Snowmass 2021 Community Survey

Physics Outlook

July 24th, 2022
Snowmass Summer Study, Seattle

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for the Snowmass Survey Team
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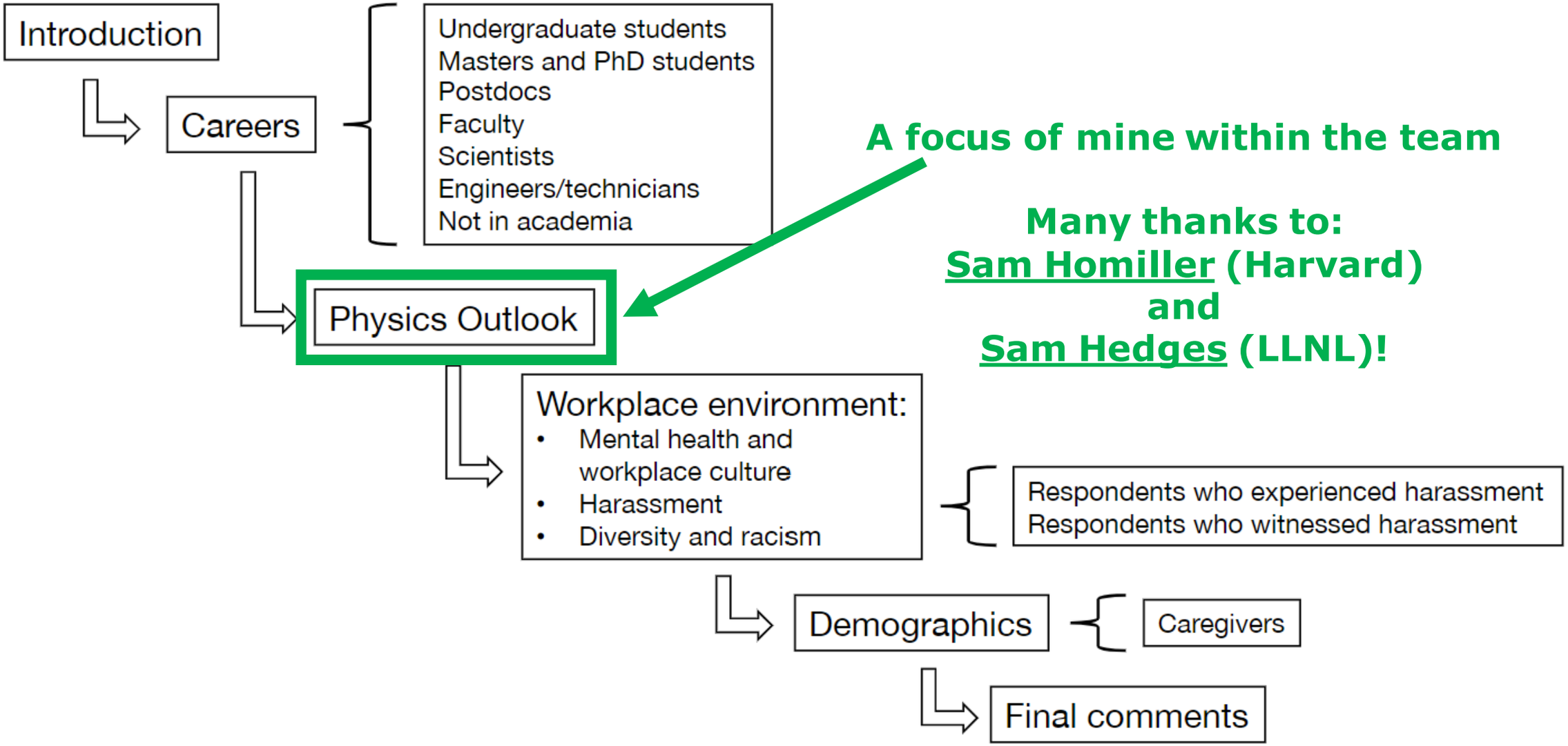
Formerly of the University of Tennessee

