

# P5 Process and Progress



Hitoshi Murayama and Karsten Heeger  
Town Hall at FNAL/ANL, Mar 21-23, 2023



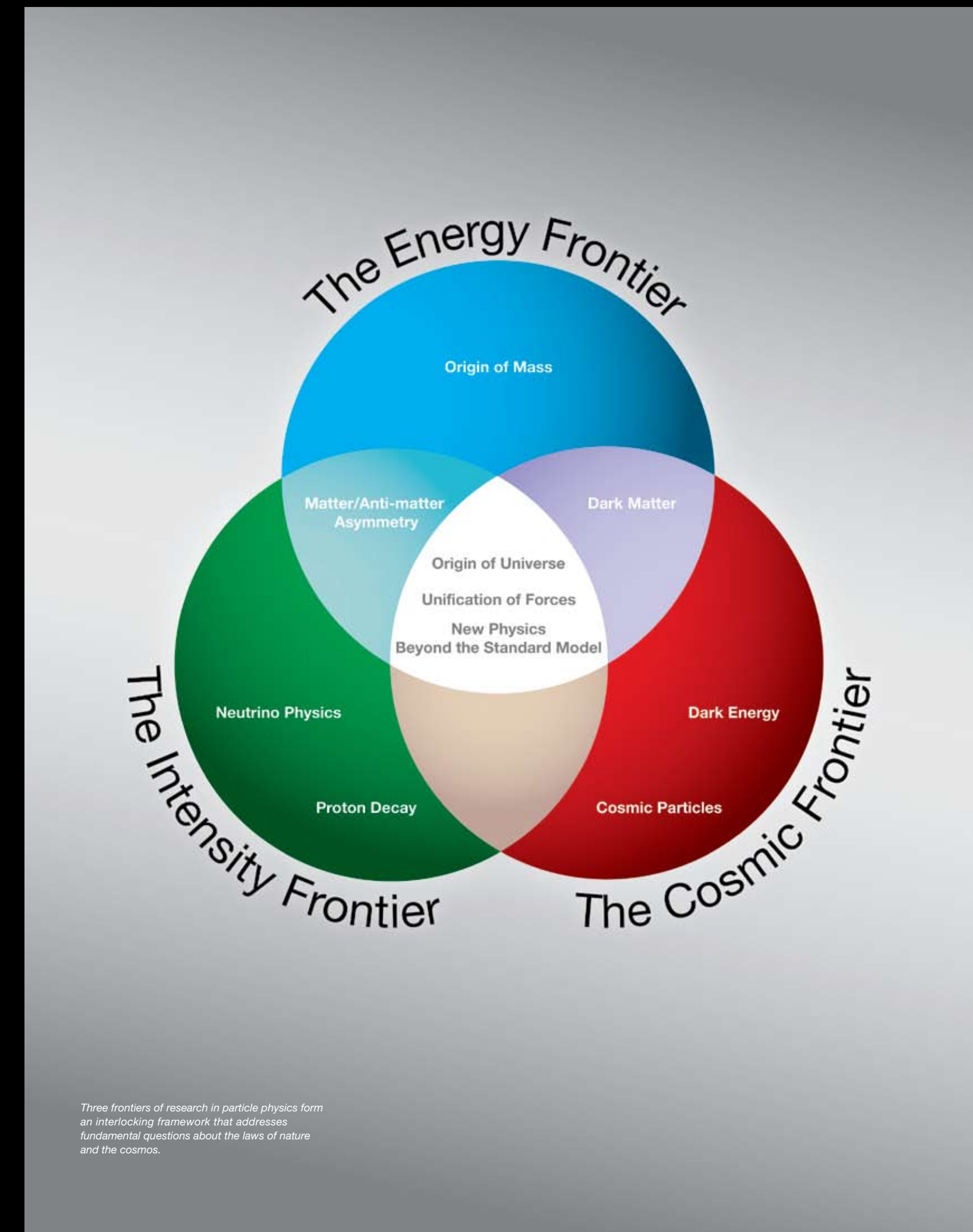
# Key Elements of a Successful P5

- Well informed by the science community
- Set a grand long-range vision for U.S. particle physics
- Faced budget constraints realistically
  - “Community made tough choices.”
- Balanced portfolio
  - Domestic and international
  - Small, mid-scale, and large projects
- Community engagement critical to success
  - “Bickering scientists get nothing.”

