HIGH ENERGY PHYSICS ADVISORY PANEL
to the
U.S. DEPARTMENT OF ENERGY and NATIONAL SCIENCE FOUNDATION

PUBLIC MEETING MINUTES

Gaithersburg Marriott Washingtonian Center
9751 Washingtonian Blvd
Gaithersburg, MD 20878

September 29 - 30, 2014

HIGH ENERGY PHYSICS ADVISORY PANEL
SUMMARY OF MEETING

The U.S. Department of Energy (DOE) and National Science Foundation (NSF) High Energy Physics Advisory Panel (HEPAP) was convened at 9:00 a.m. EST on Monday, September 29, 2014, at the Gaithersburg Marriott Washingtonian Center, Gaithersburg, MD, by Panel Chair Andrew Lankford.

Panel members present:

Andrew Lankford, Chair	Robin Erbacher	Patricia McBride
Ilan Ben-Zvi	Karsten Heeger	Gabriella Sciolla
Mary Bishai	Georg Hoffstaetter	Ian Shipsey
James Buckley	A. Hassan Jawahery	Thomas Shutt
Bruce Carlsten	Zoltan Ligeti	Paul Steinhardt
Mirjam Cvetic		Robert Tschirhart

HEPAP members joining by conference call:
Tao Han

HEPAP members unable to attend:
Ursula Bassler John Carlstrom Hitoshi Murayama Leslie Rosenberg

HEPAP Designated Federal Officer:
Glen Crawford, U.S. Department of Energy (DOE) , Office of Science (SC), Office of High Energy Physics (HEP), Research Technology, Detector R&D, Director

Others present for all or part of the meeting:
Anwar Bhatti, DOE
Greg Bock, Fermi National Accelerator Laboratory (Fermilab), Associate Laboratory Director for Particle Physics
David Boehnlein, DOE, SC, HEP, Energy Frontier, Physics Research
John Boger, DOE, SC, HEP, General Accelerator R&D
Fred Borcherdt, Fermi National Accelerator Laboratory (Fermilab)
Raymond Brock, Michigan State University
Jeff Carson, White House Office of Science and Technology Policy
Lali Chatterjee, DOE, SC, HEP, Computational High Energy Physics
Jim Cochran, Iowa State University
Corey Cohn, DOE
Mark Coles, National Science Foundation
Michael Coske, American Association for Advancement of Science
Jean Cottam, NSF, PHY, Particle Astrophysics, Program Director
Patricia Crumley, DOE
Robert Diebold, Diebold Consulting
Saul Gonzalez, NSF, Division of Physics, Experimental Elementary Particle Physics
Rajan Gupta, Los Alamos National Laboratory (LANL)
Nick Hadley, University of Maryland
Jeter Hall, Pacific Northwest National Laboratory (PNNL)

Mike Harrison, BNL
Don Henhill, Cornell University
Alex Kanavaglis
Young Kee-Kim, University of Chicago
Peter Kim, DOE, SC, HEP, Detector R&D
John Kogut, DOE, SC, HEP, Facilities Operations
Ted Lavine, DOE SC
Dan Lehman, DOE
L.K. Len, DOE
Elaine Lessner, DOE
David Lissauer, BNL
Laurence Littenberg, Brookhaven National Laboratory
Nigel Lockyer, FNAL
Ken Marken, DOE, SC, HEP, General Accelerator R&D
Helmut Marsiske, DOE, SC
Bob McKeown, Jefferson Laboratory
Donna Nevels, Oak Ridge Associated Universities (ORAU)
David Nygren, University of Texas-Arlington
Scot Olivier, Lawrence Livermore National Laboratory
Ken Olsen, Superconducting Particle Accelerator Forum of the Americas
Luis Orotto, University of Maryland
Ritchie Patterson, Cornell University, Director of CLASSE, Professor of Physics
Abid Patwa, DOE, SC, HEP, Energy Frontier, Physics Research
Michael Procario, DOE
Lee Roberts, Boston University
Carly Robinson, DOE
Natalie Roe, LBNL
Simona Rolli, DOE, SC, HEP, Theoretical Physics
Rob Roser, Fermilab
Randy Ruchti, NSF, PHY, Experimental Elementary Particle Physics, Program Director
Bernard Sadoulet, University of California-Berkeley
David Salamon, DOE
Linda Severs, ORAU
James Shank, National Science Foundation
Nigel Sharp, National Science Foundation
Tom Shott, Stanford University
James Siegrist, DOE, SC, HEP, Associate Director
Anthony Spadafora, LBNL, Physics Division, Deputy
Bruce Strauss, DOE
David Sutter, University of Maryland
James Symons, LBNL
V.L. Teplitz, NASA
Kathleen Turner, DOE, SC, HEP, Cosmic Frontier
Michael Tuts, Columbia University, Experimental High-Energy Physics, Professor
Bruce Wafford, ORAU
Karsten Weegu

Jim Whitmore, NSF
P.K. Williams
Rik Yoshida, ANL
Charles Young, Stanford University
Jae Hoon Yu, University of Texas-Arlington
Michael Zisman, DOE

SEPTEMBER 29, 2014

OPENING REMARKS

The U.S. Department of Energy (DOE) and National Science Foundation (NSF) High Energy Physics Advisory Panel (HEPAP) was convened at 9:00 a.m. EST on Monday, September 29, 2014, by **Panel Chair Andrew Lankford**. The meeting was open to the public and conducted in accordance with Federal Advisory Committee Act (FACA) requirements. Attendees can visit http://science.energy.gov/hep/hepap for more information about HEPAP.

DOE OFFICE OF SCIENCE REPORT

Patricia Dehmer presented an update from the DOE Office of Science (SC). She noted that Congress has adjourned for the election cycle so there is little action on nominees for the DOE. Upon their return on November 12, Congress will review 112 confirmations and the continuing resolution.

Dehmer reviewed the DOE Office of High Energy Physics (HEP) budget. She pointed out that HEP did well in House and Senate marks. Dehmer hopes that these levels are sustained into appropriation.

The P5 Report was published and represented two-months of activity. Dehmer views it as one of the most impactful reports during her 19 years with the DOE. Lankford and Steve Ritz gave many presentations and briefings to the Hill. The Report has been impactful. Congressional staffers were briefed and want to see how their FY15 appropriation marks will align with the report. The Office of Management and Budget (OMB) was briefed on the FY16 budget. They want to see how HEP's budget is aligned with the P5 Report. The report is something with which they want to help, and all are looking for alignment with budget proposals and new activities.

In 2012, OMB asked for cuts to STEM education and workforce development programs in 10 Federal agencies. Within DOE, this included cutting nine programs.

In response to OMB passback language that asked for an evidence-based assessment of workforce needs, SC tasked its six FACA committees to do an assessment. Dehmer shared findings on SC workforce development needs. The findings were presented to DOE Secretary Moniz. Responses pointed to 50 specific disciplines that need greater emphasis. Several cross-cutting areas are computational sciences, accelerator and detector R&D, instrumentation, and nuclear chemistry / radiochemistry. Interdisciplinary science was emphasized by several programs and labs.

Survey comments suggest that more can be done to train scientists at levels needed by national laboratories and industry. Comments showed that a high-energy physics Ph.D. is rare in the U.S., and that accelerator science and technology are not yet broadly recognized as an essential, vital, and exciting frontier research fields.

SC was able to keep three programs: the U.S. Particle Accelerator School, the Computational Sciences Graduate Fellowship (CSGF), and the Summer School for in Nuclear Chemistry and Radiochemistry. The CSGF is vital and a model for other programs.

There were other STEM training programs nominated as appropriate for SC that involve DOE laboratories as a unique asset.

Survey comments pointed out that at least 70 percent of applicants to openings at labs and research facilities are foreign-born and 100 percent in some specialties.

Dehmer noted that accelerator science is poorly represented in U.S. academic curricula with only 10 to 12 accelerator science Ph.Ds. awarded per year. Many survey respondents pointed out the value of the U.S. Particle Accelerator School.

OMB sees the value of the CSGF program and recommended its reinstatement. It has a level of rigor not found in other programs. OMB presented a list of questions to include asking what is unique about the program and how it is run. The outcome at present is uncertain.

FY15 interactions with OMB led to language that pointed out that DOE has mission-specific workforce needs in STEM fields. DOE labs are a unique resource for training workers in R&D. The wording requested that SC STEM development activities include providing an evidence-based statement of the workforce needs, clear program goals, documented best practices to ensure a diverse application pool, and ways to track program outcomes and evaluate success.

Dehmer and SC will address OMB's wording and show that DOE activities have protocol that follow OMB's request. New activities will also need to abide by this standard. SC is attempting to reinstate mission-specific workforce development activities.

Dehmer announced that Jim Siegrist is concluding his tenure as the Director of the Office of HEP. SC is initiating a search for a new director and the position will open in October.

Discussion

Robin Erbacher asked about the timeline for defending the Particle Accelerator School. **Dehmer** is not aware of OMB's timeline but it could be in the next year. The questions asked about the CSGF can inform how SC should adjust the other two programs to include the School.

Robert Tschirhart asked about the accelerator stewardship program, an initiative presented to Congress. **Dehmer** thinks that the program is a good idea. It is the first time that HEP has engaged disciplines other than its own, and reflects outreach being conducted by other SC programs. This effort puts HEP in the same realm as other SC programs.

Tschirhart asked about the difference between House and Senate FY15 marks for SC and HEP. **Dehmer** agreed that the marks are different due in part to the usual differences between the House and Senate and because the House has a smaller bottom line this year.

Georg Hoffstaetter asked about U.S. students leaving high-energy physics.

Dehmer told **Mary Bishai** that even though some recommendations in the 2008 P5 Report were not funded, the 2014 report has made an impact due to outreach by the community and at events such as Snowmass. The P5 process was important. Recommendations were balanced across physics, institutions, and both big projects and little projects. The report has a high level of rigor.

Bishai noted that the large number of foreign citizens applying for the Particle Accelerator School seems to have always been the case.

