

# Introduction: Snowmass 2021

Frontier for Rare Processes and  
Precision Measurements

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- The Particle Physics Community Planning Exercise (a.k.a. “Snowmass”) is organized by the Division of Particles and Fields (DPF) of the American Physical Society.
- Snowmass is an opportunity for the entire HEP community to come together to identify and document a vision for the future of particle physics in the U.S. and its international partners.
  - Snowmass is a science study exercise and the outcome is a report on the progress and opportunities for science in the next 10 years
  - This report will serve as an input to the Particle Physics Project Prioritization Panel (P5), whose role is to formulate a 10 year plan for the US science program within funding constraints.
- Given the increasing importance of interdisciplinary work in related fields such as astrophysics, cosmology, nuclear physics, etc., members of other Divisions (Astrophysics, Gravitational Physics, Nuclear Physics, Physics of Beams etc.) with a connections to particle physics are strongly encouraged to participate in this process.

# Rare Processes and Precision Measurements

- The Frontier for Rare Processes and Precision Measurements explores fundamental physics with intense sources and ultra-sensitive detectors.

## Topical groups

- RF1: Weak decays of b and c quarks
  - RF2: Weak decays of strange and light quarks
  - RF3: Fundamental Physics in Small Experiments
  - RF4: Baryon and Lepton Number Violating Processes
  - RF5: Charged Lepton Flavor Violation (electrons, muons and taus)
  - RF6: Dark Sector Studies at High Intensities
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- Wiki page: <https://snowmass21.org/rare/>

# RF4: Baryon and Lepton Number Violating Processes

This Topical Group will address the following

1. Theories for baryon and lepton number violation:
  - P. Fileviez Perez (CWRU), M.B. Wise (Caltech)
2. Neutrinoless double beta decays:
  - V. Cirigliano (LANL), A. Pocar (UMass)
3. Baryon and Lepton number violation at colliders:
  - R. Ruiz (Louvain Univ.), E. Thomson (UPenn)
4. Proton decay:
  - E. Kearns (Boston Univ.), S. Raby (Ohio State Univ.)
5.  $n$ - $\bar{n}$  oscillations:
  - K. Babu (OSU), L. Broussard (ORNL)
6. More exotic L and B violating processes:
  - S. Gardner (Univ. of Kentucky), J. Heeck (UC-Irvine)
7. Connections to Cosmology:
  - A. Long (Rice Univ.), C. Wagner (Univ. of Chicago/ANL)

This is a group effort!

# Liaisons to other frontiers

Role: ensure information/facilitate discussion on frontier activities on items of common interest

	Frontier	Co-Conveners		
Angelo Di Canto	Energy Frontier	Meenakshi Narain	Brown University	meenakshi_narain@brown.edu
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	Frontier in rare processes and Precision measurements	Marina Artuso	Syracuse University	martuso@syr.edu
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Marina Artuso	Instrumentation Frontier	Phil Barbeau	Duke University	psbarbeau@phy.duke.edu
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Bob Bernstein	Community Involvement	Ketevi Assamagan	Brookhaven National Laboratory	ketevi@bnl.gov
		Breese Quinn	University of Mississippi	quinn@phy.olemiss.edu

# Road Map for R&P Frontier

- Elucidate the case for the physics program that we are engaged in
  - Practical aspects: develop a program of workshops, open up slack conversation, formalize joint studies to sharpen the physics case with scenarios on how we will achieve our physics goals in the medium and long-term future
  - Develop milestones [in coordination with MA, RB & AP]
- Methodology: identify key measurements, theoretical approaches needed to relate measurements to fundamental physics (e.g. lattice QCD...), bottom up and top down interpretation tools
- Gather a strong community to advocate for this physics program
  - Invite participation to slack channels, listservs and workshops, solicit LOIs
  - Find connection with other communities
  - Build network with other frontiers (physics groups, computing, instrumentation, accelerator, social engagement)
  - Identify cross-sectional physics interest
  - Identify common instrumentation, computing/infrastructure need

## **Letters of Interest (submission period: April 1, 2020 – August 31, 2020)**

Letters of interest allow Snowmass conveners to see what proposals to expect and to encourage the community to begin studying them. **They will help conveners to prepare the Snowmass Planning Meeting that will take place on November 4 - 6, 2020 at Fermilab.** Letters should give brief descriptions of the proposal and cite the relevant papers to study. Instructions for submitting letters are available at <https://snowmass21.org/loi>. Authors of the letters are encouraged to submit a full writeup for their work as a contributed paper.

## **Contributed Papers (submission period: April 1, 2020 – July 31, 2021)**

Contributed papers will be part of the Snowmass proceedings. They may include white papers on specific scientific areas, technical articles presenting new results on relevant physics topics, and reasoned expressions of physics priorities, including those related to community involvement. **These papers and discussions throughout the Snowmass process will help shape the long-term strategy of particle physics in the U.S.** Contributed papers will remain part of the permanent record of Snowmass 2021. Instructions for submitting contributed papers are available at <https://snowmass21.org/submissions/>

## **Final Product: Snowmass 2021 Report**

You do NOT need to submit LOI to submit Contributed Paper!

- Summer 2020
  - R&P Kick-off Workshop (July 28): <https://indico.fnal.gov/event/44121/>
  - R&P Topical Group meetings/workshops (Zoom)
- Fall 2020
  - Snowmass Planning Meeting: November 4-6, 2020 (FNAL/Zoom)
- Winter 2021
  - R&P Topical Group meetings/workshops
- March 2021
  - R&P Frontier meeting (hopefully F2F or F2F/Zoom combination)
    - Site proposals: send them to AAP, MA, & BB!
- Summer 2021
  - 2021 Snowmass Summer Study: July 11-16, 2021 (UW Seattle)