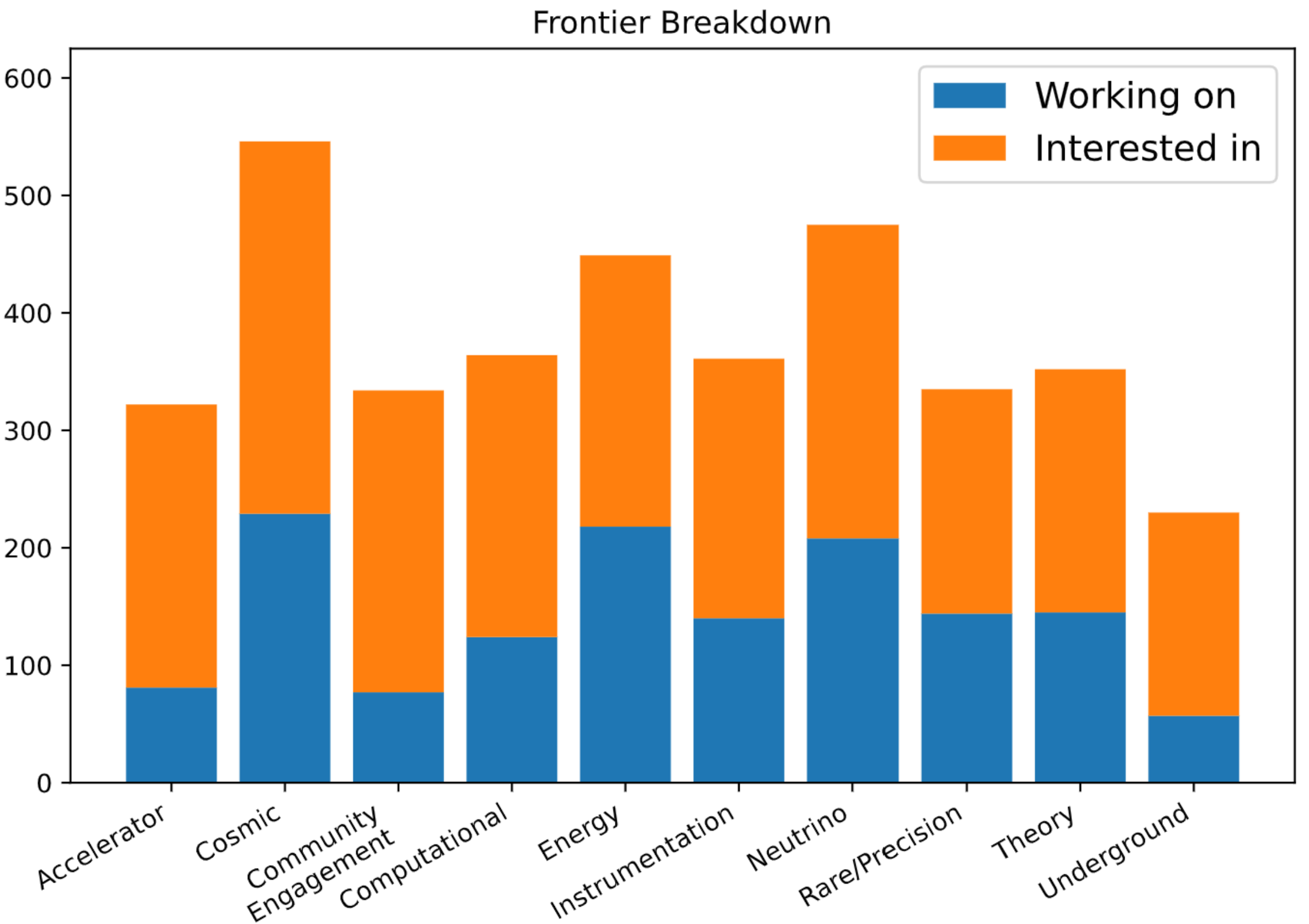
TEL AVIV UNIVERSITY

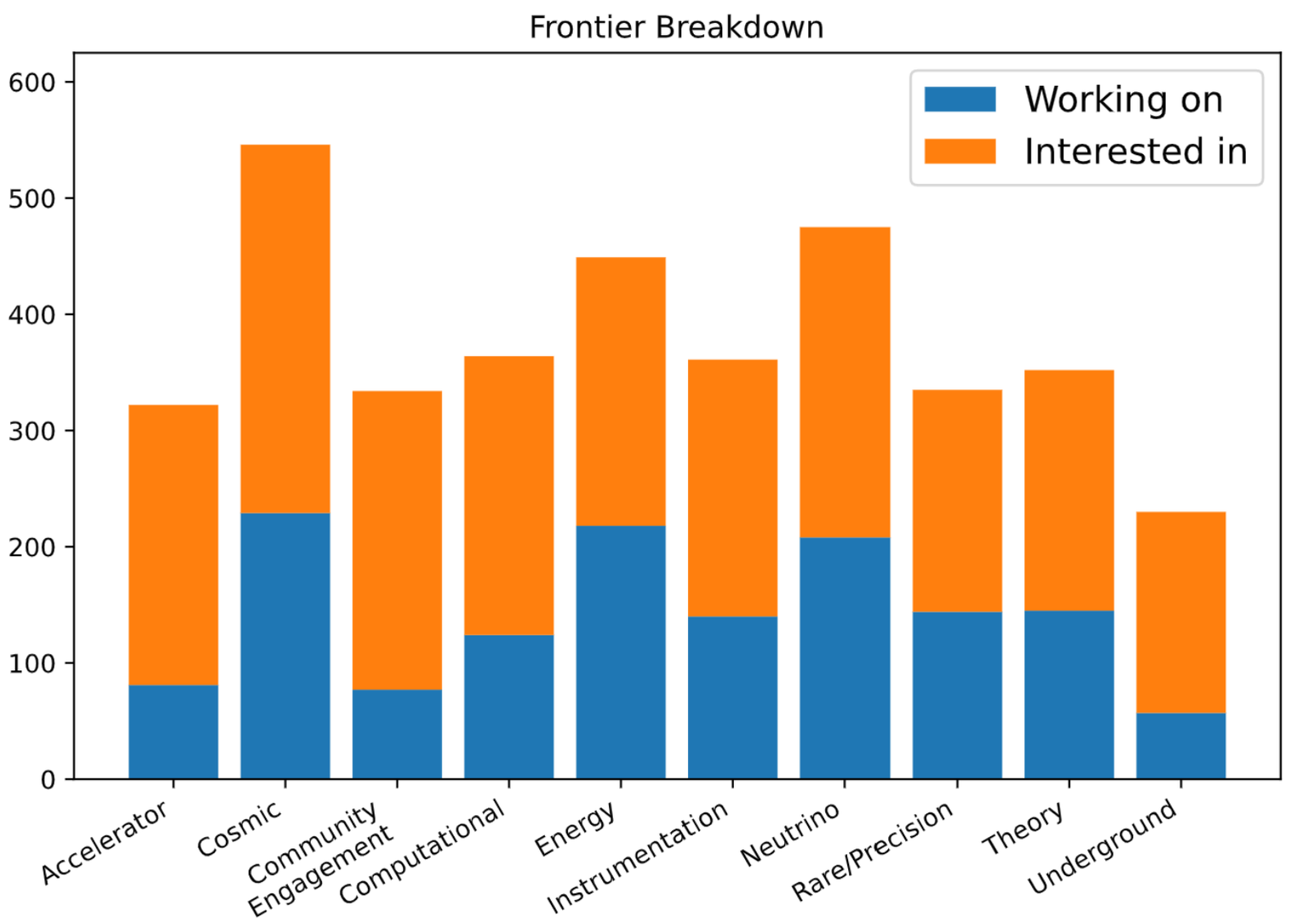
MORTIMER B. ZUCKERMAN STEM LEADERSHIP PROGRAM


Introduction
Careers
Undergraduate students
Masters and PhD students
Postdocs
Faculty
Scientists
Engineers/technicians
Not in academia
Physics Outlook
A focus of mine within the team
Many thanks to:
Sam Homiller (Harvard)
and
Sam Hedges (LLNL)!
Workplace environment:
• Mental health and workplace culture
• Harassment
• Diversity and racism
Respondents who experienced harassment
Respondents who witnessed harassment
Demographics
Caregivers
Final comments