DOE OFFICE OF HIGH ENERGY PHYSICS REPORT

Dr. James Siegrist gave an update from the SC HEP. He said that the P5 Report has given a unified vision for the field and defined big issues for HEP to make progress, backed by widespread community support. A critical part of the P5 Report is a balanced approach that is time-phased with a range of projects across the frontiers, both domestic and foreign. The plan is global, as reflected in high priority investments such as the Large Hadron Collider (LHC) upgrades and Long-Baseline Neutrino Facility (LBNF). Full implementation of the P5 recommendations will take time.

Siegrist showed how the HEP frontiers mapped to the five scientific thrusts detailed in the P5 report.

The Energy Frontier shows that Higgs decay research should continue to be pursued. The LHC will resume operations in Spring 2015. The search for new physics will increase the U.S. role in LHC discoveries. Plans are to implement a high-luminosity (HL) upgrade by 2023, and work is underway. The U.S. Department of State has agreed for negotiation with CERN on the U.S.-CERN LHC Agreement. SC is waiting to hear from the Energy sub-panel about investments in R&D for options that include lepton colliders.

With regards to the HEP the Intensity Frontier program, the NOvA project was completed when CD-4 was achieved in September. Next steps for the long-baseline neutrino program need to be decided. A meeting in June 2014 between nine nations examined large neutrino infrastructures. They concluded that the community should create a coherent international program. The group will convene again in early 2015 to address this goal. Another meeting held at Fermilab in July 2014 examined schemes for Fermilab-based project management structure and governance. Various aspects of CERN's structure were adopted and a working group was started to examine program management and organization. A world-neutrino summit at Fermilab in July 2014 led to the creation of an interim international Executive Board (iiEB) to arbitrate disagreements and enable effective international cooperation. The group agreed that the primary far detector technology for the Long Baseline Neutrino Facility should be liquid argon. The iiEB met again in September and will visit Sanford Underground Research Facility to finalize facility decisions.

As for the Cosmic Frontier, a new precision measurement by the Alpha Magnetic Spectrometer (AMS) of the positron fraction in primary cosmic rays has made. Other achievements include the operation of BOSS and Dark Energy Survey (DES) initiation in the dark energy sector. A number of first generation (G1) dark matter experiments have begun. DOE and NSF announced in July the selection of generation two (G2) experiments. This decision was influenced by the P5 Report's emphasis on the dark matter (DM) program. HEP seeks to move forward with three G2 experiments. Cosmic-ray and gamma-ray work continues to make progress.

The Accelerator Stewardship program was authorized for first time in FY14 with redirection of funds to support it. The program was developed through discussions with DOE Offices of Basic Energy Science and Nuclear Physics. The program is expected to support 10 university grants in the first year. HEP is waiting for the FY15 appropriations to launch the first accelerator stewardship Funding Opportunity Announcement (FOA) in three applied R&D topic areas as recommended by the Accelerator Task Force and subsequent workshops. The Accelerator Test Facility Pilot Program in FY15 will gauge the nature of non-HEP demand for HEP accelerator facilities.

Siegrist next described the HEP budget. He pointed out that in the early 2000s, HEP increased its support of projects over research, but the difference between the two has since

narrowed. The P5 report suggested increasing the project budget fraction to 20 or 25 percent of the total.

The FY15 request totals $744,000k and will be the operating budget until Congress decides on the continuing resolution. HEP has seen reductions from FY14 to FY15 in the Energy and Intensity frontiers, and an increase of $20M in the Cosmic Frontier tied to the ramp-up of the Large Synoptic Survey Telescope (LSST) camera. There are reductions in the HEP Theoretical and Computational Sciences and Advanced Technology R&D subprograms, with growth in Accelerator Stewardship to support new R&D efforts and to open accelerator test facilities, as described above

Funding trends point to constraints in funding to universities since FY10. Laboratory research funding is decreasing with funds going to laboratory projects.

Senate and House marks for FY15 are similar in sum and higher than the President's request. The Senate provides more funding for accelerator stewardship and construction than the House.

The P5 committee asked if the HEP budget will permit the implementation of the scenarios detailed in the report. Scenario B could be implemented based on Senate and House marks, but the continuing resolution is at a level below scenario A. Upon passage of the appropriation, HEP plans to seek enhanced funding for second generation DM experiments, reduce funding for efforts with large carryovers, and make decisions on how to fund longer-term investments. Laboratories are asked to defer costs and may be faced with making layoffs.

Some projects were not recommended by the P5 Report under any scenario. HEP is therefore helping labs redirect funding from these projects to others. Included is a ramp-down of the Muon Accelerator Program (MAP)- Muon Ionization Cooling Experiment (MICE) from $9M in FY15 to $3M through FY17. HEP felt that it would take time to consider what to do with MAP. Detailed plans were sent to DOE that propose how to ramp-down that program.

Siegrist described HEP funding opportunities. The FY15 Comparative Review and Accelerator Stewardship FOAs are now closed, and HEP is preparing for its next comparative review. The Early Career Research Program FOA is currently open.

The Office of Science (SC) has issued an official statement: All FOAs issued after 1 October 2014, will require a data management plan and compliance with SC requirements.

Siegrist announced the movement of HEP staff to new roles, the conclusion of terms for various IPA and detailee staff members, and the incorporation of new staff.

Discussion

James Buckley noted that the P5 Report suggested investing in CPA as part of a small project portfolio. The P5 Report carefully pointed out that CPA has a broad science program. This broad program needs partnership with the astronomy community. The CPA faces a large hurdle to get support from NSF Astronomy as it competes with a large project portfolio. NSF is bound to not saying no to anything as it responds to proposals. DOE has to decide what it will do. **Siegrist** commented that HEP will not proceed with CPA. HEP appreciates extra work that indirect detection will do but that does not seem to be in the P5 plan.

Glen Crawford clarified for Buckley that NSF Physics and NSF Astronomy will meet when needed, in response to his question about agencies discussing the P5 Report and forming conclusions. It is important to be clear about DOE's position, especially for areas in which there may be little to no funding. **Siegrist** added that DOE's position could change based on discussions with NSF Astronomy, and **Crawford** shared that DOE does not currently plan on making investments in this area.

Siegrist told **Gabriella Sciolla** that a next step in the long-neutrino baseline program is for an interested community to submit a letter to Fermilab. There is a framework that describes what the letter should contain but it is unknown if there is a community of PIs who would agree to the letter. Rob Roser has drafted a letter and will convene a group for discussion.

Ilan Ben-Zvi asked about the difference between the Accelerator Test Facility and the Accelerator Test Facility pilot for industrial use. **Siegrist** noted that the test facility at Brookhaven has users and does basic accelerator science. Other facilities are high-powered test centers for industrial use. HEP wants to open test facilities at all labs with accelerator facilities. HEP does not yet know about the number of users and other issues.

Ian Shipsey urged that it is important to stress that the P5 Report has widespread community support. He added that the Division of Particles and Fields (DPF) at the American Physical Society (APS) was crucial to the report's acceptance and means that the report can become a reality. **Siegrist** agreed that the DPF and HEPAP were both important. He highlighted the value of the community's engagement of Congressional staffers because DOE and NSF cannot lobby Congress.

Bishai noted two recommendations in Scenario B related to the Cosmic Frontier. **Siegrist** shared that Dark Energy Spectroscopic Instrument had a CD-1 review. **Mike Procario** added that funds are inadequate to maintain the project schedule. **Siegrist** commented that the community needs to develop a research vision for the cosmic microwave background (CMB).

Tschirhart asked about the process between agencies that will define the use of the two related facilities. **Eric Cole** shared that a rules of engagement document has been sent. There is an agreement on how organizations can participate. A kickoff meeting was delayed while agencies await a response on an appropriations package. At the meeting, labs will summarize their outreach efforts, how they have contacted the community to share which facilities are available, and discussions on the facilities with users. This will inform the process for submitting proposals. A small amount of seed funds will be awarded. **Siegrist** highlighted the need to know which facilities will be made available. This is not restricted to U.S. vendors but does emphasize the need to bolster U.S. competitiveness.

Lankford asked if SC had given the House updated language on the FY15 budget request that considers the P5 Report. **Siegrist** shared that the P5 report was adopted in May. HEP needs to urgently get major items of equipment (MIE) projects started for DM research. Staffers did not ask about DESI, but DESI should start as soon as possible now that scenario B is in play. Siegrist is concerned that the continuing resolution may last for the entire FY16 year. SC leaders have engaged staffers, and this is an ongoing process.

Paul Steinhardt asked if the P5 Report will lead to a decrease in funding for universities and theory, and what university groups should do about long-term planning. **Siegrist** noted that the original plan was for research funding to go flat in the next few years. The House wants to restore research funding, and **Siegrist** hopes that there will not be large reductions after FY15. What Congress will actually do, he noted, is not known.

Siegrist clarified that SC does not know what the budget will be like if there is a year-long continuing resolution. **Dehmer** added that the continuing resolution is often just a budget line and that SC has the flexibility to make decisions based on that.

NATIONAL SCIENCE FOUNDATION REPORT

Dr. Denise Caldwell, Division Director from the NSF Division of Physics (PHY), provided an update. PHY is embedded in Mathematical and Physical Sciences (MPS), and MPS is part of

a larger R&RA funding request. The PHY budget for FY14 was $266M. A 10 percent budget cut in FY13 set back the Division. In FY14, there was a five percent increase. Around 57 percent of the budget goes into six major areas of physics, 30 percent is in M&O for facilities, eight percent for physics frontiers centers, and three percent for education and broadening participation.

In contrast to the DOE, particle physics in NSF does not have its own budget line item but is part of the PHY budget. There are six other activities among which funds are dispersed. There are six cross-cutting physics programs that draw on funds from various areas of the division. Priority areas in FY15 take up about 10 percent of the R&RA budget. Priorities relevant to physics include an emphasis on cyber infrastructure for science, engineering, and education.

