General Introduction to the Snowmass Process

April 3rd 2023

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https://snowmass21.org/

Goals of Snowmass

Goal of Snowmass 2021

- This Snowmass Community Planning exercise is organized by the Division of Particles and Fields (DPF) of the American Physical Society (APS) as a ~ year-long "Science" study
- Goal: To identify the most important questions in HEP and the tools and infrastructure required to address them
  - To achieve a broader and deeper understanding of the science in our field and its connection to other research areas.
  - To engage junior scientists and foster our community development
  - To reach a compelling, shared scientific vision for the field moving forward for the US in alignment with its international partners
  - Provide input to the "Particle Physics Project Prioritization Panel" (P5) process, expected to begin its work in the late fall of 2022 and produce a report in the spring of 2023.

Joel Butler, CSS Seattle, link

Structure of Snowmass

10 Frontiers	80 Topical Groups
Energy	Higgs Boson properties and couplings, Higgs Boson as a portal to new physics, Heavy flavor and top quark physics, EW Precision Phys. & constraining new phys., Precision QCD, Hadronic structure and forward QCD, Heavy Ions, Model specific explorations, More general explorations, Dark Matter at colliders
Neutrino Physics	Neutrino Oscillations, Sterile Neutrinos, Beyond the SM, Neutrinos from Natural Sources, Neutrino Properties, Neutrino Cross Sections, Nuclear Safeguards and Other Applications, Theory of Neutrino Physics, Artificial Neutrino Sources, Neutrino Detectors
Rare Processes	Weak Decays of b and c, Strange and Light Quarks, Fundamental Physics and Small Experiments. Baryon and Lepton Number Violation, Charged Lepton Flavor Violation, Dark Sector at Low Energies, Hadron spectroscopy
Cosmic	Dark Matter: Particle-like, Dark Matter: Wave-like, Dark Matter: Cosmic Probes, Dark Energy & Cosmic Acceleration: The Modern Universe, Dark Energy & Cosmic Acceleration: Cosmic Dawn & Before, Dark Energy & Cosmic Acceleration: Complementarity of Probes and New Facilities
Theory	String theory, quantum gravity, black holes, Effective field theory techniques, CFT and formal QFT, Scattering amplitudes, Lattice gauge theory, Theory techniques for precision physics, Collider phenomenology, BSM model building, Astro-particle physics and cosmology, Quantum information science, Theory of Neutrino Physics
Accelerator	Beam Physics and Accelerator Education, Accelerators for Neutrinos, Accelerators for Electroweak and Higgs Physics, Multi-TeV Colliders, Accelerators for Physics Beyond Colliders & Rare Processes, Advanced Accelerator Concepts, Accelerator Technology R&D: RF, Magnets, Targets/Sources
Instrumentation	Quantum Sensors, Photon Detectors, Solid State Detectors & Tracking, Trigger and DAQ, Micro Pattern Gas Detectors, Calorimetry, Electronics/ASICS, Noble Elements, Cross Cutting and System Integration, Radio Detection
Computational	Experimental Algorithm Parallelization, Theoretical Calculations and Simulation, Machine Learning, Storage and processing resource access (Facility and Infrastructure R&D), End user analysis
Underground Facilities	Underground Facilities for Neutrinos, Underground Facilities for Cosmic Frontier, Underground Detectors
Community Engagement	Applications & Industry, Career Pipeline & Development, Diversity & Inclusion, Physics Education, Public Education & Outreach, Public Policy & Government Engagement
Snowmass Early Career	Snowmass Early Career to represent early career members and promote

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Snowmass Timeline

- April 2020: first meetings
- August 2020: Snowmass Letter of Interest
- Fall 2020: Community-Wide Town Hall Meetings
- October 2020 Snowmass Community Planning Meeting

- December 2020: Decision to delay Snowmass by ~1 year due to pandemic

- Fall 2021: More meetings
- Match 2022: Snowmass white paper deadline
- June 2022: topical group reports
- July 2022: Community summer study (CSS) in Seattle
- September 2022: Frontier reports
- October 2022: Snowmass summary

- 2023: P5

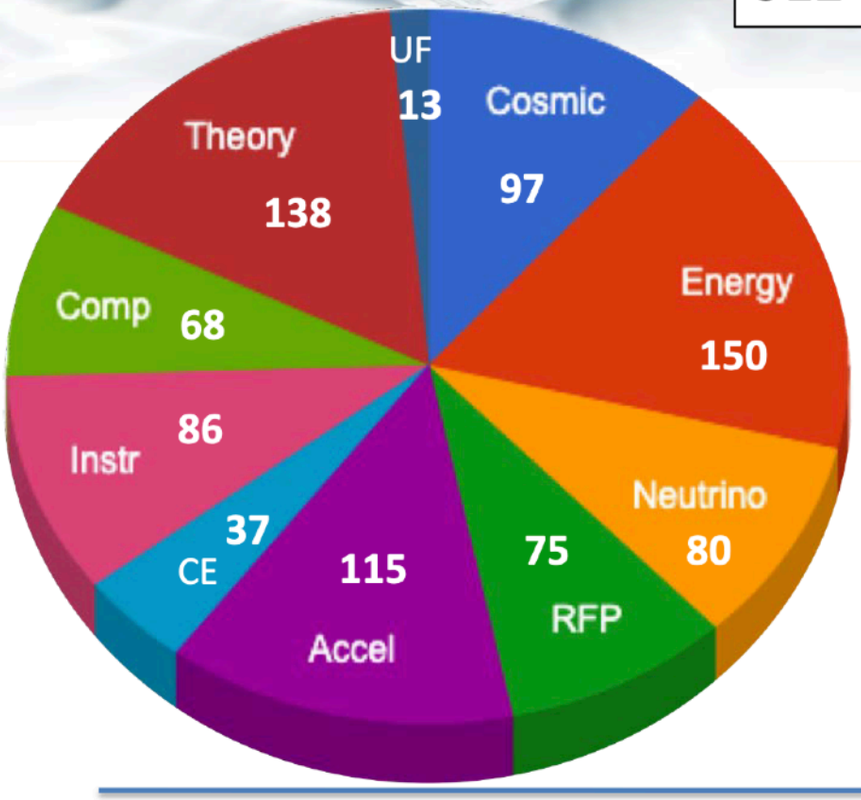
For reports, see link

For those who contributed:
many many meetings

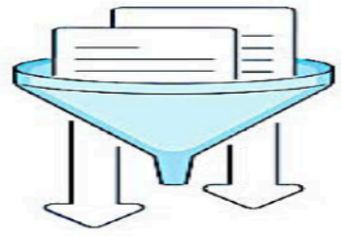
Plenty of Documentation

Getting there…

512 White Papers



79 topical group reports



10 Frontier Summaries

And lots of meetings and presentations and plots along the way

Executive Summary by October

Priscilla Cushman, CSS Seattle, link