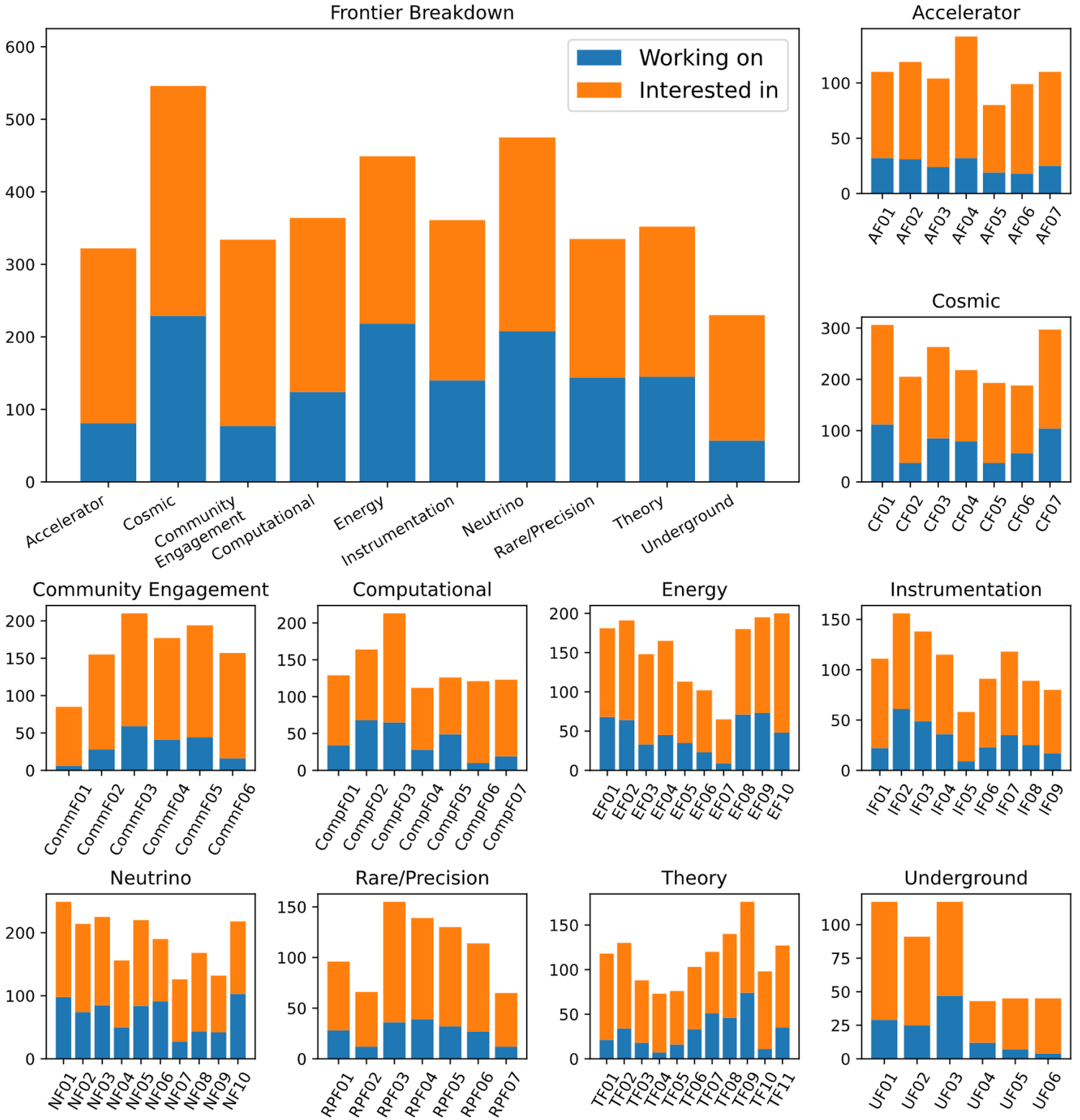
Goals and Overarching Philosophy

- Didn’t request opinions on specific experimental plans
  - Difficult to enumerate and prioritize considering scale
  - Should not choose “winners” and “losers”, avoid lobbying
- Understand community’s views on where the field…
  - …*is heading*…
  - …and where it *should go* potentially, *instead*
  - **We see a future beginning; *do we want to go there*?**
- Effects of future experiment’s long time-scales?
- Public service in software and data management
- Underfunded areas across the field


Frontier Breakdown
Working on
Interested in
600
500
400
300
200
100
0
Accelerator
Cosmic
Community Engagement
Computational
Energy
Instrumentation
Neutrino
Rare/Precision
Theory
Underground



