APS DPF plans for Snowmass 2021

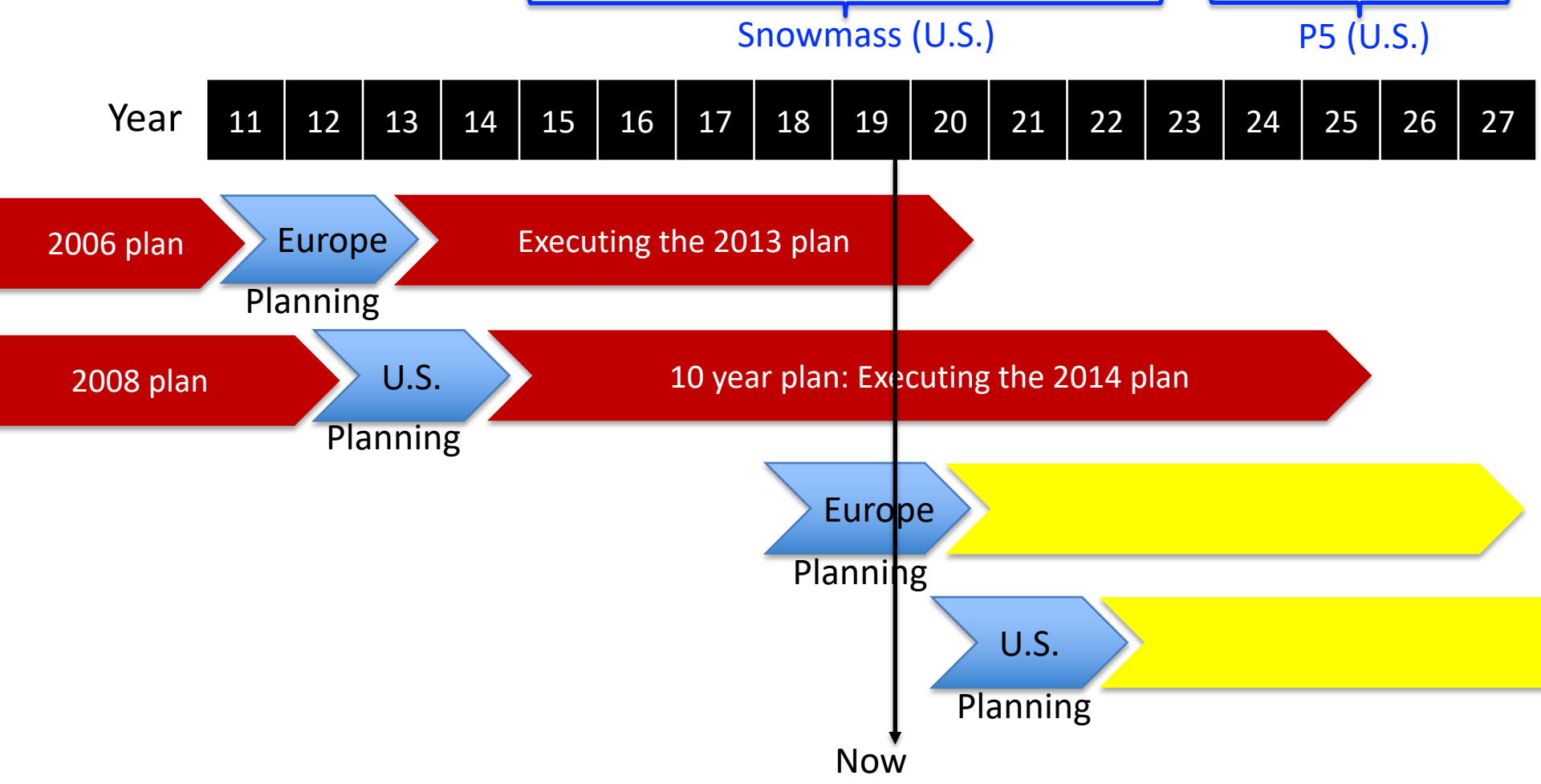
Priscilla Cushman (DPF Chair)

HEPAP Meeting Nov 21, 2019

Planning Long-Term Strategies for Particle Physics

Europe and U.S.

- Frequency: 7 years (Europe), ~8 years (U.S.)
- Process: ~2 years in total (~1 year on science by the community + ~1 year priorities)



Snowmass 2013

The planning process included more than a year of workshops. It presented a status of the field and exciting opportunities going forward. It did NOT prioritize.

