Minutes of the Meeting of the
Astronomy and Astrophysics Advisory Committee
20-21 September 2018

Members attending:

Dieter Hartmann
John O'Meara (Chair)
Kelsey Johnson
Ian Dell'Antonio
Eliza Kempton
Shane Larson
Rachel Bean
Andrew Connolly
Constance Rockosi
Mansi Kasliwal

Agency personnel:

Richard Green, NSF-AST
Diana Phan, NSF-AST
Chris Davis, NSF-AST
Elizabeth Pentecost, NSF-AST
Richard Barvainis, NSF-AST
Matt Benacquista, NSF-AST
Glen Langston, NSF-AST
Peter Kurczynski, NSF-AST
Joseph Pesce, NSF-AST
Ken Johnston, NSF-AST
David Boboltz, NSF-AST
Ralph Gaume, NSF-AST
Edward Ajhar, NSF-AST
James Neff, NSF-AST
James Whitmore, NSF-PHY
Jean Cottam Allen, NSF-PHY
Pedro Marronetti, NSF-PHY
Vladimir Papatashvili, NSF-Polar
James Ulvestad, NSF-OD
R. Chris Smith, NSF-MPS OAD
Paul Hertz, NASA
Rita Sambruna, NASA
Evan Scannapieco, NASA
Jim Green, NASA
Kartik Sheth, NASA
Daniel Evans, NASA
Bill Latter, NASA
Terri Brandt, NASA
Kathy Turner, DOE
Eric Linder, DOE
Drew Baden, DOE

Others:

Rachel Osten, STScI
Philip Puxley, AURA
David Charbonneau, Harvard/CfA
Steve Ritz, UCSC
Lindsey Millken, Lewis-Burke
Michael Ledford, Lewis-Burke
Monty Di Biasi, SwRI
Sarah Lipscy, Ball Aerospace
Ben Kallen, Lewis-Burke
Jeff Foust, *Space News*
Ashlee Wilkins, AAS
Kevin Stevenson, STScI
Scott Gaudi, OSU
Peter Plavchan, George Mason U
Alexey Vikhlinin, Harvard/CfA
Jeremy Weirich, AURA
Marcia Smith
Emily Gibson
Wil Thomas
Julianne Arnold
Mike Henry

MEETING CONVENED 9:00 AM, 20 SEPTEMBER 2018

The Chair called the meeting to order and welcomed all new Committee members. Introductions were made.

The minutes from the June 27, 2018 meeting were approved by the Committee.

Elizabeth Pentecost, the AAAC Recording Secretary, reviewed the list of identified Conflicts of Interest (COIs) for the AAAC and asked that members send their conflicts to her.

Richard Green reviewed the rules, membership, and duties of the AAAC, especially since there were new members of the Committee attending the meeting.

AAAC Annual Report - Agency Response

Richard Green (NSF) provided feedback on the AAAC Annual Report.

The AAAC recommended that all current and planned surveys should publicly release their data with suitable access tools and documentation. Suitable access tools and documentation are the intention of the Dark Energy Survey, the VLA All-Sky Survey, the DESI dataset, and the LSST. AST's current approach to adequate public access of LSST data is supporting the NOAO data science effort for Level 2 data product development and similarly to NRAO for VLASS data. Advice is welcome on whether the intention for full user re-reduction of raw data into the future, and whether that capability is of more value than similar investment to enhance Level 2 data products if a trade-off were necessary.

The AAAC recommended that the three agencies should coordinate, and where possible standardize, the guidelines and expectations for the rleases of data sets, data products, data access tools, and related software used to produce future surveys, astrophysical simulations, and missions. The utility of this request is understood. There are several proven platforms for large-scale data access, and a considerable middleware infrastructure developed for the VO that is finding application in projects like LSST. Ultimately the imposition of standards is an Agency policy decision. A possible starting point is a three-agency expert working group.

Shane Larson commented that the above two recommendations are more long term and the agencies should be planning for the future not yesterday.

The AAAC recommended that the three agencies either broaden the current discussions or create parallel discussions to consider broadly the costs and benefits of coordination on the science areas of interest to both the Euclid and LSST communities. NASA, NSF, and DOE have formed a Tri-Agency Group to discuss the possible implementation-and cost-of joint pixel analysis for data from LSST, Euclid, and WFIRST. NSF's support for planning through carefully defined use of LSST construction funding is combined with that from other agencies to develop a set of requirements, as well as a cost proposal, for implementing joint pixel analysis; their report is expected next year. The community-based Dark Energy Science Collaboration is a strong participant in that activity.

The AAAC recommended that the agencies should continue to prioritize a balanced portfolio, and in particular maintain a viable research an analysis program, using existing mechanisms familiar to the community such as the portfolio reviews and pacing of the early funding and review milestones for new projects. The agencies should continue to communicate with each other about current and future portfolio reviews and consider how joint projects between agencies are meeting the priorities of all stakeholders. NSF/AST acknowledges the need and priority for a vital individual grants program and takes seriously this advice for appropriate balance with facilities support. Communication with the community is through AAS and DPS Town Halls, posting updates on the NSF website, and using the AAS exploder. The next intended AST portfolio review will be after the release of the A&A Decadal Survey in early 2021. Particular attention to joint projects is a useful suggestion for the charge to that upcoming review.

The AAAC supports an intensification by NSF and NASA of existing collaborations that support multi-messenger astronomy, inspiring a new generation of engineers and scientists to work in this emerging area. The AAAC recommends that all three agencies, in recognition of the compelling science opportunities provided by the emerging field of multi-messenger astronomy, do their best to support the capabilities, facilities, missions, and programs on which progress in this area depends. For the NSF, multi-messenger astronomy is a well-recognized high priority. NSF recommends that DOE and NASA stay in close communication with NSF to avoid inadvertently hindering, through actions affecting their own programs or missions, this high priority of their partner agency.

The AAAC recommended that NASA and NSF should enhance their collaboration with each other and with other groups, including international agencies and commercial interests, to protect the accessibility of essential astronomical wavelengths to researchers. NSF's newly constituted agency-wide spectrum management group is reaching out to enable interagency coordination with such entities as NASA's well-established spectrum management team. Since radio spectrum management is at the international treaty level, it is appropriate for Agency involvement as well as that of NRAO and GBO, and the initial steps for ground-based astronomy to coordinate its need for protected passive observing with broader scientific needs for space-ground communication are critical.

The AAAC urged NSF and DOE to put in place a long-term operations plan and research plan that will, while maintaining a balanced overall portfolio, ensure that the US science community can capitalize on the substantial investment in LSST. The establishment of an operations plan that has stable long-term and full support is a critically high priority for the LSST operations partners. That will obviously be a requirement for approval of the operations proposal by the National Science Board. Given the limitation of its grant resources compared to demand, NSF/AST has not typically pre-allocated funding by topic or relation to facility, but has allowed community demand to define the distribution. AST anticipates a strong demand as LSST approaches first light and data start to flow, for which a healthy overall program is the best preparation.