- Multiselection allowed
  - 40% respondents selected > 2 primary Frontiers
- $\sim$100+ experts in most all Frontiers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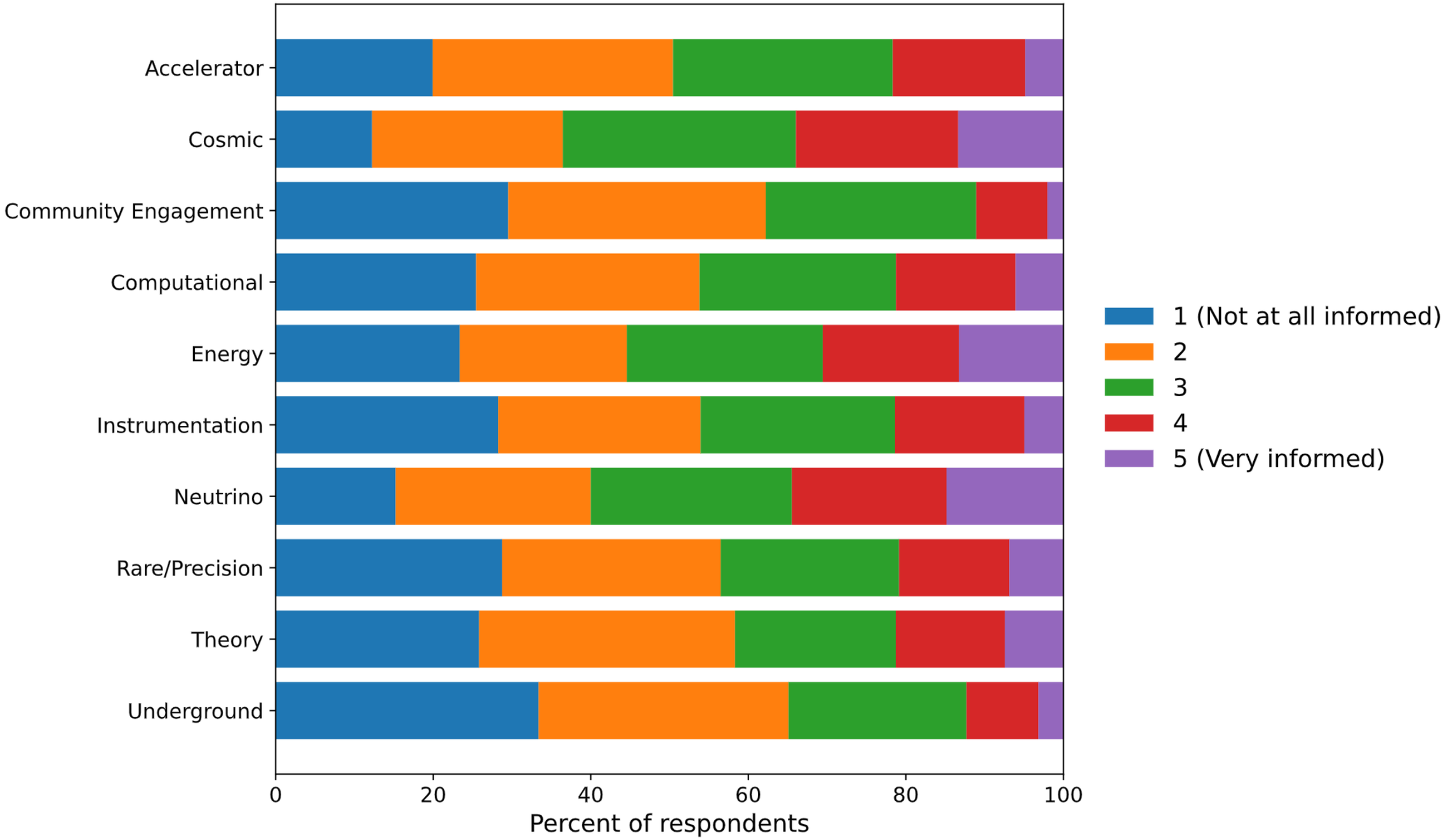
Accelerator
AF01 AF02 AF03 AF04 AF05 AF06 AF07
Cosmic
CF01 CF02 CF03 CF04 CF05 CF06 CF07
Community Engagement
CommF01 CommF02 CommF03 CommF04 CommF05 CommF06
Computational
CompF01 CompF02 CompF03 CompF04 CompF05 CompF06 CompF07
Energy
EF01 EF02 EF03 EF04 EF05 EF06 EF07 EF08 EF09 EF10
Instrumentation
IF01 IF02 IF03 IF04 IF05 IF06 IF07 IF08 IF09
Neutrino
NF01 NF02 NF03 NF04 NF05 NF06 NF07 NF08 NF09 NF10
Rare/Precision
RPF01 RPF02 RPF03 RPF04 RPF05 RPF06 RPF07
Theory
TF01 TF02 TF03 TF04 TF05 TF06 TF07 TF08 TF09 TF10 TF11
Underground
UF01 UF02 UF03 UF04 UF05 UF06

How well informed do you feel about future scientific directions within the Frontiers?



