



SnowMass2021

Conveners: Clarence Chang & Joel Meyers

Snowmass & P5

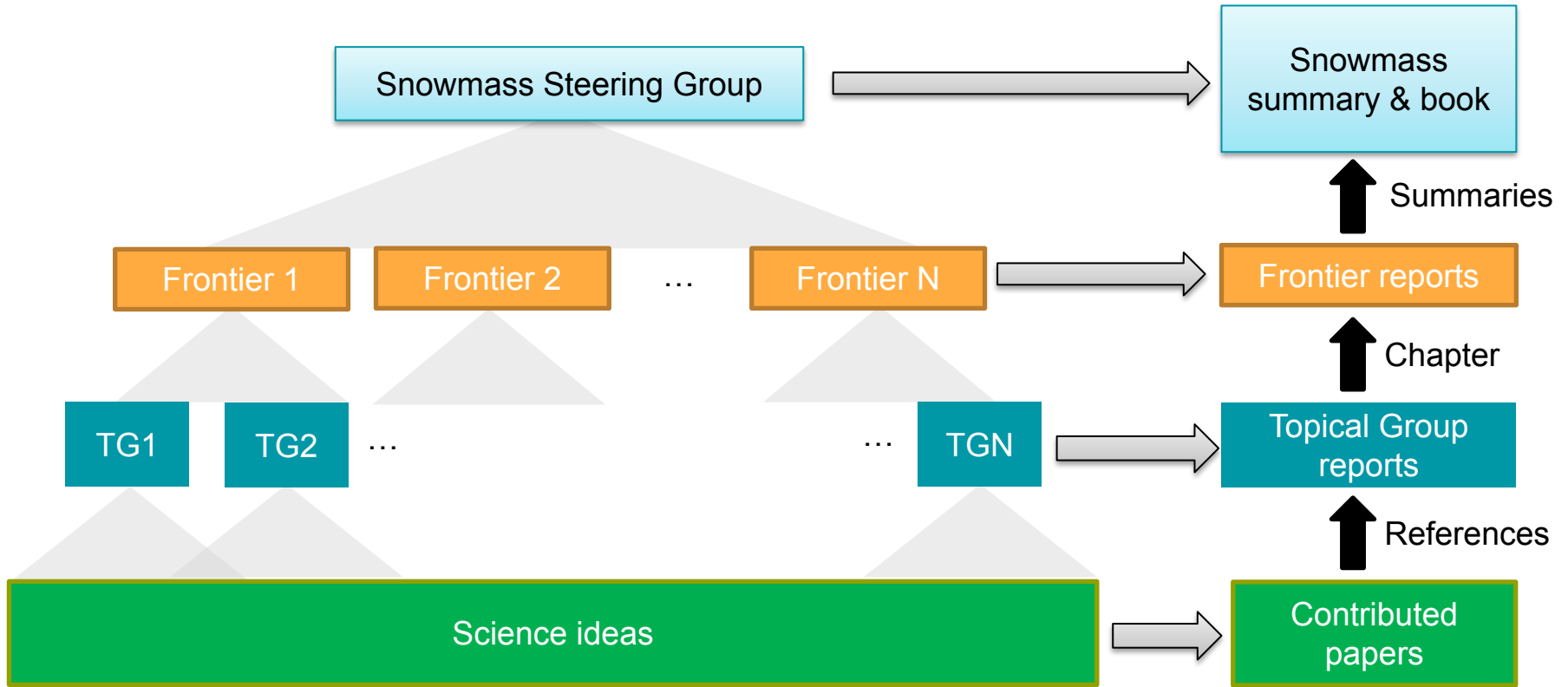
- Snowmass is a Particle Physics Community Planning Exercise
 - organized by the Division of Particles and Fields (DPF) of the American Physical Society.
 - Snowmass is a scientific study. It provides an opportunity for the entire particle physics community to come together to identify and document a scientific vision for the future of particle physics in the U.S. and its international partners.
 - Snowmass will define the most important questions for the field of particle physics and identify promising opportunities to address them.
- P5, the Particle Physics Project Prioritization Panel
 - P5 is a scientific advisory panel tasked with recommending plans for U.S. investment in particle physics research over the next ten years, on the basis of various funding scenarios.
 - The P5 is a temporary subcommittee of the High Energy Physics Advisory Panel (HEPAP), which serves the Department of Energy's Office of Science and the National Science Foundation.
- The prior Snowmass & P5 were connected. P5 took as one of its inputs, the scientific reports from Snowmass, and develops a strategic plan for U.S. particle physics that can be executed over a 10 year timescale, in the context of a 20-year global vision for the field.
 - This brought in more funding into HEP, so this connection was regarded as successful.
- Current thinking is to repeat this pairing
 - Time horizon: 2025-35 with a vision out to 2050