**Harriet Kung, Snowmass in Seattle**

# 2008 P5

- **2008 P5** (Charlie Baltay)
  - First “modern” P5 with budget scenarios and long-term vision
  - Energy, Intensity, Cosmic Frontiers
  - Tevatron for one to two more years
  - **World-class neutrino program**
  - **Dark matter & dark energy, LSST**
- ***US Particle Physics: Scientific Opportunities A Strategic Plan for the Next Ten Years***



# 2014 P5

- **2014 P5 (Steve Ritz)**
  - 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.
- **Finally “got it right”**
  - Well received in Washington
  - Embraced CMB (inflation)
- ***Building for Discovery***

## Buil Strategic

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

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**Figure 1**  
Construction and Physics Timeline

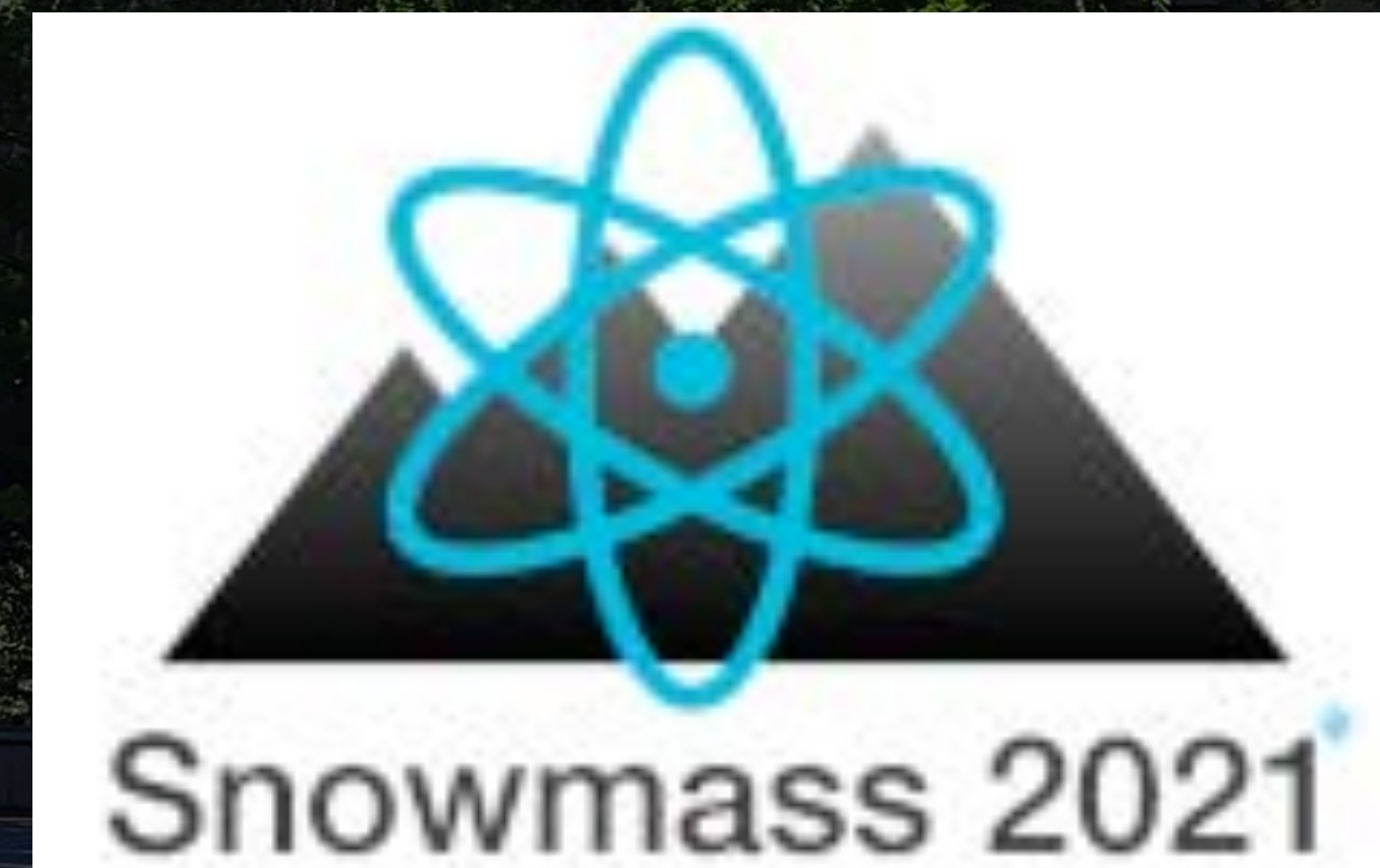


**FIGURE 1** Approximate construction (blue; above line) and expected physics (green; below line) profiles for the recommended major projects, grouped by size (Large [ $> \$200M$ ] in the upper section, Medium and Small [ $< \$200M$ ] in the lower section), shown for Scenario B. The LHC: Phase 1 upgrade is a Medium project, but shown next to the HL-LHC for context. The figure does not show the suite of small experiments that will be built and produce new results regularly.



# Take aways from Snowmass

- We have an exciting program
  - Thanks to Steve Ritz, previous P5, agencies!
- We are broader than the current program energy, intensity, cosmic
  - Where is the boundary of our field?
- We are a forward-looking community
  - We need program beyond what the previous P5 outlined
  - We also need more freedom
  - better balance big, medium, small; projects vs research
- We deeply care about our community
  - Diversity, equity, inclusion, outreach, engagement
- It's a daunting task





# Last P5 science drivers

- 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.
- Still very much true
- Main aim: physics beyond the standard model







