

Canadian Subatomic Physics

LONG RANGE PLAN 2022 - 26

LRP Community Townhall

Day 1 - Canadian Subatomic Physics in 2021

subatomicphysics.ca

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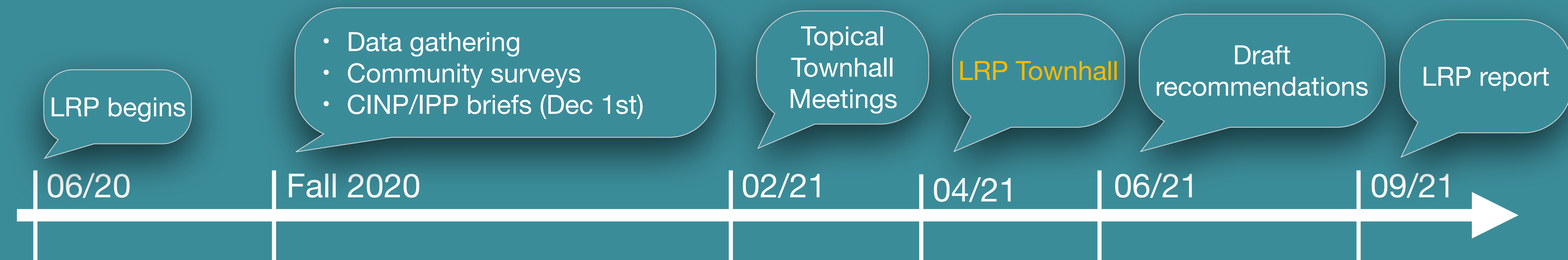
LRP Community Townhall

Day 1 - Canadian Subatomic Physics in 2021

subatomicphysics.ca

- Welcome and land acknowledgement
- Public forum - respect, inclusion and courtesy are requested; please use the chat to participate, ask questions and add comments
- Sessions will be recorded for those unable to attend

Overview and Agenda



- **Report from the LRPC**

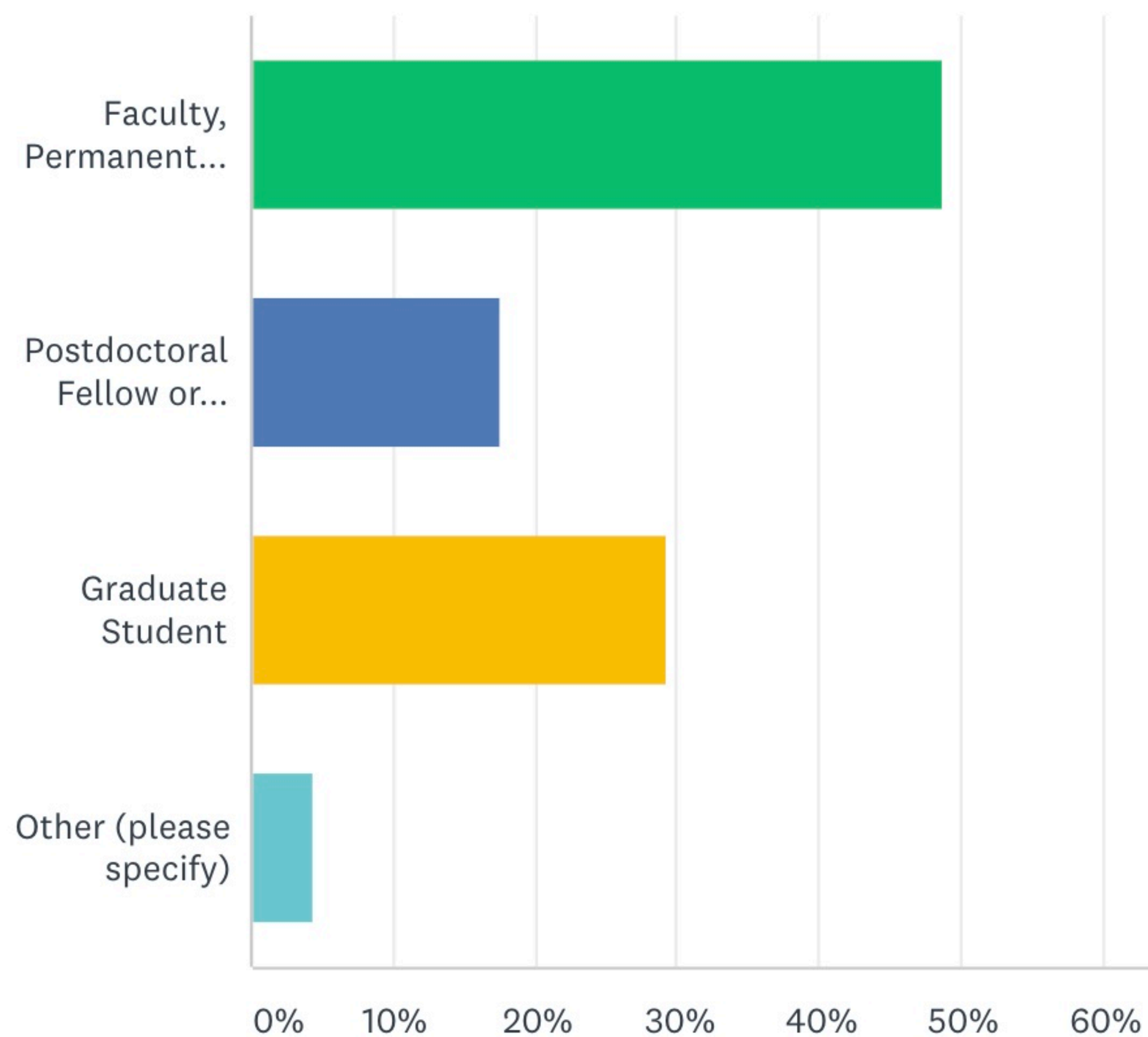
1. LRP Community Survey results
2. SAP funding data and science drivers
3. Topical Townhall outcomes

[Break]