Snowmass on the Mississippi (July 29 - August 6, 2013)

Archive of video streaming during the snowmass

Charge: *The American Physical Society's Division of Particles and Fields is initiating a long-term planning exercise for the high-energy physics community. Its goal is to develop the community's long-term physics aspirations. Its narrative will communicate the opportunities for discovery in high-energy physics to the broader scientific community and to the government.*

- The final reports were completed in about 6 months
- P5 (Particle Physics Project Prioritization Panel) took the scientific input from Snowmass and formulated a strategic plan to address the science within specified funding constraints
- A successful Snowmass process results in community buy-in, even when hard budgetary decisions need to be made

Snowmass 2013 topics led to P5 Science Drivers

Snowmass Report

Frontiers

Energy Frontier
Cosmic Frontier
Intensity Frontier

Cross-Cutting

Facilities (Underground and Accelerator)
Instrumentation
Computing
Theory
Communication

P5 Report

Five intertwined scientific Drivers were distilled from the results of a yearlong community-wide study:

- Use the Higgs boson as a new tool for discovery
- Pursue the physics associated with neutrino mass
- Identify the new physics of dark matter
- Understand cosmic acceleration: dark energy and inflation
- Explore the unknown: new particles, interactions, and physical principles

P5: Strategic Plan for U.S. Particle Physics in the Global Context

Much has changed since the last long-range planning document for high energy physics was endorsed by HEPAP (the Particle Physics Project Prioritization Panel (P5) report, submitted in 2008). It is therefore an opportune time to revisit this guidance to the DOE and the NSF. To that end, we ask that you constitute a new P5 panel to develop an updated strategic plan for U.S. high energy physics that can be executed over a 10 year timescale, in the context of a 20-year global vision for the field.

Your report should provide recommendations on the priorities for an optimized high energy physics program over the next ten years (FY 2014-2023), under the following three scenarios:

A: Constant for 3 yrs + 2% increase (based on 2013 appropriated)
B. Constant for 3 yrs + 3% increase (based on 2014 Presidential budget)
C. Unconstrained (but prioritized)

Patricia M. Dehmer
Acting Director, Office of Science
U.S. Department of Energy

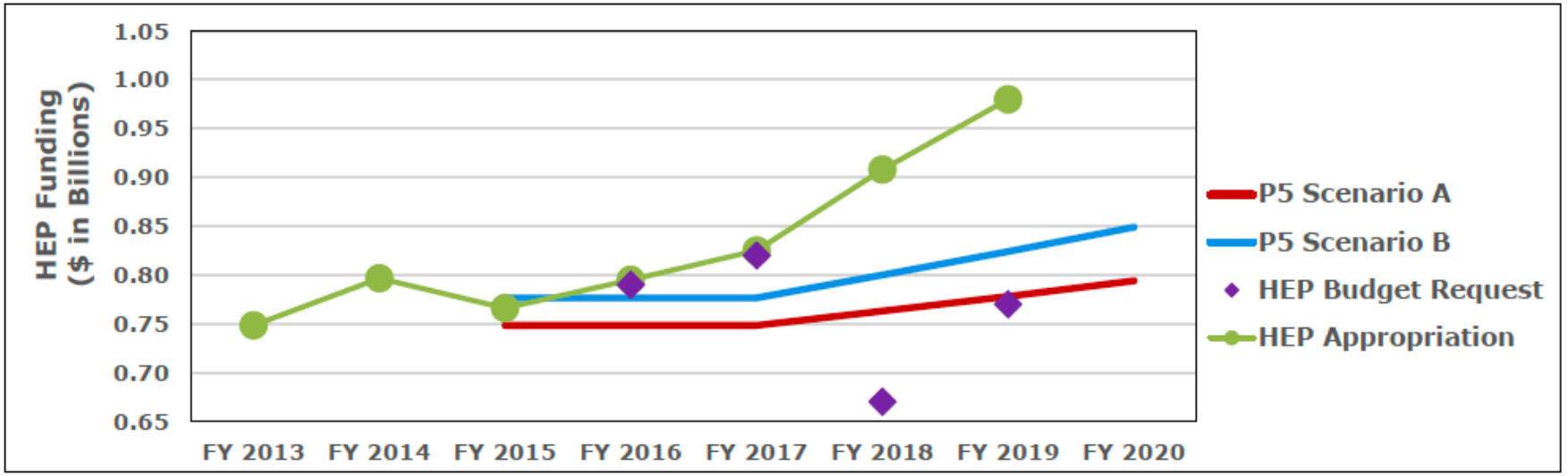
Dr. F. Fleming Crim
Assistant Director
Directorate for Mathematical and Physical Sciences
National Science Foundation