The FY14 budget for particle physics is divided into two subsets. One is base support for disciplinary programs that provide funds for competitively-reviewed proposals to support disciplinary research. Every program in NSF has access to cross-cutting resources. These are not directed to any specific discipline but are available upon review for co-funding for a specific period of time. Mid-scale resources enabled the LHC Phase-1 upgrades.

There has been discussion of mid-scale funding for things like Cerenkov Telescope Array (CTA), but the level of funding has limits. Proposal submitters have access to NSF-wide resources, and the physics community has been successful in accessing these funds.

Within the PHY Division, NSF looks at the science questions to be addressed, for example, an award was made to Yale and Harvard for the measurement of the electron dipole moment. The accelerator science program was funded for about $9M in FY14. In sum, FY14 funds for particle physics totaled $94M when adding up all of these resources.

Caldwell hopes that the community is aware of the activities and resources available at NSF, and the various opportunities to which they can apply to supplement base program funding.

One achievement in 2014 was the launch of the academic-based program in accelerator science, developed through discussions with the DOE. The program supports and fosters research that has discovery potential and welcomes high-risk, transformational ideas that cut across multiple disciplines. An outcome will be correcting the perception that accelerator science is not an academic discipline. The program will provide knowledge, research, and the workforce needed to drive accelerator science and support other fields. The program is not an R&D program, nor does it seek to provide incremental improvements to existing facilities. The PHY Division webpage includes a description of the 12 awards made in 2014, totaling $9M.

For several years, NSF has supported mid-scale instrumentation. In 2014, PHY established the Mid-Scale Instrumentation Fund because funded projects in PHY require resources for off-the-shelf purchases or for the construction of specialized equipment. Funding awards can total $20M. Funding is not renewable and all funding allotments are for projects with specific end dates. Requests come through the disciplinary program rather than directly into the Fund. Awards made in FY14 were for Phase-1 Upgrades for ATLAS and CMS, and the LHCb Upgrade. Funding will total $29M through FY18.

Caldwell offered a response to the P5 Report. She noted that NSF responds to proposals and is not a project-oriented entity. In looking at the 29 P5 recommendations, NSF found that it cannot take the report and start a program due to how it operates, the fact that particle physics is not a budget line item, and that NSF's focus is on science questions and funding for PIs and students. MPS has a FACA committee (MPSAC). An MPSAC subcommittee led by Young-Kee Kim has been formed. It will examine the P5 Report to see how it maps to NSF, where PHY will go in the next five years, and how to balance NSF investments in light of the report. The subpanel may identify target areas for PHY, ways in which PHY can balance support between

small to large-scale projects, and how PHY can play a unique role in areas supported by DOE. The MPSAC will deliver an interim report in November 2014. A final report is due in January 2015.

Caldwell completed her presentation by noting that there are some outgoing PHY program directors with new personnel coming on board. Caldwell identified other program directors who are continuing in their roles. She noted that Saul Gonzalez will be on detail to the Office of Science, Technology and Policy.

Discussion

Hassan Jawahery asked how the MPSAC subcommittee will share its findings relative to DOE's response to the P5 Report. **Caldwell** clarified that DOE's response to the P5 Report will be known to MPSAC and its subcommittee, but its recommendations will not drive NSF to work independently of DOE, rather they will guide NSF as to how to best position itself.

Karsten Heeger asked if the subpanel will review all of the P5 Report recommendations. **Caldwell** shared that the review will not identify specific proposals to fund or those type of details, but will inform NSF on what things to consider when deciding how to go forward.

Tschirhart noted that the subpanel will look at candidates for MIE upgrades, so there is some judgment as to who should receive funding. He asked if other candidates could be identified for upgrades. **Caldwell** shared that the subpanel will identify criteria for making these decisions. The charge specifically calls out LHC Phase 2 Upgrades as it is a short-term priority. The subpanel may provide direction on where else to invest.

Ben-Zvi noted that this will enable advances in accelerator science at universities.

ROLLOUT OF THE P5 REPORT

Andrew Lankford described the rollout of the P5 Report and a letter from the community to DOE Secretary Moniz and NSF Director Cordova. The letter conveyed broad community support for U.S. particle physics. Lankford reviewed a schedule of briefings in which the report was presented to government agencies, Congress and Congressional staff members, associations, laboratories, CERN and other entities, universities, and other FACA committees.

PRESENTATION OF THE FERMILAB REPORT

Nigel Lockyer shared details on Fermilab's reaction to the P5 Report and activities for FY14. He noted that Fermilab is the premier U.S. particle physics and accelerator lab committed to solving mysteries of matter, energy, and space and time. Fermilab is aligning itself with the P5 Report and is moving away from Tevatron operations in the Energy Frontier towards hosting an Intensity Frontier international neutrino program in a project and operations-based setting. He pointed out that organizational changes are underway to manage more projects and to share expertise across multiple divisions. Fermilab's master campus plan is directing decisions about how to meet future needs. He noted that the lab adheres to the P5 Report in many ways in order to be the best accelerator-based neutrino program possible. Strengthening the complex by providing muon beams is part of this process. Partnership is central to Fermilab's mission and the lab seeks ways that it can support P5 recommendations.

Lockyer listed projects that will advance the P5 recommendations. Some recent changes at that lab that have occurred include shifting from the Long Baseline Neutrino Experiment (LBNE) to an international Long Baseline Neutrino Facility (LBNF) and a coherent Short

Baseline Neutrino experimental program. The lab is also focused on wrapping up bits of work in areas such as the Tevatron research program, the cosmic area, and Minos+.

Lockyer further noted that NOvA is one of the major initiatives and awaits the start of data taking. MicroBooNE is expected to have CD-4 approval soon. LBNE is becoming LBNF (as noted above), and the Short-Baseline Neutrino Program will support three experiments. It is coming up with a coherent plan for these experiments that uses a liquid argon technology that will be useful for LBNF. It seeks to find evidence for sterile neutrinos and give a definitive resolution to LSND and MiniBooNE anomalies.

Accelerator complex upgrades are essential to meeting future needs. The next step is making sure the booster is complete which should be around the end of 2016. Proton Improvement Plans (PIP-I and PIP-II) will support the lab's suite of neutrino and muon experiments through 2030.

PIP-II uses the Linac and includes a superconducting pulsed Linac. It injects into the booster and will provide >1 MW of beam power. The work represents an in-kind donation from India, and partnerships with multiple laboratories, universities, and other nations.

Fermilab is driving large hadron collider research and upgrades.

Lockyer shared that US CMS phase 1 upgrades have started and CD-2/3 review is expected to be complete by the end of 2015. Discussions on phase-2 upgrades have begun.

Work on LARP/HL-LHC includes other labs with contributions from many nations. The project has to be finalized, but the major pieces have been thought out. The conductor and tooling are part of a total investment of $215M and the project is on a tight schedule for completion.

Muon g-2 work seeks to measure the precession rate of the muon's magnetic moment (g-2) four times more precisely than previous experiments in order to search for new physics beyond the Standard Model.

The Mu2e project is seeking CD-2/3. The technical design is in very good shape.

The Dark Energy Survey (DES) program has been successful and interesting results are expected.

Lockyer described the Super CDMS effort and shared that the Super CDMS will move into the SNOLAB in the future with a focus on probing a lower mass range for dark matter.

Cosmic Microwave Background (CMB)-S4 is a popular project at Fermilab. It seeks to explore physics on the ~10^{16} GeV scale during the time of cosmic inflation, measure the sum of the neutrino masses, and constrain dark radiation. DESI is also a popular project. It follows on the Dark Energy Survey and has the support of labs.

Lockyer pointed out that the Linear Coherent Light Source II (LCLS II) project involved multiple partners. It is a high energy x-ray beamline located at SLAC that allows the U.S. to lead photon science for the near future.

With regards to accelerator science, the lab has had success with the Superconducting RF Cryomodule. Furthermore, nitrogen doping of accelerator cavities is a new technique being developed at the lab. Nitrogen doping seems to increase the Quality factor (Q). For a Continuous Wave (CW) machine, it is important for cavities to have a high Q as it keeps operating costs down. A new finding suggests that a higher Q may lead to reduced cryomodule and magnetic shielding requirements. The refrigeration capacity needed can cost up to $60M, and this doping work helps to avoid those costs.

Lockyer reviewed some recent highlights from experiments:

- The MINERVA project sits in the high-energy neutrino beam line. It measures the effects of different targets and materials.

- MINOS+ is looking at various deviations and the experiment will run through 2016. It will continue until NOvA becomes the main experiment.
- The Fermilab Holometer will run through 2015. It seeks to discover or constrain quantum spacetime fluctuations with spectral density equal to Planck time.
- SeaQuest looks at skin properties of the proton. It is a nuclear physics experiment.
- The Test Beam Facility is a popular place at the lab. It brings users from 84 institutions and 20 countries. The beam line is completely overbooked.

Fermilab is having to manage the facilities, experiments, and funding to serve community needs and meet goals. The lab has a new LDRD program that is part of a recruiting tool and can help initiate new projects. Other indirect initiatives include revitalization of the Wilson Hall.

Performance management is improving through a "Building for Discovery" message that emphasizes a tightly managed portfolio of projects. Senior management has been reconfigured. A "One Lab" theme means that Fermilab should function as a single lab rather than divisions.

The LBNF Program Process began in June. The CERN Medium-Term Plan was approved and allows CERN to invest in outside facilities. A meeting in June emphasized the maneuverings of the CERN budget report. Fermilab hosted a meeting to identify ways for international partners to maximize their investments in the lab. A follow-on summit kicked-off a broader-team building process that formed an iiEB to define a clear common set of points and letter of intent (LOI) for the PAC. The next steps are to develop a letter of intent and form a new collaboration to be announced in Summer 2015.

Lockyer described the General Accelerator R&D (GARD) research program. It will address priorities that are aligned with the P5 Report. Rationale and goals for this effort were described. The main goal for high-field magnets and materials is to push the cost down by a factor of four or five in order to make building the next high-energy collider reasonable. Cost-effective SRF technology is saving money, but it will also need to look at how to fuse niobium onto copper, for example, to lower the cost of cavity production. Accelerator science, modeling and design are also areas of research.