Kelsey Johnson noted that there were past discussions about ALMA proposals being tracked to see how well they did in response to the general body of proposals; were the ALMA proposals funded even if specific funding for ALMA wasn't carved off. She was curious to see what happened with regard to that and how the numbers played out because that would guide how she would think about this for LSST. Richard Green replied that it was an interesting question and that AST was putting together some statistical studies for an upcoming Committee of Visitors (COV) and it would be easy to address and answer Kelsey's question as part of a number of questions the Division will be looking at as they prepare information for the COV.

The AAAC recommended that NSF/AST should continue their efforts to grow and develop the MSIP program, while maintaining a balanced portfolio of investments by NSF/AST. NSF/AST established the MSIP program to create opportunities for mid-scale projects otherwise not commensurate with existing programs. The increased Congressional appropriation for FY18 allowed ~$40M to be awarded to 8 projects (with the full amount subject to availability of FY19 funds), with a success rate comparable to that in other competitions. The FY19 NSF budget request has $60M for Foundation-level mid-scale awards.

The AAAC concurred with NWNH-AMA recommendations that the NSF facility divestment process be moved forward and that the agencies work to ensure that individual investigators are funded, in order to capitalize on and leverage the full capabilities of the new facilities and large projects that represent such important and substantial investments by the agencies. The AAAC supports the NSF approach of working to divest from their funding portfolio aging NSF-developed facilities to partners or non-federal

organizations that are able to extend the productive scientific lifetime of these facilities. This approach enables NSF/AST to redirect saved funding to the operations costs of new facilities and maintain a robust grant program.

The AAAC recommended the implementation of the *OIR System Report*. Efforts by AURA, NOAO, Gemini, LSST, and the proposed new NCOA to implement the recommendations of the OIR System Report should be supported by NSF as long as they can be accommodated while maintaining a balanced investment across the portfolio of NSF/AST. In March 2016, AST asked NOAO to either plan for or carry out the tasks in the recommendations that are relevant to NOAO. Most of the tasks require resources above the NOAO base budget, and therefore require supplemental funding. In July 2016, NOAO submitted to NSF a plan to accomplish the tasks with an estimate of the resources required. The plan noted that a total of ~$5 million over 3-4 years above the NOAO base would be needed. The plan is being funded in supplement installments as funding is available. Recent collaborative development within NOAO and Gemini has focused on alert processing and automated assignment. Gemini is proceeding with the SCORPIO spectrograph in response to the recommendation for high-efficiency time domain follow-up.

The AAAC commended to DOE and NSF the report of the CMB-S4 CDT, which clearly communicates the results of the CDT's efforts to respond to the charge they were given. The AAAC is confident that it will meet the needs of the agencies to inform funding and programmatic decisions in the near term regarding CMB-S4. The value of that report is acknowledged and will set the context for consideration of requests for support of development projects.

The AAAC recommended that NSF and NASA should continue to carry out and evaluate their strategies for reducing proposal pressure, reporting to the community for feedback on their evaluation strategies and the results. NSF/AST just concluded a two-year trial for no-deadline submissions of proposals to the Solar and Planetary Grants program. The number of proposals in certain subtopics was reduced and those communities appreciated the well-defined identity of the program. There were several disadvantages that informed the decision not to continue after the trial period: The periodic evaluation of proposals in hand led to a very broad distribution of topics for any given panel, requiring considerable engagement of ad hoc reviewers and raising the question of whether this review process provided expert input at comparable level to more concentrated subject panels. Given the total breadth of subfields comprising the Astronomy and Astrophysics Grants solicitation, it is much more difficult to take proposal pressure by topic into account in advance when allocating resources when the total demand isn't known until the end of the year. The no-deadline irregular cadence placed substantial additional administrative burden on the support staff, but that could be an artifact of "mixed mode" operation.

Shane Larson asked whether AST constructed panels of people who had broad expertise and looked at proposals that were maybe not their subdiscipline or did AST construct panels that for the panels there was a little expertise. Richard Green replied that the attempt was made to do both; when there was a real absence of specific expertise, the program officer used ad-hocs. The process allows for accepting higher risk than is the case; the program officers have the discretion to change rank (recommendations by the panel which is advisory). There are multiple ways to fund meritorious proposals. AST is offering MSIP and ATI in alternate years to evaluate proposal pressure; AST has made the decision to not continue with the SPG pilot, so it will have to think about how to deal with proposal pressure in different ways, those proposals will be evaluated in the AAG program and a notice will go out (e.g. Dear Colleague Letter) explaining that

Agency Program Updates

NSF

Richard Green provided an update on AST activities. He presented a few science highlights. Using the Gemini North telescope in Hawai'i, an international team of astronomers from Brazil, Italy, the Netherlands, and the UK (led by A. Saxena, et al.) has discovered the most distant radio galaxy to date, at 12.5 billion light years, when the Universe was just 7% of its current age. The team used spectroscopic data from the Gemini Multi-Object Spectrograph (GMOS-N) to measure a redshift of z = 5.72 for the radio galaxy identified as TGSS J1530+1049. This is the largest redshift of any known radio galaxy. The relatively small size of the radio emission region in TGSS J1530+1049 indicates that it is quite young, as expected at such early times.; thus, the galaxy is still in the process of assembling. Astronomers used the Very Long Baseline Array (VLBA) to study the effects on radio waves coming from a distant radio galaxy when an asteroid in our Solar System passed in front of the galaxy. The observation allowed them to measure the size of the asteroid, gain new information about its shape, and greatly improve the accuracy with which its orbital path can be calculated (J. Harju, et al.) Extensive analysis of these effects allowed the astronomers to draw conclusions about the nature of the asteroid. In close agreement with earlier observations, they measured the diameter of the asteroid as 192 kilometers. They also learned that Palma, like most other asteroids, differs significantly from a perfect circle, with one edge probably hollowed out. The shape determination, the astronomers said, can be further improved by combining the radio data with previous optical observations of the asteroid.

NSF, DOE, and NASA continue to work well together to support the priorities of the astronomy and astrophysics research community, both in collaboration on large managed projects and through coordination of diverse research programs. Current examples for NSF-NASA include co-sponsorship of the Decadal Survey, joint NSF-NASA FACA review panels (e.g. your committee), cooperation on space weather and solar research, joint ground-space observations of astrophysical objects (e.g., neutron star mergers), collaboration on the exoplanet research program (WIYN 3.5m telescope), cooperation on Near Earth Object detection and characterization (Arecibo and LSST Observatories), search for techno-signatures, and semi-annual joint NSF-NASA staff meetings. Current examples for DOE include the Dark Energy Camera, Dark Energy Survey Instrument (DESI), LSST, and the CMB Task Force.