- **Report from CINP**
- **Report from IPP**

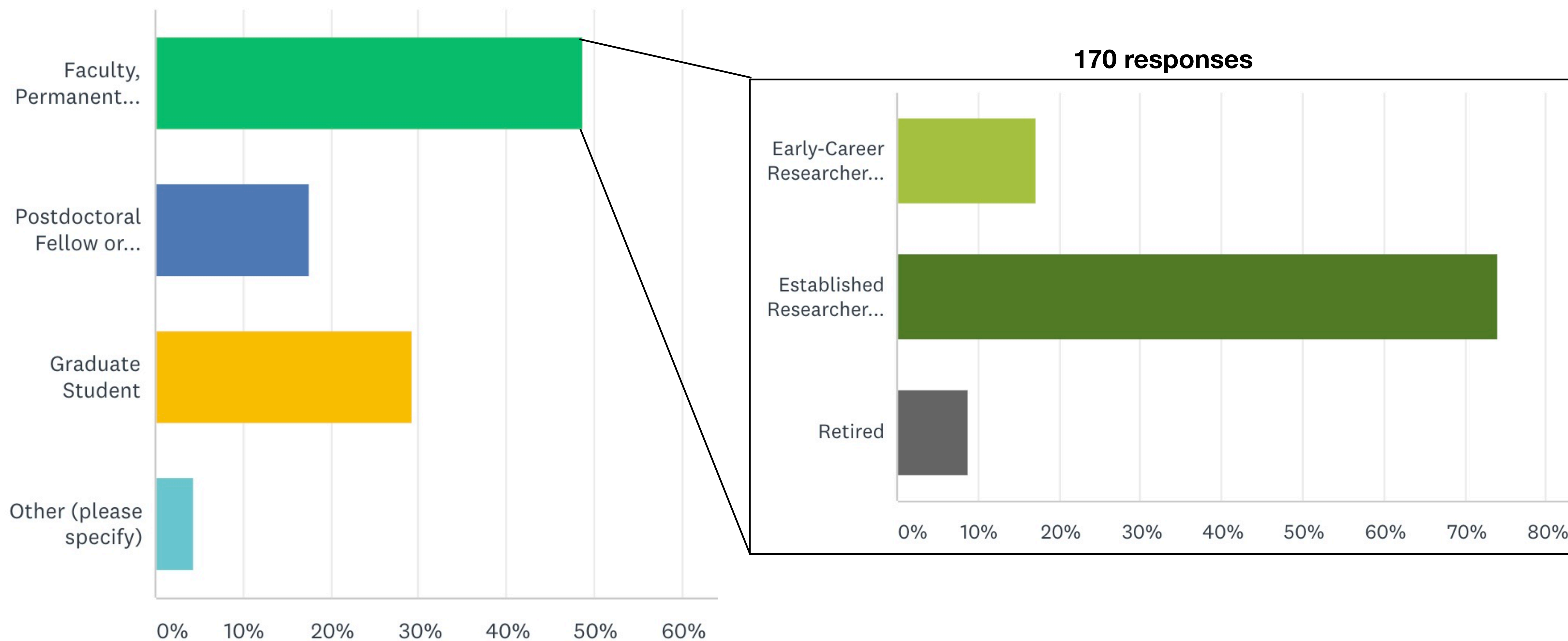
1. Community Survey

LRP Community Survey

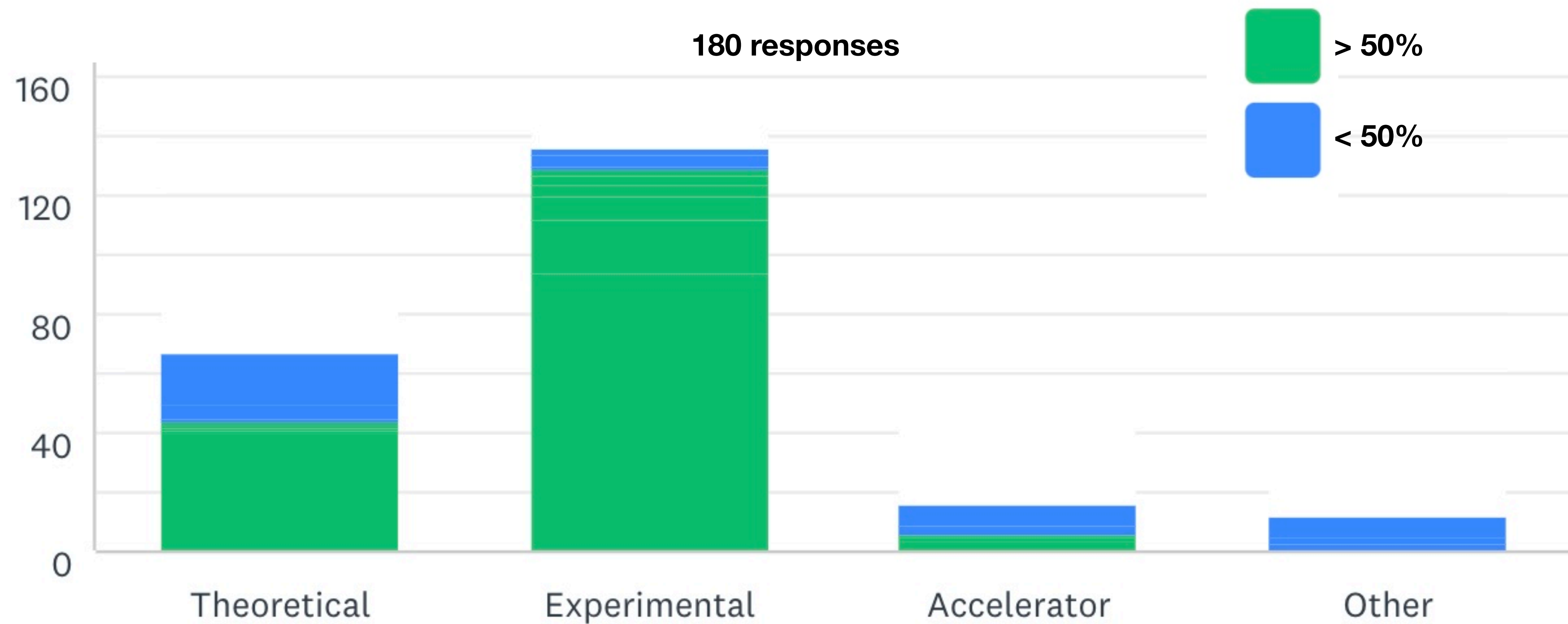


**370 total respondents, including
~80% of all grant holders**

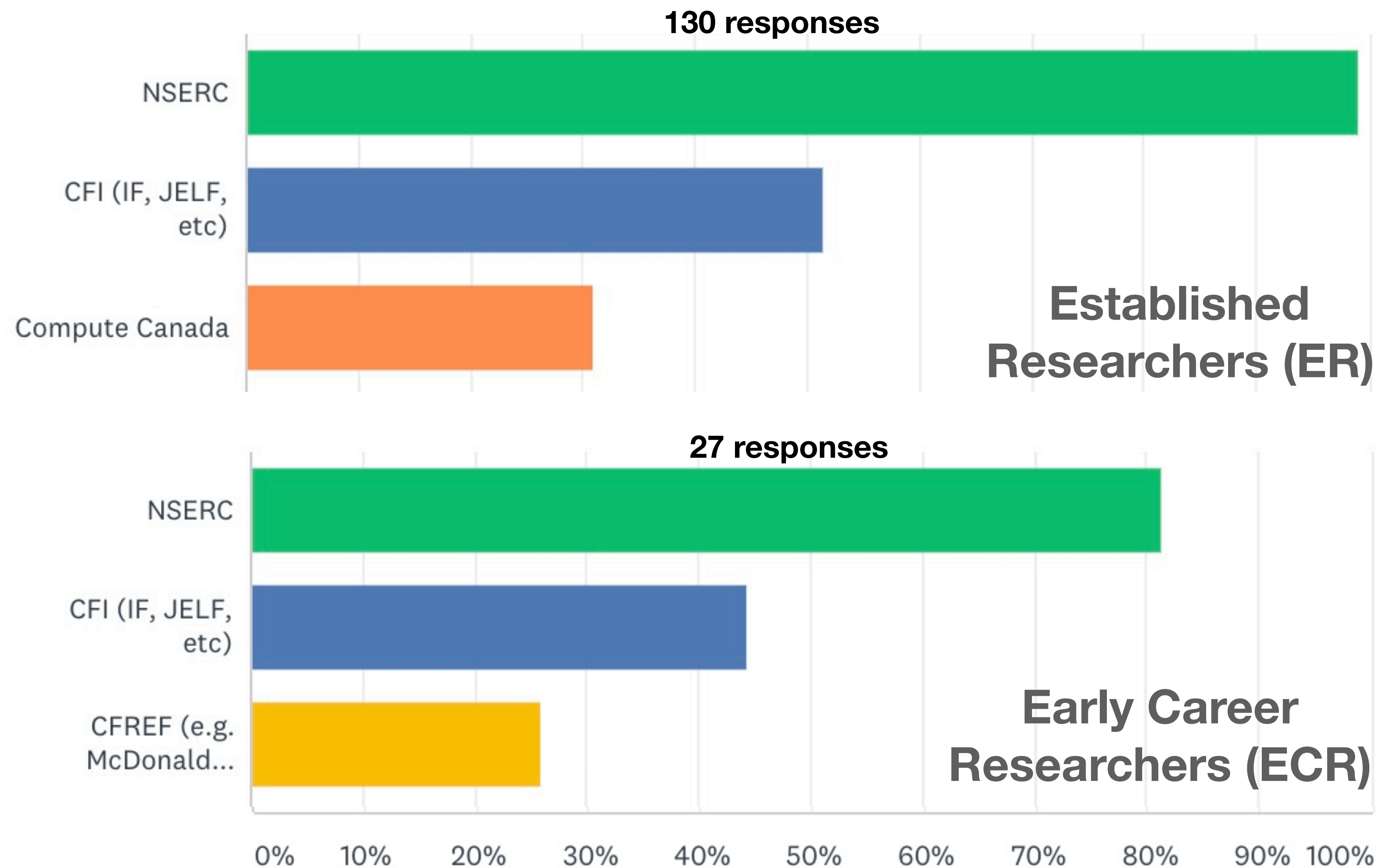
Career Status



Research Time



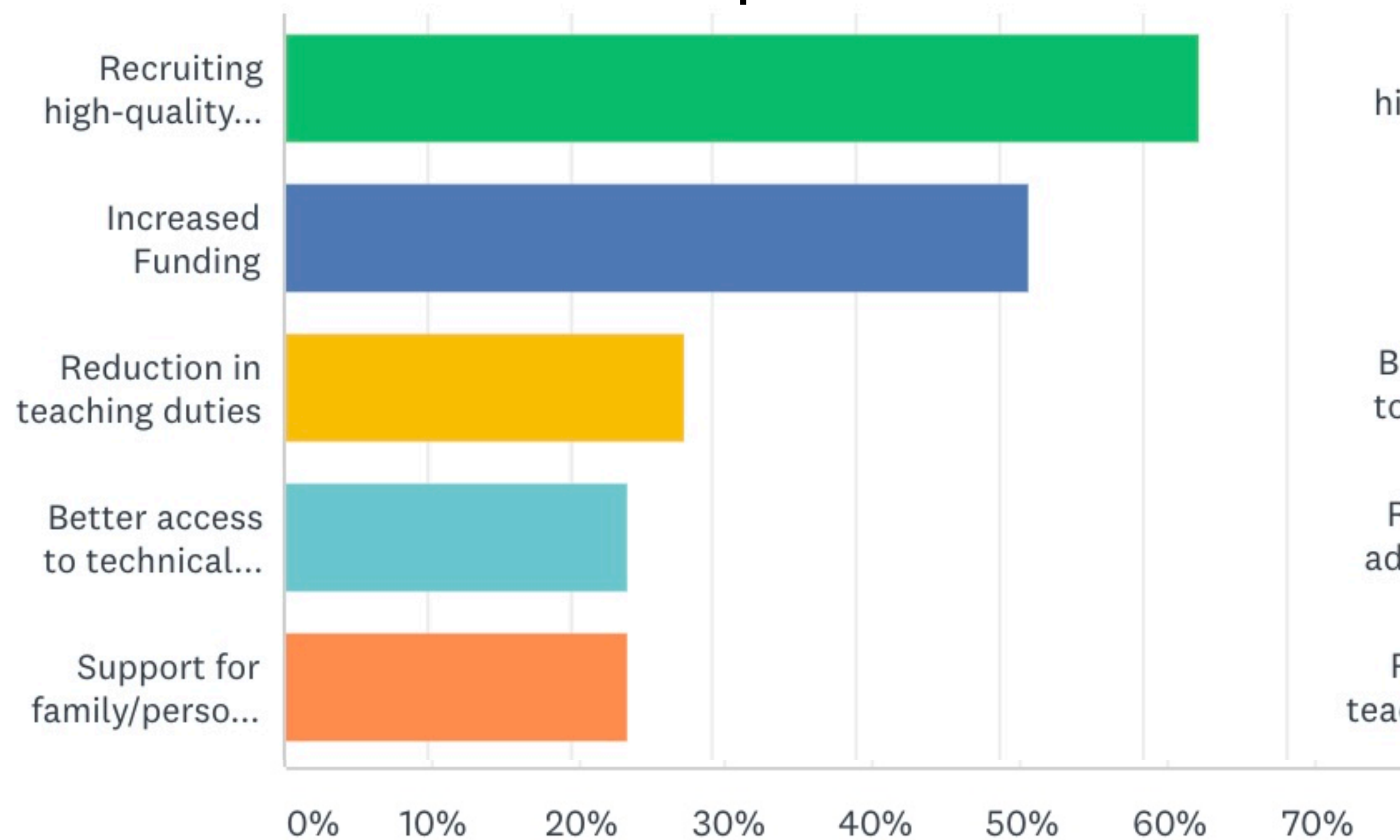
Funding Sources (primary)



Increasing Productivity

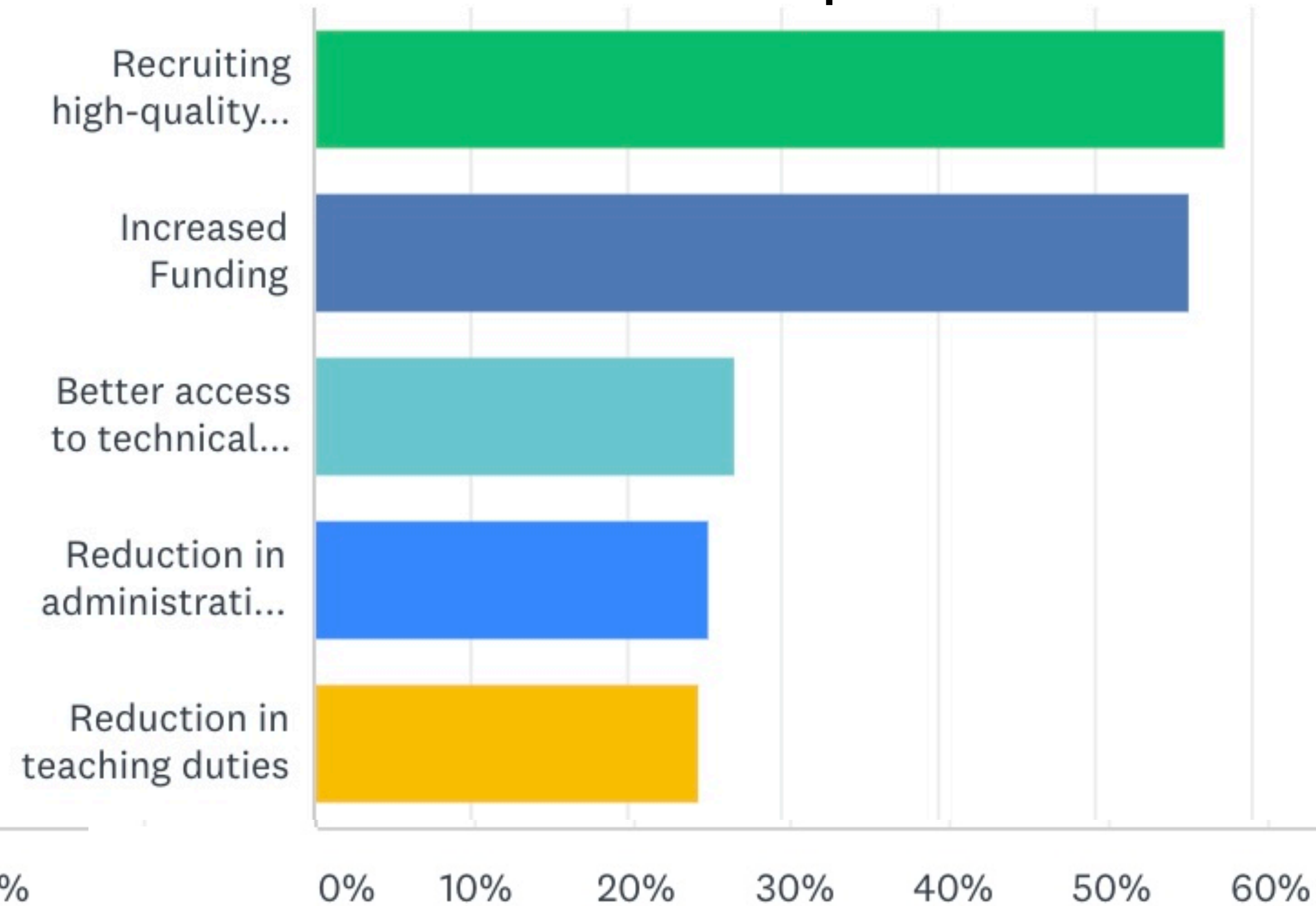
Early-Career Researchers

27 responses



Established Researchers

130 responses



Highly-qualified Personnel

Trainees

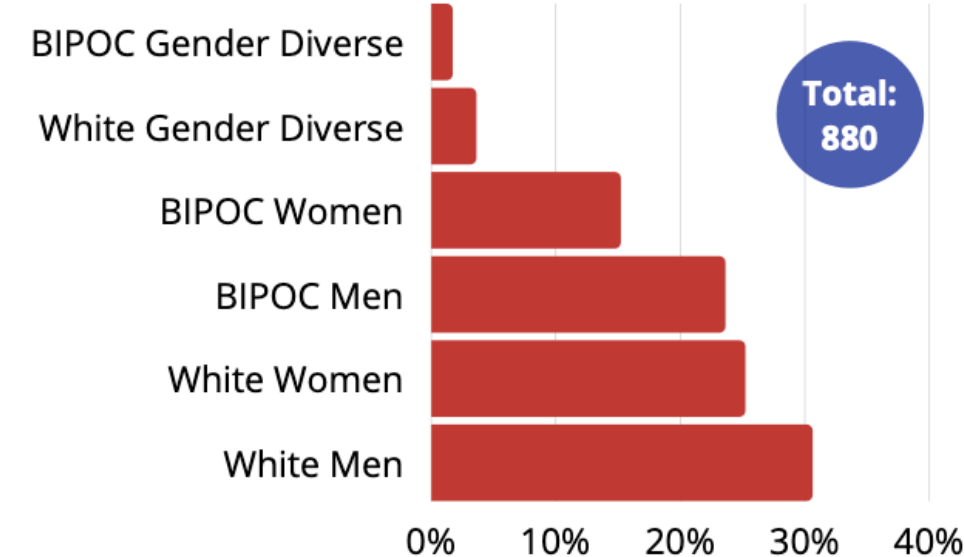
- Graduate students - 2.6/FTE (60% international)
- Postdocs/Research Associates: ~ 1.0/FTE (90% international)
- Undergraduate students: ~ 1.5/FTE

	Current Grad students (Ave/FTE)	Grad student capacity (Ave/FTE)
2002	2.2	-
2008	2.1	-
2015	2.1	3.7
2020	2.6	3.7

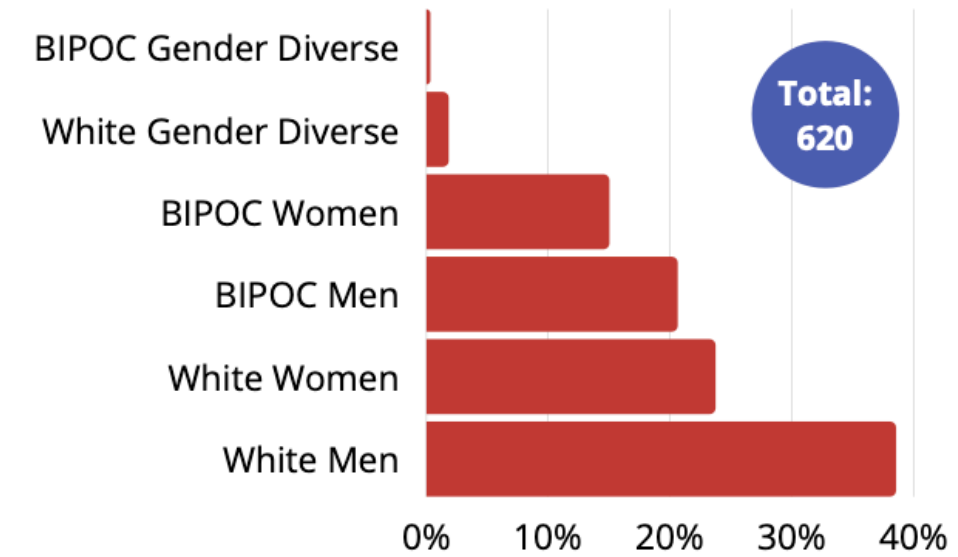
CAP EDI Survey (preliminary)

- Working with CAP EDI to include research area query, to disaggregate data (given sufficient statistics)
- Data released to date - survey respondent demographics (not SAP-specific)