Discussion

Erbacher asked if there will be enough resources to carry on the lab's projects. Lockyer shared that the lab has looked at the resources needed for the out years. Meeting those periods in which costs peak is a challenge. Many projects are still awaiting starts and moving toward CD-3 as much as possible. The project starts have to be done in order.

Erbacher asked how the lab gets university participation and if there is enough expertise to work on projects. Lockyer noted that support is needed in areas such as cryogenic engineering and RF. The lab has expertise in traditional areas but must redirect its efforts to build expertise in new areas.

Sciolla asked how much the lab will know about international involvement in LBNF by next Summer. **Lockyer** believes the scientists must agree on what they are doing. A sticking point was the use of different baseline lengths. All agreed at the iiEB meeting on a 1,300 km baseline pending inspection by the LBNF group. Once successful, the group must agree on the LOI and then form a collaboration. The main components are there, and PAC's goals and requirements for CD-1 have been discussed. CERN is a big player and funding from India has helped.

Heeger asked about CERN's involvement in the lab. **Lockyer** described it as an evolving story. Marcelle Soares-Santos is responsible for the short baseline program. He is leading efforts to work underground and on an agreement with the CERN council.

Lockyer shared details with **Siegrist** and the HEPAP about the master campus plan. It is concentrated on the high-rise and industrial complex. The lab wants to build an arm on the high-rise to bring in groups to work together. The industrial complex is focused on technology transformation but needs areas for constructing things such as LCLS modules. The plan will bring all of these development projects into one location and create the core of an international atmosphere. **Siegrist** added that SC is funding infrastructure upgrades.

Bishai asked if some start-up companies have signed up with the Fermilab Illinois Accelerator Research Center (IARC). **Lockyer** shared that IARC is a new building connected to the heavy-assembly building. HEP funds cannot be spent on IARC, hence new funding sources and industrial partners are helping. A flue-gas project at IARC, for example, will remove some oxides. The challenge is the amount of power needed to extract everything at a 99 percent level. The accelerator is designed, and there are negotiations with DOE to see if they are interested in this project. Small Business Innovation Research (SBIR) does not play a role. There is a business model being shared at DOE and other partners are being sought.

Tschirhart noted that the GARD HEPAP subpanel would focus on broader impacts and enabling technologies, and asked about balancing the subpanel effort with accelerator stewardship. **Lockyer** clarified that particle physics should own accelerator research. Principles are needed over balance. Global particle physics should drive things. The subpanel should focus on handing off accelerator science to other fields. **Lockyer** shared with **Tschirhart** programs at SLAC and Berkeley are examining plasma wakefields that some think may not lead to technology used for a collider but that could have other applications. **Lockyer** hopes that the field wants this type of research.

Lankford asked how the lab's involvement in LCLS-II is funded. **Lockyer** shared that Basic Energy Science (BES) funds LCLS-II and it is funded via past infrastructure investments by HEP and generic ILC type and American Recovery and Reinvestment Act (ARRA) funds. Fermilab is able to test cavities, assemble prime modules, do research, and keep expertise in the lab. LCLS-II runs through 2018 or 2019 and when finished, the lab could start production on more modules. The field benefits from knowing how to put cryomodules together, and the lab must do it more efficiently and inexpensively.

PRESENTATION ON THE NUCLEAR SCIENCE ADVISORY COMMITTEE NEUTRINOLESS DOUBLE BETA DECAY SUBCOMMITEE REPORT

Bob McKeown shared a report from the subcommittee. The first report was presented to the Nuclear Science Advisory Committee (NSAC) in April 2014. The charge to the two-year standing subcommittee seeks a strategy to guide DOE and NSF's implementation of a possible second generation U.S. experiment on neutrino-less double beta decay (NLDBD) that would allow for reaching the sensitivity needed to determine whether the nature of the neutrino is Majorana or Dirac. There are multiple experiments occurring globally and the subcommittee evaluated those.

McKeown described the science behind NLDBD, showing how $2\nu\beta\beta$ decay can occur. Two beta decays are required along with a third nucleus. The sum of the electrons can be detected to view an endpoint. This has been observed with a variety of nuclei and has a long half-life of 10 to 20 years. The 0vBB have the same starting point as the three nuclei but the neutrino is absorbed leading to just two electrons. A neutrino cannot be reabsorbed as a neutrino and is tied up in the lepton process.

Particles have a non-zero mass hence right-hand coupling is needed. There are other mechanisms that can be responsible for NLDBD, such as heavy particles, but the violation of lepton numbering still occurs. NLDBD may not be the only mechanism for this process to occur.

Neutrino mass is non-zero and there are measurable oscillations in experiments. Researchers are also interested in the absolute neutrino mass. Cosmology and other processes show that the sum of the neutrino mass is less than .23 eV. It is likely that neutrino masses are actually less but it is not clear how strongly this value should be accepted.

Neutrino masses are different from matter particles. The most common alternative is known as the "see saw" mechanism. The other aspect of light neutrino masses is that the order of the scales is not necessarily known. It is known that m2 is heavier than m1 but it is not known if m3 is the heaviest or lightest neutrino.

For NLDBD, the inverse half-life consists of the phase space, nuclear matrix element, and the $m\beta\beta^2$. Observing this process allows physicists to infer this $m\beta\beta$.

McKeown shared a colored graph that showed which experiments are pushing into the inverted hierarchy band. This gives the impression that there is a goal to convert this band. A much longer experiment is needed to get into this region.

The subcommittee report indicated that the pursuit of the NLDBD addresses important scientific questions, and recommended that the agencies support work in this area.

In February 2014, 11 researchers leading known experiments shared details on their current projects, future next generation projects, and the timelines for that work. A variety of methods and materials are used. The subcommittee noted in its initial report that pursuing NLDBD would address urgent and important scientific questions. Sensitive second generation experiments could lead to a new discovery. It recommended agency support to ensure U.S. leadership.

The subcommittee plotted a half-life if the Mbb is 17.5meV. After calculating matrix elements, it was deduced that findings are within the rough order of magnitude but vary across different isotopes. Limits used in the experiments are down around 1025y but need to reach about 1028y.

The major issue is background. If it exists, a higher level of mass is needed. Background reduction is the key requiring working underground, radiopurity, better E resolution, and better event characterization. R&D will be crucial to establishing effective programs in this area.

For the future, the subcommittee offered guidelines that describe what research proposals should propose, that they feature international collaboration to draw funds from multiple parties as there is a desire to establish a signal with different isotopes.

From a theoretical view, there are many different techniques that are possible in addition to the light Majorana neutrino. The subcommittee recommended creating a theory task force to develop criteria to create and rank the quality of existing and future calculations, and identify methods to constrain the less-tested assumptions in current approaches.

NSAC is writing a long-range plan. The APS DNP has led town hall meetings on various topics. McKeown does not know what will happen but believes that community wants to participate in the NSAC long-range plan. The evolution of this approach is not known, but some think that this will lead to a big experiment in the range of $100M to $200M.

Discussion

Buckley asked about the amount of overlap between G3 DM and these types of experiments, and about collaboration between NP and HEP experiments. **McKeown** shared that things are in an R&D phase. The next big experiment would be stewarded by NP and there is no intention to

lend research support to individual groups to work on this subject. Other agencies have shown concern about duplicative efforts if two offices are pursuing the same research in two different ways, but it seems that nuclear science, HEP and NSF are working together. **Siegrist** added that eventually agencies will conduct a downselect that will cause some reordering in the NLDBD community. That is unlikely to occur with HEP people.

Buckley asked about solutions in instances where a university group has NPG base funding. **McKeown** acknowledged that this is a potential problem and that the Offices are trying to maintain a flexible attitude. Research being done on both sides needs to be maintained to optimize the U.S. position in this area. This is something to keep an eye on. **Lankford** added that the P5 Report did not address this with a specific recommendation but made one about HEP-related groups and used this scenario as an example.

Tschirhart commented that background is important as a critical to the next stage of experimentation but that the subcommittee did not identify reduction as important. **McKeown** acknowledged the distinction as dependent on a researcher's opinion. The subcommittee did not conduct a detailed analysis of this piece but it could be addressed after the subcommittee's final report by engaging experimenters to gain consensus on this topic.

Tschirhart asked what would happen if the normal hierarchy is established. **McKeown** responded that it would be interesting if an experiment found that the normal hierarchy would be at a higher range, and recognized that it is an important question.

Erbacher noted three isotopes identified in inverted hierarchy coverage and asked if that was a downselect. **McKeown** thinks that this will be the range of things to be selected. Others could be used but this level of isotope was possible with existing experiments and most work will involve these three isotopes.

PRESENTATION OF MUON ACCELERATOR REVIEW

Mike Procario shared a response to the P5 Report from the viewpoint of muon acceleration. Research was initiated in the late 1990s. Funding for neutrino production and muon collider collaboration came from DOE in 1997.

MICE researchers received funding of about $11M in 2003 to test their ideas on muon cooling. A section of a cooling channel was developed and placed on a muon beam, and performance was assessed. MICE was developed in six stages. By stage four of six, an absorber was introduced to production ionization losses. Step five reaccelerated the muon beam restoring lost longitudinal momentum.

Funding for MICE has never been reliable and has changed over time. In 2010, HEP reviewed muon acceleration efforts. In 2011, MAP was formed to demonstrate that fundamental technology challenges in MICE could be solved. MAP research was assigned to Fermilab.

After starting MAP, funding was increased but is not at a level needed for project success. The request was at $16M per year but only reached $13M in FY14.

P5 reviewed this situation recognizing an effort to build some advanced accelerators and solve a specific challenge. P5 suggested reassessing MAP and incorporating MAP activities related to accelerator R&D into GARD. This was not a criticism of the program but was based on physics. A large value of $\sin^2(2\theta_{13})$ enables new oscillation experiments to use conventional beams, pushing the time frame when neutrinos might be needed into the future.