AST has a high demand in its individual investigator programs. There are a suite of optical/infrared, radio, and solar telescopes being supported in the Division. DKIST and LSST construction is being done through the MREFC line of funding. AST is reorganizing its management of NSF's OIR facilities to optimize time-domain science. AST is also divesting of facilities given lower priority by the external review process to accommodate operations of new facilities and to maintain programmatic balance. AST is sponsoring the National Academies decadal survey to set future priorities for scientific direction and facilities development.

AST receives approximately 1,000 proposals a year, mainly in its Astronomy and Astrophysics Research Grants program. For 2018, the AAG budget was $50.85M, with a proposal funding rate of 22%. DKIST and LSST are currently under construction and full operations are expected in 2020 and 2022, respectively.

The National Center for Optical-Infrared Astronomy (NCOA) will integrate the NSF-funded entities-NOAO, Gemini, and LSST operations, under a single organization framework, managed by one management organization. NCOA initiation will be no later than October 2019. LSST operations is on track for initial funding in FY2019.

There was a very positive outcome for AST in the 2018 budget, a total of $307M, compared to the FY2017 actual of $252M. Much of the increase went to one-time specific projects (some dependent on FY2019 availability of funds to complete): MSIP, multi-messenger astrophysics grants, forward funding for DKIST operations for timely completion of the data center, funding of DKIST Level 2 data products, and Center infrastructure upgrades with awards to be made soon.

The FY2019 PBR is a decrease from the FY2018 request; Congressional appropriations subcommittees levels are higher. The NSF bill is not under consideration for passage before the end of the fiscal year, so initial operations after October 1 will be under a Continuing Resolution (NSF will be operating at the FY18 level). The FY2019 PBR allocates $30M each for *Windows on the Universe* and *Harnessing the Data Revolution* and $60M for mid-scale projects. These programs can support the mix of ground-based data acquisition, development of systems and structures for end-user data science and the theoretical modeling required for interpretation and prediction. Some solicitations and announcements are already appearing. These "off the top" investments in key future directions result in a ~8% reduction of core funding for AST in the PBR, given the flat top line request. Astronomers are well positioned to compete and win a larger total of research support than a flat-funded core grants program.

Planning is now underway for input into the next Decadal Survey. NSF/AST and NASA's Astrophysics Division are the primary sponsors of the survey. DOE's Cosmic Frontier in the Office of Science is also a sponsor. The Agencies and the National Academies have agreed on the statement of task; the entire process is then organized by the Academies. The NAS proposal for NSF's share has been awarded. NSF is including all ground-based astrophysics (i.e., gravitational wave detection and Astro-particle detection) for project prioritization, not limited to AST. A call for science white papers was issued with a due date of early 2019. NRAO held a series of three Kavli-sponsored workshops to identify and prioritize the key scientific problems the RMS community would address in the coming decade. NOAO is coordinating with the TMT and GMT projects to develop a community science case requiring time on both telescopes; the approach will be based on key science programs requiring substantial allocations of time. A new NSB report addresses how to handle lifecycle costs beyond scope of the individual divisions.

Ian Dell'Antonio asked what the timeline is for implementing NCOA. Richard Green replied that the working plan right now is have the organization stand up in October 2019. AURA needs to be submit their management-based cost model and NSF needs to review that information before NCOA can be approved. It will be implemented in phases, with the full matrix by FY2020.

Dieter Hartmann asked how multi-messenger astrophysics is being folded either into the Portfolio Review facilities that were on the way out and brought back in or resources in current facilities been allocated and dedicated, i.e., follow-up work on the ground; what is the actual mechanism that NSF would like see resources flow toward multi-messenger astrophysics? Richard Green replied that the $30M will be used of dedicated funding to respond to community-based proposals that address 2 of out the 3 messengers either by doing theory on a source that produces more than one messenger, or by having a scheme that merges datasets, or data analysis, or mobilizes instruments in some way contains more than one of the messengers.

DOE

Eric Linder gave an update on DOE activities. The DOE Office of High Energy Physics (HEP) fulfills its mission by building projects that enable discovery science, operate facilities that provide the capability for discoveries, and support a research program that produces discovery science. Through ground-based telescopes and arrays, space missions, and deep underground detectors, research at the Cosmic Frontier aims to explore dark energy and dark matter, which together comprise ~95% of the universe. There is a strong interaction with theory, detector R&D, and computational HEP.

The P5 strategy continues to define the investment in the future of the field. The FY19 Congressional bill increased project funding above the request. Profiles for high-priority projects recommended by P5 continue to ramp up. The Office of Science budget for FY 2019 was $6.585 billion. All Cosmic Frontier projects are fully funded. FY 2019 completes the funding for construction of the LSST camera, DESI, LZ, and SuperCDMS-SNOLab. Construction projects and fabrication of large pieces of experiment equipment costing over $10M are managed through a series of "Critical Decision (CD)" milestones. The CD process ensures successful execution and scientific return on agency investments.

HEP receives advice from several advisory committees including the High Energy Physics Advisory Panel (HEPAP), which is jointly chartered by DOE and NSF to advise both agencies; subpanels such as P5 also provide advice. The AAAC advises DOE, NASA, and NSF on selected issues in astronomy and astrophysics of overlap, mutual interest and concern. Formal advice is also provided by the National Academies. There are also community studies such as Snowmass, the CMB-S4 Concept Design Team, the Gemini-Blanco-SOAR telescopes roles subpanel of the AAAC, and tri-agency groups for such projects as LSST, WFIRST, and Euclid. DOE funding for the proposal for the Decadal Survey is in peer review.

For the Cosmic Frontier, the study of dark energy, dark matter, and cosmic microwave background are supported. Dark energy studies are done through a staged program of complementary surveys such as the Dark Energy Survey (DES), the fabrication of the LSST camera and DESI, and eBOSS. Search for dark matter is done through direct detection experiments over a wide mass range that includes LZ, SuperCDMS-SNOLab, and ADMX-G2. The study of cosmic acceleration at energies near the Planck scale and neutrino properties through the cosmic microwave background (CMB) will be done with new generations of the South Pole experiment and next generation CMB. Exploring the unknown, e.g. through high energy particles from dark matter annihilations in cores of galaxies are being coordinated through HAWC, Fermi/GLAST, and AMS.