Snowmass leads into P5: Particle Physics Project Prioritization Process

- The equivalent of the Decadal Survey (i.e., P5's recommendations get translated into what gets funded and what does not) for all US High Energy Physics (LHC, LHC+, Fermilab, muons, theory, cosmic). So, there will be intense competition for funding.
- P5 in 2014 wrote: “ Support CMB experiments as part of the core particle physics program. The multidisciplinary nature of the science warrants continued multiagency support.” (This was new for DOE.) However, CMB-S4 is at the earliest stages (in the DOE process) of any project recommended by P5 in 2014.
- It is important to articulate an updated science case for CMB-S4.

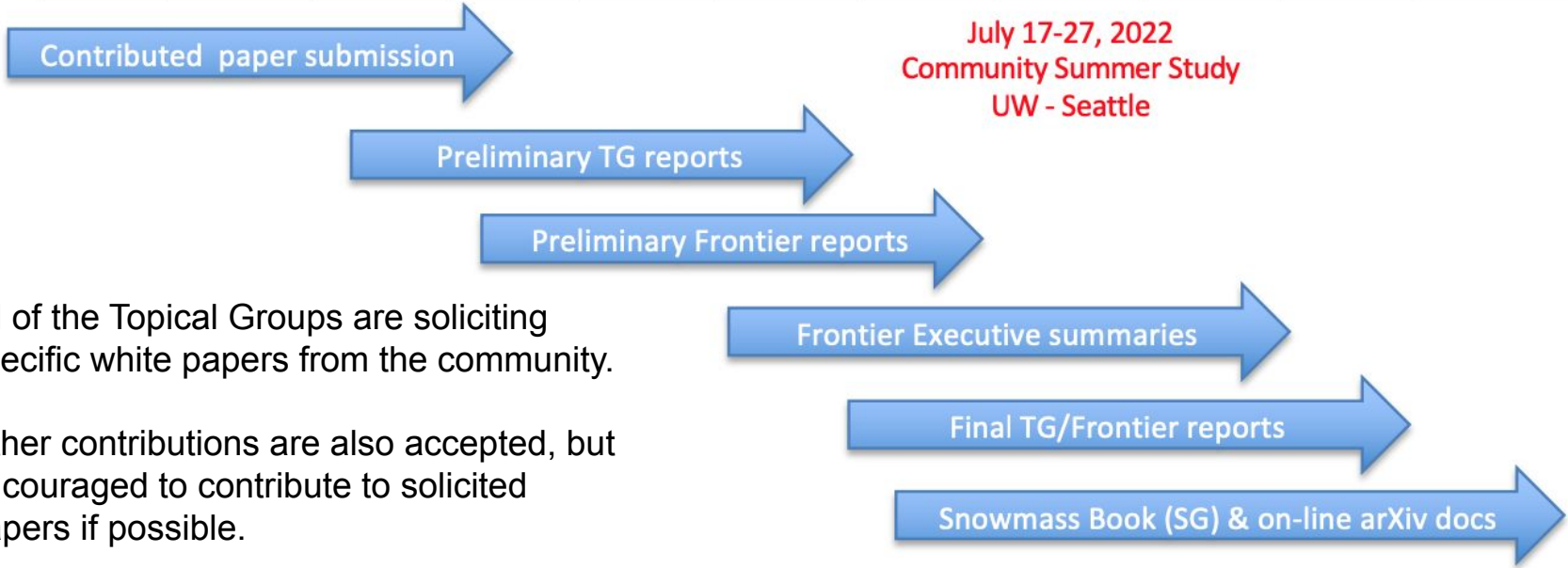
Snowmass21 organization: connecting science to reports