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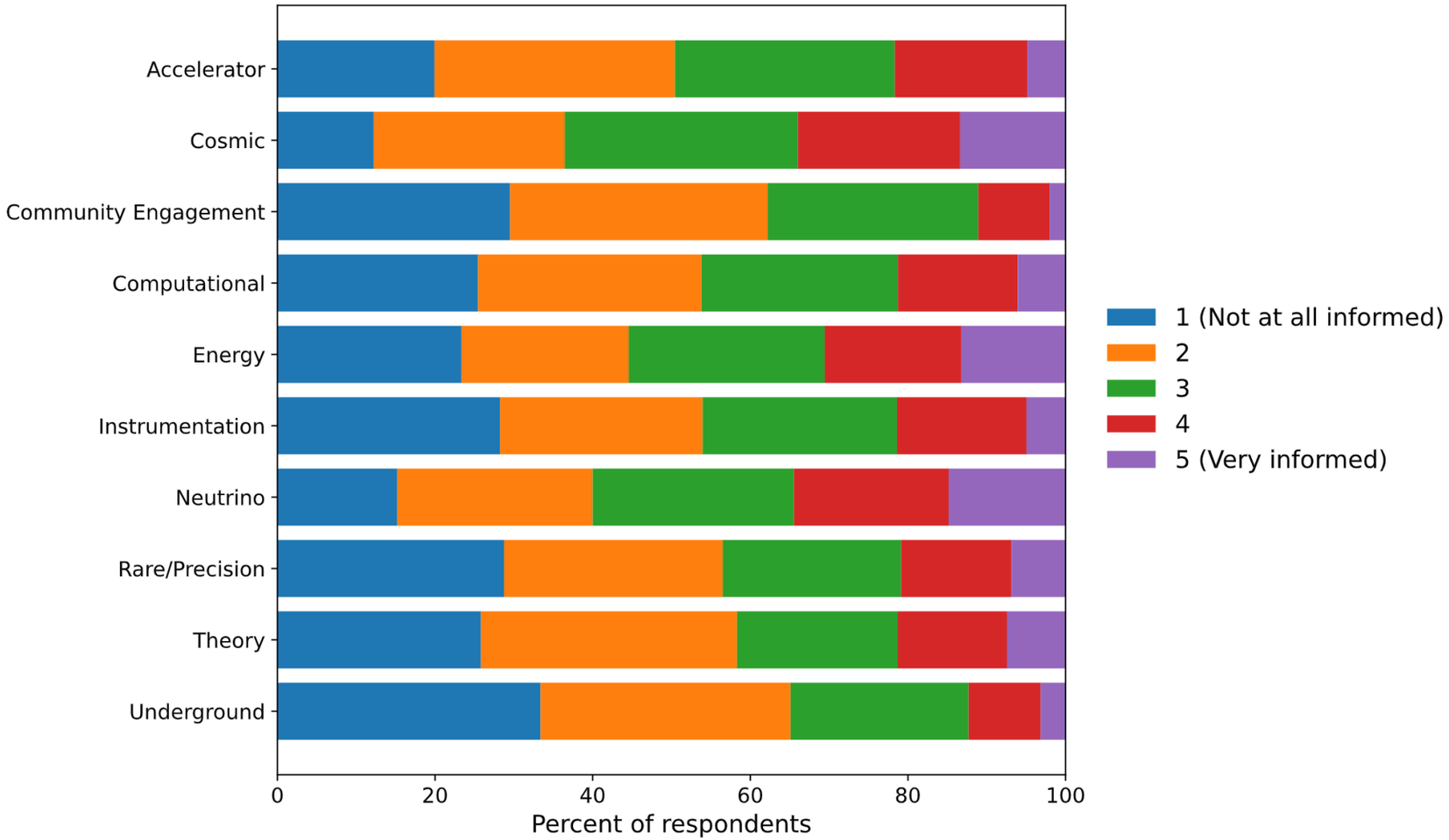
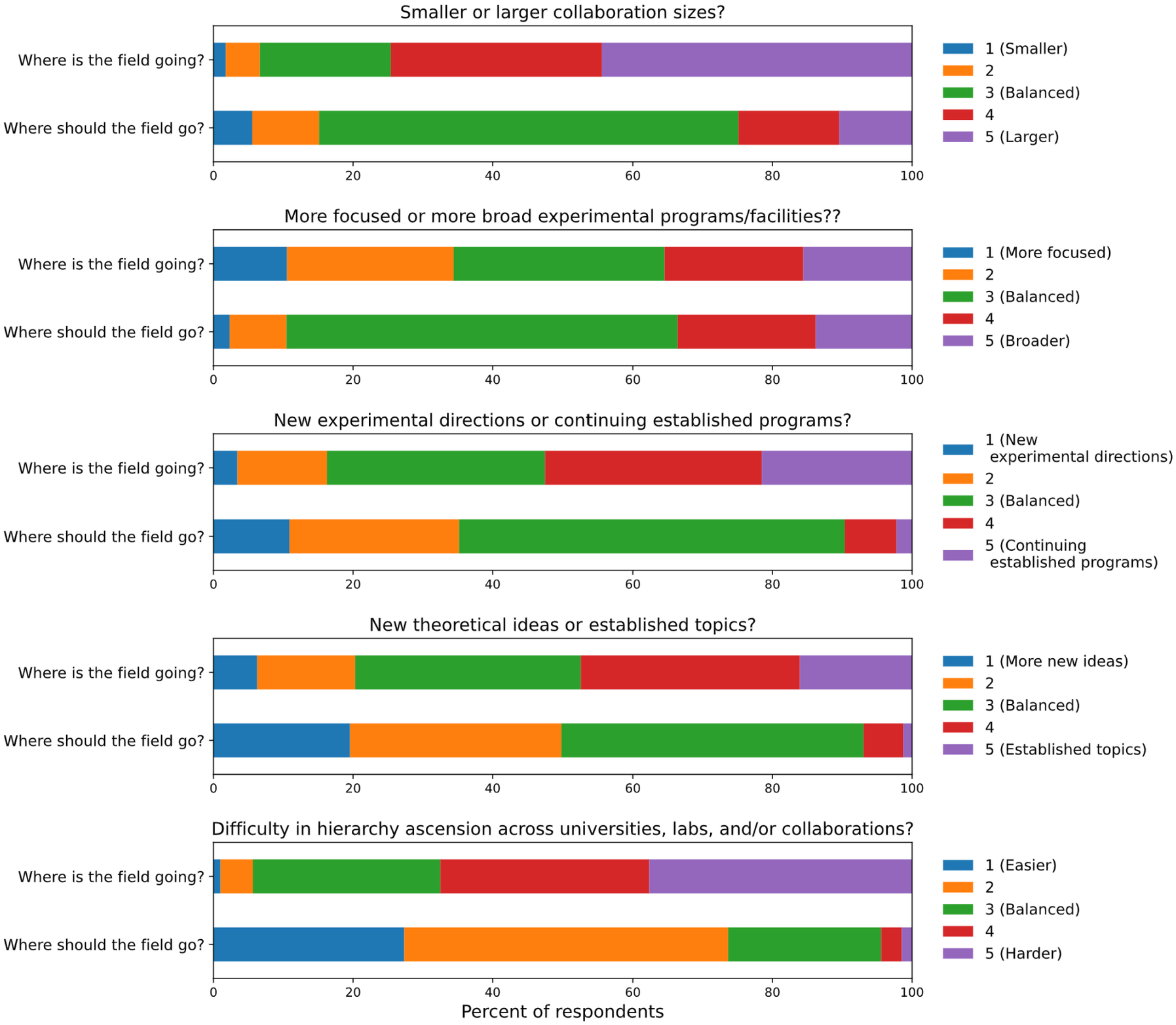
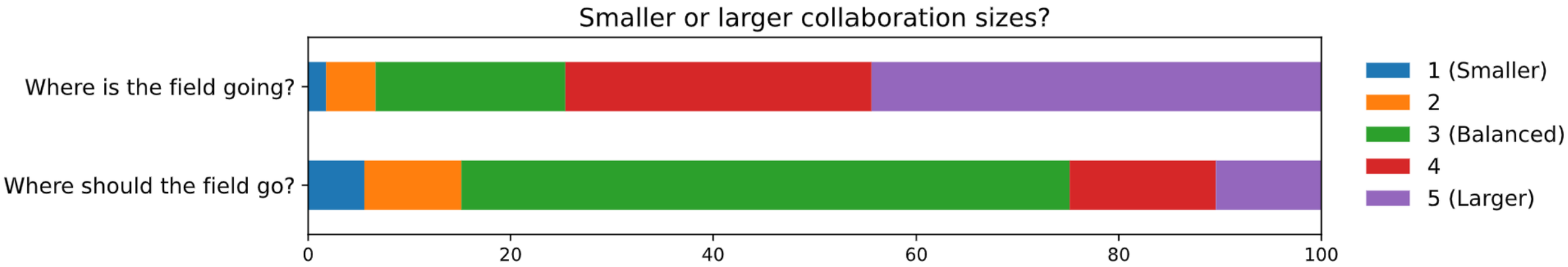