HEPAP was charged in October 2017 to carry out a Portfolio Review; it was modeled on NSF's Portfolio Review and the NASA Senior Reviews. It was an independent peer review of currently operating experiments supported by HEP. The draft report was presented and accepted at the May 2018 HEPEP meeting. The groups and subpanels' recommendations were grouped into four categories: (1) experiments that should be pursued with highest priority, i.e., DES, eBOSS, NOvA, T2K; (2) experiments with outstanding promise and relevance to the P5 science drivers, but whose funding could be reduced somewhat in the event of severe budget shortfalls, i.e., HAWC, MINERva, NA61/SHINE; (3) experiments that address the P5 drivers in important ways, but for which a reduction in funding would clause less harm to the DOE/HEP program, i.e., Daya Bay, Fermi/LAT, MicroBooNE, SuperK; (4) experiments that require further demonstration of likely success, or whose future program is less effective in advancing the P5 science drivers, i.e., AMS, KOTO.

The Office of Science has several funding opportunities include workforce development programs, science undergraduate laboratory internships, visiting faculty programs, and early career research programs. The Early Career Research Program is highly competitive and the Cosmic Frontier has done well in both FY2017 (4) and FY2018 (5) doing dark energy, dark matter, and cosmic microwave background research.

HEP held a PI meeting in August. It is an opportunity to brief and guide the HEP community on future funding opportunities and to provide a status and overview of the DOE-supported HEP program. The meeting included general presentations during a plenary session covering the overall DOE-HEP program, budgetary issues, and different HEP FOAs at DOE to which PIs may apply; parallel sessions led by

individual DOE-HEP Program Managers (PMs) within the subprograms; and, opportunities for separate one-on-one sessions. There were about 150 participants.

HEP is maintaining the core of the DOE Science Mission, and that is reflected in the FY19 current plan. HEP is looking forward to participation in the National Academies 2020 Astronomy and Astrophysics Decadal Survey.

John O'Meara noted how much he appreciates DOE working with the other agencies are collaborative projects. He asked what the investment is for data management for DESI in order to get a sense of scale, considering the earlier discussions on data management. Eric Linder replied that the legacy surveys that are being released are not part of the DESI project costs; community service of DESI that is not costing directly money. The DESI data management is folded in the DESI operations so a specific number for the data management is not available now; operations and computing reviews are done to make sure the resources are there for analyzing and serving the data., e.g., getting the supercomputer time to serve, archive, and analyze the data; this is high profile so HEP is very conscious of the computing costs and the data management costs. He further asked when the DOE review of the 2020 Decadal Survey proposal from the National Academies will be concluded; Eric Linder replied that DOE expected an answer back to the National Academies in the early Fall.

Kelsey Johnson inquired about how DOE handles the release of data and software. Eric Linder responded by stating that the public release of data is done. For example, on October 1, DES is releasing its project data and the LSST Dark Energy Collaboration is already putting a lot of its software on the Noto site and Data Challenge 2. The different surveys are doing various things but there is no particular timeline where software aspects have to be released. All of the surveys are moving forward to be as useful as they possibly can with respect to release of data and software to reproduce the science results. She further asked about the Early Career awards and wanted to know if it was a strict requirement of 10 years beyond Ph.D. for applying for the awards, especially for candidates who may have children. Eric Linder replied that the Office of Science establishes the rules for the awards, however, there are three opportunities for candidates to submit their applications for the Early Career awards.

John O'Meara inquired about CMB and the MREFC process. Eric Linder responded by stating that the DOE keeps in contact with three offices at NSF (OPP, AST, and PHY) but he could not really comment on the MREFC process itself. DOE has bi-weekly to monthly meetings to work on the issues; NSF needs to a proposal and DOE is using a pre-design group as the way to put together a design so that it can eventually do into the Critical Decision review. The agencies operate differently but clear communication is essential for keeping everything in sync. Richard commented that it has been AST's position that to start the path of full-scale investment and NSF's share of that investment, the project concept really needs the full endorsement of the Decadal Survey and now that the NSF Director has made it clear that she wants a broad interpretation of what astronomy and astrophysics is. In encompassing the other divisions recommendations, AST needs to wait until all the considerations for astronomy and astrophysics get a thoroughly uniform review by the Academies, however, AST should do what it can to prepare major projects to put their best foot forward to that process; will be seeing proposals the CMB consortium, the large optical/IR consortium, etc. to help them prepare for initial science white papers but the subsequent deeper analysis the Decadal is likely to give them. There are paths that AST can take to keep the projects moving until AST gets advice from the Decadal Survey.

Constance Rockosi asked some additional questions about data releases. The DES release that will correspond with the Year 1 cosmology data, was that originally part of DES plan, was it part of the project scope? Eric Linder replied that DES went through its Critical Decision process laying out its scope before there was an Office of Science data management or an AAAC *Principles of Access*, so at that time it was not specified what would be done and what sort of public releases there would be as far as

data and software, etc. Historically that does not have as many specifics that would be put into a project that is now going through the Critical Decision process.

Shane Larson asked about the Principal Investigator (PI) Conference that DOE organized in August. He wanted to know what DOE's goals were with the meeting, the way it was implemented, and what the outcomes were. Eric Linder replied that this is the third or fourth year (odd years with APS/DPF) that DOE has done this so it relatively new. The community is responding positively to holding these conferences; DOE does special sessions at the meeting. The meetings are a way for the community to come up to date on the status of DOE projects, the status of the HEP budget, to communicate how DOE is listening to the community advisory agencies (AAAC, HEPAP, P5), talking about new funding opportunities. There were several sessions at the most recent meeting on how the works on a federal level (HEP, DOE Office of Science, DOE Secretary, OMB, Congress, etc.); there was also an early Career session that was well attended as well as a Diversity, Equity, and Inclusion session. The meeting is also an opportunity for the PIs to meet individually with the program managers. There were poster sessions where the PIs could explain what they are doing; extremely helpful for both the program managers and the university PI.

Rachel Bean asked about delays in funding and what impacts it will have on the upcoming fiscal year. Eric Linder replied that for FY2019, DOE will not be under a Continuing Resolution (they will have an appropriation) and will know what funding is available at the beginning of the new FY which makes planning easier. Regarding the individual funds for the grants program, the funding opportunity for HEP Research has not been released yet; it is hoped that it will be released soon then a reasonable amount of time will be given for individuals to submit their proposals and the proposals reviewed and funds allocated. The funding for new proposals will occur in sometime in 2019; the funding for continuation and renewal proposals may not match up to when their current grants expire because HEP does not know when the review panels will occur because there is no funding announcement yet; no cost extensions are the way to matching that up and universities also allow 90-days pre-spent once HEP gives its the level of recommendation even though the DOE funds are promised but have not arrived yet.

