



December 15, 2023

The Honorable Jennifer Granholm
Secretary of Energy
United States Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

The Honorable Shalanda D. Young
Director
Office of Management and Budget
725 17th Street NW
Washington, DC 20503

The Honorable Sethuraman Panchanathan
Director
National Science Foundation
2415 Eisenhower Avenue
Alexandria, VA 22314

The Honorable Arati Prabhakar
Director
Office of Science and Technology Policy
1650 Pennsylvania Avenue
Washington, DC 20504

Dear Secretary Granholm, and Directors Young, Panchanathan, and Prabhakar:

As US physicists engaged in the study of the fundamental constituents of our universe, we are writing to strongly endorse the conclusions and recommendations of the recently released 2023 Particle Physics Project Prioritization Panel (P5) report, [Exploring the Quantum Universe: Pathways to Innovation and Discovery in Particle Physics](#). This report has been unanimously approved by the High-Energy Physics Advisory Panel (HEPAP), which advises the DOE Office of Science and the NSF Directorate for Mathematical and Physical Sciences.

Exploring the Quantum Universe charts a fiscally responsible program to study the very large (the cosmos as a whole) and the very small (the structure of matter at scales ten thousand times smaller than the atomic nucleus) by selecting the most promising avenues of investigation for the next 10 to 20 years. The new report builds on the successes of the program mapped out by the previous [2014 P5 strategic plan](#) and follows in-depth consideration of the full range of future scientific opportunities studied in a planning exercise by the US High-Energy Physics community known as the [Snowmass study](#). The proposed pathways for innovation address the scientific questions in our field in a manner that is balanced across near, intermediate, and long timescales, as well as small, medium, and large experimental programs, and make strategic investments to develop the needed scientific workforce. In addition, the P5 panel made the hard choices required to maximize the potential for scientific discovery within feasible budget constraints.

As our highest priority the report supports the operations of ongoing experiments and reaffirms the construction of projects currently underway, such as the Large Hadron Collider (LHC) and High Luminosity LHC project (HL-LHC); the Deep Underground Neutrino Experiment (DUNE) and the associated PIP-II accelerator improvements at Fermi National Accelerator Laboratory (FNAL); the Rubin Observatory to carry out the Legacy Survey of Space and Time (LSST) and the LSST Dark Energy Science Collaboration; as well as a suite of impactful medium-scale projects.

The report further recommends an exciting portfolio of major new projects that collectively study nearly all fundamental constituents of our universe and their interactions, including:

- The Cosmic Microwave Background Stage Four (CMB-S4) survey that looks back at the earliest moments of the universe.
- A re-envisioned second phase of DUNE with an early implementation of an enhanced FNAL accelerator to definitively study the properties of the most elusive known particles, neutrinos.
- US participation in an offshore Higgs factory, realized in collaboration with international partners, in order to study the Higgs field from which the masses of the fundamental particles emerge.
- An ultimate Generation 3 (G3) dark matter direct detection experiment to search for the particles that constitute the bulk of the matter in our universe, pushing existing technologies to their limits.
- The IceCube experiment Generation 2 (IceCube-Gen2) upgrade to study the highest-energy neutrinos produced by the most violent events in the cosmos.

The report complements these large projects with support for small- and medium-scale experiments to open new scientific avenues and provide increased opportunities for training early career scientists, as well as support for a comprehensive effort to foster the new theoretical, computational, and technological advances needed to realize our twenty-year vision for the field. The report highlights the need to make certain that all training programs are broadly accessible, especially to those historically underrepresented in science, and incorporate rigorous standards for the ethical conduct of all physicists involved. It also emphasizes our responsibility to continue and expand efforts to share our science with the general public.

A particularly exciting aspect of the investments proposed by *Exploring the Quantum Universe* is the funding of an aggressive R&D program for a Higgs factory and for revolutionary new accelerator designs that reach an order of magnitude higher energies than the LHC. These investments would enable the current generation of early career US scientists, technologists, and engineers to lead the world in taking the next steps in exploring the fundamental constituents of the universe and their interactions - and could enable the US to host a major next-generation collider facility.

We are enormously grateful to the DOE, NSF, and taxpayers of this country for the investments that have been made in the study of the properties of the universe, which have enabled the discoveries of the past. While hard choices had to be made to construct a fiscally responsible plan, the *Exploring the Quantum Universe* program capitalizes on previous investments to enable US particle physics, in collaboration with our international partners, to take the next steps in exploring the quantum universe.

We fully and strongly support the recommendations in *Exploring the Quantum Universe*, and we ask for your help in realizing these exciting scientific opportunities.

Sincerely yours,

R. Sekhar Chivukula, UC San Diego, DPF Chair
Joel Butler, Fermilab, DPF Past Chair
André de Gouvêa, Northwestern, DPF Chair Elect
Heidi Schellman, Oregon State University, DPF Vice Chair
Sarah Eno, University of Maryland, 2024 DPF Vice Chair
Kelly Stifter, SLAC, DPF Early Career Representative
Harvey Newman, Caltech, US LHC Users Executive Committee Chair
Caterina Vernieri, SLAC, SLAC Users Organization Chair
Jane Nachtman, University of Iowa, Fermilab Users Executive Committee Chair

cc: Asmeret Asefaw Berhe, Director, DOE Office of Science
C. Denise Caldwell, Acting Assistant Director, NSF Division of Mathematical and Physical Sciences

[This letter is endorsed by over 3200 members of the
US High-Energy Physics Community](#)