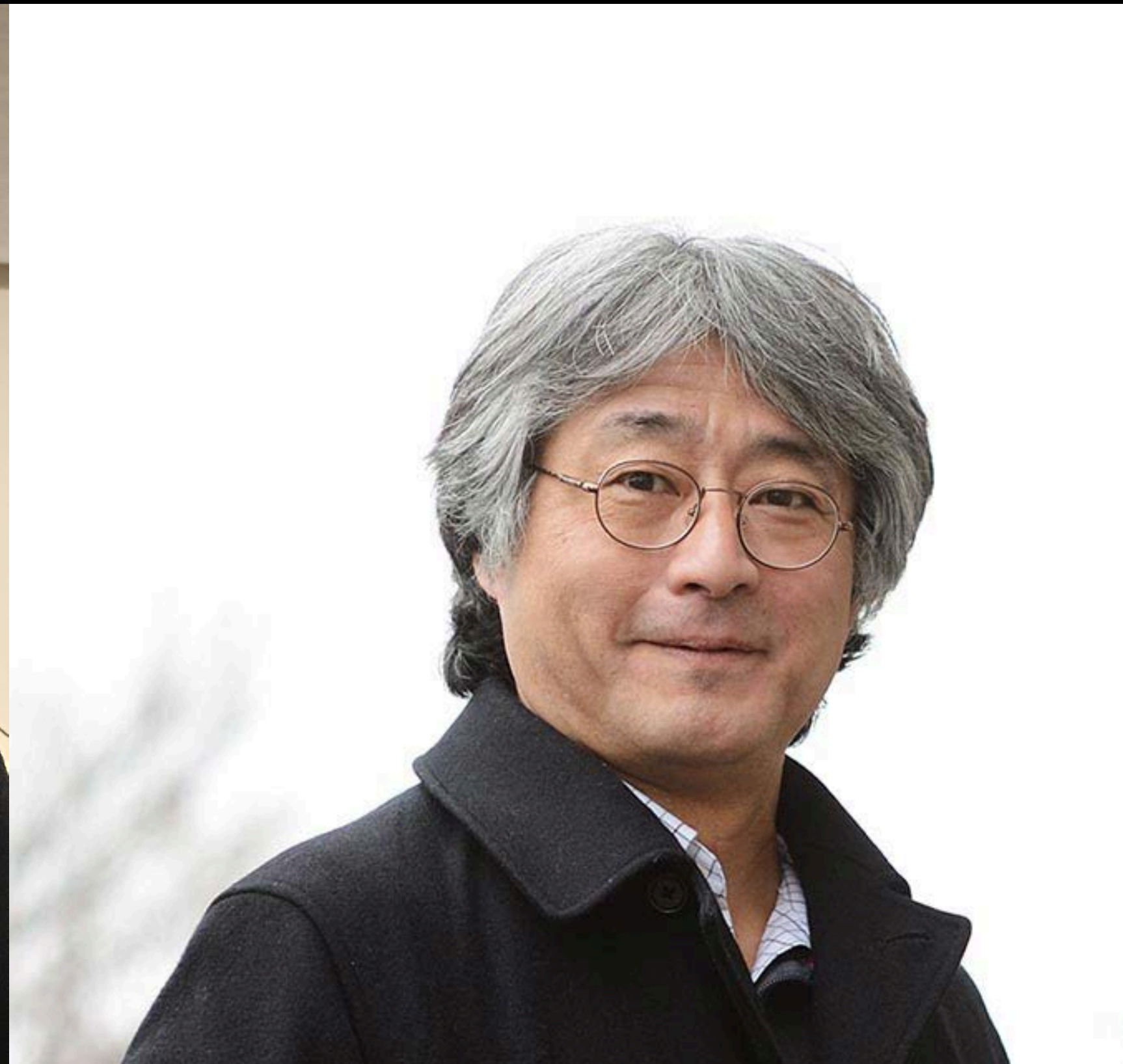
P5 Panel



# P5 Leadership Team



JoAnne Hewett  
HEPAP chair



Hitoshi Murayama  
P5 Chair

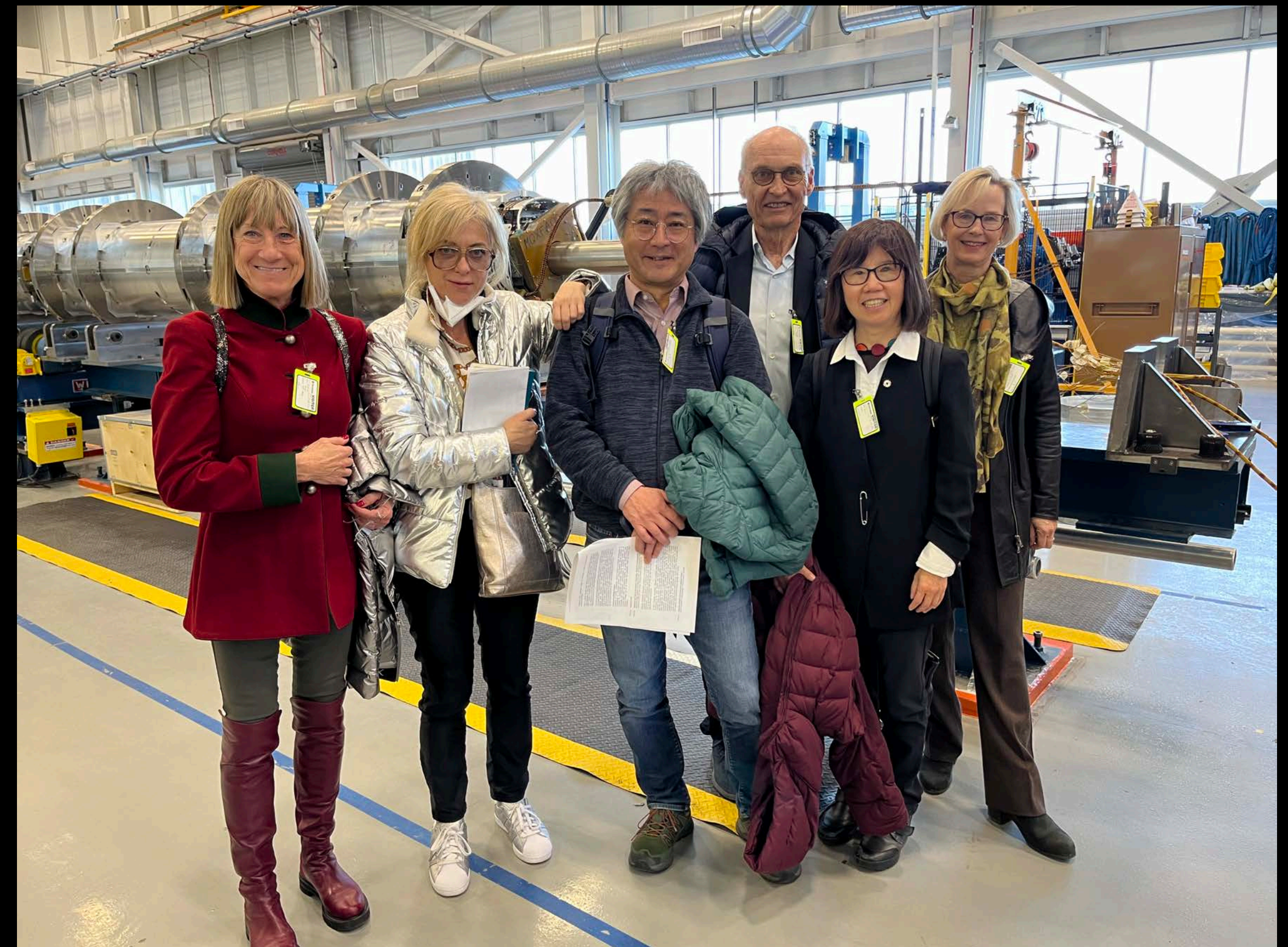


Karsten Heeger  
Deputy Chair



# Interface with EPP2024

- EPP2024 looks into long-term vision, dreams, unconstrained by budget scenarios
- We invite all EPP2024 members to P5 town halls to make sure we get the same inputs from the community
- Will keep informing EPP2024 about our progress and vice versa
- Hopefully what we recommend will smoothly connect to their longer-term vision





# Snowmass Input

Decadal Overview of Future Large-Scale Projects		
Frontier/Decade	How do we develop enabling technology for long-term vision in a fashion executable in 20 years?	
Energy Frontier	U.S. Initiative for the Targeted Development of Future Colliders and their Detectors	
	US role?	Higgs Factory Scope? Technology? Complementarity?
Neutrino Frontier	LBNF/DUNE Phase I & PIP- II	DUNE Phase II (incl. proton injector)
Cosmic Frontier	Cosmic Microwave Background - S4	Next Gen. Grav. Wave Observatory*
	Spectroscopic Survey - S5* Scope?	Line Intensity Mapping* Do we embrace them?