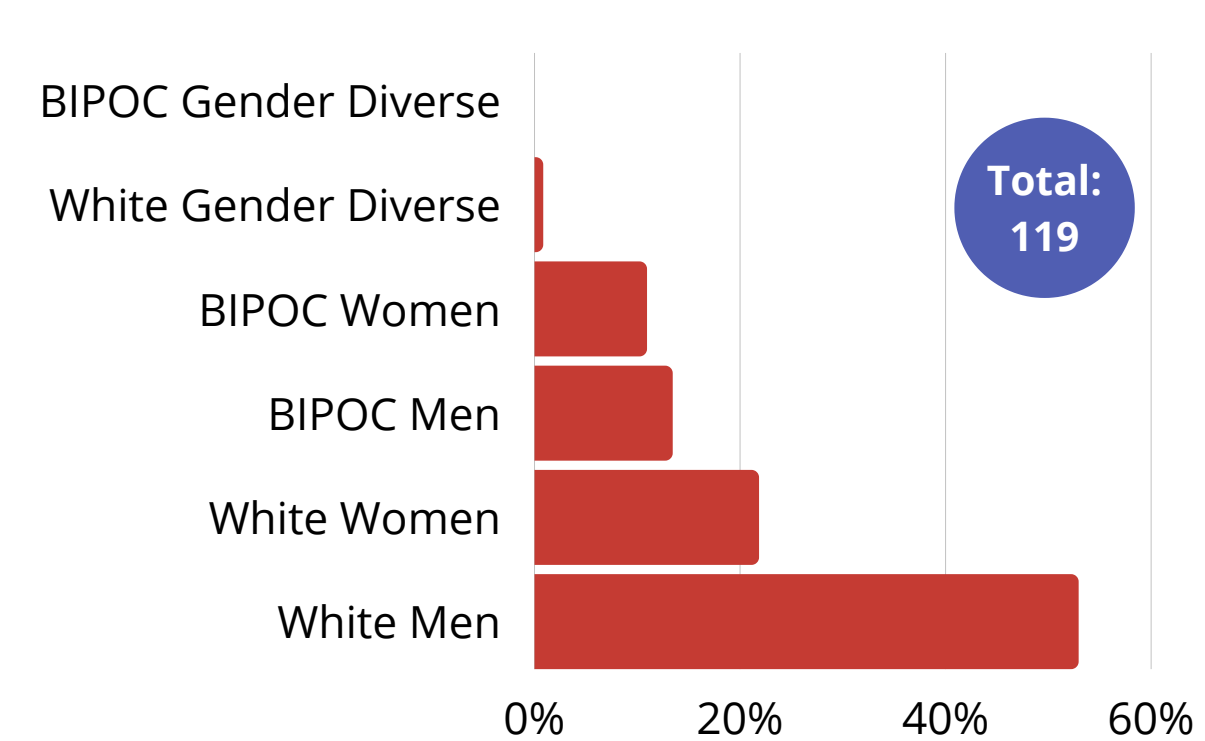
UNDERGRADUATE STUDENTS



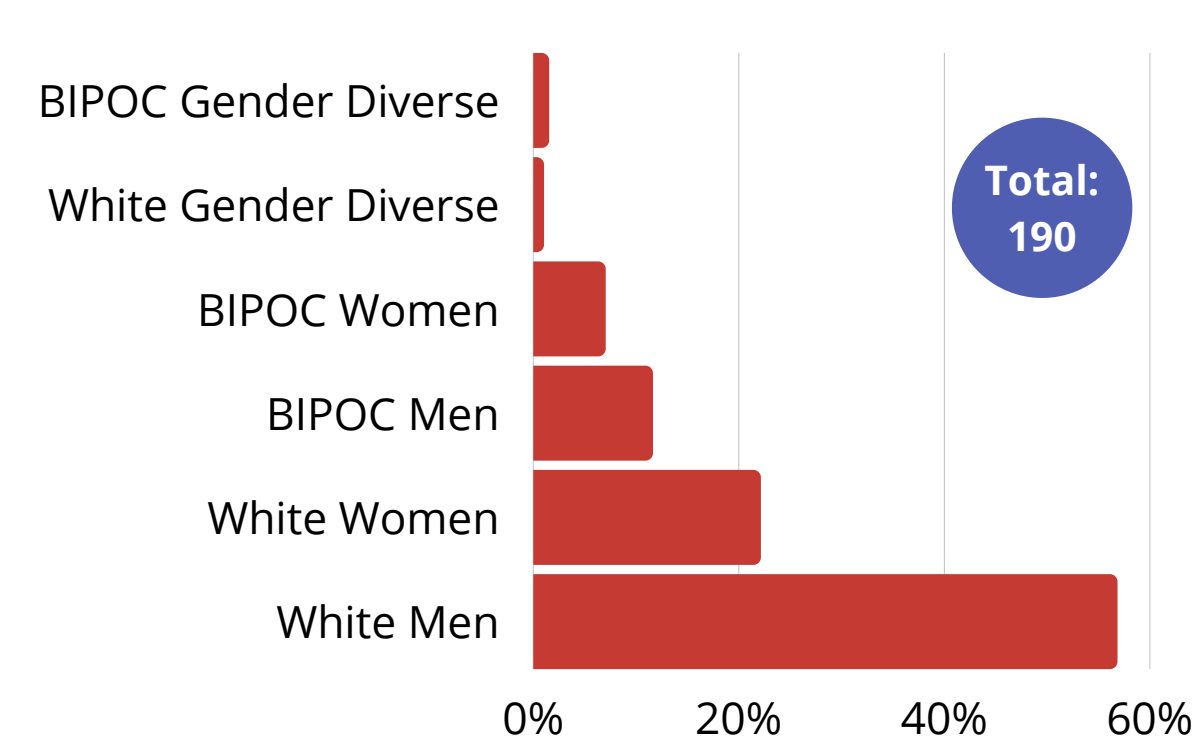
GRADUATE STUDENTS



RESEARCH INSTITUTES



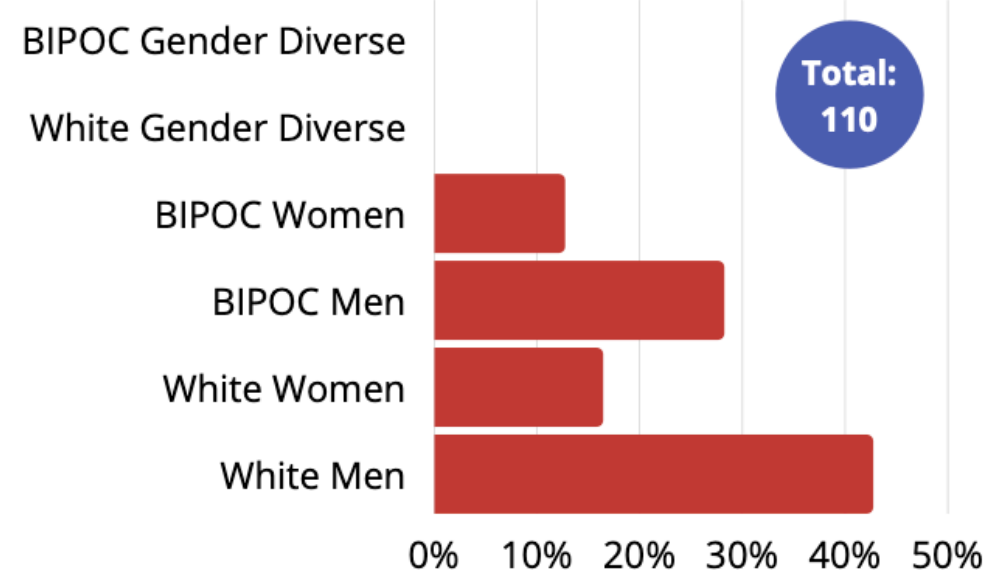
INDUSTRY & GOVERNMENT



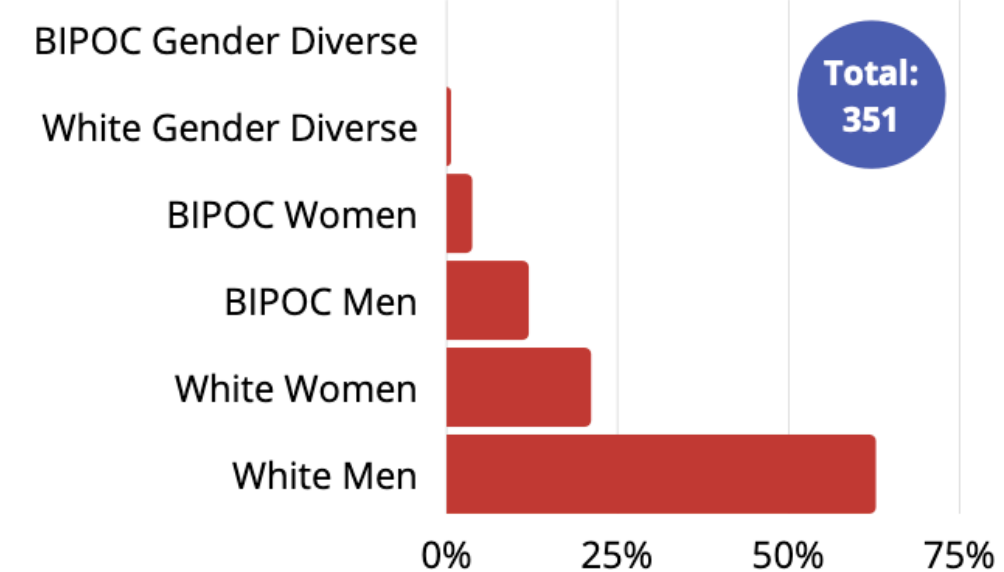
Note: BIPOC refers to Black, Indigenous, and People of Colour. Gender Diverse includes those who identified as non-binary, gender non-conforming, genderqueer, transgender (only if man or woman not specified as gender identity), and those who preferred to self-describe another gender identity.

**This method is not intended to yield a fully representative sample of the physics community, and the data should not be interpreted as such.*