Because MICE is an international effort, simple withdrawal was not an option. Consultation with the Science and Technology Facilities Council (STFC) pointed out that step six was not

achievable in the time frame proposed, but stage five could be achieved in three years with a consistently decreasing funding level from FY14 through FY17, from $9M down to $3M.

A review was requested to evaluate the status and future plans for the MICE experiment as well as MAP interactions with international collaborators. The goal is to complete this with some physics results in a finite amount of time. Evaluation plans were presented for the orderly continuation, transfer or termination of other core MAP activities. An option was the transfer of activities to GARD.

An international committee reviewed the plan for MICE and concluded that no activities should be transferred to GARD. Step five could be achieved in the given profile. There were risks identified inherent in achieving results within the given profile. The MAP team developed a step 3π/2 somewhere between steps IV and V.

Step four proposed operation in 2015 using two spectrometers with an absorber in the middle. The muons would be measured individually to detect energy loss and momentum change due to the absorber.

Step five is a definite test that looks at cooling. It proposes an RFCC to restore the longitudinal momentum that gets lost. It is restored before reaching a second absorber with spectrometers able to measure changes in emittance with close to 0.1 percent accuracy.

Step 3π/2 proposes taking out the coupling cavity in the middle. MAP has shown that it can operate cavities with higher gradients that was assumed, hence only half of the cavities are needed. The design of cooling channels for MICE has evolved, but MAP did not use the newer approach as it did not want to change its baseline. The cavities are no longer used in a big magnet. A new magnet is being built and some funding, technical risk, and schedule is saved as the work can be done sooner. The design also reduces the need for magnetic shielding. The plan gets to a lower cost apparatus, gets done sooner, and looks more like the current muon cooling channel design. The configuration is the same as the example tested in the Fermilab Muon Test Area. The emittance reduction is not the same as that possible with step five but the high sensitivity of the spectrometers can show that this could produce clear results.

The committee recommended that MAP grow with step 3π/2. MAP has submitted a draft plan to confirm what was said at the review. It believes that everything will work. HEP plans to support Expedited MICE Final Configuration, which is the new name for step 3π/2. A final call with the STFC will finalize the plans and allow MAP to move forward.

Discussion

Buckley asked how the ramp down matches the budget guidance given to P5 and if there was a budget exercise that produced scenarios A and B. **Procario** shared that the P5 is relying on the conclusion of this program in order to use funds for other activities. P5 did not specify a timeline for this. Giving just half of the funding at the start indicates that the money is being placed elsewhere. Trying to build step five would have been problematic due to technical challenges.

Bruce Carlsten noted that the committee did not recommend transfer to GARD. **Procario** felt that GARD was working on muon and did not feel that anyone else was doing that work.

Procario told **Jawahery** that there are no plans to complete this work and he has not heard that there are plans to extend the program further.

Bishai shared that there are some activities related to the transfer to GARD but the front-end is shared with neutrinos as well. **Procario** thinks that the R&D panel would suggest that targetry is important. Targetry was done and there are no plans to do anymore.

PRESENTATION FROM THE HEPAP ACCELERATOR R&D SUBPANEL

Don Hartill shared that the R&D subpanel suggested medium and long-term goals for accelerator R&D for a world-leading future program in accelerator-based particle physics. The focus included assessing how accelerator R&D efforts are training future accelerator scientists and technologists. The subpanel suggested ways to maintain a healthy and appropriate balanced national program. The final report will be presented by March 2015.

Input has been drawn from engagement with labs and the Snowmass gathering. Panel members are meeting to discuss inputs and review the findings. Input from colleagues is also invited to share input via the subpanel website.

The GARD Program was funded at $86M in FY14. Since the P5, $26M of SRF R7D at Fermilab has been redirected to the PIP II project. The current GARD program splits funding among seven sources with most going towards new accelerator concepts.

NSF has also started a new program in accelerator science in addition to GARD with 14 awards made to cover the broad range of topics in accelerator science.

LHC upgrades are part of the GARD program. LARP, as an example, seeks to contrast high field quadrupoles and dipoles and has been moved from GARD to LHC Hi-Lumi directed R&D. Upgrades will begin in 2023 with a 2.5 year duration and continue through 2035.

Future collider options include an ILC in Japan, a 50 to 80 km ring in China, and a $150M Euro investment spread over 10 years in laser plasma acceleration. Discussions at the Future Circular Collider collaboration meeting at CERN in September also pointed out other collider work being proposed and undertaken globally. R&D is now part of CERN's medium term plan.

The opportunities for the GARD Program include leveraging higher beam power to strengthen research and results in the intensity frontier. Future high energy colliders are costly hence optimization studies can help lower costs and optimize efficiency.

The subpanel heard several initiatives each with a price of about $25M.

Hartill described further challenges. The superconducting magnet program will need more investment in higher magnetic fields and in developing manufacturing techniques that reduce the magnet assembly labor costs to make a contribution to future high energy colliders.

The subpanel identified six areas within accelerator R&D that should be studied in more detail, and processes for improving the field of accelerator R&D. It is believed that R&D needs for future high energy colliders should be covered in each of these six research areas.

The subpanel will produce a draft report in November based on input from colleagues.

The subpanel concludes at this time that accelerator R&D health is vital to ensure that U.S. accelerator based high energy particle physics program is world-leading.

Discussion

Hartill shared with **Sciolla** that about 16 students per year in the U.S. get PhDs in accelerator R&D. A fairly large number are involved in laser and plasma-based activities. There are limited opportunities to continue in this activity. Conventional training opportunities exist in places like Cornell and contribute to accelerator R&D activities. This low number may be due to a low number of advisors as few universities have programs that attract students. R&D activity could attract more participants and make this activity more legitimate in universities.

Erbacher noted that the preliminary and final reports will be produced as about one-third of HEPAP membership turns over. **Lankford** shared that the final report will be approved in March after the turnover. The preliminary report will be seen by this HEPAP. He expects that the

subpanel will be responsive to this HEPAP. There will be some new people who will be new to the topic and the final report.

Jawahery commented that over the last 30 years, gradients have gone from five to about 30 MeV per meter. This is good but slow. He worries that only about 10 percent of GARD's budget is going into SRF research. Based on material scientists' input, there is no real physics behind achieving higher performance and that this is not just a funding-based problem. **Hartill** noted that there is a lot of activity in areas such as LCLS-II enterprise that will test manufacturing techniques. In new materials, there is one student at Cornell making progress in dionium 310 production. Single-cell cavities have performed well and are being extrapolated to nine cavities. That is limited by money. **Hoffstaetter** agreed that there is a lack of funding, and noted that accelerator knowledge in single cavities have achieved well over 50 MeV per meter. New materials could reach higher gradients, research could grow, and this area is underfunded.

Bishai noted that accelerator science has become mature enough to be a discipline, yet she does not see support for a more multidisciplinary effort should funding open up and engage materials science and engineering departments. NSF would fund more faculty in applied departments. She asked if program expansion and skills development should be part of the charge.

Tschirhart added that despite the funding pie chart shared by Hartill, the field should not forget funding in SRF is about $50M per year and there is a lot of development occurring in LCLS-II. The SRF slice of the accelerator R&D budget is small but there are projects grow the field and do not rely just on the 10 percent wedge for that work.

Tschirhart asked if faculty and advisors are turning students away leading to a small number of Ph.D. recipients per year. **Hartill** thinks there is a good match between the number of faculty and students. **Ritchie Patterson** suggested that there are students not getting enough research support. **Ben-Zvi** added that some students are turned away as there is not enough faculty to support them. **Carlsten** reinforced the fact that accelerator education resides in more than one department. **Patricia McBride** asked if training or R&D are more important, and if that should be among criteria used to examine programs. **Hartill** responded that training and research opportunities are both important.

PRESENTATION ON HEPAP ACTIVITIES

Andrew Lankford reminded all that the growing number of conferences was discussed at the last HEPAP meeting. HEP asked for guidance on this topic. There is a diverse range of conferences that are broad and specialized, and conducted by many types of groups. Conferences are held for many reasons, while at the same time the field has become more global and communication methods have changed.

Lankford presented questions that could help determine if there are too many conferences. Community input can help generate answers. With Ian Shipsey, Lankford drafted a survey that could be disseminated by APS DPF to collect information and provide guidance to agencies.

Discussion

Mirjam Cvetic shared that there are a number of annual conferences in the theory field. This approach may be different from that of experimental science and areas such as instrumentation. Lankford acknowledged the need to consider how sub fields may be different.

Lankford told **Heeger** that agencies sponsor conferences and workshops and want to know how they might be advised on these investments. **Crawford** added that agencies need to know

the criteria to be used when evaluating proposals for conferences. It is hard to judge the value of a conference in a key area and the value of one conference versus another. **Siegrist** shared that DOE has been questioned on the need for large conferences. He pointed out that at times, participation has been capped, which is not optimal. **Heeger** suggested that this means that decisions are sub-field dependent. **Siegrist** would like to know the priorities in fields.

Hoffstaetter suggested that Elementary Particle Physics might best support the survey, and **Lankford** shared that DPF could do more than just consult.

Siegrist confirmed for **Bishai** that blanket approval for annual conferences, rather than approval each year, is not possible.

Erbacher noted that large conferences are a chance for students to make presentations and network, but this would be lost if the number of slots are reduced and competition for presentation slots continues. **Lankford** stressed the importance of a carefully designed survey and the need to ensure that data collection allows for demographic segmentation. **Siegrist** added that conferences allow for serendipitous connections and serendipitous discoveries.

Paul Steinhardt shared that the draft survey may not carry things far enough into the future and asked if it would be continuous. He pointed out that things are changing and this snapshot may not be useful in two years' time. **McBride** responded that large conferences are stale and running on history. The survey could shift how large and small ones are organized. Organizers grapple with how to reinvent meetings and usually just repeat things. **Lankford** noted the value in knowing the role of conferences now and if they are playing the role that they used to. He opined that the survey will give a sense of direction but we should not develop too many conclusions.

Buckley believes that conferences play a vital role. **Lankford** stated that community members can share insight on the roles that conferences play specific to a field, whether it is understanding fine details of the science or giving students working in experiments a chance to get together.