- Significant unfamiliarity about Community Engagement and Underground *concerning*
- Cosmic *prevalent* in the community and public consciousness
- Neutrino and Energy are strong
- Few experts in Instrumentation, Underground, Community Engagement, Accelerator

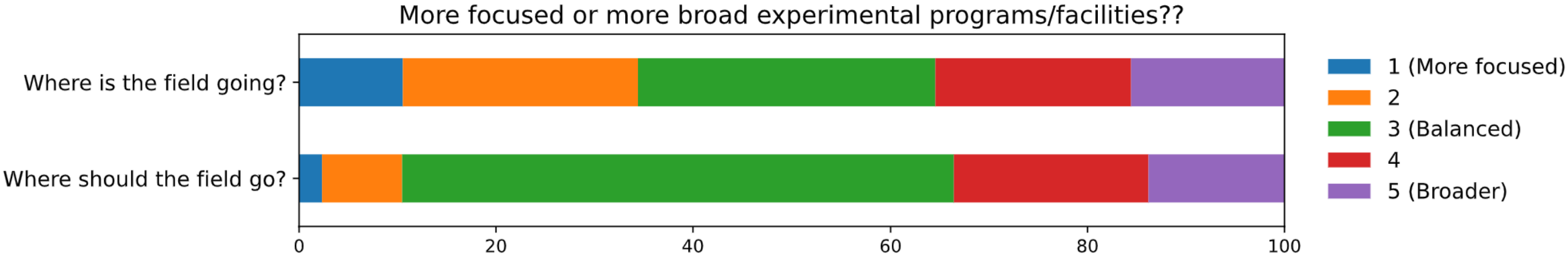
Where is the field going?
Where should it go?


Smaller or larger collaboration sizes?
Where is the field going?
Where should the field go?
0
20
40
60
80
100
1 (Smaller)
2
3 (Balanced)
4
5 (Larger)
More focused or more broad experimental programs/facilities??
Where is the field going?
Where should the field go?
0
20
40
60
80
100
1 (More focused)
2
3 (Balanced)
4
5 (Broader)
New experimental directions or continuing established programs?
Where is the field going?
Where should the field go?
0
20
40
60
80
100
1 (New experimental directions)
2
3 (Balanced)
4
5 (Continuing established programs)
New theoretical ideas or established topics?
Where is the field going?
Where should the field go?
0
20
40
60
80
100
1 (More new ideas)
2
3 (Balanced)
4
5 (Established topics)
Difficulty in hierarchy ascension across universities, labs, and/or collaborations?
Where is the field going?
Where should the field go?
0
20
40
60
80
100
1 (Easier)
2
3 (Balanced)
4
5 (Harder)
Percent of respondents



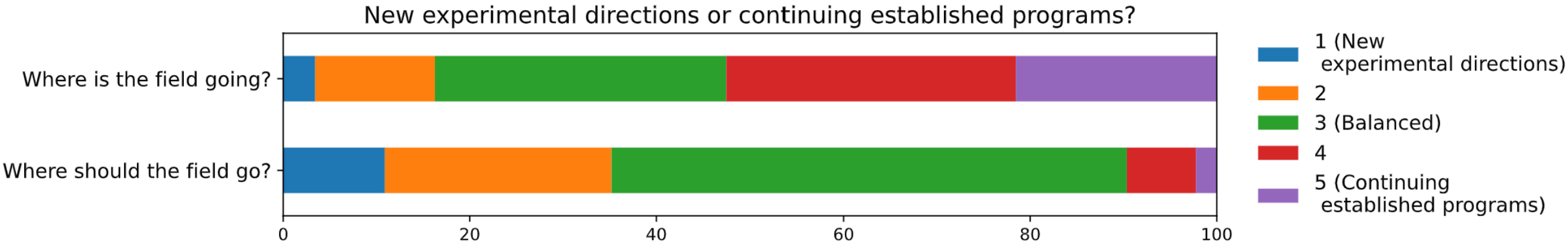
- Discovery potentials and funding pressures likely pushing size increases

- Community **prefers a more balanced approach in the future**
  - Likely can help optimize:
    - Rate of scientific outputs
    - Lower costs
    - Building greater experience within scientific career trajectories



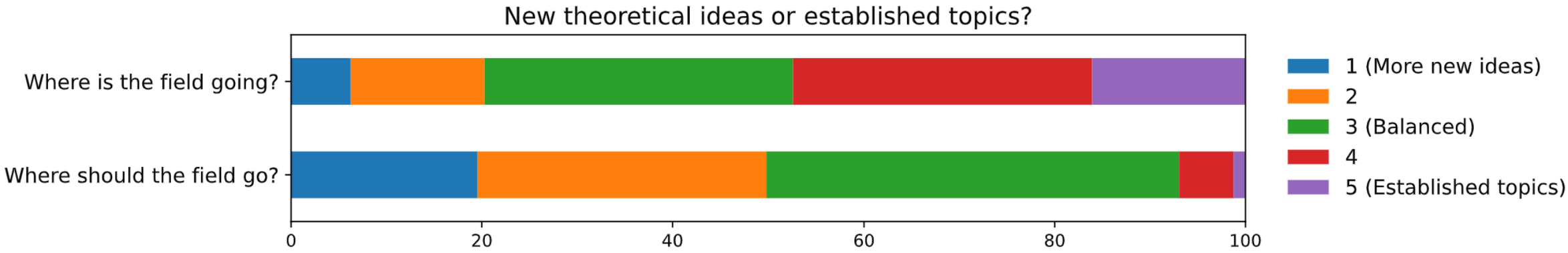
- Field sees many avenues being pursued currently
  - Arguably, these opinions are rather balanced