NASA

Paul Hertz provided an update on NASA Astrophysics activities. He presented some recent science highlights for 2018. The NuSTAR mission proved that the superstar Eta Carinae shoots cosmic rays; NuSTAR is picking up radiation caused by cosmic rays interacting with the interstellar medium around Eta Carinae and locking down that Eta Carinae is a source of high energy cosmic rays, one of the mysteries is trying to figure what the sources are. The Hubble telescope has shown that our solar system's first know interstellar object, *Oumuamua*, was not following a ballistic trajectory but was accelerating away from a ballistic trajectory; one theory is that it was outgassing at the surface and became active as it passed closest to the Sun not unlike the surface of a comet. The Spitzer Observatory showed how water is destroyed then reborn in ultrahot Jupiters on the dark/night side of planets. The Chandra Observatory showed the source over two different epochs and the high energy peak is consistent with what one would see if a planet had been devoured by a star that was omitting x-rays.

NASA's Astrophysics program is led by strategic missions (in response to decadal surveys) and PI-led missions (Explorer missions) that are supported by research and technology (R&A, suborbitals, CubeSats, ISS). The FY2018 budget for Astrophysics was $1.38B which included mission development (including GO), mission operations, research and technology, and infrastructure and management. WFIRST and JWST will have its own program offices within the Astrophysics Division.

Some of the major accomplishments include SOFIA returned to science operations following an extended maintenance period in May. Funds were appropriated by Congress in FY18 to allow WFIRST to begin

Phase B design. NASA submitted the Webb replan cost and schedule report to Congress based on the results of the independent review board report in June. TESS entered science operations in August. Planned activities for FY2019 include the Antarctic balloon campaign in December 2018 through February 2019. The next Astrophysics Midex and Mission of Opportunity will be downselected in January. The SOFIA five-year review will be conducted in early 2019 but will not be in the Senior Review in the spring; it is important to Congressional appropriators that SOFIA not be subject to a Senior Review. The Astrophysics Senior Review (includes science productivity review of SOFIA) will be conducted in Spring 2019. Kepler will be completing its mission when the fuel is exhausted.

The FY19 budget request proposes a reduced level of funding for NASA Astrophysics. The total requested PBR funding for FY2019 is ~$1.185B, a reduction of $200M (14%) from the FY2018 appropriation. Webb is included as a project within the Astrophysics budget; integration and testing continues toward a launch in 2021. Given its significant cost within a proposed lower budget for Astrophysics and competing priorities within NASA, WFIRST is terminated from the PBR with remaining WFIRST funding redirected towards competed astrophysics missions and research. The House and Senate Appropriations Committees markups will need to conference in order to provide an appropriation for the Astrophysics Division.

Shane Larson asked if justification is provided for each of the numbers that Astrophysics provides to Congress. Paul Hertz replied that on the web page for NASA's FY2019 budget there is a document that has the narrative and the spreadsheet of all the numbers that is submitted to Congress.

The Research and Analysis programs supports data analysis, the Guest Observer program, mission science and instrumentation, archive and theory programs, fellowships, etc. There has been a 26% increase in Research and Analysis (R&A) support since the last Decadal Survey and there is a notionally planned increase of ~28% over the next five years; this includes the CubeSat initiative. The Theoretical and Computational Astrophysics Networks (TCAN) supports coordinated efforts in fundamental theory and computational techniques; aims to unite researchers in collaborative networks that cross institutional and geographical divides. It was originally funded by NSF and NASA but only NASA participates currently. The last call for proposals was in 2012 but a call for proposals was issued in ROSES-2017 with a $1.5M allocation of funds. Proposals were due in January 2018 and selections were made in June; 3 proposals were selected. The selection rate for Guest Observer programs is ~32% whereas the selection rate for the R&A program is around 20%; 80% of PIs are notified within 89 days of submission. The funding for research grants is going up but the proposal numbers are going up faster, which brings the success rate down.

Kelsey Johnson and Rachel Bean would like to see some statistics on the size of the grant awards from all of the three agencies. Paul Hertz recommended that a specific request be sent to the Agencies for that information, so a formal response can be sent back to the Agencies.

In response to a National Academies review of NASA's Planetary Science Research and Analysis Programs that recommended that NASA investigate ways to ensure high-risk/high-payoff fundamental research and advanced technology development activities because there is a perception that NASA is hostile to innovative high-risk research, NASA asked peer reviewers to grade the proposals they had just reviewed separately on impact and risk; the peer reviewers looked at 1,577 proposals submitted to the ROSES-2017 program. The results were that 10% of the proposals examined were judged to be high-impact/high-risk, 24% of all of the proposals (regardless of risk or impact) were selected for funding, and 35% of the high-risk/high-impact proposals were selected for funding. There was no evidence that high-impact/high-risk lowered the success rate; success rates are highly correlated with impact (merit) and they are not correlated at all with risk; no correlation of whether the panel thought it was risky but highly

correlated that it was worth doing. The community should propose high-impact proposals and if they are risky that is the nature of high-impact work.

NASA has developed a Code of Conduct for its panels/chairs that strives for an inclusive and professional environmental for all participants in NASA activities. These are reviewed at all panel reviews before they start. The Astrophysics Division initiated this effort and the rest of NASA has taken this on as well.

The Astrophysics Division has 4 CubeSats in process and has just awarded a 5th CubeSat. TESS has launched and is working well; the ground-based follow-up program is underway. JWST is scheduled for launch in March 2021 with an 80% confidence cost level; NASA is implementing the IRB recommendations with the IRB assessing the progress of implementing those recommendations in November. NASA has completed all of the repairs with the problem of the fasteners on the spacecraft and will re-do the acoustics test in November. Tests have been completed on the payload and the GO call will be re-issued in late 2019/early 2020. The telescope will be deployed 2 more times before it is stowed for launch. The new development cost of $8.03B; the increased development cost is $805M through commissioning. The existing operations budget through FY2021 is ~$310M, so ~$490M additional funding is needed for FY2020-FY2021. WFIRST was terminated in the FY2019 PBR but funds were appropriated in FY2018 to allow WFIRST to begin Phase B. NASA's budget allows for 4 Explorer missions recommended by the Decadal Survey; the next Announcement of Opportunity will be issued in Spring 2019. There is a new class of small missions, SmallSats, that are between a typical R&A and Explorer Mission of Opportunity project: NASA will fund mission concept studies in advance of the 2019 SMEX/MO AO.

NASA will have its Senior Review in 2019. Proposals from the missions will be due in 2019 and the panels (Chandra and Hubble separate panel; other missions, Fermi, NICER, NuSTAR, Swift, TESS, and XMM-Newton) will meet and make their recommendations to the Senior Review Subcommittee, who in turn reports to the Astrophysics Advisory Committee who make formal recommendations to NASA.

The Astrophysics Division is planning for the next decadal survey. In early 2018, NASA tasked the CAA to provide an independent assessment of NASA's preparations for the 2020 Decadal Survey and suggested some improvements. The CAA released a short report in July 2018 with seven findings aimed at improving the value of the studies to the Decadal. The Decadal Survey will go ahead as planned; NASA is waiting for the proposal from the National Academies to fund the effort. The large mission concept studies are underway along with the Probe-size mission concepts.