At this HEPAP meeting, we will be taking stock of the plan 5 yrs out

P5 has been very successful

- FY 2019 Senate Energy and Water Development Appropriations Report:
  - "The Committee recommends $1,010,000,000 for High Energy Physics. **The Committee strongly supports the Department's efforts to advance the recommendations of the Particle Physics Project Prioritization Panel Report [P5],** which established clear priorities for the domestic particle physics program…"

"Four years into executing the P5, the Committee commends the Office of Science and the high energy physics community for achieving significant accomplishments and meeting the milestones and goals set forth in the strategic plan…"



Snowmass ➔ P5 is good publicity

Increase public engagement with High Energy Physics

https://www.usparticlephysics.org/

Provides an integrated vision for congressional visits and "asks"

Ten Snowmass 2021 "Frontiers"

- Energy Frontier
- Cosmic Frontier
- Frontiers in Neutrino Physics
- Frontiers in Rare Processes and Precision Measurements
- Theory Frontier
- Underground Facilities and Infrastructure
- Accelerator Science and Technology Frontier
- Instrumentation Frontier
- Computational Frontier
- Community Involvement

We anticipate that most people will be in 3-4 different frontiers

Cross-cutting is now defined within the group.

Example: Theory Frontier

- Field Theory Techniques and Scattering Amplitudes
- Quantum Gravity, Blackholes, and String Theory (DAP, DGRAV connections)
- Lattice gauge techniques and applications
- BSM model building: SUSY GUTs, composite models, string models
- Organizational group of liaisons to Cosmic, Neutrino, Rare/Precision, Energy

Theorists need to participate in one of the 4 topical frontiers as well as study formal techniques

Initial organization by the DPF Program Committee

The DPF Program Committee (created in 2017)

- Serves by appointment of the DPF Executive committee
- 3-year terms with staggered rotation
- 25 of your HEP colleagues with expertise in a broad range of fields
- Main job is to help organize the April APS meeting and DPF unit meeting.
  (schedule and invite talks, public outreach, Grad slam, code of conduct ….)

Details here: https://www.aps.org/units/dpf/governance/committees/program.cfm

In order to jumpstart the process and to understand the scope of each Frontier
The DPF Exec + Program Committee has also defined a first draft of the Sub-groups

- Better defines the Frontier categories
- Provides a framework to request convener nominations
- Will be optimized later by each Frontier, once the working groups form.

Topical Groups under the Frontiers

Topics can be found at the DPF website: https://www.aps.org/units/dpf/snowmass-2021.cfm
They will not change.

For example…

Frontiers in Rare Processes and Precision Measurements.
(Contact slstone@syr.edu, rhbob@fnal.gov to nominate conveners)
Weak decays of b & c quarks
- Tests of Standard Model CP violation, CKM measurements
- Lepton flavor universality tests
- Rare phenomena, B(s)->mu+mu-, B->K(*)lepton+lepton-, Bs-> phi gamma,other S
- Beyond the SM direct searches including dark photon, Majorana neutrinos, etc...

CP violation at colliders
CP violation at low energies (e.g. where CP violation is not bound by EDM measureme
Electric and magnetic dipole moments
CLFV (mu to e conversion, rare muon and tau decays)
Parity violation and fundamental symmetry tests
Nucleon decay, n-n-bar mixing
Low Energy Measurements (AMO)
New Light Weakly-Coupled Particles
Nano-gravity and Fifth Force, frame-dragging, Eotvos

Energy Frontier (Contact chill@physics.osu.edu, tmptait@gmail.com to nomin
Higgs Physics
- Properties (mass and width)
- Decay channels
- Production processes (VBF, associated etc.)

Top Quark physics
BSM: new bosons, new fermions
BSM: SUSY and MET
Accelerator Searches for DM and long-lived particles
- ATLAS & CMS
- Dedicated experiments

Electroweak: W = production, mass and Z Production processes
QCD: Pdf measurements,
- Precision X-section measurements
- Use of QCD and Lattice in extraction of CKM elements and pseudoscalar d

Heavy Ions
Hadron spectroscopy: light meson, b b-bar, c c-bar, exotic tetraquark, pentaqu

Conversation and changes are already happening via a monitored slack channel:
https://app.slack.com/client/TNNU4A570/CNLN41C21