POST-DOCTORAL RESEARCHERS

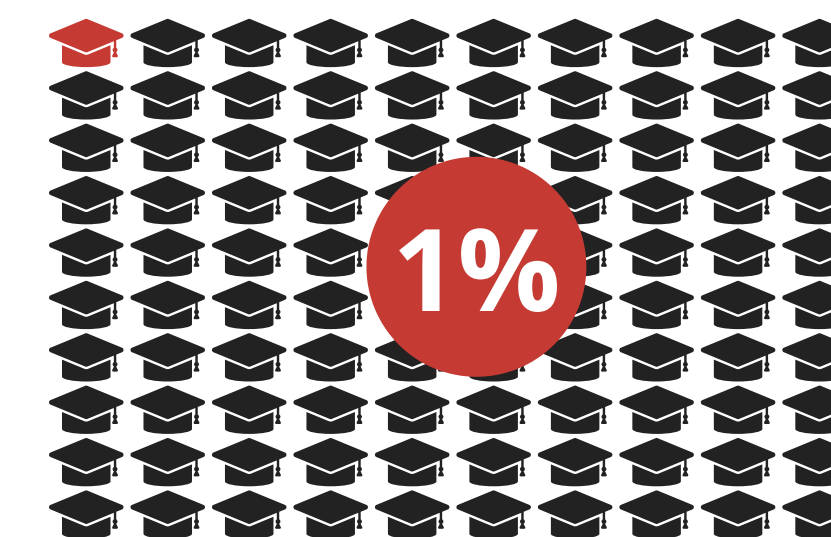


FACULTY MEMBERS

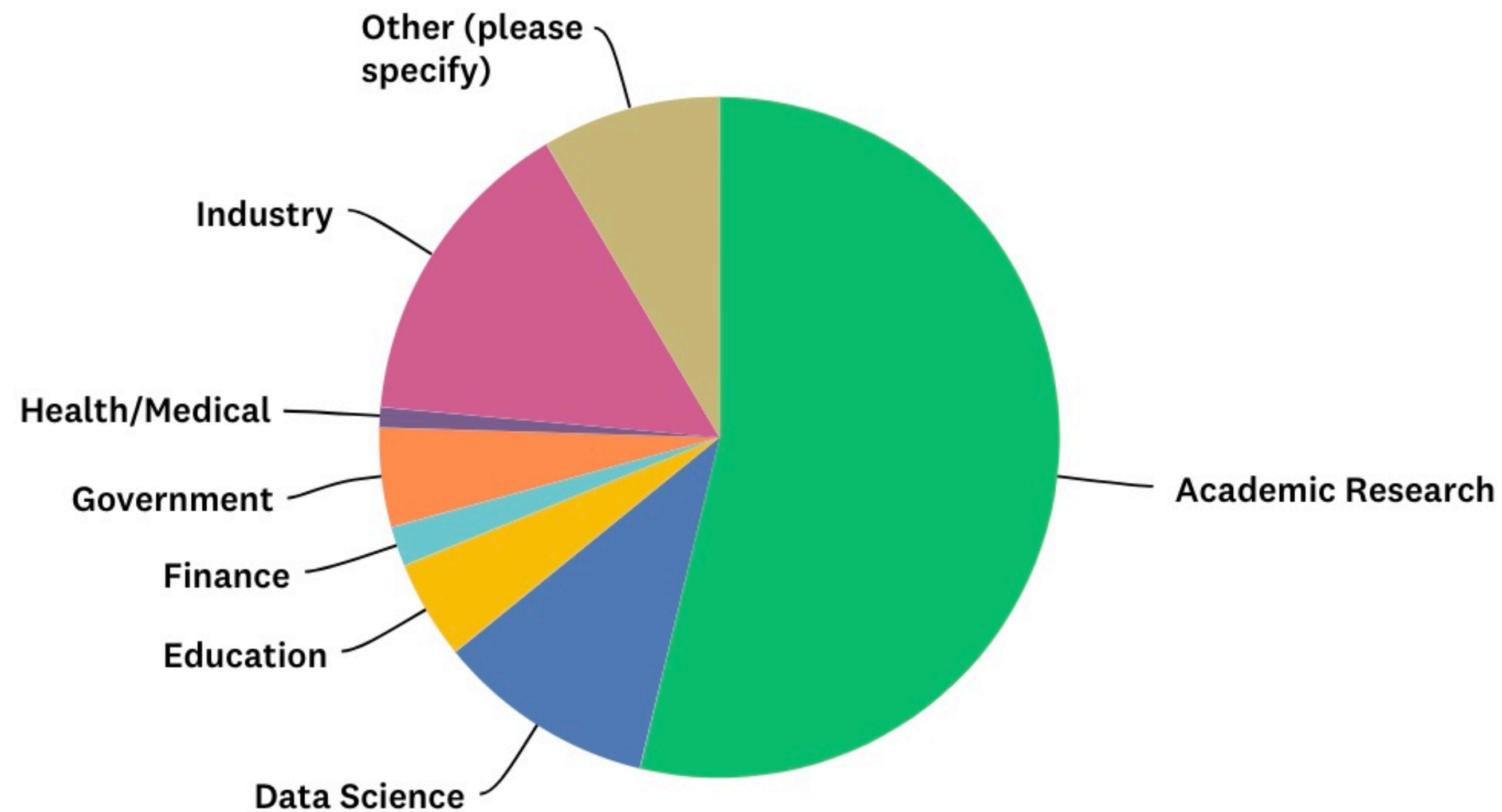


Only 1% of respondents identified as Black

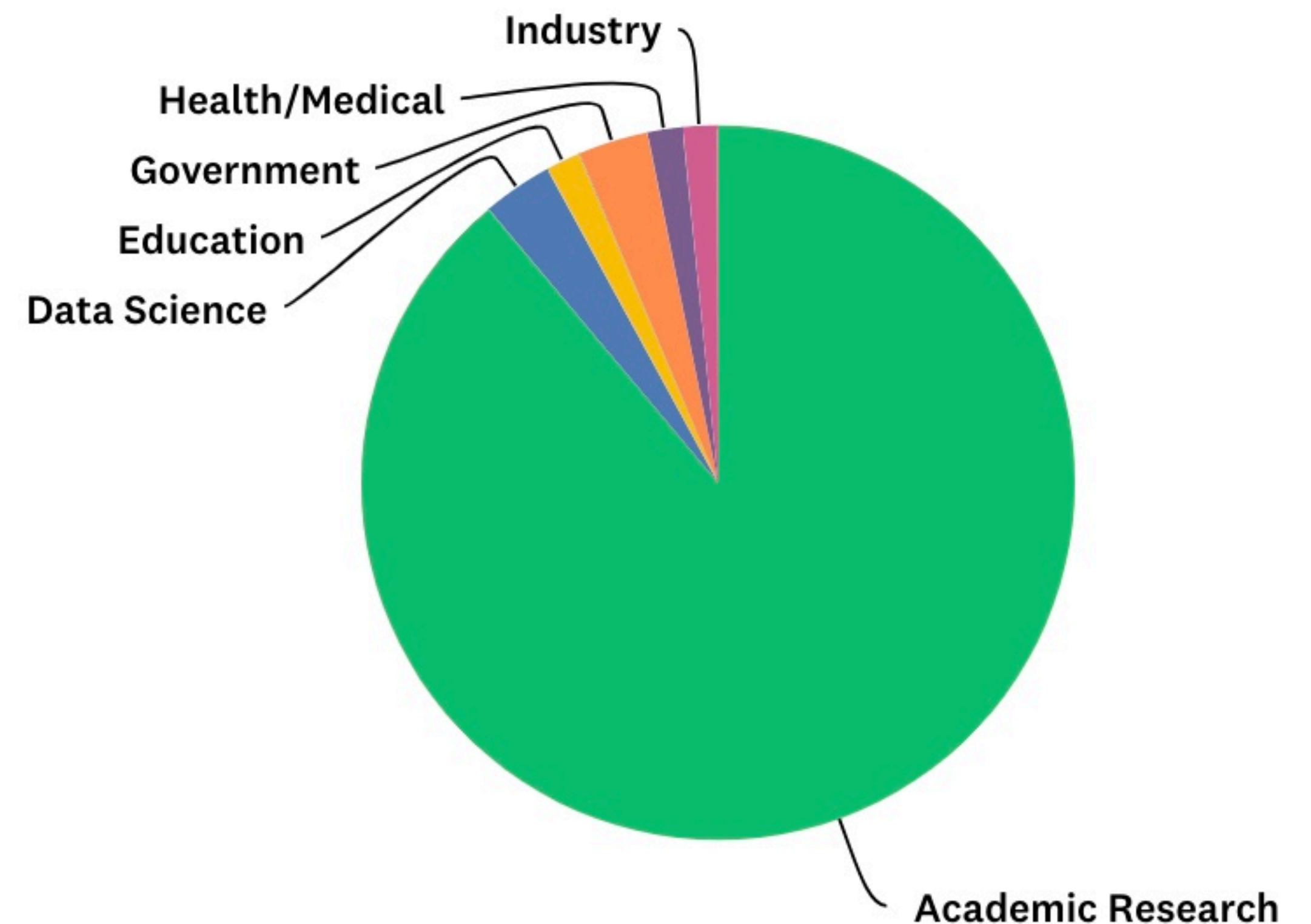
The largest group of respondents in all categories were White men



Future Plans (HQP)

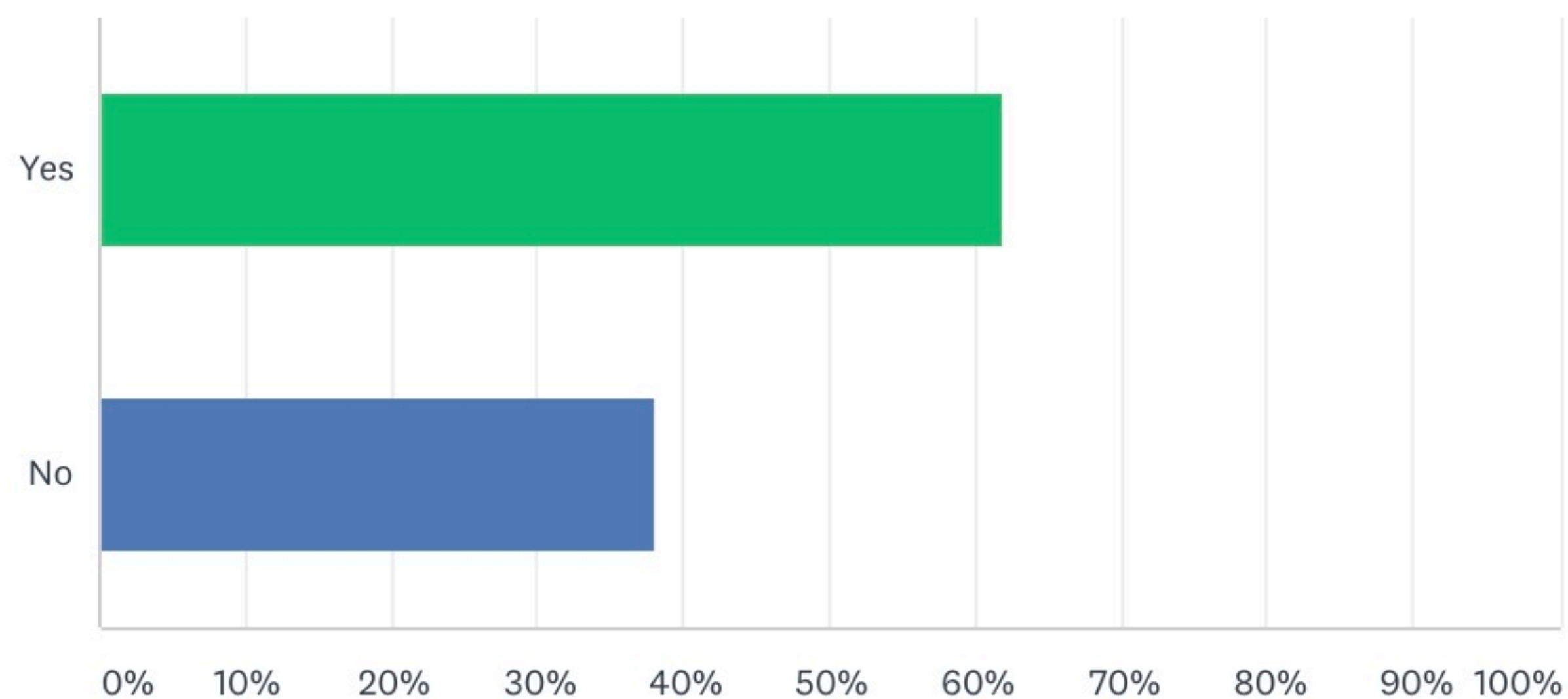


Grad Students
(106 responses)

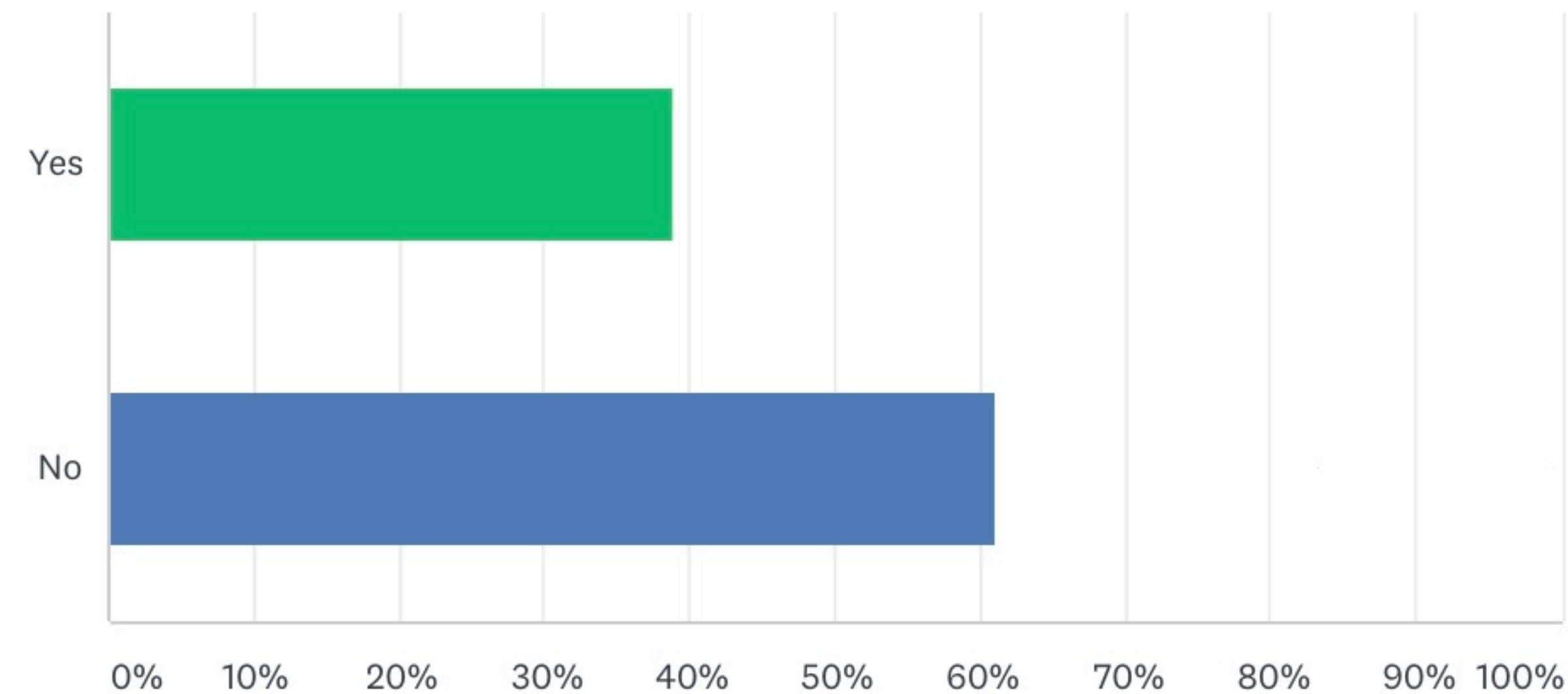


PDFs/RAs
(63 responses)

Participation in EDI Activities



Faculty & permanent staff
(163 responses)



Grad Students & Postdocs
(159 responses)

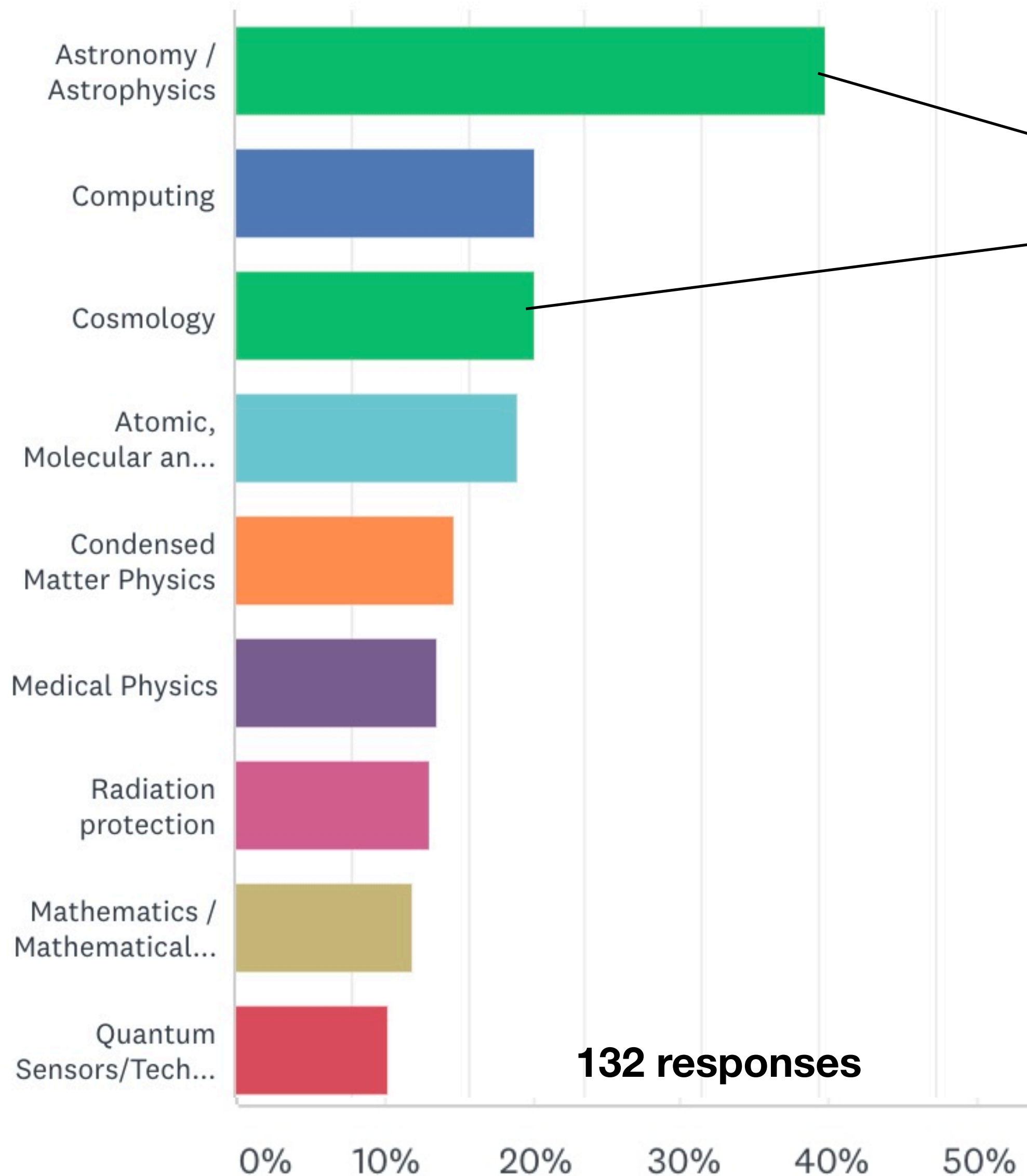
EDI Initiatives



Faculty & permanent staff
(151 responses)

Grad Students & Postdocs
(150 responses)

