

National Science Foundation  
Directorate for Mathematical and Physical Sciences  
Charge to: MPSAC Subcommittee on NSF Response to Strategic Plan for Particle Physics Outlined in the  
May 2014 Particle Physics Project Prioritization Panel Report

The NSF has significant investments in accelerator-based elementary particle physics and in particle astrophysics in the Division of Physics (PHY). Particle physics is a highly collaborative discipline that brings together physicists from around the world and the nation to advance the science. The NSF focuses its support on high impact science carried out by the university community, and partners in support of the field with the DOE Office of High Energy Physics, which supports both laboratories and university groups. The MPS Directorate and the DOE Office of Science (“Agencies”) jointly secure advice from the High Energy Physics Advisory Panel (HEPAP).

Informed by community input through the APS Division of Particles and Fields’ 2013 Snowmass<sup>1</sup> process, the Agencies charged<sup>2</sup> HEPAP to form a subcommittee to develop a strategic plan for US Particle Physics that could be executed over the next ten years within the context of a 20-year global vision for the field. In May 2014 that subpanel, the Particle Physics Project Prioritization Panel (P5), released its report<sup>3</sup> “Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context”. This report was unanimously accepted by the High Energy Physics Advisory Panel (HEPAP) and overwhelmingly endorsed<sup>4</sup> by the US Particle Physics community at large.

The P5 report identified five intertwined science drivers that encompass the most compelling scientific questions in the field for the coming decade. The report recommends a global program with projects at all scales, from the largest international projects to mid- and small-scale projects. It also lists as the highest near-term priority for large projects Phase 2 Upgrades to the LHC accelerator and the ATLAS and CMS detectors. In this context, this subcommittee is asked to address the following questions:

1. Based on the science drivers identified in the P5 report, how should the NSF target its investments in such a way that they maximize the NSF impact and visibility? Should the Physics Division target specific areas or should it invest broadly?
2. What criteria should the Physics Division use to balance support between small-scale, mid-scale and large projects?
3. How should the Division of Physics define a unique role in areas of common interest with DOE?

The subcommittee is not expected to revisit the P5 charge, priorities, or conclusions. Rather, the subcommittee is expected to focus on the balance of NSF investments in light of the P5 report.

In response to P5, the Division of Physics is considering the following scenario for major investments in the next 10 years:

An investment in LHC Phase 2 Upgrades, which could range from the midscale to the MREFC level, and Midscale investments in other scientific priority areas identified by P5.

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<sup>1</sup> <http://www.snowmass2013.org>

<sup>2</sup> [http://science.energy.gov/~media/hep/pdf/files/COV/P5\\_Charge\\_2013.pdf](http://science.energy.gov/~media/hep/pdf/files/COV/P5_Charge_2013.pdf)

<sup>3</sup> [http://science.energy.gov/~media/hep/hepap/pdf/May%202014/FINAL\\_P5\\_Report\\_Interactive\\_060214.pdf](http://science.energy.gov/~media/hep/hepap/pdf/May%202014/FINAL_P5_Report_Interactive_060214.pdf)

<sup>4</sup> [https://dl.dropboxusercontent.com/u/24655052/P5\\_CommunityLetter\\_to\\_DOE\\_NSF\\_Final\\_2100\\_DNSF-4.pdf](https://dl.dropboxusercontent.com/u/24655052/P5_CommunityLetter_to_DOE_NSF_Final_2100_DNSF-4.pdf)

In the context of P5 and NSF priorities as elaborated in its Strategic Plan<sup>5</sup>, this subcommittee is asked to assess this scenario and how it contributes to and impacts the Physics Division mission. This analysis should be undertaken assuming both a budget that is flat at the FY 2014 level and a budget at constant FY2014 dollars for particle physics funding over the 10-year period of FY 2015 through FY 2024.

For this scenario:

4. Would proposed investments of this type best capture the strengths of NSF and result in NSF funding having a significant and identifiable impact in the field? What criteria should be used to determine whether or not the Physics Division should pursue this scenario?
5. What are the opportunity costs of such an investment strategy? Would required investments<sup>6</sup> outside the MREFC budget line before, during, and after a construction project allow enough flexibility to respond to new, unforeseen particle physics opportunities? Is the balance between facility investments (pre-construction, construction, and operations & maintenance) and PI-driven research awards appropriate for particle physics at the NSF?

We would appreciate an interim report from the subcommittee to the MPSAC at its November 2014 meeting, and a final report delivered to the MPSAC at its January 2015 meeting. The committee is expected, if necessary, to consult with the relevant communities and/or stakeholders. We recognize that this will be a challenging task; however your considerations on these issues will be essential input into planning at the NSF.

**Timeline:** Charge Delivered to Panel – August, 2014

Interim Report Due to MPSAC: November 2014 MPSAC Meeting

Final Report Due to MPSAC: January 2015 MPSAC Meeting

These reports will detail progress and interim (draft) findings, and will bring to the attention of the MPSAC any major opportunities and challenges. The report can be delivered virtually, and will be coordinated by the MPSAC.

The Chair of the subcommittee should coordinate delivery of materials with the MPS AC Chair in advance of scheduled MPS AC meetings.

The final written report will be due no later than January 31, 2015, with a presentation to the MPSAC at its January 2015 meeting.

Presentations to the MPSAC may be delivered remotely or in person.

### **Resources**

NSF will arrange for and host virtual meetings of the subcommittee as required by the Chair.

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<sup>5</sup> [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf14043](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf14043)

<sup>6</sup> While midscale projects derive support during pre-construction, construction, and operations from the PHY research budget, funding for construction of MREFC projects is provided by a dedicated MREFC budget line external to the Physics Division. However, both pre-construction and operations support for MREFC-level projects is provided from the Physics Division research budget.