Jawahery noted that conferences are a place where students and postdocs who are members of a group or collaboration can have a chance to exhibit individual existence and present individual work.

Thomas Shutt suggested that a survey would only capture information about people in a field with direct links to DOE HEP but miss others from other disciplines who might attend the same conferences. They might not care about the outcomes of the survey. **Shipsey** urged that the survey should be done carefully as members of other communities may not be interested.

Natalie Roe urged asking the APS Division of Astrophysics what frontier or area they identify with. She suggested exploring the results of the April 2014 APS meeting and how the next meeting should be refreshed to help the community. **Heeger** agreed and noted that the APS could benefit from input from the community. **Roe** added that parallel sessions at APSmeetings can be sparsely attended and organizers may need to see that sub-fields have their own larger meetings at other times of the year. Groundwork should be laid for an effective Division of Particle and Fields (DPF) meeting that would strengthen cohesion and avoid the failure of large conferences that do not allow networking.

Bishai suggested contacting chairs of recurring meetings to obtain their vision for and the evolution of those meetings. **Lankford** does not foresee the DPF providing a review of conferences. He wants to know the value of conferences and not pick winners or losers. Some conferences think they have a purpose but it is not as clear as it once may have been. Engagement with conference organizers could help define the questions to be used in the survey.

Jawahery asked about the DPF and HEP's roles relative to large conferences that are well organized and occur with good frequency. He suggested that the process would lead to micromanaging, especially for conferences in particular places in the world that are designed to emphasize a region's scientific progress.

Nick Hadley voiced concern about the tone of the survey and that it might conflict with academic freedom. People should have the right to organize and the ability to attend conferences when they want to. **Siegrist** noted that the OMB is already regulating conferences, and confirmed that they are regulating laboratories but not yet universities. **Hadley** asked if that is any different from telling researchers what they should and should not do.

Steinhardt shared that the draft survey may not answer the right questions because our questions are qualitative, not statistical. There are small and big conferences, and people go to small conferences and vote via attendance. **Lankford** responded that the survey would not rely on statistics but more on information gathering to form a non-statistical basis for a rational discussion to make sure that nothing is overlooked. Lankford was worried that HEPAP would decide on the legitimacy of some conferences without community input. He urged that HEPAP should not draw too many conclusions from any survey and that there would be a conference review before any report goes to the agencies.

Hoffstaetter commented that it seems appropriate for agencies to identify a percentage of funding to be used for conferences but that PIs should decide which ones to attend.

Zoltan Ligeti asked about the range of actions that could result from this activity, expressing concern about micromanagement. **Tschirhart** responded that networking and collaboration building are vital outcomes of conferences that no one has talked about. One action coming out of this exercise might be eliminating proceedings, which could be something identified in the survey. Community input can drive the enhancement of conferences and ideas, and illustrate differences in the value of certain things in specific fields such as poster sessions.

Lankford added that one outcome that HEPAP has asked for is a set of criteria that DOE can use to decide what to support. HEPAP advises the agencies, and they have asked for advice. DPF could be a partner in survey dissemination. Concerns about the conclusions that could be formed are understandable. The exercise will take an investment of time. Lankford wondered if the effort would be worthwhile.

Barry Sutter added that there is a delicate configuration of what is done at conference to make them valuable, citing the PACOC and its role for organizing the International Particle Conference which is now the North American PACOC conference. **Lankford** urged that this exercise will not seek to review specific conferences.

Siegrist clarified for **McBride** that DOE support for conferences is mostly concerned with travel costs. HEP gets proposals for conference support, and travel usually dominates the proposal.

McBride shared that a survey sent to APS members in many divisions showed differences between the divisions as to what sort of conferences they like. General information would make things better but care should be taken to not go too far down this path.

Hoffstaetter noted that organizers take pride in their conferences, may resist consolidation, and asked if that might be an unwanted outcome. **Lankford** responded that that is too specific for HEPAP, it would take a great deal of time to come to those decisions, and it would not serve the agencies. A more community-based group could take on that level of granularity.

Ben-Zvi suggested the survey should ask about publications that result from a conference, their value to attendees, and preferences such as electronic format, in a journal, or from an independent publisher.

Steinhardt suggested asking if researchers have enough, too much, or not enough funding to attend the conferences that they want to attend.

Crawford responded to a question about DOE organized workshops, sharing that this is rare and last happened for an Intensity Frontier conference in Rockville several years ago.

Jawahery noted that the input that would be gathered more than likely would hurt the field. **Lankford** responded that the decision on where to draw the line needs to be explored. He would like HEPAP to suggested things that the survey should cover and ways to gather input.

Lankford shared information on the European Committee on Future Accelerators (ECFA). It advises CERN and European funding agencies on particle physics. A restricted ECFA includes Richie Patterson as its U.S. representative. Patterson suggested a rotation, and JoAnne Hewitt accepted the nomination. In that role, Hewitt will facilitate communication between Europe and the U.S., and must be well-informed about U.S. and ECFA activities. **Ian Shipsey** has informed ECFA Chair Manfred Krammer of the nomination, and Hewitt will serve a three-year term starting in January 2015. Lankford thanked Patterson for her service.

CLOSING REMARKS AND ADJOURNMENT

HEPAP Chair Lankford adjourned the meeting for day one at 6:03 p.m. EST.

SEPTEMBER 30, 2014

The High Energy Physics Advisory Panel (HEPAP) was convened at 9:00 a.m. EST on Tuesday, September 30, 2014, by Panel Chair Andrew Lankford.

PRESENTATION ON THE DOE / NSF JOINT G2 DARK MATTER PROGRAM

Jean Cottam-Allen shared insights on the Generation 2 (G2) Direct-Detection Dark Matter (G2 DDDM) Program. Collaboration between the agencies was informed by an independent R&D phase selection and independent solicitations. The process for selection ran from January 2012 through a joint DDDM review in early 2014. The joint review occurred prior to the publication of the P5 Report. The G2 MD Program was formed after the P5 Report and was informed by the report.

A specific set of five criteria were used in the review.

P5 recommendations for DM focused on the need for multi-generational experiments and a suite of progressively more sensitive and ambitious direct detection experiments. The P5 Report recommended specifically to proceed with a G2 DDDM Program at an investment level of what was called for in the 2012 joint agency announcement of opportunity.

One project selected was the LUX-Zeplin (LZ) and Super CDMS - SNOLAB. Another was the ADMX-Gen2. These are part of a U.S. portfolio to be jointly managed by the agencies. These fit with 10 current DDDM projects independently or jointly supported by the two agencies.

R&D proposals from the projects in the portfolio will be submitted through the usual methods used by both agencies.

Discussion

Cottam-Allen confirmed for **Bishai** that this was not the first time NSF and DOE have aligned for joint DM experiments. This collaboration on jointly funded work is unique as it represents a long process of working together.

Cottam-Allen told **Sciolla** that despite different individual missions, processes, cultures and constraints, the agencies can work together by learning each other's issues and staying dedicated to program success. **Michael Salamon** shared that the relationships were cooperative, and agencies worked to make independent but coordinated selections when there were differing requirements to be met. Proposals were jointly reviewed and reviews were used in selection criteria. The DOE could make use of a project review study that enabled its effectiveness. **Cottam-Allen** added that the agencies did not necessarily use the same solicitation process but received proposals in very similar formats.

Erbacher noted that it can be easy to come to the same conclusions with the same reviewers. **Salamon** shared that the agencies worked hard to assemble their review panel and that it was a fair selection process with well-informed decisions.

Cottam-Allen confirmed for **Erbacher** that the R&D program is a way for PIs to propose new ideas toward future experiments and all ideas are welcome via that mechanism. This is different from plans to construct new things. **Erbacher** asked about support for PI work in other countries, and **Cottam-Allen** shared that G2 DDDM is not about things that will be constructed.

Crawford added that people write proposals for what they think is the best science. DOE's priority is to complete these experiments as expediently as possible.

Buckley described the opportunity as a great step forward that encourages communities to develop their most creative ideas in line with NSF and NASA's efforts. He asked if joint panel reviews and announcements would expand collaboration. **Salamon** shared that the precedent has been set and the groups are likely to work together in the future. **Cottam-Allen** added that some things are well-suited for collaboration and others for independent efforts.

Cottam-Allen shared with **Sciolla** that the awards are still being made and there are two projects selected for R&D funds. Funding levels are being decided and the agencies are likely to create and effort for future R&D investments that reflects this effort.

Cottam-Allen confirmed for **Shutt** that mid-scale instrumentation funding is being used and the effort is trying to leverage that resource on the NSF side.

PRESENTATION ON THE G2 DIRECT DETECTION PROGRAM IN A BROADER SCIENTIFIC CONTEXT

Dr. Bernard Sadoulet described the nature of DM, the future direction of G2 experiments, and offered views on G3 work. DM efforts focus on many fundamental questions. The field is active and includes astronomy, cosmology, and nuclear and particle physics.

Within cosmology, DM is about 27 percent of the complete picture based on measurement. It is known that DM is not light neutrinos.

There are a number of things for which to correct. Axions enable correction. Weak scale WIMPS help with hierarchy problems and present a coincidence between cosmology and particle physics. An expansion of this is to look at the DM hidden sector. One example in the sector is asymmetric DM which proposes that the DM sector assumes asymmetry. This sector can be viewed with great complexity. Another view is the notion of a sterile neutrino in the keV range.

Particles can be detected through four independent and complimentary ways. Inputs from cosmology include the remarkable success of the Lambda CDM. Also demonstrated are potential problems at a small scale, and there is lack of observation of large satellites that should be too

big to fail. The debate in cosmology is if this is a sign of poor understanding and the simulation of gas and feedback mechanisms, or the indications that there is new DM physics. A 3.5 keV X ray line was used to view warm DM. The other indication comes from the notion of self interactive DM.

In looking at axions specifically, there are two photons, and the axion will interact with their magnetic field. There are sets of experiments that work at the cosmological limit but at present there are no results.