Collaboration with other fields

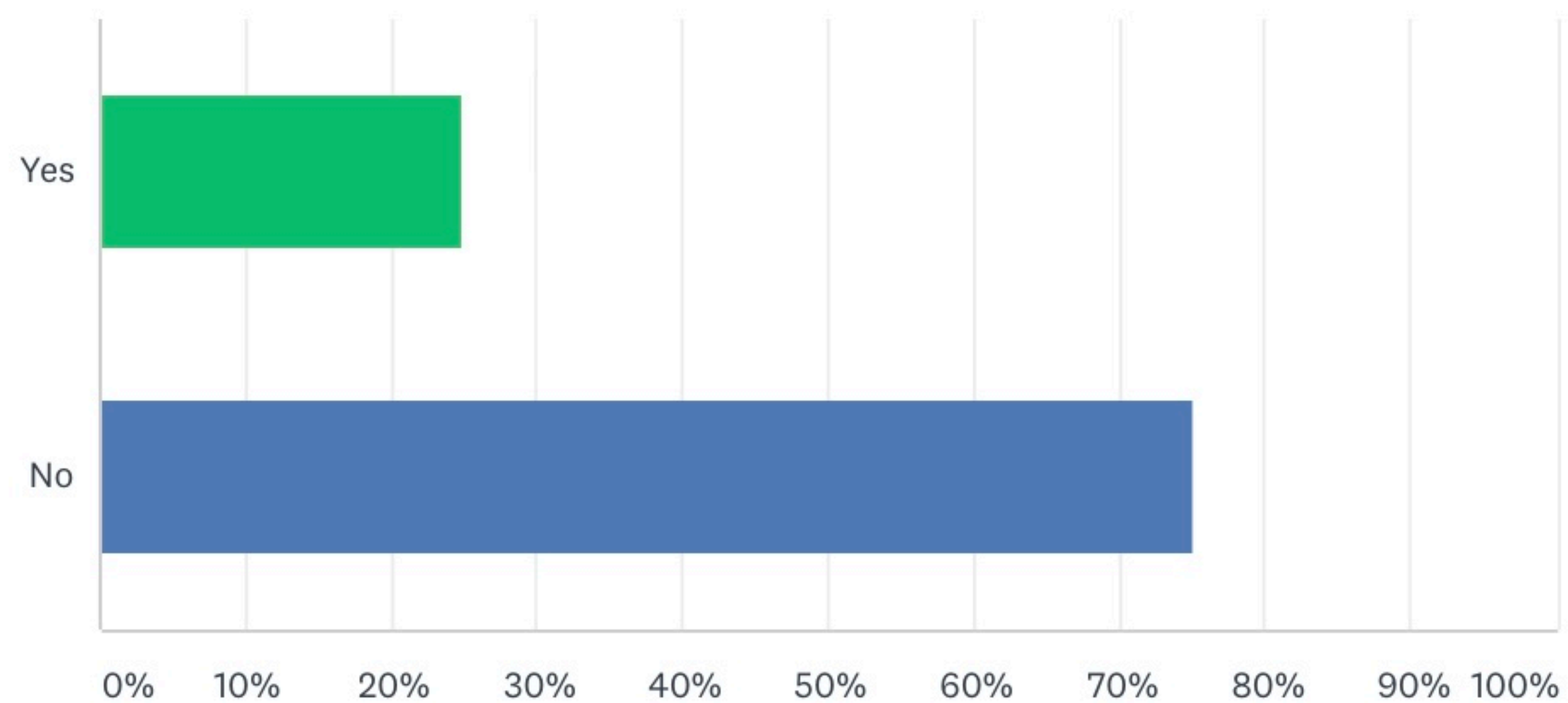


Dominant overlap with astronomy/cosmology

Collaboration within the field - 81% international

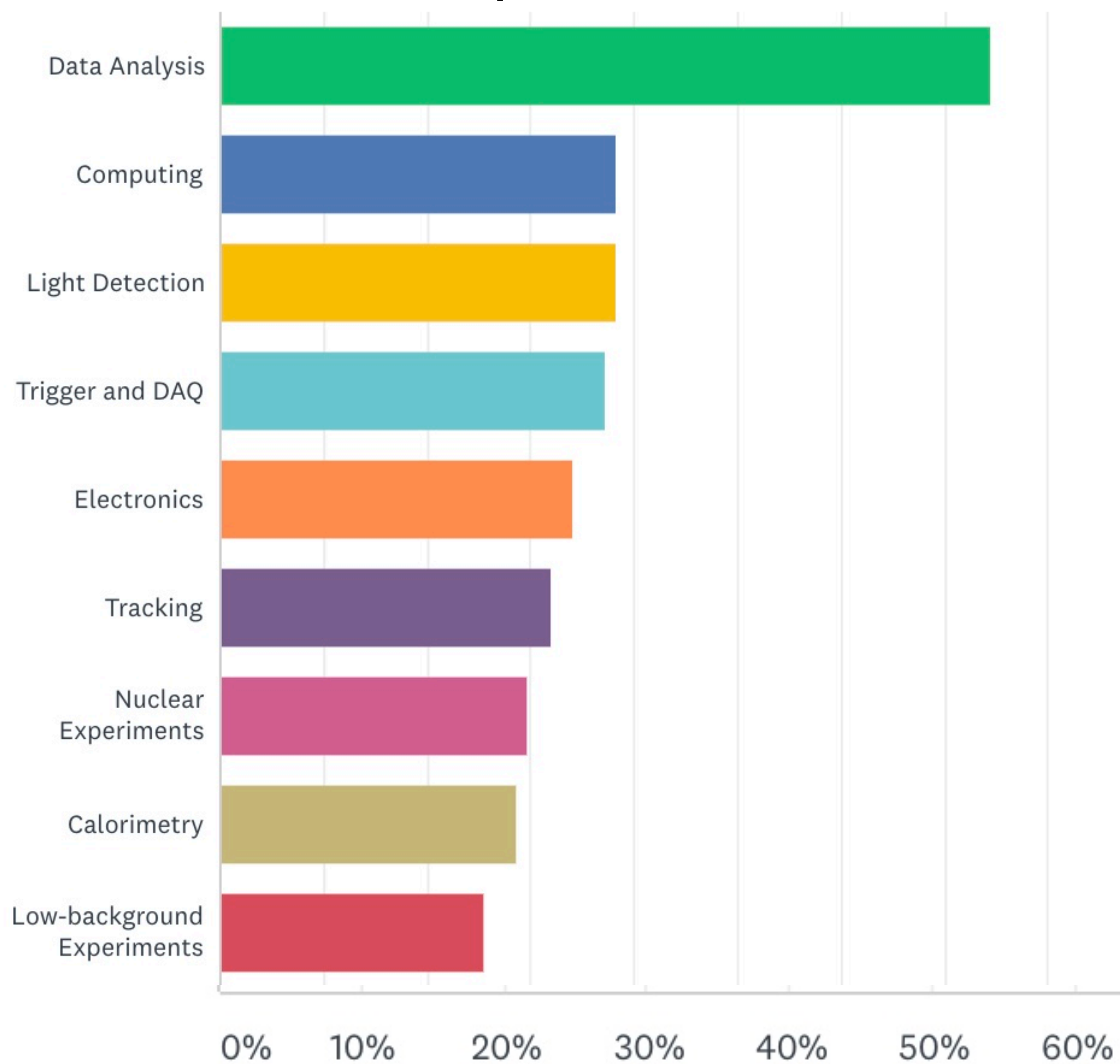
Broader collaboration - Knowledge & Tech Transfer

177 responses

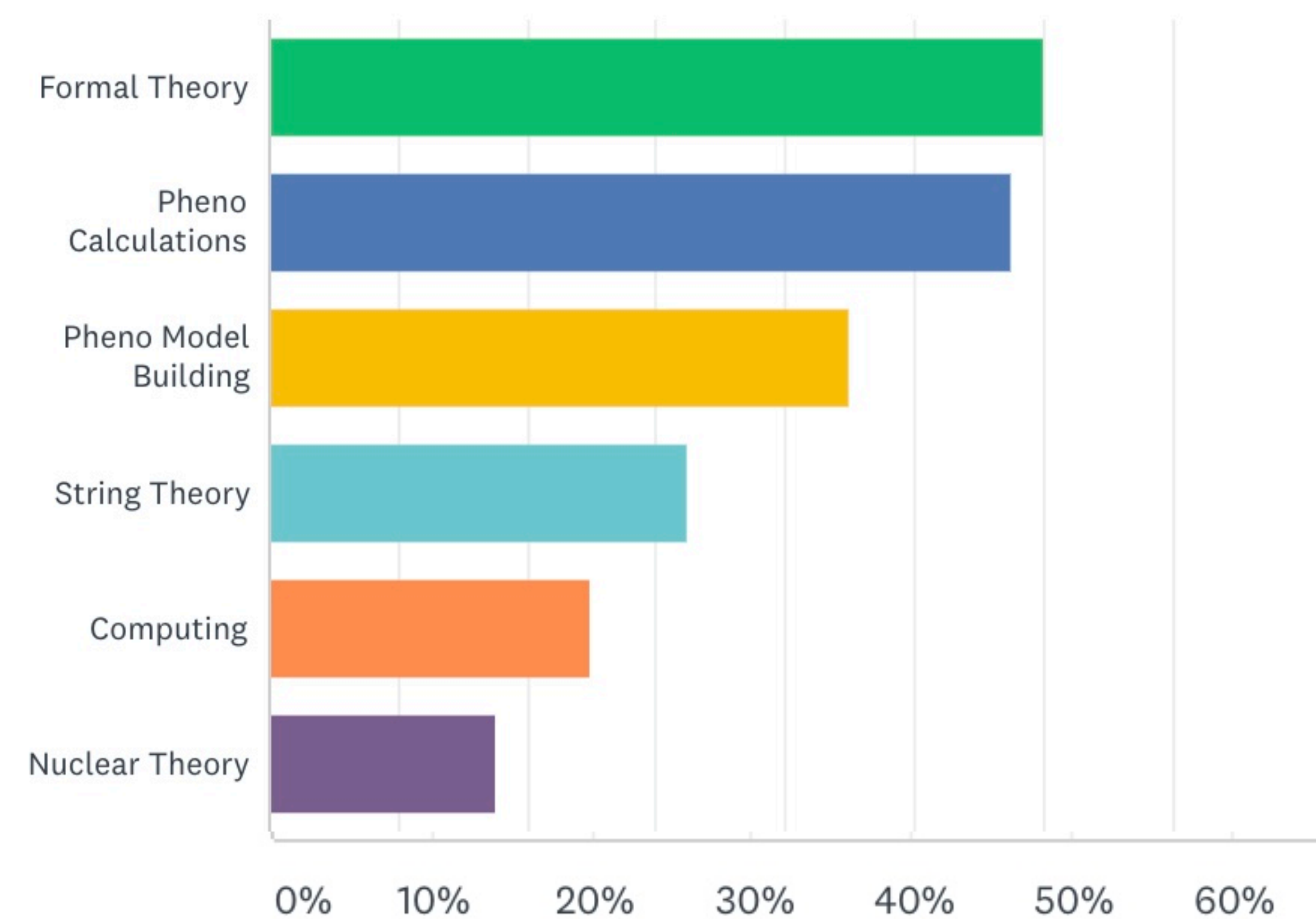


Expertise

Experimentalists



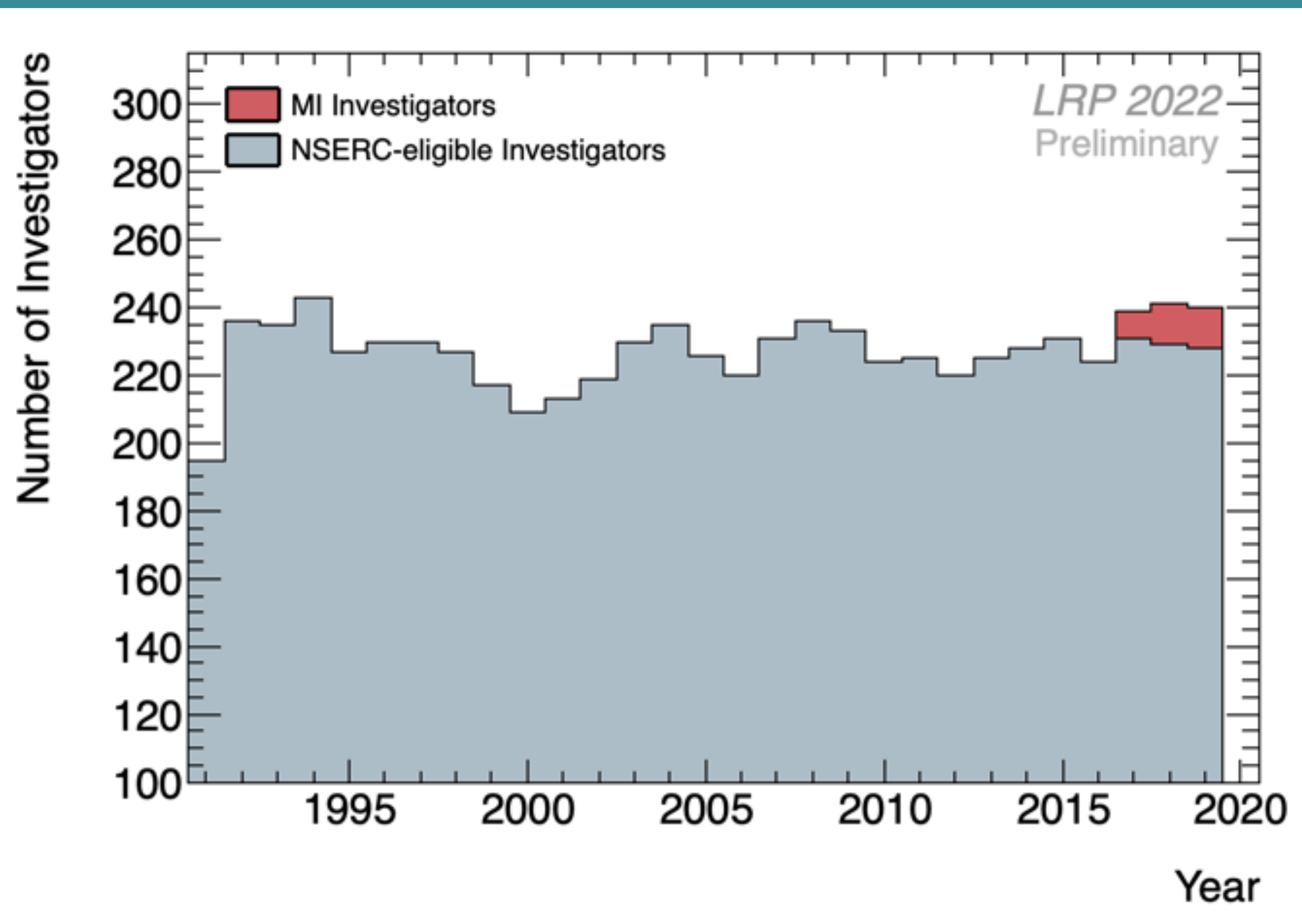
Theorists



Questions?