Dieter Hartmann asked whose makes the decision to discontinue a project if another agency, i.e., ESA, has a similar project. Paul Hertz replied that it is his responsibility to make those decisions, but they are based on discussions of the peer review panels and other reviews. For example, NASA decided to discontinue the FINESSE project because it was similar to ESA's ARIEL project; both of them were good projects but 2 similar projects were not needed and ESA made its decision first. This was part of a strategic decision in which the PI for FINESSE was also the PI for a proposal to provide a contribution to ARIEL and his proposal was that he would do whatever NASA decides based on what ESA does.; the peer review panels endorsed the strategy that NASA executed.

Multi-Messenger Astrophysics – NSF Windows on the Universe

A team of NSF and NASA program officers gave a presentation on one of the "Big Ideas," *Windows on the Universe, the Era of Multi-messenger Astrophysics* that NSF is pursuing. The NSF/NASA team (Jean Cottam Allen, Ralph Gaume, Jim Whitmore, Pedro Marronetti, Matt Benacquista, and Rita Sambruna) provided the goals and implementation plans for the effort, an update on some recent awards for aLIGO

and IceCube and the alert systems for both facilities and how they go out into the multi-messenger environment, and efforts in interagency coordination in multi-messenger astrophysics.

Jean Cottam Allen noted that the binary neutron star merger detected by aLIGO in August 2017 was the first multi-messenger astrophysics result detection observation using gravitational waves. There were many interesting things that resulted from using multiple facilities and messengers. The flaring blazar observation in September 2017 was the first multi-messenger observation that used IceCube electromagnetic spectrum; important consequences is that this occurrence was with more than one messenger. This is a new era of multi-messenger astrophysics.

Scientists can now probe the universe through several powerful and diverse windows, electromagnetic waves, high-energy particles, and gravitational waves. Each of these windows provides a different view and together they reveal a detailed picture of the Universe that allows scientists to study matter, energy, and the cosmos in new ways.

Ralph Gaume noted that science community does not need to think of multi-messenger as only seeing objects in or outside our galaxy. NSF has a very active solar program and this type of science is multi-messenger as well; the Solar Orbiter is an ESA program that will be detecting electromagnetic radiation out of the plane, the Parker Solar Probe is particles, and NSF is development the DKIST solar telescope.

The goals of *Windows on the Universe-Multi-messenger Astrophysics* (WoU-MMA) program are to build the capabilities and accelerate the synergy and interoperability of the three messengers to enhance and accelerate the theoretical, computational, and observational activities within the scientific community; building dedicated midscale experiments and instrumentation; and, exploiting current facilities and developing the next generation of observatories. Enhanced investments in the activities of the scientific community will help to build a new workforce that is skilled in this new paradigm. New experiments and instrumentation in the midscale project range will make critical contributions to the multi-messenger research infrastructure by enabling new capabilities in energy range or sky coverage, improved sensitivity, or new computational and data analysis capabilities. Enhanced infrastructure and modest upgrades will enable the full utilization of the current generation of multi-messenger facilities. Investments in the planning and development for the next generation of observatories will accelerate progress to realize significantly greater capabilities and extend scientific reach.

Jean Cottam Allen noted that the WoU-MMA program description was posted in July. Proposal can be submitted to participating programs in MPS/AST, MPS/PHY and the Office of Polar Programs. There is a coordination group that is facilitating the activity across the Divisions and offices. The proposals are funded through the "Big Idea" funds allocation ($30M for FY2019) as well as through existing program funding. The WoU-MMA programs will welcome proposals in any area of research supported through one of the criteria outlined in the program description: (1) Coordination: hardware, software, or other infrastructure to coordinate observations involving more than one messenger; (2) Observations: observations of astrophysical objects or phenomena that are potentially sources of more than one messenger, including the use of existing observatories, experiments, and data archives, as well as the development and construction of new capabilities for advancing multi-messenger astrophysics; and, (3) Interpretation: theory, simulations and other activities to understand or interpret observations of astrophysical objects that are sources of more than one messenger.

There may be proposals that are co-reviewed by the three divisions. No new mechanisms will be opened up at this time; scientists will need to submit their proposals against existing programs. Proposals will be tagged by the program officers unless the proposers do that at the time of submission.

The Division of Physics together with the Office of Advanced Cyberinfrastructure funded a workshop in May to look at cyberinfrastructure for multi-messenger astrophysics. The workshop participants concluded that there needed to be the formation of an Institute for Multi-messenger Astrophysics that would coordinate resources to address the many challenges associated with cyberinfrastructure including adaptive and rapid-response observing campaigns, high-volume datasets, etc. NSF received a set of collaborative research proposals, one of which was selected (Patrick Brady, U Wisc-Milwaukee) for funding community-building activities to document cyber needs for MMA. A strategic plan is to be developed which would propose the mission for the institute, develop high priority areas for cyber research and development, and a strategy for managing and evolving services that benefit an engage the MMA community; plan to be completed by July 2019.

Jim Whitmore noted that to take advantage of multimessenger opportunities, the IceCube Neutrino Observatory has established a system of real-time alerts that rapidly notify the astronomical community of the direction of astrophysical neutrino candidates. From the start of the program in April 2016 through October 2017, 10 public alerts have been issued for high-energy neutrino candidate events with well-reconstructed directions. An upgrade proposal for IceCube was recently awarded which will deploy 7 strings (each 100+ DOMs) in the center of the IceCube Deep Core array. The main science objective is multi-messenger astrophysics for the PeV universe; would improve IceCube's capabilities for neutrino astronomy by inserting additional calibration devices.

Pedro Marronetti noted that Advanced LIGO Plus is the first upgrade of aLIGO, done in collaboration with the UK and Australia. NSF has made an award for the US contribution, STFC is reviewing the UK proposal, and ARC is currently supporting the Australian team. Construction will start in 2020 with operations in 2023/2024. A+ will increase aLIGO's design sensitivity by a factor of 1.5-2.0, leading to an event rate of ~5 times larger; A+ will have improved capacity for constraining the neutron star equation of state (EOS). Improved mirror coatings will reduce Brownian thermal fluctuations in the middle of the frequency range. Gravitational wave (GW) triggers notices are sent through the Gamma-ray Coordinates Network (GNC); this process was in place for the first and second aLIGO run but is being revamped because the increased sensitivity in the next aLIGO run may lead to 2 triggers/one GW event per week. Starting with the third observing there will be public alerts. If the event is confirmed, the GNC Circular will include an updated Sky map.

Shane Larson asked if the events would be for all source classes or for example, just binaries and spirals, but not supernova. Pedro Marronetti replied that it was his understanding that it would be for all sources.

