strange, uncertain business!
- Jennifer: Noticed strong alignment between Presidential budget and Congressional around reduction of MREFC. How will that impact major facilities? In MPS context, significant impacts?
 - Caitlyn: Note that projects move out of MREFC when they are done. Reduction was because DKIST and RCRV funding was completed. Natural fluctuations. MREFC is challenging because can change wildly, looking to stabilize this. Haven't had new major construction projects proposed in last several budgets.

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Meeting and Discussion with NSF Director and Chief Operating Officer - Dr. Sethuraman Panchanathan and Dr. Fleming Crim

Closing remarks and adjorning for the day