Direct detection of WIMPS has been conducted through multiple experiments. Most reach a WIMP-nucleon cross-section of 10^{-7} to 10^{-5}. Asymmetric DM is visible in the WIMPS mass area. The low mass region experiments have inspired optimism as there are claims that that is the region expected for asymmetric DM. There is some pessimism in that the current evidence is insufficient.

Modulation work in DAMA has created suspicion that a lack of findings is tied to instrumental challenges as nothing has been found to date. CoGeNT has demonstrated weak evidence. Five-year's worth of data will be released soon. Currently it is difficult to control systematics. This work does not necessarily show proof of WIMPs.

Sadoulet described the spin independent limits. Some experiments have achieved better physics reach than others and are finally entering the SUSY region.

Fermi-LAT has been looking at indirect detection but has found no evidence from dwarf galaxies. There is excitement about the 10-30 FeV/c2 working toward a Galactic Center. Research asks if it is DM or standard astrophysics with a millisecond pulsar, and if there are some other processes in physics. 135 GeV/c2 lines are showing data that demonstrates the need for strategic couplings.

Input from particle physics includes the Higgs at 126 GeV/c but show no sign for supersymmetry. There is also no evidence from monojets and gammas. The dark sector models used typically have low mass mediators and low mass theories align with dark photon searches. Additional input comes from understanding of basic complementarity.

In conclusion there is no smoking gun just yet. Experiments need to be done at lower sensitivity at large and small mass. The latter is possible through low temperate detectors.

Sadoulet described the G2 DM experiments. The ADMX work is speeding the DM search. As it searches on a frequency band, resonators for the next one are constructed. Work will run through 2019 and are funded by DOE at $5M.

Sadoulet described the LZ Method: 2 Phase Xenon TPC work. The instrumentation design has replaced the LUX at SURF and incorporates 7 tonnes of xenon. The work at LZ will work at a lower WIMP level and will be able to detect some neutrinos. The LZ cost was about $55M at the time of the proposal about $21M of which was generated from non-U.S. Federal sources. The project was approved in July 2014. There is currently no DOE funding guidance for LZ.

The SuperCDMS SNOLAB experiment includes a low temperate Ge/Si detector and is focused on low mass, high mass. Agencies allowed the experimenters to keep Cryostat and there are discussions with EURECA to increase target mass/diversity with the same geometry. There is also the possibility to increase the mass with CDMS technology. Moving the photon oto better than 20eV would offer a view of discrimination. This work will enhance neutrino detection.

Funding from agencies has been proposed at $25M. Researchers are hopeful that there could be a new joint venture from DOE and NSF. Eighty percent of the request will allow for experimentation at 50kg. Researchers hope to attract funding from Canada and EURECA.

Technical challenges described by Sadoulet include radiopurity at LZ and CDMS. Thresholds are another challenge, working through low mass + ^{8}B solar neutrinos.

The G2 WIMP program is very complementary. Complementarity between LX and SCDMS are demonstrated through high mass-low mass, and shows that different technologies have different susceptibility to backgrounds. There is a need for both experiments. LX and SCDMS are complementary to other ongoing experiments, and Sadoulet reviewed how each fits and when upcoming projects will be initiated.

There are many collaborative opportunities supported by a focus on theory around programs and experiments, debate on experimental results, a common analysis when data is added, and work on low radioactive backgrounds with a new consortium starting.

The timeliness of the experiments undertaken is critical. G2 work holds great potential but must be executed rapidly. The environment for this work is very competitive and some of the work such as the first SNOLAB CDMS started late. Cost is another issue and researchers will try to enlist multiple universities to push the work forward.

Sadoulet reviewed G3 goals and the potential for new experimentation. Diverse approaches, support for R&D, learning from difficulties encountered, and following the P5's recommendation that G3 go forward can help maximize continued success in this field. Equipment is also an issue as a new cavity is likely needed at SNOLAB.

One of the pathfinders for this work is liquid argon with dark side running at 50l at Gran Sasso. Mini Clean is another capability, as is ArDM that will begin gathering data in the coming weeks. Another pathfinder for this work are directional detectors that include DRIFT and the DMTPC. The latter is constructing a 1,000l detector for use underground.

Aspirations for G3 include work in crystals, noble liquids, and the XENON 1T project that is under construction and will work with Darwin Xe + Ar.

Discussion

Tao Han asked how Band X fits into the picture. **Sadoulet** explained that this work is building a 1T.

Erbacher referred to Sadoulet's description of ongoing experiments noting that the timescale for XMASS is commissioning by 2017 and 2019, and other good sensitivity experiments start in 2015. **Sadoulet** confirmed that they are all based on the same cycle. A larger mass will allow work to proceed faster and some projects will move more quickly. The problem with XMASS technology is reconstructing the position of the timing by sizes within the detector. A phototube on one or both sides can create solutions or problems, as was shown in XMASS 1.

Sadoulet shared with **Tschirhart** that XENON has isotopes with a neutron excess. The flow-in of iodine is missing. It will come through more systematically if there are follow-ups to gamma. There are two proposals that will eventually come to NSF to address this. PICO intends to keep going at some level, but Saboulet is unsure about the other proposal.

Tschirhart asked about coherent neutrino background, referring to slide 30 and asked if there are other possible significant uncertainties. **Sadoulet** explained that the band shown in slide 30 is just for visual purposes and that the atmospheric neutrino background is probably well known. The cosmological supernova background shown is likely of considerable sensitivity. There should not uncertainty about other neutrinos but that has not been tested with certainty. For G2, it must be shown that something can be detected in the region being probed, and anything detected may be the first demonstration of neutrino scattering.

Heeger asked about the G3 process. **Saboulet** shared that there will be upgrades to G2 first.

Sadoulet shared with **Heeger** that there are two scenarios in which a switch of technologies to G3 can occur. If there is a clear discovery, then a huge and very complex setup would be desired. The other direction is to try to optimize existing resources, but that scenario is unlikely.

Shipsey noted the importance of this topic and opportunity to compare some community work with XENON. He noted being told that the actual mass of a neutrino is 3T and that would not synch with the timing. He added that the competition for discovery is very intense. **Shutt** added that the neutrino mass is between 2T and 3T. He clarified that the first year of research is brutal so things would not be reset by one year. Researchers are trying to get through the parameter space and the delay now is limiting their work.

PRESENTATION OF DOE POLICIES REGARDING PUBLIC ACCESS TO RESEARCH PUBLICATIONS AND DIGITAL DATA MANAGEMENT

Dr. Laura Bivens told HEPAP about a memo from Office of Scientific and Technical Personnel (OSTP) that calls for better handling of data for public access. The DOE has established a public access plan and will release a statement on data management and requirements for the department on October 1, 2014. FOAs will include the requirement for a data management plan in research proposals starting on October 1.

The origin of DOE's effort was the American COMPETES Act of 2010. Information received from FACA panels such as HEPAP in 2011 helped DOE develop its public access plan.

DOE's Statement on Digital Data Management is accessible on the DOE website. It suggests how funding recipients might format their data management plan. Individual DOE offices such as HEP might have additional requirements that should be read.

Principles guiding this initiative include making information accessible to make efficient and effective use of research funded by DOE and to strengthen collective public knowledge by ensuring access to research findings.

Biven outlined requirements for data management plans that have to be covered in the plan that is part of a researcher's proposal when submitted to DOE. These requirements do not apply to proposals submitted to a user facility or proposals for something other than research activities.

The DOE website includes links to all DOE-funded user facilities. The intent is to guide researchers to details on how individual facilities will manage the data that is produced at the facility and by its personnel. Biven indicated that proprietary details do not have to be included in the data management plan.

The definition of digital data includes a wide variety of information in various formats. Software is considered to be digital data. Data preservation and data sharing are also components of the data management plan.

DOE will ensure access to the best available version of peer-reviewed scholarly publication results from DOE funding within 12 months from publication. At times, the best available version may be one held by a publisher. The Public Access Gateway for Energy and Sciences (PAGES) is the way for the public to view information. It is managed by the DOE OSTI.

Starting on October 1, lab researchers should use the lab's existing information submission system to submit accepted manuscripts.

Biven showed the PAGES website and site navigation. There is a 12-month timeframe by which a manuscript must be available for PAGES. Until then, PAGES will host a link to the publisher's site for access to the article. The publisher may charge a fee on their site to read an article.

Biven explained the Clearing House for Open Research of the U.S. (CHORUS). It organizes Federally-funded research information and ensures public accessibility. CHORUS has worked with FedRef to add metadata fields to every article that describe the funding organization and the specific office that supported the research and the associated grant or contract number.

Discussion

Erbacher asked if HEP is developing language for research publications in ATLAS and USCMS. Biven shared that both are adding language on what they would like to see.

Bivens shared with **Erbacher** that DOE will not host a repository due to funding limitations, in reference to her question about inserting data that includes tables and charts.

Ben-Zvi asked about publications such as a talk given at a conference. **Bivens** shared that it depends on the author's roles as a lab or university researcher. Slides can be submitted to Office of Scientific and Technical Information (OSTI). The material will not appear in PAGES as that is for peer-reviewed publications but it will show up in pages run by OSTI. The slides themselves are not considered data.

Shutt asked about the timescale for keeping raw data that forms a plot or a figure, noting that data kept at a DOE facility could be contained, whereas data at a university could end up on a computer and become obsolete. **Bivens** shared that there are no rules from OSTP but DOE hopes that researchers will determine whether or not the amount of data that accompanies a publication is adequate. The use of existing repositories is encouraged.

Shutt noted that this effort might signal a shift in the notion of a journal, especially once the 12-month access timeline is in play. **Bivens** shared that the mix of research that is Federally-funded and funded in other ways is different. CHORUS manages journals. It is assumed that they have thought about their business model to determine that subscription rates will not be hurt.

Biven noted that theory papers must be accessible if resulting from a public grant. Simulated data can be stored. She clarified for **Ligeti** that DOE's definition of data is open to allow the community to define it. That can be subjective and based on the opinions of peer-reviewers.