Major agreed-upon changes are posted in our wiki: https://snowmass-wiki.fnal.gov/
- Edit permission resides with DPF Exec
- Once chosen, Frontier conveners can make their own pages

Create a transparent and inclusive process

This is NEW and also ahead of the curve compared to last time

- Announcements sent to APS members and posted in labs and universities

- General call for frontier and topical convener nominations (closed November 15)
  - Expect to have 2-3 co-conveners for each of the 10 Frontiers
  - Can be self-nominated, by peer, or by a small group

- The Snowmass2021 Steering Committee
  - will choose Frontier Convener pairs and triplets from among the nominations
  - seeking broad representation: e.g. early career + established scientist, theory + experiment, gender balance, background

- The Steering Committee are your elected representatives
  - The DPF Executive Committee + the Chair line from DAP, DNP, DPB, DGRAV

- The Frontier Conveners
  - Will choose their topical group leaders from the ***all the*** compiled nominations and the Steering Committee will approve topical nominations
  - Will optimize the topics and working groups

Create a transparent and inclusive process

Much has changed in the last decade with respect to Inclusion and Diversity
We can benefit from existing tools and new awareness

APS has a code of conduct – publicize and follow
Allies program has been successful with DNP, incorporate at Snowmass

Accessibility issues understood from the beginning and planned for
including building access, ASL interpreters, child care options,…

Enrich and strengthen Snowmass-Young SNOWMASS-YOUNG@LISTSERV.FNAL.GOV

The Topic called "Community Involvement" is not just outreach

Applications & Industry
Physics Education
Public Policy and Government Engagement
Public Education and Outreach
Diversity & Inclusion
Career Pipeline & Development

Rough Timeline for the next year

November 15, 2019
- Deadline to submit proposals for the summer study site
- Deadline to nominate conveners

December 15, 2019
- Decision on summer study site
- Finalize co-conveners for the frontiers

January - February, 2020
- Finalize topical conveners
- Convener organizational meetings

March, 2020
- Outline the overall structure of the Snowmass process

APS April meeting, 2020
- Snowmass Steering Committee meets with frontier/infrastructure conveners
- Frontier/infrastructure have their own working group meetings
- Present the outline to the community / receive feedback from the community

2021 Summer Study: July 11-20

Modeled after the successful Snowmass 2013

Much of the work is done via workshops throughout the previous year

Summer study week is for consolidation, cross-fertilization, report organization

Dates

Sunday July 11 afternoon start

possible early arrival (Sat-Sun) for Frontier conveners

Covers one full weekend, ends Tuesday, July 20

Avoids CIPANP, WIN 2021, LeptonPhoton, July 4,…

Sites

Four very good site proposals received

- University of Washington. Venue: Seattle Campus
- Virginia Tech. Venue: Blacksburg Campus
- University of Minnesota and Fermilab. Venue: Minneapolis Campus
- University of Pittsburgh and Carnegie Mellon. Venue: Wyndham Grand Pittsburgh Downtown hotel

Investigated revisiting Snowmass Village in Colorado

But cost is not competitive, travel is difficult, resort concept might still be suspect.

Particle Physics is not isolated: Other Planning Processes

Long-Range Plan for Nuclear Science (2015)

Funded by Nuclear Physics Offices of funding agencies

Fundamental Symmetries and Neutrinos

QCD: Structure of Hadrons and Phases of Strongly Interacting Matter

National Academies Astronomy and Astrophysics (2010, 2020)

Dark Energy, Cosmic Microwave Background, Indirect dark matter searches

Canadian Astroparticle Community Planning Process

(The McDonald Institute, SNOLAB, IPP, CNIP, Perimeter Institute, and TRIUMF)
To develop a long-term vision for the future of astroparticle physics in Canada. The process is expected to be concluded by the end of 2020, which will allow the Canadian community vision to be considered by other scientific planning purposes, such as the Canadian Subatomic Physics Long Range Plan and the SNOWMASS/P5 processes in the United States.

Looking forward to a productive couple years

Process in place

- Organize Frontier Working Groups and optimize topical groups
- Select site for summer study
- Strong effort to promote balance, diversity, and broad participation
- Snowmass2021 Steering committee includes DPB, DAP, DNP, DGRAV

The Science is interconnected

- Boundaries need to be explored - P5 can draw narrower, funding priorities
- Liaisons and task forces will be formed between Frontiers

Workshops will begin next spring

Under frontier convener control

At Universities and Labs around the world

We've done this before

Take advantage of lessons learned

Lots of hard work ahead

We're ready!