Matt Benacquista noted that in order to do it right, multi-messenger astrophysics needs to be done from both the space and the ground. An Interagency Multimessenger Taskgroup is being developed and he and Rita Sambruna (NASA) are the responsible leads for the group. Membership is drawn from both the civil servant and IPA workforce at the two agencies. The group is now working out organization and agency reporting details; enhance communication and interagency cooperation between the agencies and designed to be flexible enough to include other agencies and. There was a joint NSF/NASA Town Hall on multi-messenger astrophysics at the summer AAS meeting. The purpose was to bring together members of the community; several panelists representing the gravitational wave and electromagnetic community were invited; discussion of various issues between the agencies, i.e., improved communications, interagency cooperation in review and funding of MMA proposals, improved joint scheduling of observations from NASA and NSF facilities, and improved support for modeling, simulations and predictions.

Shane Larson asked how international cooperation will be factored into any discussions. Matt Benacquista indicated that the group will be looking at that as well as they move forward. Also, during

Target of Opportunity events, selective facilities may be utilized instead of every telescope trained on the event.

There is a WoU team led by the MPS and GEO Assistant Directors with a Windows Working Group co-chaired by the Astronomical and Physics Divisions.

John O'Meara asked if the U.S. needs to be strategizing about how to take a larger leadership role in, for example, gravitational waves. Paul Hertz commented that the mid-term review made a recommendation that NASA should take a larger role in LISA (LISA is a ESA-led mission), and in response NASA has increased its role in LISA from approximately a 10% partner to a 20% partner; that is the current baseline plan and any change in that plan would require additional out-year funding and would have to be prioritized with other decadal survey recommendations for how to spend out-year funding.

Constance Rockosi asked about the co-review of proposals that would be submitted. Jean Cottam replied that NSF does co-review of proposals all of the time; there are proposals that are submitted to both divisions that are co-reviewed and co-funded. and this has been happening for many years.

John O'Meara was encouraged to hear that there are already discussions about data infrastructure. Discussions about this topic with individual agencies will only get amplified when multiple telescopes from multiple agencies are used; anything that can be done to get out ahead early on not just having the data but having the data infrastructure commonality across things such as standards would be good.

NAS Report on Exoplanets

David Charbonneau (Harvard CfA) and Scott Gaudi (OSU) gave a presentation on the recently published *Exoplanet Science Strategy* report (study requested by NASA); both were co-chairs of the Committee on Exoplanet Science Strategy (Space Studies Board). The Committee met several times and the report was delivered to NASA in August., with a public release on September 5. The Committee was asked to survey the status of the field of exoplanet science, including the use of current and planned facilities such as TESS, JWST, WFIRST, and any other telescope, spacecraft, or instrument as appropriate. They were to recommend an exoplanet science strategy that outlines the key scientific questions for exoplanet science and research and related near-, medium-, and far-term measurements and technology goals. The committee was to consider and regularly consult with the concurrent study "State of the Science of Astrobiology," in the area of assessing habitability, searching for signs of life, and other relevant areas of scientific overlap; was instructed not to revisit or redefine the scientific priorities or mission recommendations from previous decadal surveys.

Shane Larson noted that this looked more like an observational strategy but was this also imagined to be a theory strategy as well. David Charbonneau replied that it was not meant only to be an observational strategy but an overall strategy to achieve the science and that definitely requires intensive theoretical work in addition to new observational sources and laboratory settings.

David Charbonneau noted that the Exoplanet Science Strategy Committee concluded that a space-based exoplanet imaging mission is needed and recommended that NASA lead this imaging mission capable of measuring the reflected-light spectra of temperate terrestrial planets orbiting Sun-like stars. They also recommended that NSF should invest in both the GMT and TMT and their exoplanet instrumentation to provide all-sky access to the US community. In addition, Scott Gaudi noted that the Committee recommended that NASA should launch WFIRST to conduct its microlensing survey of distant planets and to demonstrate the technique of coronagraphic spectroscopy on exoplanet targets in space.

David Charbonneau indicated that NASA and NSF should establish a strategic initiative in extremely precise radial velocities to develop methods and facilities for measuring the masses of temperate terrestrial planets orbiting Sun-like stars; an example is the NN-Explorer project supported by NSF and NASA.

Scott Gaudi commented that NASA should create a mechanism for community-driven legacy surveys of exoplanet atmospheres early in the JWST mission. Building on the NExSS model, NASA should support a cross-divisional exoplanet research coordination network that includes additional membership opportunities via dedicated proposal calls for interdisciplinary research and support a robust individual investigator program that includes grants for theoretical, laboratory, and ground-based telescopic investigations. Engaging the entire community is essential for exoplanet science. To maximize scientific potential and opportunities for excellence, institutions and organizations can enable full participation by a diverse workforce by taking concrete steps to eliminate discrimination and harassment and to proactively recruit and retain scientists from underrepresented groups. Development and dissemination of concrete recommendations to improve equity and inclusion and combat discrimination and harassment would be valuable for building the creative, interdisciplinary teams needed to maximize progress in exoplanet science over the coming decades.

John O'Meara thanked the Committee for emphasizing the need to maximize progress in exoplanet science by making sure that a diverse workforce is able to do their science without discrimination and harassment; this is a critical topic that needs to be addressed in the next Decadal Survey.

Constance Rockosi had a question about the timing of the activities, the EPRV initiative was nominally scheduled to happen in the 5-15-year timeline. She wanted to know why it was not considered a near-term activity given the state of the landscape now. David Charbonneau replied that none of the initiatives fit cleanly in the timeframes outlined; scientists will need to work on the technology now for the space-based direct imaging mission that might be launched in the 15-20-year timeframe and one should think more about the fact this is the time when scientists will be thinking heavily about the investment needed for each of the initiatives during these timeframes.

Interagency cooperation and coordination are discussed in Chapter 5 of the committee report in answer to John O'Meara's statement about interagency cooperation on these initiatives. The report discusses this in detail as part of their charge. For instance, when NSF and NASA collaborate, it is extremely efficient use of resources and very productive. For example, what would the Kepler mission had been, if ground-based astronomy had not measured masses of those planets.

Decadal Survey Planning

Steve Ritz, the CAA Co-chair, gave an update on the CAA activities and decadal survey planning. The CAA helps the National Academies and the Agencies think through relevant issues as they generate the statement of task, stimulate and gather community inputs in advance of the Survey, and pave the way into the Survey. The CAA are continuing to discuss Astro2020 preparations, including the role of State of the Profession; discussed with AAS the types of inputs that can be provided and aspects of the call for white papers. There is a special event in October for early career astronomers to learn about the decadal process. A call for white papers was issued with a deadline of January 18, 2019. In the Call document, it anticipated that there will be one or more additional call(s) for white papers on other essential topics, such as issues relating to the state of the profession and to missions, projects, and technology development, once the survey begins along with getting advice on what demographic information could/should be collected with the science white paper submissions. There will be an AAS Town Hall meeting at the January AAS meeting where the survey leadership will be introduced. The CAA is also reaching out to other related fields, i.e., particle physics.