- Community **prefers a more balanced approach in the future**
  - Potentially broadening horizons, as well

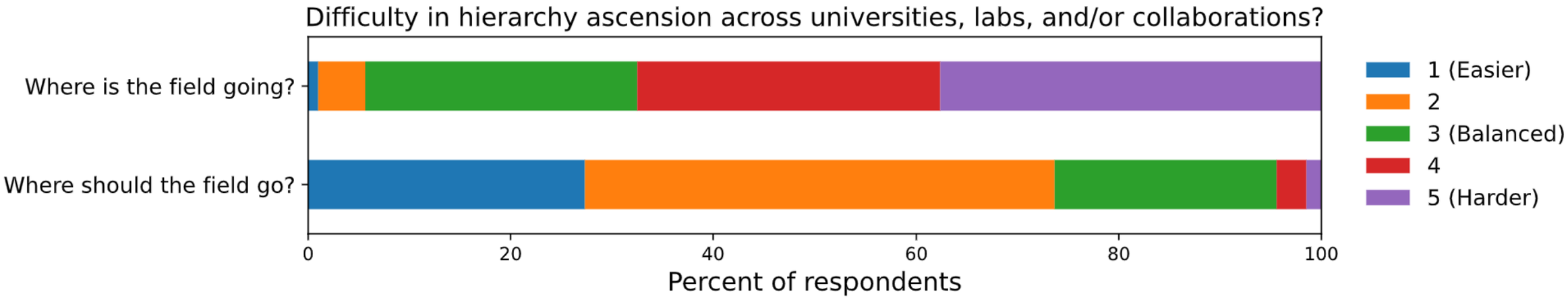


- Field largely believes more established programs are being prioritized

- Community **prefers a more balanced approach in the future**
  - New directions should be considered *more than they are*



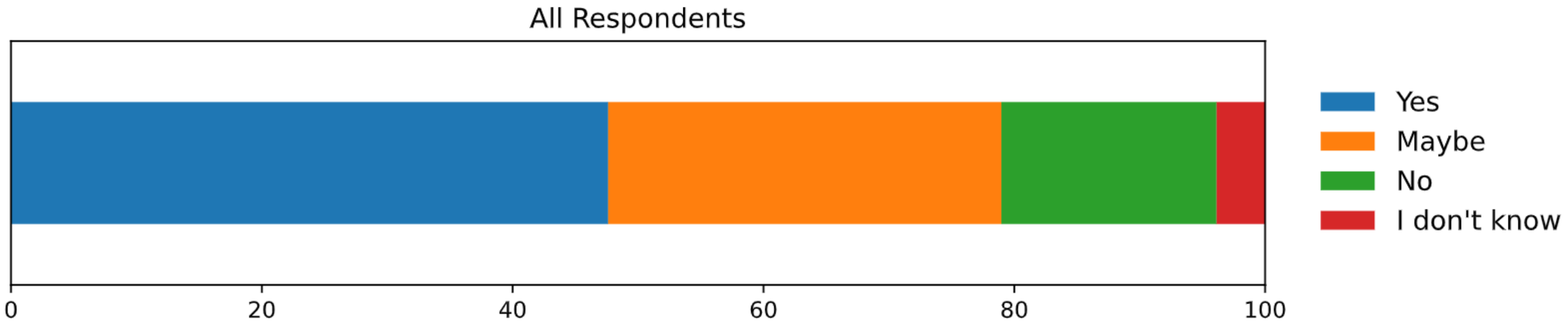
- Community is focused on mostly established topics
- Community believes new directions should be pursued
  - Arguably little to no attention toward established topics



- Getting harder and harder to climb the ladder in particle physics
  - Almost no one thinks it's getting easier
  - Poses threat of lost talents, even if *only perceived* by candidates

- Community believes in most all cases that this should become easier
  - **How to achieve this more fairly and openly should be considered for inclusion within the Snowmass Report**

Are long timescales of experimental programs in HEPA concerning for the field?



- We may be taking too long to do good science
  - As experiments and collaborations enlarge, this is expected
- Potential questions:
  - How does an early career physicist envision their future when the experiment they design may not be built during their career?
  - Now, consider the same, but for a graduate student; how long should degrees take in the future?
  - How do we as a community maintain talent across such timescales?
  - Given such timescales, can funding arguments continue to be made for maintaining the HEPA-to-industry engine, or will such industries begin training candidates themselves to save time?