Overall Snowmass Structure

- Snowmass Frontiers
 - Energy Frontier
 - Neutrino Physics Frontier
 - Rare Processes and Precision
 - **Cosmic Frontier** →
 - **Theory Frontier**
 - Accelerator Frontier
 - Instrumentation Frontier
 - Computational Frontier
 - Underground Facilities
 - Community Engagement Frontier
 - Each Frontier has subgroups (7 on average)
- ❖ CF1. Dark Matter: Particle-like
 - ❖ CF2. Dark Matter: Wave-like
 - ❖ **CF3. Dark Matter: Cosmic Probes**
 - ❖ **CF4. Dark Energy and Cosmic Acceleration: The Modern Universe**
 - ❖ **CF5. Dark Energy and Cosmic Acceleration: Cosmic Dawn and Before**
 - ❖ **CF6. Dark Energy and Cosmic Acceleration: Complementary Probes and New Facilities**
 - ❖ **CF7. Cosmic Probes of Fundamental Physics**

Snowmass21 Timeline



All of the Topical Groups are soliciting specific white papers from the community.

Other contributions are also accepted, but encouraged to contribute to solicited papers if possible.

Challenges for Snowmass 2021

- COVID
 - Extended process by 1+ years
 - Remote/virtual configuration
 - CF structure
 - The largest and most impactful cosmic facilities advance multiple topics
 - Difficult to create coherent narrative across multiple Topical Groups
 - No appropriate clearing house for large facilities
 - At this collaboration meeting, we want to re-articulate the case for CMB-S4 science (the parts more relevant to HEP)
 - Opportunity to step back and review our science
 - Engaging conveners from CF3,4,5,6
- ❖ CF1. Dark Matter: Particle-like
 - ❖ CF2. Dark Matter: Wave-like
 - ❖ **CF3. Dark Matter: Cosmic Probes**
 - ❖ **CF4. Dark Energy and Cosmic Acceleration: The Modern Universe**
 - ❖ **CF5. Dark Energy and Cosmic Acceleration: Cosmic Dawn and Before**
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 - ❖ **CF7. Cosmic Probes of Fundamental Physics**

Preview of Friday Session (May 13 10:00-12:00 CT)

Goal: engage with the Topical Working Group conveners to communicate and make the case for the science of CMB-S4.

History & status of CMB-S4 (John Carlstrom)

CF03: Astro probes of Dark Matter

- Dark matter physics with CMB-S4 - (**Cora Dvorkin**)
- Dark matter-baryon scattering with CMB - (**Kim Boddy**)
- Ultralight axion dark matter - (**Renée Hložek**)
- Dark matter-dark radiation interactions - (**Francis-Yan Cyr-Racine**)

CF04: Dark Energy

- Galaxy clusters and dark energy - (**Srini Raghunathan**)
- CMB lensing and dark energy - (**Alex van Engelen**)

CF05: Inflation and Early Universe

- Features in the primordial power spectrum - (**Benjamin Wallisch**)
- Primordial non-Gaussianity - (**Daan Meerburg**)
- Primordial gravitational waves - (**Kimmy Wu**)
- Light Relics - (**Joel Meyers**)

CF06: Cross correlations & facilities

- CMB lensing x galaxy surveys - (**Chihway Chang**)
- Multi-wavelength observations of clusters - (**Lindsey Bleem**)
- kSZ x galaxy surveys - (**Mat Madhavacheril**)