	Big, small, new? Multi-Scale Dark Matter Program (incl. Gen-3 WIMP searches)	
Rare Process Frontier		Advanced Muon Facility Scope? Other science?

**Table 1-1.** An overview, binned by decade, of future large-scale projects or programs (total projected costs of \$500M or larger) endorsed by one or more of the Snowmass Frontiers to address the essential scientific goals of the next two decades. This table is not a timeline, rather large projects are listed by the decade in which the preponderance of their activity is projected to occur. Projects may start sooner than indicated or may take longer to complete, as described in the frontier reports. Projects were not prioritized, nor examined in the context of budgetary scenarios. In the observational Cosmic program, project funding may come from sources other than HEP, as denoted by an asterisk.



# Balance

- Project vs research
- Large ( $> \$200\text{M}$ ), medium ( $\$50\text{-}200\text{M}$ ), small ( $< \$50\text{M}$ ) (previous P5)
  - Collection of small may be medium
- Science vs R&D
  - Instrumentation, computing, theory
- National initiatives
  - AI/ML, microelectronics, QIS
  - How do we capitalize on it? How can HEP contribute to these initiatives?
- DEI
  - What can agencies do?



# Meetings & Schedule

- **Open Town Halls**
  - LBNL, Feb 22-24, 2023
  - Fermilab/Argonne: March 21, 22, 23
  - Brookhaven: April 12, 13, 14 (just before DPF in Minnesota)
  - SLAC: May 3-5
    - Sign up for making short remarks!
- DPF session on P5 (April 15)
- Virtual Town Halls
- Closed meetings
- Preliminary recommendations August
- Final report due October



# Community Interest in P5

- >724 participants at this town hall
- Short remarks oversubscribed
  - 36 accepted
  - Sorry for rejected ones
  - Please try again at later town halls!
- We particularly encourage contributions from early career members





# Logistics/Reminder

- Please observe the community conduct
- We ask speakers to observe time limit. Will be strictly observed. Need to leave time for Q&A.
- Online participants can leave questions in Google doc. P5 will look at all questions and may follow up offline with projects/speakers.
- Please introduce yourself with name and institution when asking questions.



