

Snowmass 2021

Rare and Precision Frontier



R. Bernstein (FNAL) for co-conveners,
Marina Artuso (Syracuse) and Alexey Petrov (Wayne State)

What is Snowmass About?

- An opportunity to look across the whole field
- Just because you're doing diHiggs now doesn't mean you can't be doing EDMs next
 - Early Career is about learning skills and ways to think
 - I was FNAL Wilson Chair for years — we always credited people who switched fields for taking chances and growing
- Snowmass is a way to get a big picture and see what sparks your interest

What is the Rare and Precision Frontier About?



- Everyone is interested in rare processes and precise measurements
- This frontier is (speaking as an experimenter) all about focus:
 - experiments designed around specific goals
 - of course this is fuzzy: LHCb CKM to antigravity, but we share that quality of targeted studies

Topical Groups/Typical Experiments (not complete, indicative!)

- RFP1: Weak Decays of b, c:
 - CKM triangle, rare b decays...
- RFP2: Weak Decays of strange and light quarks
 - CP violation in K_L, \dots
- RFP3: Baryon and Lepton Number Violation
 - $n\bar{n}$ oscillations, $0\nu 2\beta$ with neutrinos,...
- RFP4: Precision Physics and Small Experiments
 - $g - 2$, EDMs, ...
- RFP5: Charged Lepton Flavor Violation
 - $\mu^- N \rightarrow e^- N, \mu \rightarrow e\gamma, \mu \rightarrow 3e$ and muonium/antimuonium oscillations, Higgs CLFV decays, $\tau \rightarrow \mu\gamma, \dots$
- RFP6: Dark Sector at High Intensities
 - Missing Momentum, beam dump, long-lived searches...
- RFP7: Hadron Spectroscopy
 - exotic bound quark states, glueballs,...

Cast Of Characters



Marina Artuso (Syracuse U.)



Alexey Petrov (Wayne State U.)



Bob Bernstein (FNAL)

Topical Group		Topical Group co-Conveners	
RF01	Weak Decays of b and c	Angelo di Canto/BNL	Stefan Meinel/Arizona
RF02	Strange and Light Quarks	Emilie Passemar/Indiana	Evgueni Goudovski/Manchester
RF03	Fundamental Physics and Small Experiments	Tom Blum/UConn	Peter Winter/ANL
RF04	Baryon and Lepton Number Violation	Pavel Fileviez Perez/CWRU	Andrea Pocar/Amherst
RF05	Charged Lepton Flavor Violation	Sacha Davidson/Lyon	Bertrand Echenard/Caltech
RF06	Dark Sector at High Intensities	Stefania Gori/UCSB	Mike Williams/MIT
RF07	Hadron Spectroscopy	Richard Lebed/Arizona	Tomasz Skwarnicki/Syracuse

+ slack channels, mailing lists, ...

Frontier Calendar: <https://snowmass21.org/rare/start>

Liaison System

SEC:

Josh Barrow and Jake Bennett

- We talk with other Frontiers and to you

- EF: Angelo di Canto
- Neutrino, Accelerator: RHB
- Theory: Alexey Petrov
- Community Engagement: Sophie Middleton
- Cosmic: Susan Gardner
- Computational: Stefan Meinel



A few Big Issues in RPF

- PIP-II at FNAL: CLFV in Muons? EDMs? CP?
 - Accelerator-based High Intensity DM experiments?
 - BLV experiments outside of proton decay? e.g. $n\bar{n}$
 - Lepton Universality in B decays? LHCb anomalies
-
- Bring ideas!! this is about **you** making **your** future happen

General Comment

- When I was a student/post-doc I hated panels and committees
 - “who are all these old people and why should I care what they think, they’ll all be retired by the time any of this gets done”
- What I think now:
 - Our job is to help make sure you have great physics to do
 - help us do that!



COVID-era panel

What Can You Do to get Involved?

- *Learn:*

- Skim/attend some meetings <https://indico.fnal.gov/category/1102/>
- Check out (SUBMIT!) LOIs: <https://snowmass21.org/rare/start>
 - you can add your name and we'll reload the LOI

- *Communicate:*

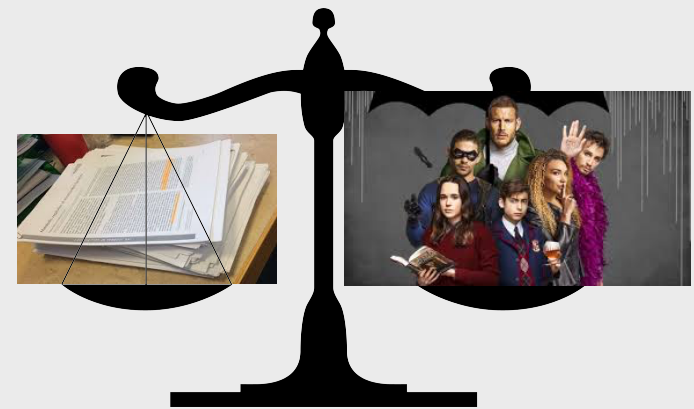
- Emails, Slack, etc.: snowmass21.org, Slack workspace
- Contact one of us and we'll help

- *Participate:*

- get involved now at the beginning, and you'll have more influence

I have 1 hr per week

- If I spend more time than that the kids don't get fed and my supervisor will come after me and so-and-so will get a job, not me
- What should I do?
 - skim LOIs (a couple a day)
 - attend kickoff talks (~20 min)
 - not the whole workshop, it gets too technical too fast
 - and not just your field, something you're curious about



“free time”

btw, I give advice better than I take it

Questions?