There is a Consultation Group (CG)who have worked closely with the National Academies in the drafting of the statement of task and prospectus for Astro2020. They are also helping to identify Survey chair candidates. The CG had been meeting frequently and will conclude when funding for the survey comes from the agencies.
Rachel Bean noted that last year one of the AAAC meetings, there were some questions asked about how the subcommittees are formed in the Decadal Survey process and what are the best practices and policies they use to make sure that the pool of subcommittee members is broad. Steve Ritz indicated that there are established NAS procedures that were used in the last Decadal Survey and cannot imagine that they will not be used in the next Decadal Survey. There will be emails to the community asking for suggestions for committee members as well as detailed evaluations of the people on the committees to make sure that everyone's voice is heard and that the committee is diverse in many ways. Rachel would like to see a copy of those formal policies that guide the selection. John O'Meara re-iterated that it is extremely important that everything possible to done make sure that the best practices and guidelines are displayed out-front by the Academies in their selection of committee members because it helps to instill confidence that is lacking right now in the community.

Richard Green wanted to know if the expansion of the statement of task to include a wider interpretation of multi-messenger astrophysics has had an impact on the structure and composition in terms of expertise on the subcommittees. Steve Ritz replied at this time there is an ongoing effort to identify and confirm the leadership of the Survey; they will work on the statement of task with all of the stakeholders about the committee composition; it is very important to get the Survey leadership early in the process.
This has not had an impact yet, but it is something that has been discussed in the consultation group.

Several AAAC members suggested that the deadline for submitting white papers be extended in order to give the community time to prepare meaningful input to the Survey.

Additional Discussions

John O'Meara reminded the Committee that the primary output is the annual report to Congress and the Agencies; he encouraged the members to read last year's report. Some of the general themes that the Committee may want to think about for the next meeting are state of the profession (decadal survey; capture any explicit information from the agencies on this), data infrastructure and data management which need to be part of a project from the beginning. With regards to that topic, Paul Hertz indicated that it would be useful to estimate some costs because they are opportunity costs. When NASA partners on a project, it makes sure that the data is made available to U.S. scientists in open and usable way but can increase the cost by as much as 50% over just providing some hardware and funding a few members of the science team.; that is built in, but it may mean that across Astrophysics, there may be a few less experiments or collaborations. All of the NASA projects have work breakdown structures (WBSs) where one can pull out that information on the data systems in a response to John O'Meara's question about examples. The archives which will be Senior Reviewed in 2020 will look at the value of each of the holdings in their archives. Richard Green commented that if there is added information that might be wanted as part of the release i.e., documented code, that would need to be found out of the operations budget if it was not built in at the beginning; understanding from a scientific perspective which of these additions make the most added value for the funds added is very helpful to the agencies. Paul Hertz indicated that NASA asked the National Academies over a year ago to do a study on the value of archiving the codes, not just data analysis codes but also theory codes and other codes, and that report will be released in a few weeks; it should be relevant to the current discussion of data management and infrastructure.

Constance Rockosi noted that two of the "Big Ideas," *Windows on the Universe* has been discussed extensively at this meeting but there is another "Big Idea," *Harnessing the Data Revolution*, that has not

had as much discussion. Will there be an effort to integrate the data initiative into astrophysics? Richard Green replied that yes, but the outcome is to be determined. A solicitation is anticipated coming out but the group at NSF managing that solicitation have a particular idea about how they see that going which may or may not be a match to all the astrophysics data initiatives.

John O'Meara noted that the GBS Subcommittee (chaired by Klaus Honscheid) was recently established to form some decision making that is happening at the upcoming Gemini Board meeting. It is an assessment of whether or not the Gemini, Blanco, and the SOAR telescopes are providing the capabilities that they need for the astronomical landscape in the next ten years like multi-messenger astrophysics, LSST follow-up, dark energy, etc. The question is whether Gemini, Blanco, and SOAR offers or plans to offer what is needed for the community to do what is going to be changing science in the next few years. The committee is planning an in-person meeting in early October with a verbal report to the AAAC before the Gemini Board meeting. Ian Dell'Antonio who is a member of the subcommittee indicated that the subcommittee has been meeting regularly by teleconference. The subcommittee has members with a wide range of expertise from multi-messenger, cosmology, and exoplanets. Discussions have centered around the key topics from the decadal survey and for each one, the subcommittee is looking at the instruments, the science cases, and are they prepared for such things as multi-messenger astronomy or follow-up of LSST transients. The subcommittee have asked the representatives from each of the observatories and representatives from LSST and other parts of the science community to come to the October 9 meeting and talk with the subcommittee; first draft by the October meeting. The goal is to have a version of the report that is clear enough for it to be used by the Gemini Board in their discussions for the future.

Shane Larson asked if the question is to understand what can be done with the facilities as they are or is the question what to map out for the facilities in the future. Ian Dell'Antonio replied it is what they are currently and what their plans are for the future. One of the questions the subcommittee has asked the observatory directors is how their plans for the next ten years fit into the overall scheme for multi-messenger astronomy, etc. The subcommittee is using several published reports as background information to guide their discussions. The GBS report should be available for the AAAC to comment on for their annual report. Richard Green commented that the report could be useful as input to the decadal survey.

John O'Meara commented that he hoped the committee had a chance to take a look again at last year's annual report. The report has a structure that has not changed much over the years, starting with a series of science highlights, followed by a set of findings and recommendations. Much of the discussion in yesterday's sessions, centered around the Agencies response to the report recommendations. The committee will draft the report in time to get feedback from the agencies before it is sent to Congress in mid-March.

Kelsey Johnson asked how well the annual report is received by Congress and other stakeholders and has there been any feedback from Congressional staff on the report. Ashlee Wilkins (AAS) indicated that the Congressional staff do read the reports and sometimes will listen in on the Committee meetings. Kelsey indicated that it would be good to have some official feedback on the reports and suggested that the AAS might be able to look at past reports to see if the reports are fine in their present form or improvements need to be made in order for them to be useful to the various stakeholders. Richard Green indicated that some of the topics that have been of interest to Congressional staff over the past year or so are of course, scientific discovery, but also divestment and forward look on MREFC, and they have not explicitly referred to the AAAC's report in any discussions. Jim Ulvestad noted that there is a different perspective from the appropriators then from a particular Congress member.

Topics for discussion at the January 2019 meeting will include the standard agency reports, issues

regarding the Decadal, and the preparation of the annual report.

MEETING ADJOURNED AT 12:00 PM, 21 SEPTEMBER 2018