# Indico Site

## Accessibility

ASL Interpreting,  
Captioning Services  
Instructions, Visually  
impaired seating

Slide examples for  
closed captioning

# Fermilab Community Standard Agreement

## How to report concerns

## Argonne Code of Conduct

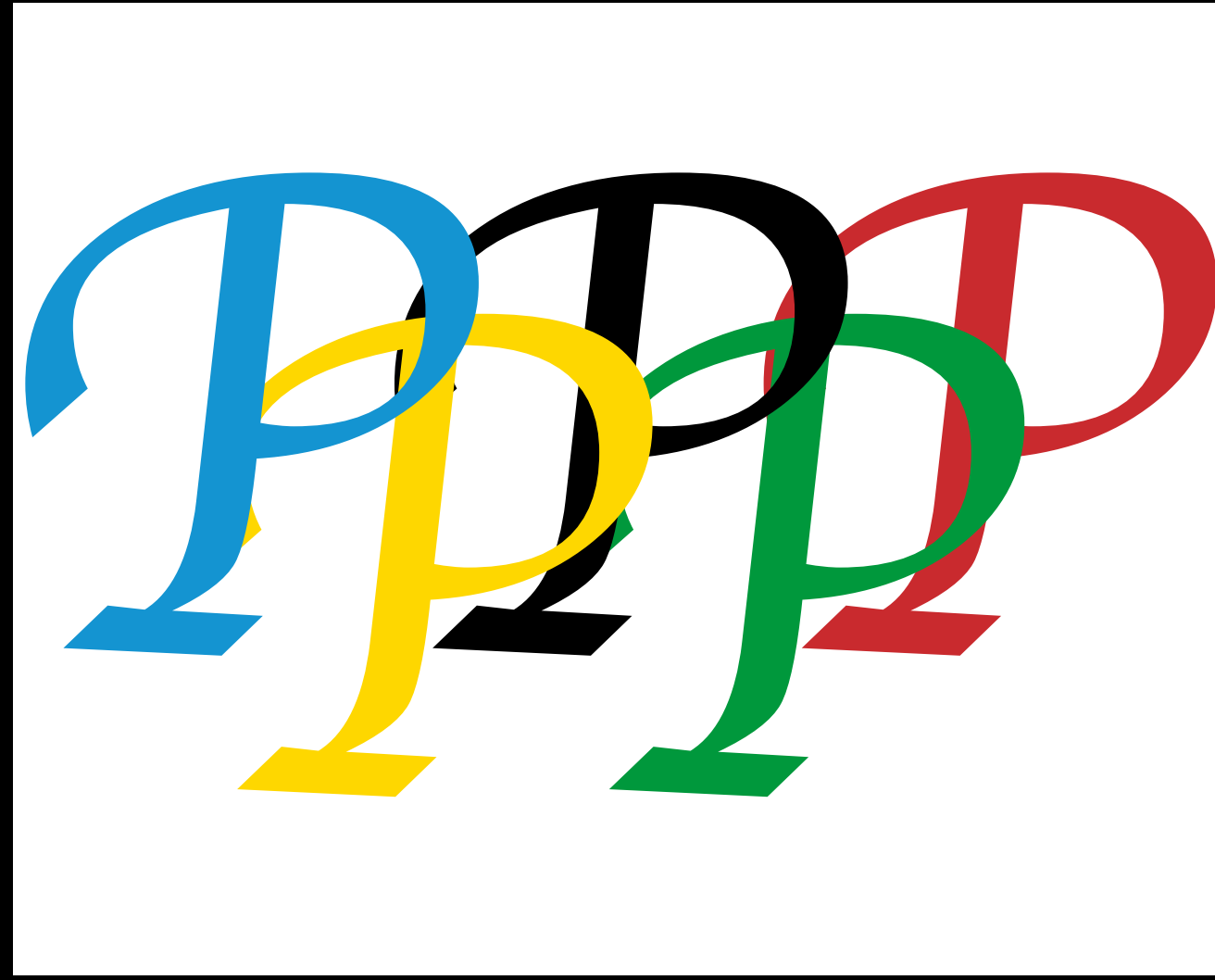
## How to Report Concerns

## APS Code of Conduct

Introduction: Fermilab		Hitoshi Murayama
Ramsey Auditorium (Wilson Hall), Fermilab		13:30 - 13:55
Neutrinos: 1		Patrick Huet
Ramsey Auditorium (Wilson Hall), Fermilab		13:55 - 16:30
Break		
Wilson Hall Atrium, Fermilab		16:30 - 16:50
Neutrinos: 2		Seon-Hee Shin
Ramsey Auditorium (Wilson Hall), Fermilab		16:50 - 18:20