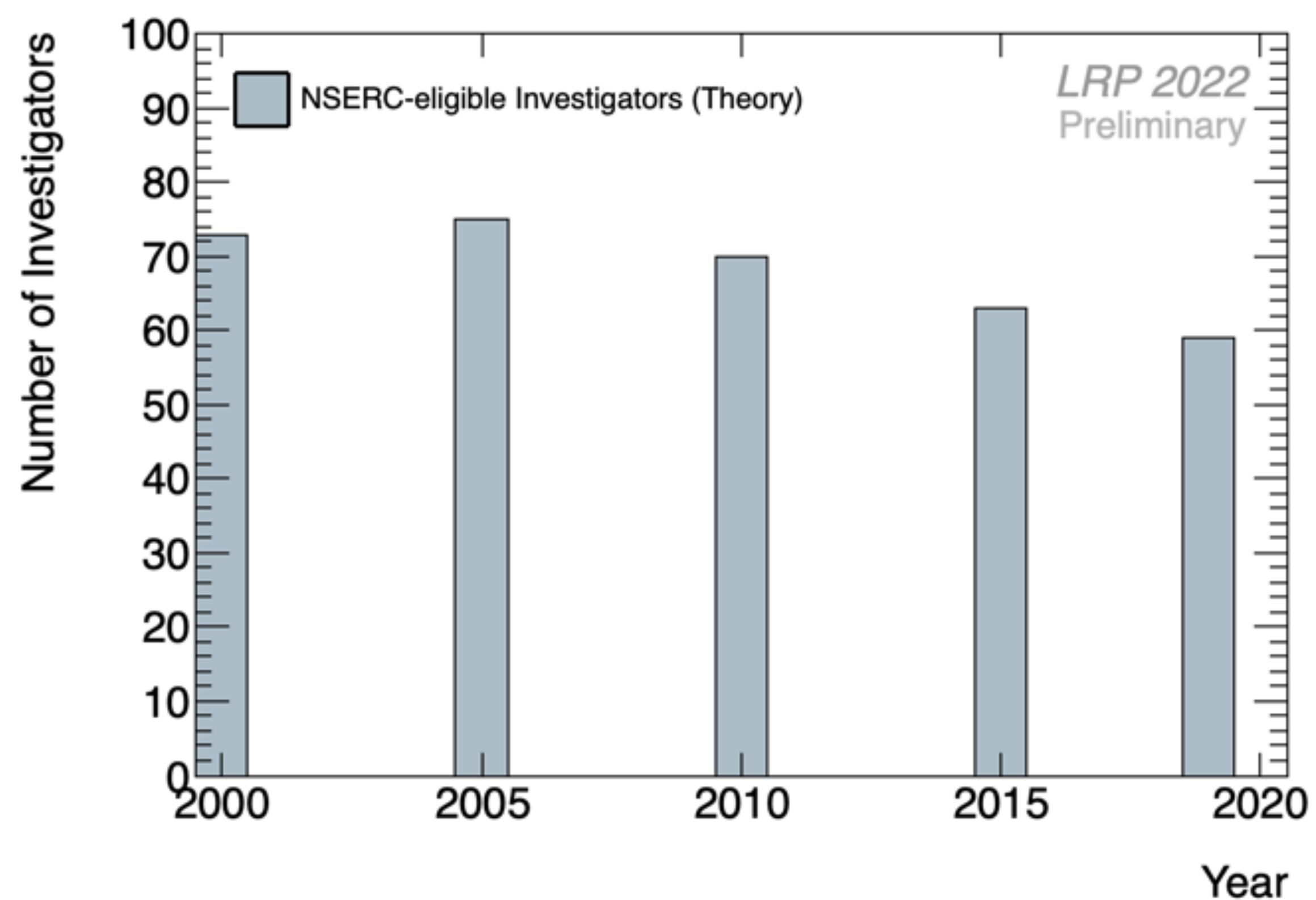
2. Analysis of Historical Funding Data

Number of Investigators

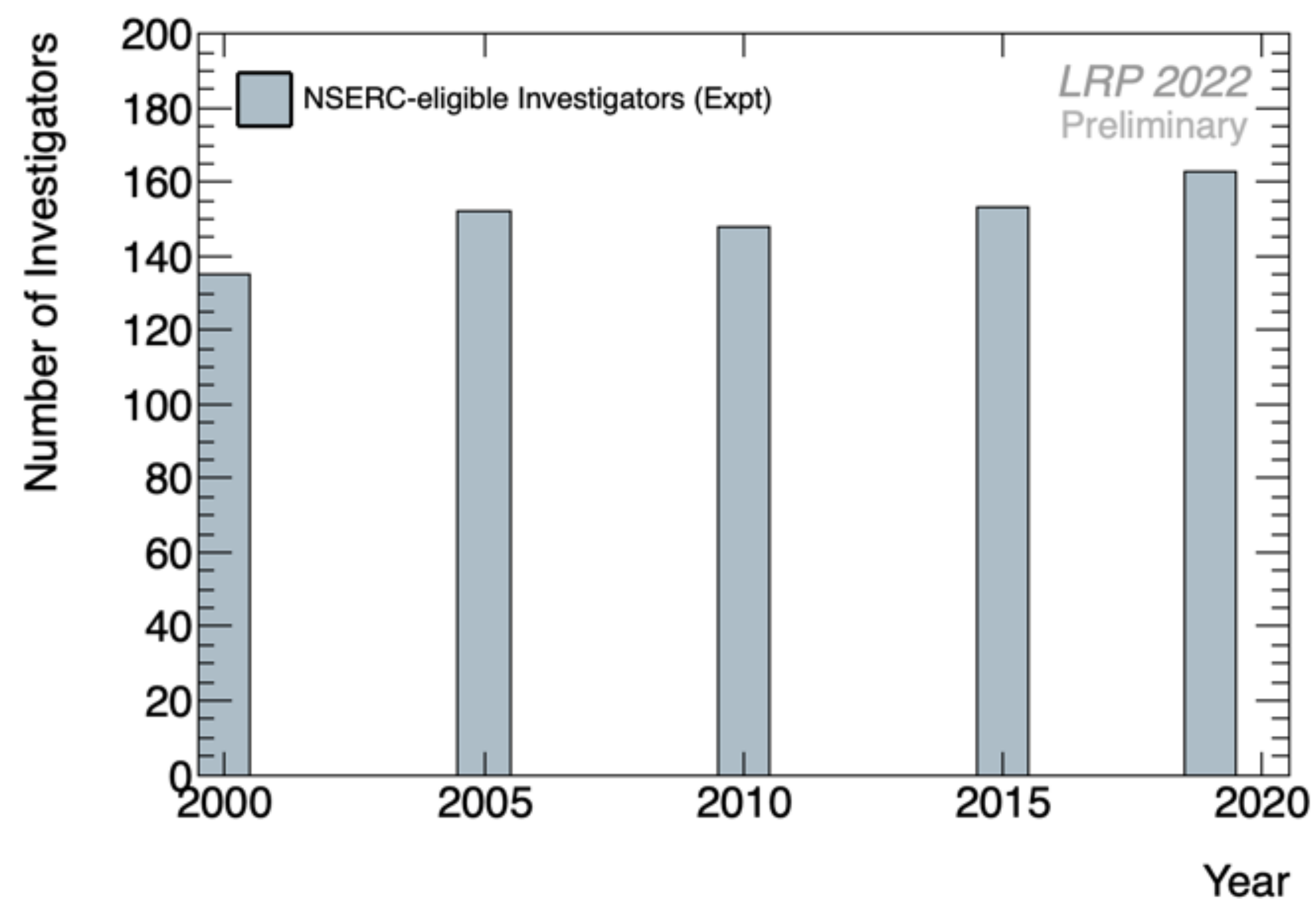


Number of Investigators

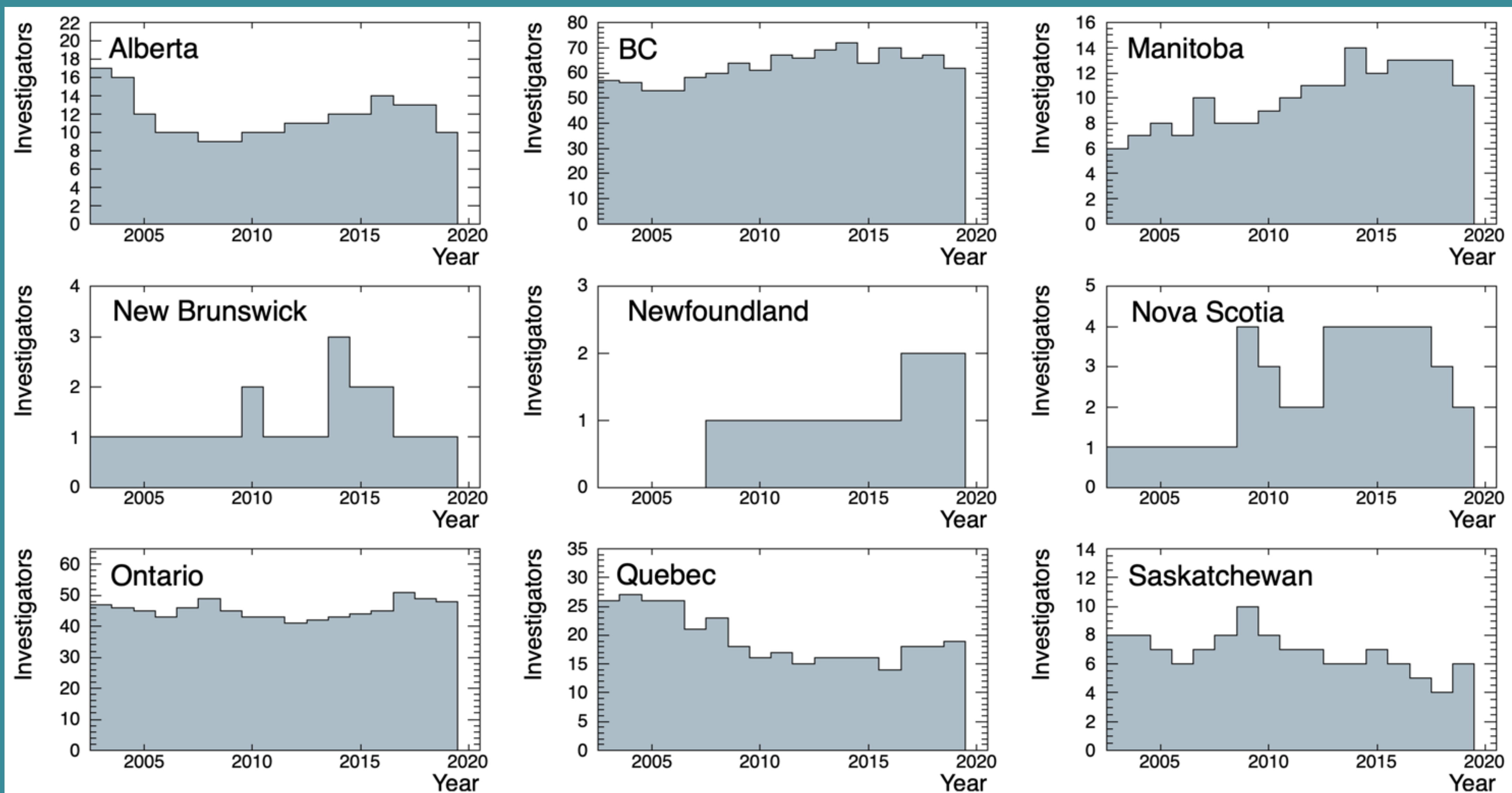
Theory



Experiment



Investigators per Province

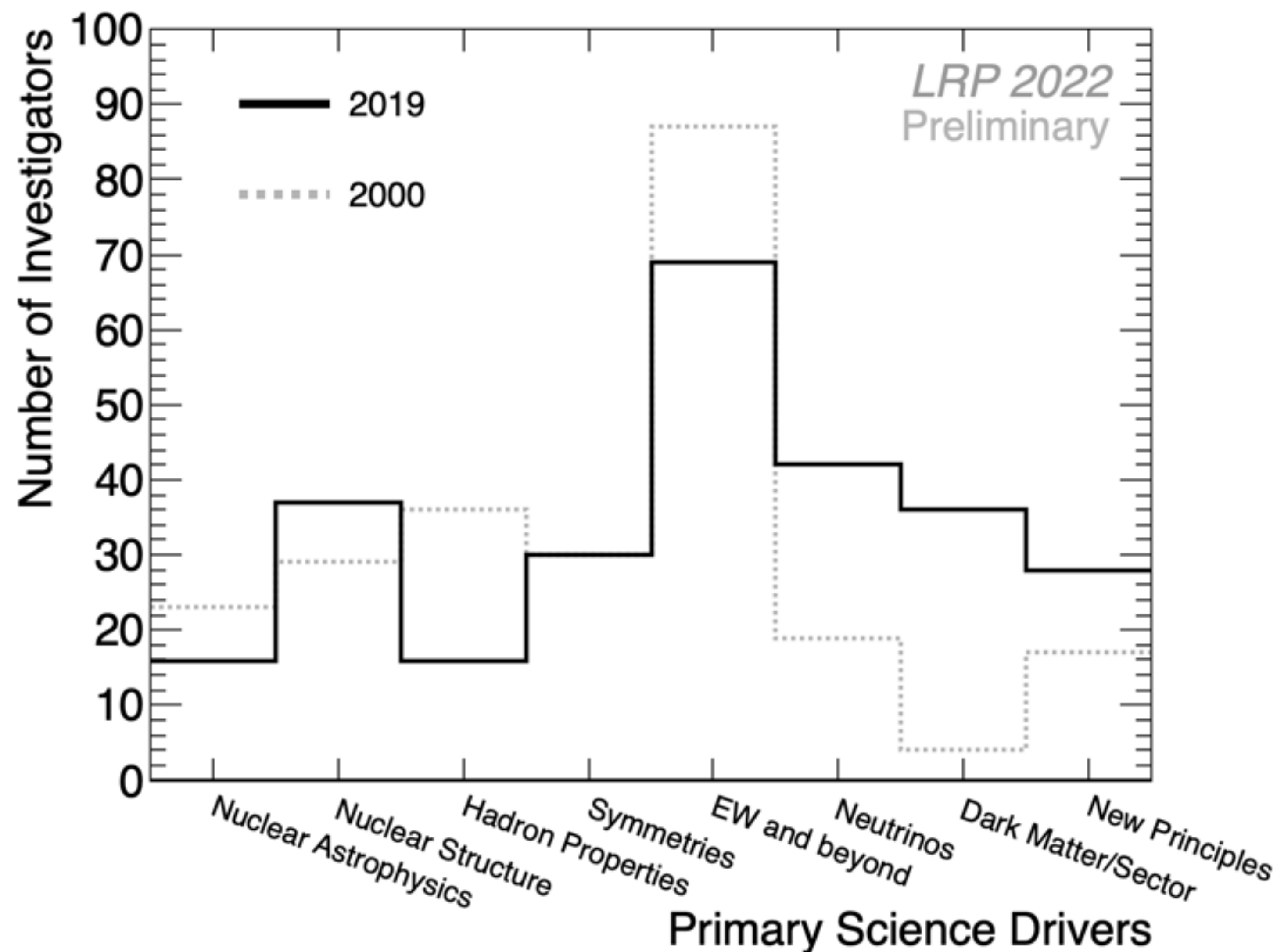


Science drivers for Subatomic Physics

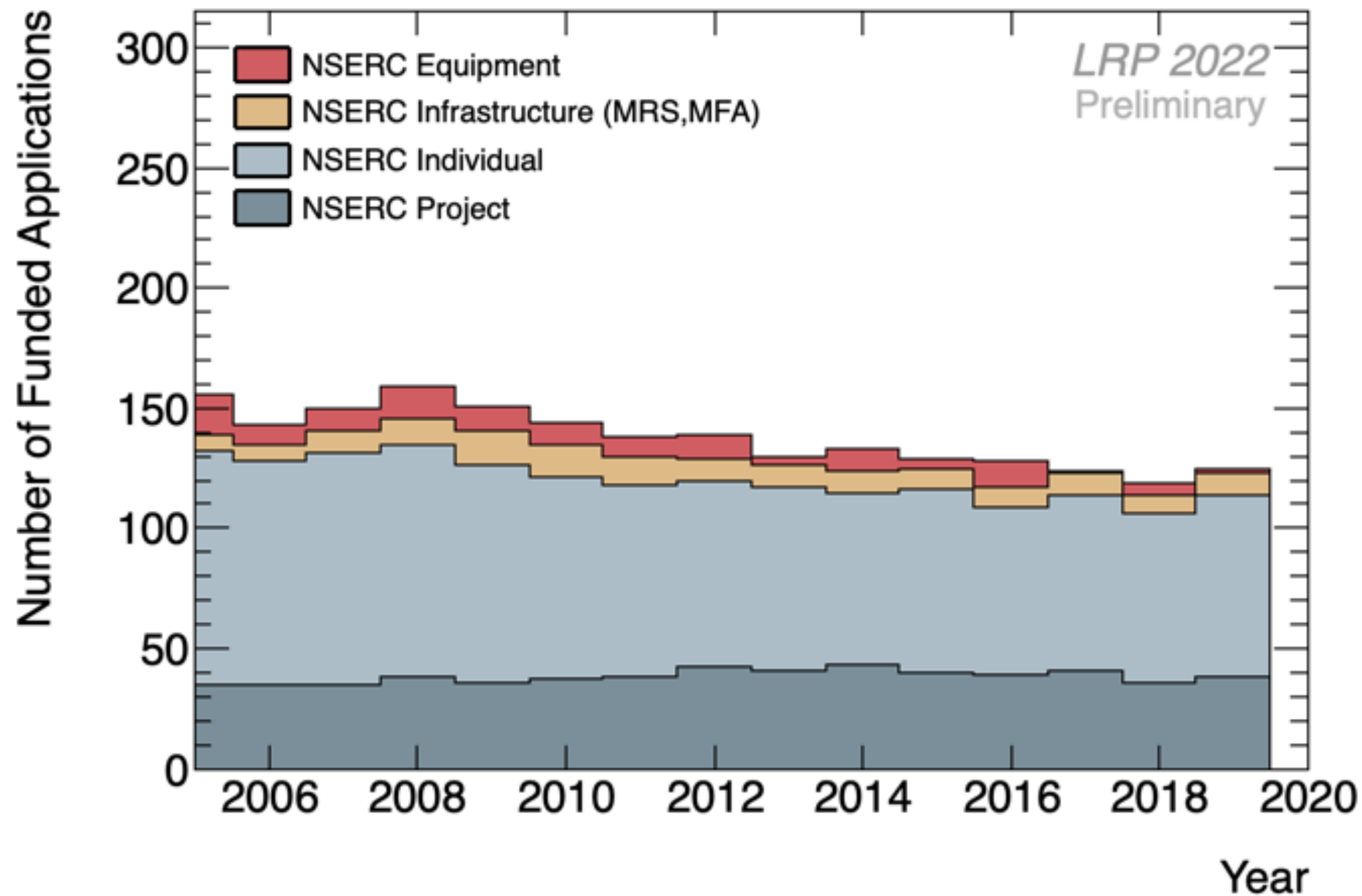
The Drivers encapsulate the questions motivating research sub-fields of subatomic physics

- **New Physical Principles & Structures**
 - What principles and formal theoretical structures underly the forces/matter in the universe? How is gravity to be understood at the quantum level?
- **Higgs Physics, the Electroweak Scale and Beyond**
 - What is the precision nature of the Higgs sector and the flavour sector? What is the physics of electroweak symmetry breaking? What lies beyond the electroweak scale?
- **Dark Matter & Potential Dark Sectors**