Erbacher shared that there needs to be open access between CERN and the journals. **Bivens** commented that this effort is decoupled from DOE but is not inconsistent with DOE efforts. Europe institutes an author-pays model to ensure more instant access.

Tschirhart asked about publishers involved in CHORUS but also annotation members. **Bivens** shared that the latter have signed up in general and are supportive. They are trying to put content into CHORUS and are actively working to put the same metadata into their workflows.

Crawford added that DOE will learn more as proposals are submitted. If reviewers do not see a valid data management plan, then that will impact the review. The forum for that discussion is unclear but will emerge as reviews start on October 1st. This requirement does not apply to anything submitted prior to October 1st.

PRESENTATION OF CONCEPT FOR A NATIONAL SCIENTIFIC PROGRAM ADVISORY SUBPANEL

Andrew Lankford described progress on the National Scientific Program Advisory Subpanel (NSPAsP) which seeks to advise DOE on the selection of small particle physics projects for the national HEP portfolio that may be too small to be considered individually by the P5 and could gain approval. The P5 report set goals for a national program and discussion of the basis for a mission need and CD-0 approval.

The NSPAsP connects with the P5 Report in three ways: the small projects portfolio, the short baseline portfolio, and project reassessment which occurs if projects costs or aims change substantively. Lankford reviewed descriptions of each. Added to this is direction from the HEPAP COV that a more thorough review process for new projects is needed.

The NSPAsP is similar to the Fermilab PAC (F-PAC) but would not operate on a national level. F-PAC's feedback indicates that the relationship between the two is unclear and could create inefficiencies.

Lankford reviewed similarities between the two, to include the performance of scientific review and use of usual merit review criteria. Differences between the two include the timing of project reviews. F-PAC does ongoing review whereas NSPAsP would review projects only proposed as ready to join the U.S. HEP portfolio. The convening timing differs, as do the arrangements for committee appointments, and the persons and agencies the two groups advice.

The NSPAsP would not replace the F-PAC. Their interplay needs to be worked out.

It was proposed that an initial pilot project would be the initial definition of a national short-baseline short-neutrino program lead by a HEPAP subpanel consisting of subcommittees of F-PAC and HEPAP. One mechanism is convening an international workshop on the neutrino program that will be intermediate in time between current experiments and LBNF. The workshop could include working groups in various areas and produce white papers that would inform subsequent action steps. A HEPAP subpanel composed of members of the F-PAC and HEPAP, and other experts could advise the DOE on an initial program definition.

Discussion

Lankford confirmed for **Ligeti** that the NSPAsP would have closed meetings.

Lankford told **Jawahery** that HEP asked HEPAP to implement this part of the P5 plan and it would not fall to the F-PAC. **Lankford** thinks that the F-PAC might see project proposals first. Proponents of a proposal might share any prior outside reviews to decide if it is ready for the NSPAsP. This outside review could include a review by the F-PAC.

Lankford confirmed for **Erbacher** that the F-PAC could respond to proposals at the lab and others not at the lab.

Lankford confirmed for **Erbacher** that the NSPAsP will be convened when needed, is not a standing committee, and will be driven by its constitution.

Lankford shared with **Jawahery** that it is unlikely that F-PAC would look at a proposal and not consider the P5 criteria. F-PAC does advise the Fermilab Director on the Fermilab program and does not advise DOE on a national context like the NSPAsP would.

Lankford shared with **Heeger** that the NSPAsP would be dealing with projects rather than prioritizing between proposals for projects and proposals for R&D.

Heeger asked if the activity is endorsed by NSF or if they would pay attention to it. **Lankford** noted that NSF is always open to proposals and once they get a proposal, the review procedure is dictated by the National Science Board.

Lankford shared with **Erbacher** that proposals will arrive at NSPAsP when the DOE is seeking advice on something.

Erbacher commented that experiments that go to F-PAC receive recommendations to proceed or not proceed, then go to the director. He is free to take their advice or not. The mechanism now allows the director to make decisions make for a national program in those cases. This has always been the case, and when there were many different HEP labs, the entire U.S. program was not being represented. Fermilab now represents the entire U.S. program.

Lankford clarified for **Tschirhart** that HEPAP will give advice to agencies, NSPAsP will give advice to HEPAP for approval and then submission to DOE.

Tschirhart suggested that the DOE Office of Nuclear Physics should be engaged on proposals for the short baseline program. **Lankford** noted that if the NSPAsP made a recommendation to DOE it would be acting as a full panel, hence it has to report to HEPAP.

Buckley added that proposal review and what the NSPAsP does could be blurry, offering that it could advise HEPAP with FOA in a way similar to the G2 process. DOE could publish an FOA for proposals for short baseline neutrino projects and coordinate it like the G2 program with NSF. **Lankford** noted that the process of having a workshop and getting white papers and then following subsequent steps could apply, and this could be applied. NSF could look at proposals coming from a workshop, but the DM model described earlier does not seem to map well onto this short baseline approach. **Crawford** added that DOE would like to move faster on small baseline proposals than the two year span from publishing and FOA for DM and getting awards, as was described earlier.

Heeger commented that timeliness is important. The F-PAC and similar mechanisms should drive this, and the process should be transparent.

Siegrist suggested that the NSPAsP should not deal with a mix of thing like the P5 does, but should address the small baseline. This will bring uniformity for conducting reviews, hence specific processes are not needed.

Lankford clarified for **Jawahery** that the NSPAsP would look at proposals at the request of DOE HEP. A proposal might not be reviewed that has not been reviewed by the Fermilab Director, but proposals can be outside of the lab. **Procario** added that nothing goes to the NSPAsP except through the DOE. **Erbacher** added that the F-PAC can make a recommendation to the Director then it can to DOE and then NSPAsP.

Lankford responded to **Ligeti** that there needs to be a mechanism for doing experiments but there are not a huge wealth of projects coming forward are started by the DOE. Two different panels could come up with different recommendations from a review. The NSPAsP is informing a national portfolio and may see how the pieces fit together differently than F-PAC which is putting together a portfolio for small baseline.

Lankford noted earlier talk of a pilot project in which experts jointly examine a national neutrino program. Fermilab participants would be asked to leave their Fermilab hats at the door.

McBride asked how the panel's advising DOE relates to the whole process. **Lankford** clarified that NSF does not need and cannot leverage this process.

Lankford told **McBride** that other labs are not engaged as they do not have physics advisors or PACs for particle physics programs. Fermilab differs as it is the accelerator-based lab. SLAC has a scientific advisory committee that gives general comments but does not review proposals.

Bishai commented that this panel seems like an ad-hoc proposal review and committee, which is problematic as they lack enough history and information to know if the people proposing a project can deliver. **Lankford** noted that there is a difference between ad-hoc committees and ad-hoc procedures. In this case, the NPSAsP would look at project proposals that have been reviewed and details will be in place before DOE hands over the proposal. In this way, the panel will not be conducting an early stage review.

Tschirhart asked were CMBS4 fits in the process and if they would go through it. **Lankford** shared that CMBS4 is very conceptual and an example of something that had not been sufficiently prepared when it came to the P5. It was blessed by the P5 but does not necessarily

have to come here. It represents a collaboration of scientists seeking to work together and it can be expected that there will not be any competing proposals.

Fleming Crim expressed to **Shutt** that NSF will not participate in NPSAsP as ingesting it into the P5 process may not work. NSF's treatment of the P5 is being determined and the Foundation is accountable to the National Science Board.

Lankford responded to an earlier comment about G3, noting that the NPSAsP will consider what DOE wants it to consider. The current CMB is supported by multiple divisions in NSF.

Buckley suggested that there may be the potential for a lot of interagency proposals and that this should be thought through in the pilot project.

Sciolla is a member of the F-PAC, and urged all to remember that Fermilab is important to U.S. high-energy physics but is not the only player. She noted the value of the NPSAsP to establish a balanced U.S. portfolio. The panel should work with F-PAC but also work independently. She cited the ad-hoc nature of the NPSAsP and urged replacing members after some time. **Lankford** shared that a continuity solution is not yet known. Rotating membership could be supplemented with expertise from many areas. Continuity is supported by HEPAP members who serve on a proposal. A strong HEPAP role would be good.

Natalie Roe offered that this type of pilot has been done in the past in the form of scientific assessment groups. These were useful to agencies. The panel differs in that HEPAP subpanels report to HEPAP and the subpanel members do not have to be members of HEPAP and F-PAC. The idea of a short baseline workshop is good but the connection between it and the panel is unclear, and she asked if members would be appointed in advance of a workshop. **Lankford** confirmed that it would help to know the members in advance, and members could assess the dynamics of the workshop and watch issues raised.

PRESENTATION OF HEPAP ACTIVITIES

Lankford asked HEPAP members to send comments on the survey for conferences that was discussed on day one.

Lankford shared that there is nothing to report at present on the future subcommittee on university and laboratory roles in executing the HEP program. He asked HEPAP members to read more about this. This is an important evolution and it is connected to the P5 Report.

The next HEPAP meeting is December 8 and 9 in Bethesda. HEPAP will hear about a preliminary report from the accelerator R&D subpanel, materials by design and opportunities for HEP, the particle data group report, and the exploration of annual reports from DPF and DPB.

The HEPAP meeting in March 2015 will be in Washington DC in the city with easy access to OMB, OSTP and other interested groups. March coincides with the roll-out of the FY16 budget. The final report from the accelerator R&D subpanel will be shared. Communication will be discussed. **Lankford** also proposed moving the meeting to April 2015.

Future activities include updates on the development of the P5 implementation plan, reports from domestic and international organizations, and an update on projects that are underway.

CLOSING REMARKS AND ADJOURNMENT

Lankford adjourned the meeting at 12:55 p.m. EST.

The minutes of the High Energy Physics Advisory Panel meeting held at the National Science Foundation on September 29 and 30, 2014, are certified to be an accurate representation of what occurred.

Signed by Andrew Lankford, Chair of the High Energy Physics Advisory Panel on (date).

(Insert electronic signature)