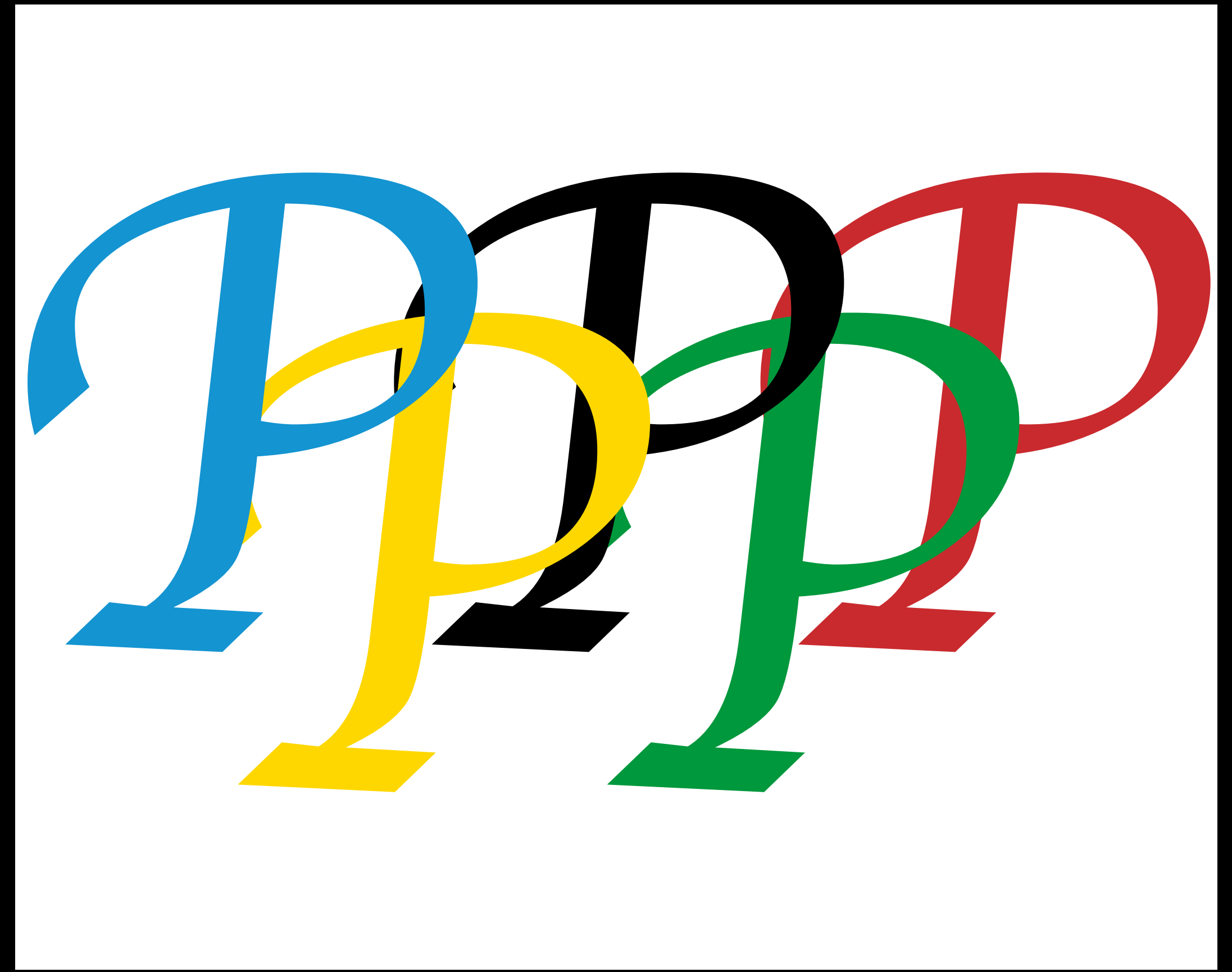
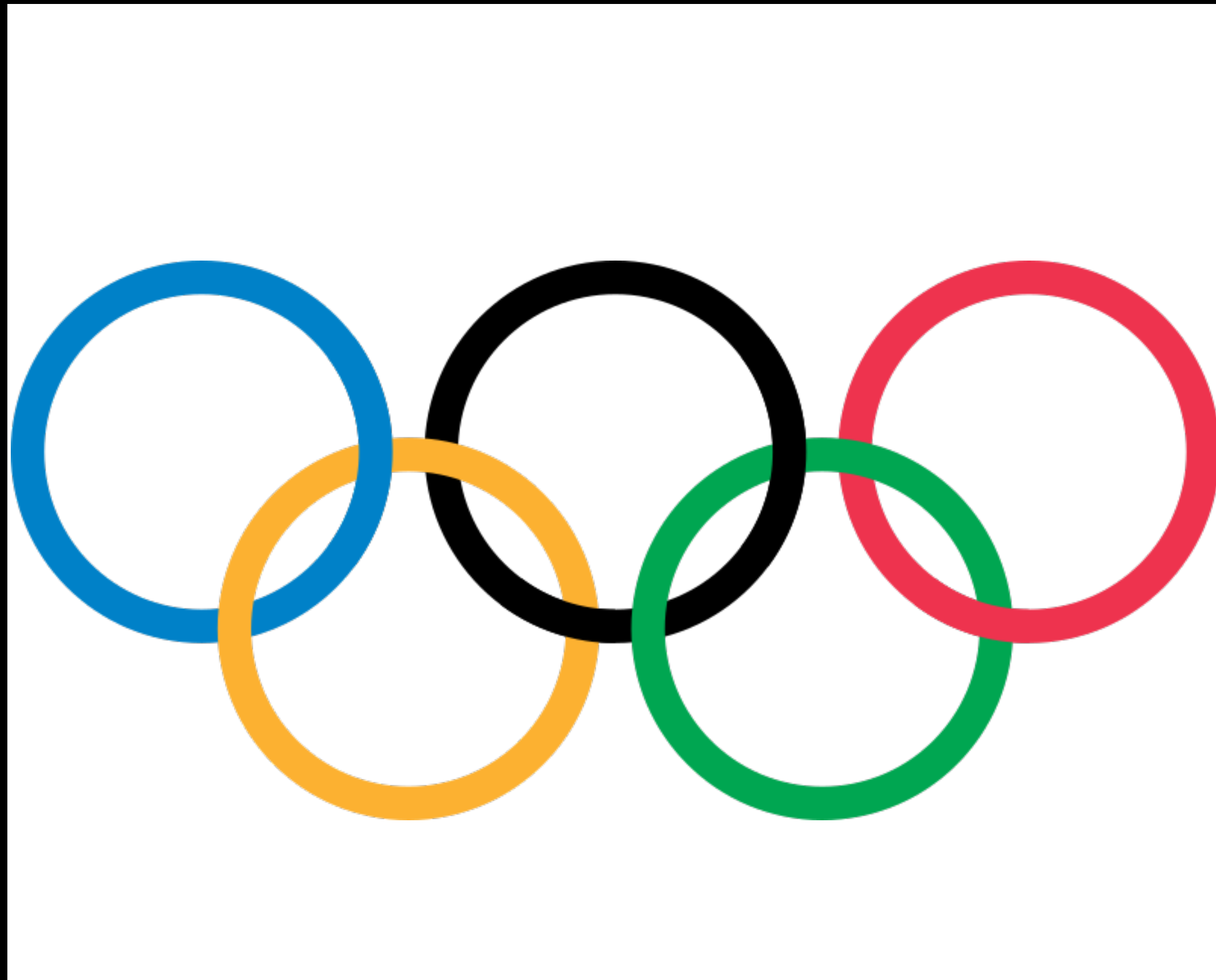


# Thanks to FNAL/ANL





# P5 Tentative Logo



Apologies to Antarctica! CMB and IceCube



# *Maximize Science!*



## *Questions?*