 - What is the nature of dark matter in the universe, and its interactions? Is dark matter part of a more extended dark sector?
- **Neutrino Properties**
 - What is the nature of neutrino mass, and of neutrino interactions?
- **Fundamental Symmetries**
 - What are the fundamental symmetries in nature, and how do we explain observed imbalances, e.g. the matter-antimatter symmetry in the universe?
- **Hadron Properties and Phases**
 - How do quarks and gluons give rise to the properties of nucleons and other hadrons, and to the hadronic phases of matter in extreme conditions?
- **Nuclear Structure**
 - How does nuclear structure emerge from nuclear forces and ultimately from quarks and gluons?
- **Cosmic Formation of Nuclei**
 - How do the properties of nuclei explain the formation of the elements in the late universe?

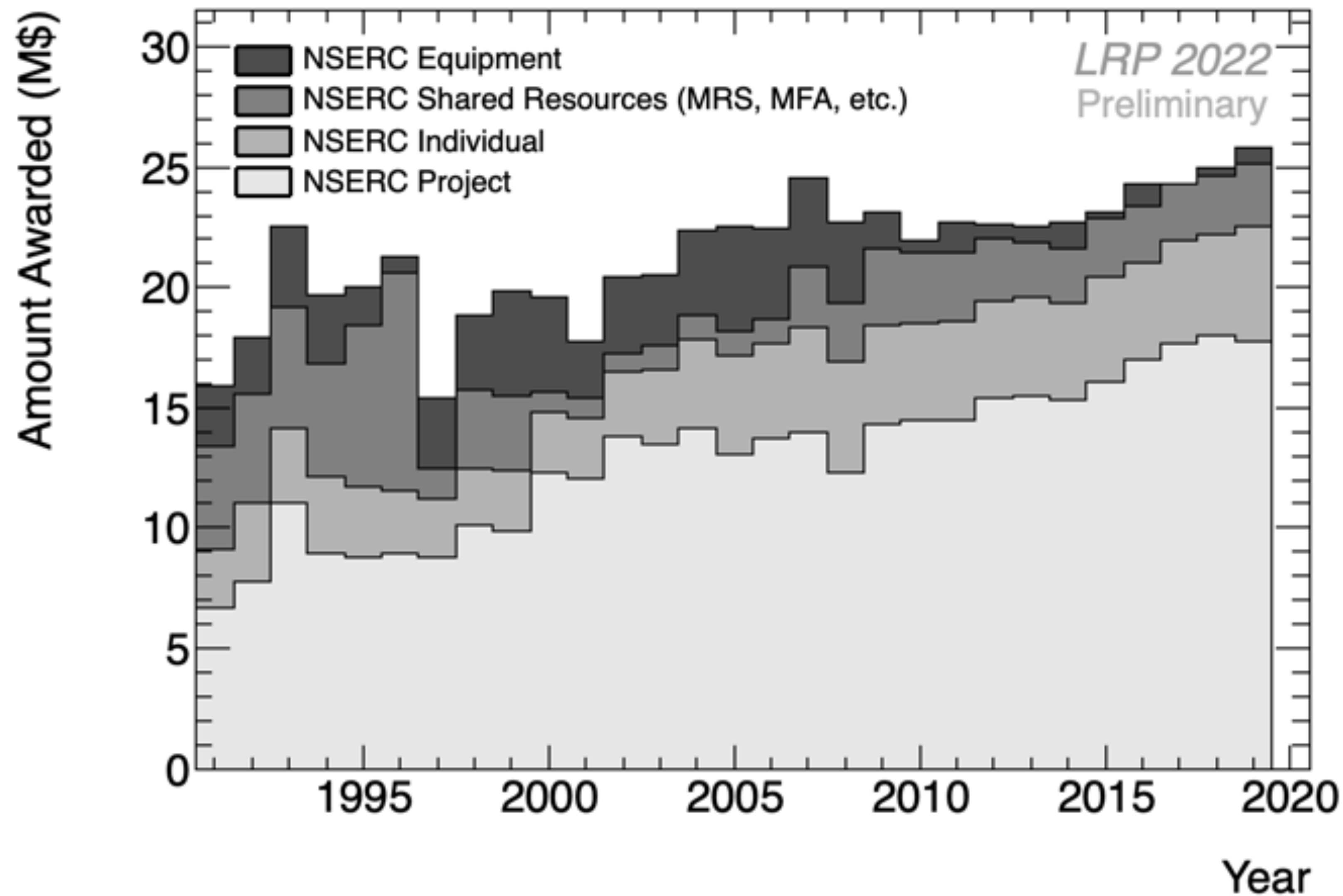
Investigators per Primary Science Driver



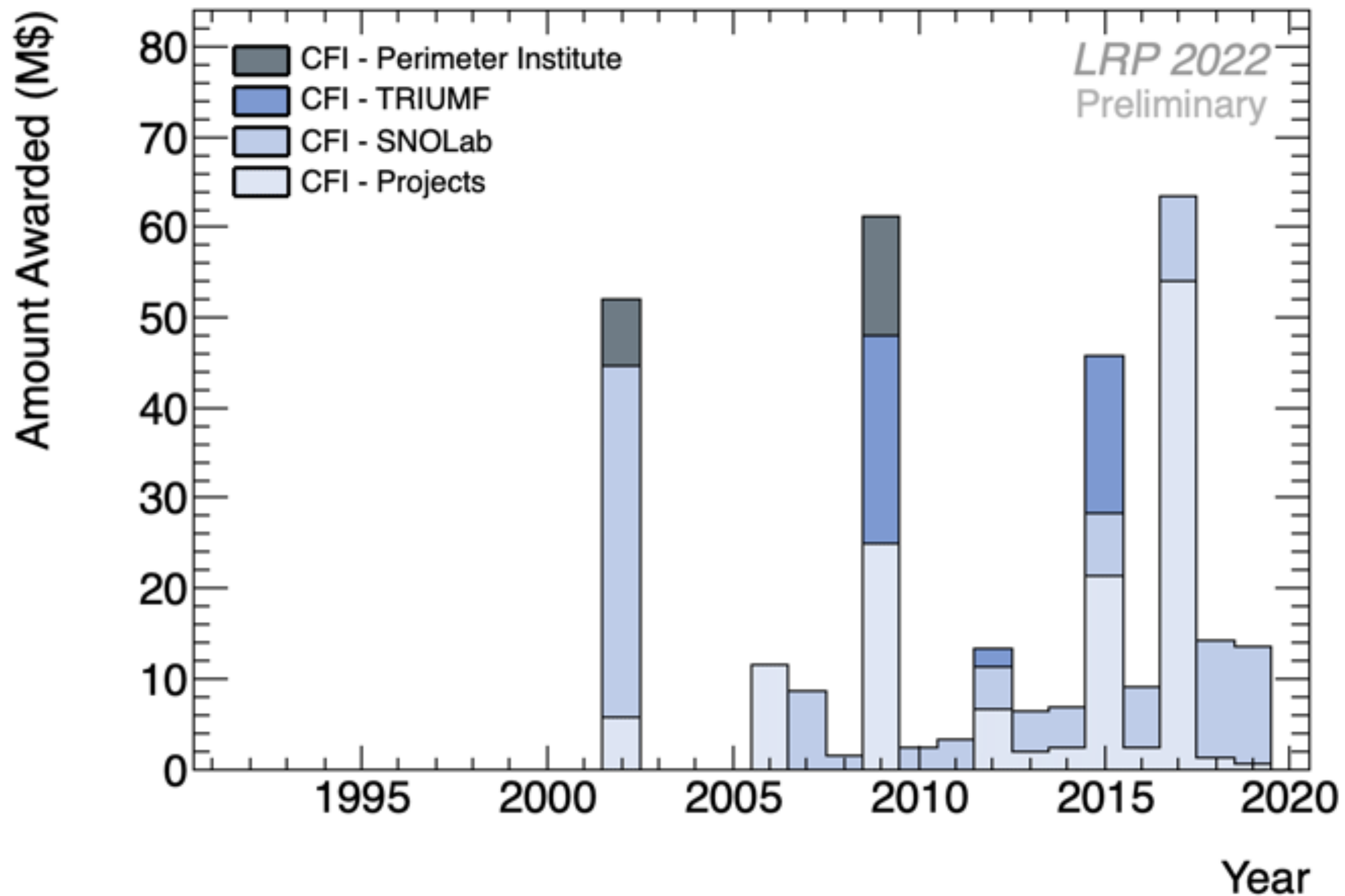
NSERC Funded Applications



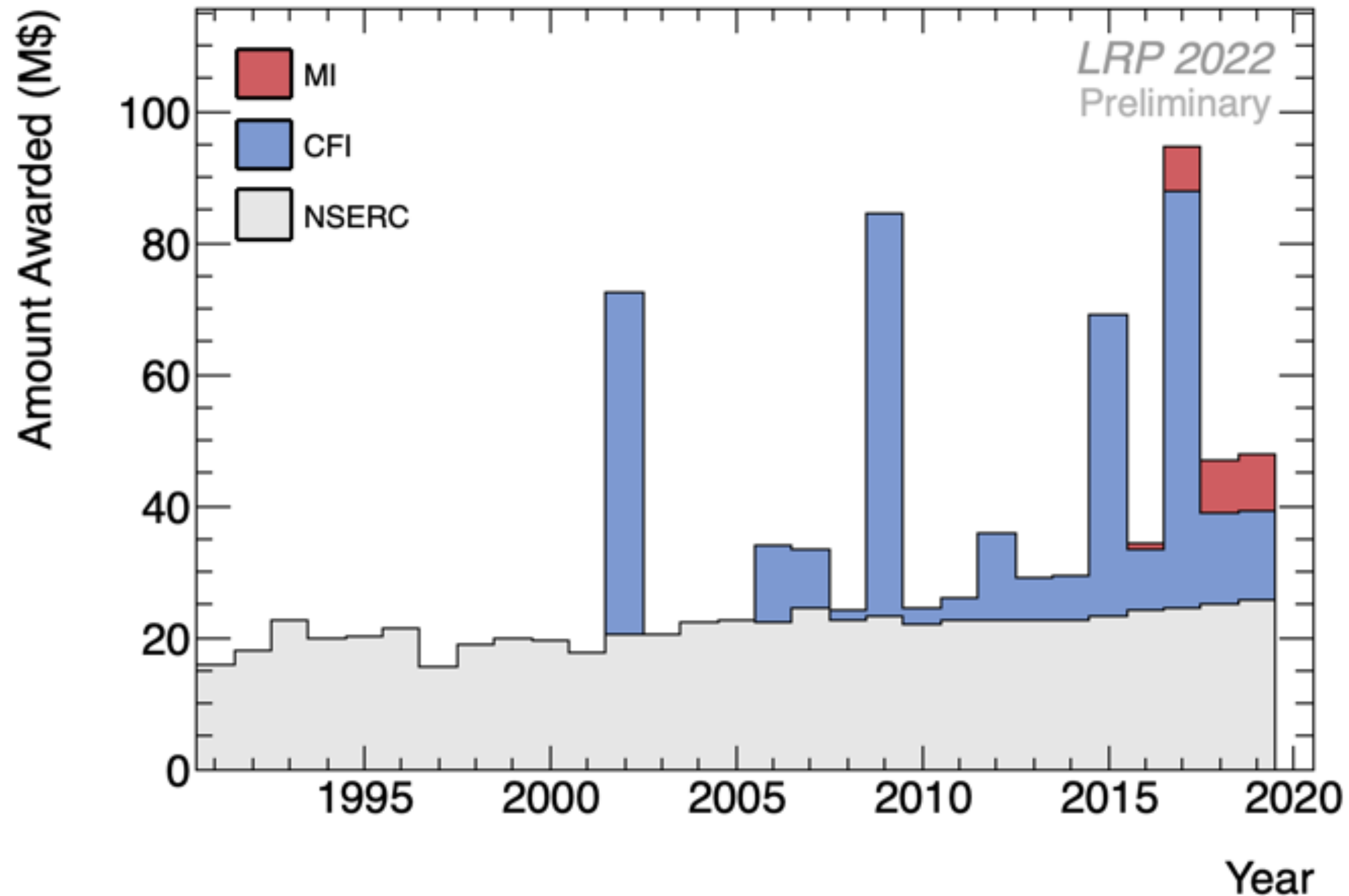
NSERC SAP Envelope



CFI SAP Investments

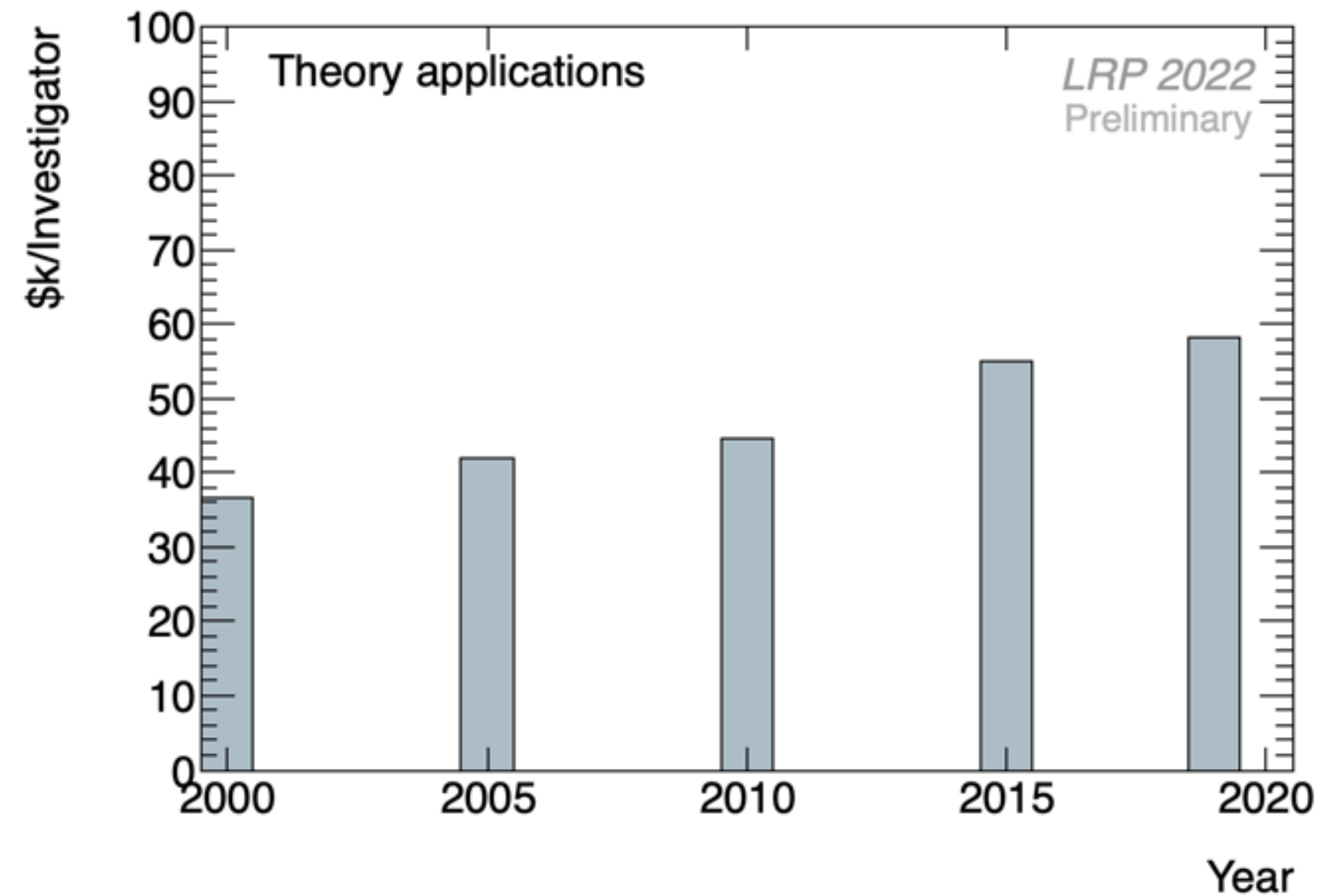
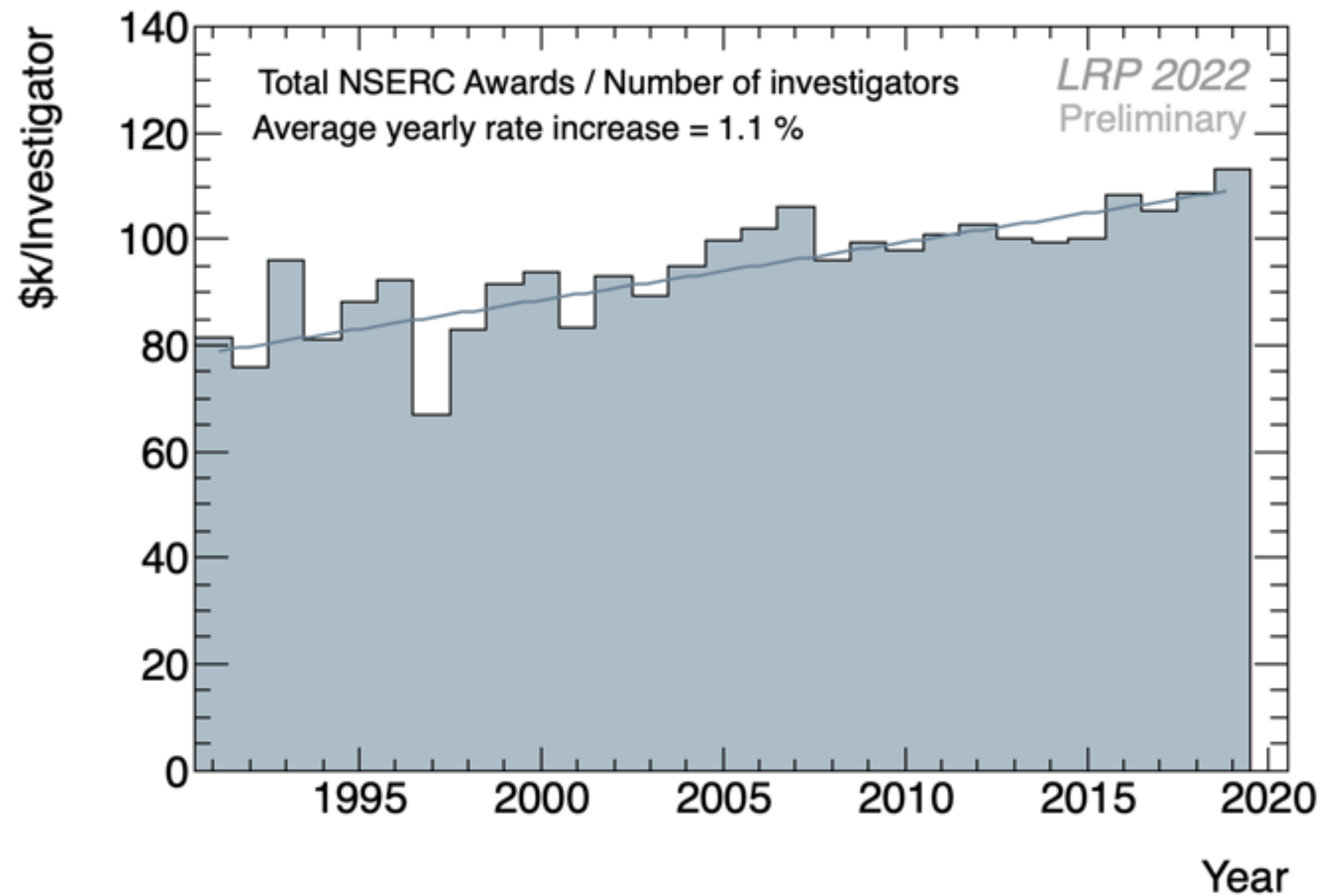


SAP Funding



- MI portion represents total investment (salary, programs)

Average \$/investigator



Questions?

3. Topical Townhalls

Topical Townhalls

- **Topical Townhall 1 - SAP Community: Education, Training & Careers**
 - Format: Moderated Q&A
 - Attendance: 88 (58 simultaneously)
- **Topical Townhall 2 - SAP Community: EDI, ECR & Community Organization**
 - Format: Moderated Q&A
 - Attendance: 75 (57 simultaneously)
- **Topical Townhall 3 - Science Planning & Opportunities**
 - Format: Panel Discussion & Moderated Q&A
 - Attendance: 126 (90 simultaneous)
- **Topical Townhall 4 - SAP Connections: Interfacing to other fields and society**
 - Format: Panel Discussion & Moderated Q&A
 - Attendance: 63 (46 simultaneous)

Meeting Agendas and Slides: [Indico](#)
Thank you everyone for your participation!

Topic 1 Summary - Education, Training & Careers

- **Aspirations**
 - The full breadth of research work, collaboration, and opportunities within SAP may not be apparent to those thinking of entering the field
- **Education**
 - Skills relevant within the field (flexible approach to problem solving, collaboration, system integration, communication, and data analysis) are also those valuable outside the field.
 - Support for those seeking outside employment may benefit from targeted effort: e.g. guidance about the credentials assisting entry to sectors like data science, and developing other soft skills (leadership/management, ethics, grant applications).
- **Equity, Diversity & Inclusion**
 - Multiple examples of initiatives/programs were highlighted, with an emphasis on the need for supervisors to model and support this effort (e.g. with time and funding).

Topic 2 Summary - EDI, ECR and Community Organization

- **Equity, Diversity and Inclusion**

- Canadian/SAP-specific EDI data would be valuable; coordination with CAP may boost sample size.
- Outreach efforts are important, but need to be valued and supported by granting agencies and institutions. There are opportunities to partner with organizations outside SAP.
- Conference best practice guidelines would be helpful, along with support to ensure equitable opportunities for attendance.

- **Early Careers researchers**

- Guidance on the Canadian funding ecosystem and resources (e.g. computing, MRS, etc.) is important.
- The lack of specific funding programs (outside SAP envelope) for ECRs relative to those available in other countries was noted.
- Specific pressures on SAP ECRs: need for extensive travel, and other pressures on work/life balance
- Tension between SAP community model to focus on priority projects vs the potential advantage in “having your own project” for career advancement within home institution.

- **Community organization**

- Coordination of grad courses available from different universities may be valuable, given online options, as would broader coordinated effort to introduce new HQP to the community.

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Topic 3 Summary - Science Planning & Opportunities

- **Coalescence & Prioritization**

- A science-motivated portfolio perspective is useful (project scale, risk, timelines).
- Critical-mass effort on specific projects may be valuable, but sufficient research breadth is critical to drive innovation.

- **Community Ambition**

- Reflects willingness to try new things (risk tolerance) as well as project leadership.
- The Major Research Facilities Committee (MRFC) recommendation of the Naylor report could be highlighted as beneficial for major projects, and such a body could also assist with inter-lab coordination and provide an international point of contact.

- **New Technologies**

- SAP provides critical science drivers for the potential use of new emerging technologies (e.g. quantum sensors). Participation in national and international collaboration may enhance development.

Topic 4 Summary - SAP Connections

- **Specific examples of science connections (not including astrophysics/cosmology)**
 - Medical Physics - isotopes, radiotherapy, imaging.
 - Materials Science - particle-based tools for probing matter, as well as connections in theory.
 - Quantum Information Science - photon detection, cryogenic technologies, many others.
 - Accelerator technology, with many applications, also has long and deep connections.
 - Spinoffs, industrial connections @TRIUMF: e.g. COVID ventilator project, quantum computing.
- **Opportunities**
 - Solutions to specific problems can have broad applicability, opening new connections.
 - Inter-disciplinary funding can be complex, and direct societal impact is an important metric. Embedding personnel in industry, public sector, and vice versa can be helpful
 - Seeding interactions (meetings, visits) across boundaries can be helpful, and currently there is a gap in funding opportunities between basic research and commercialization.
 - Access to students is generically valuable when fostering connections with industry.

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