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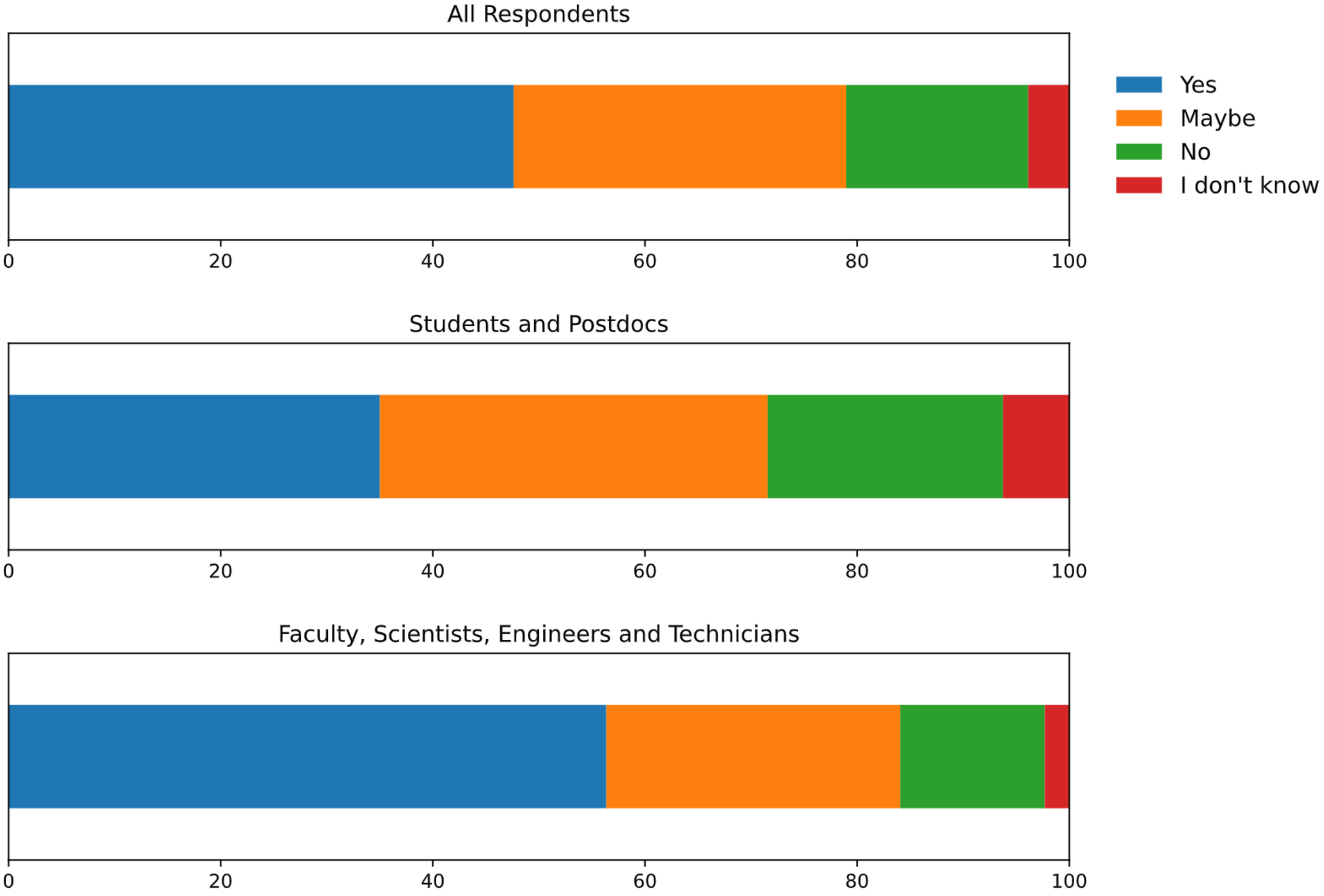
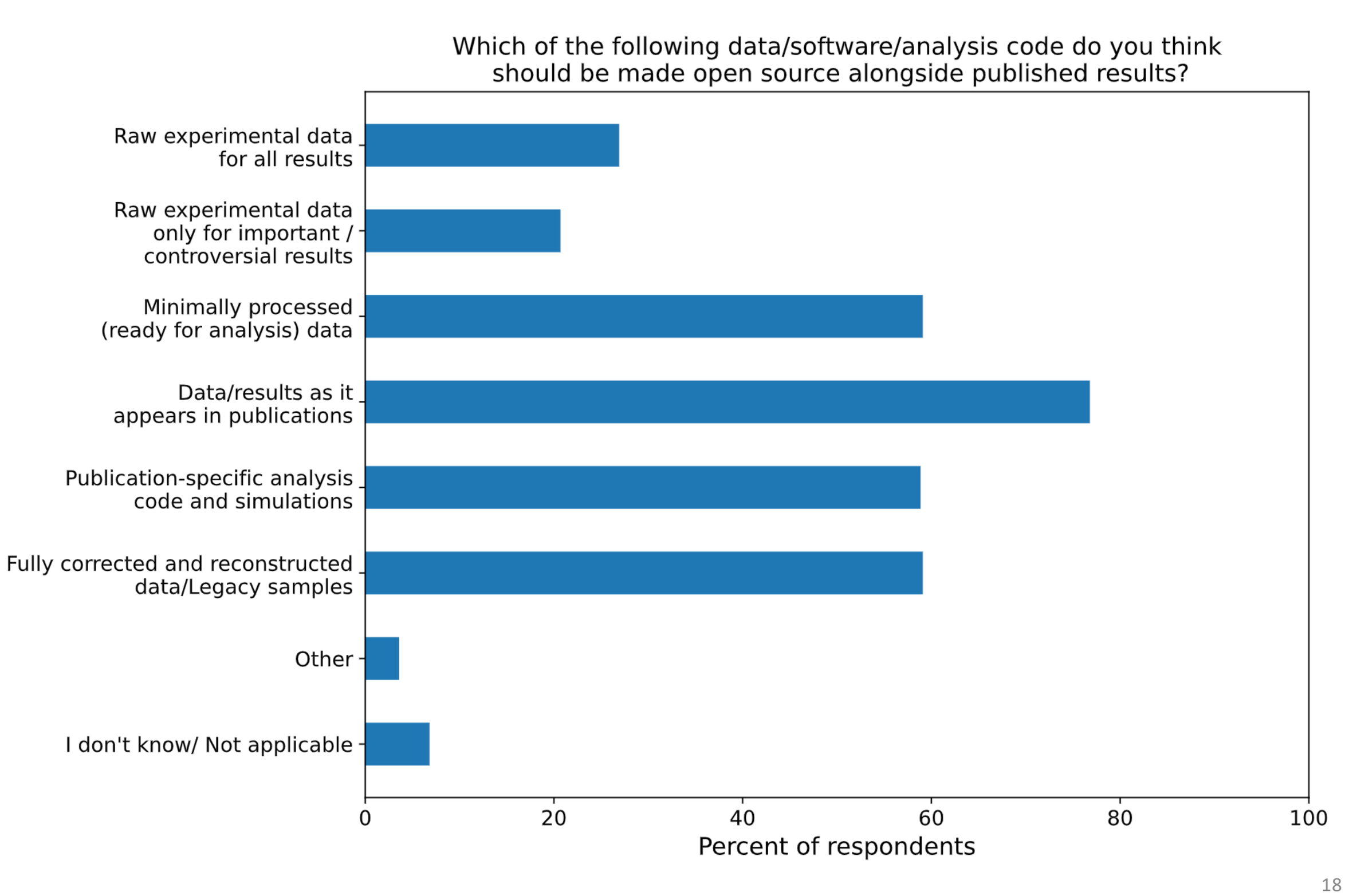
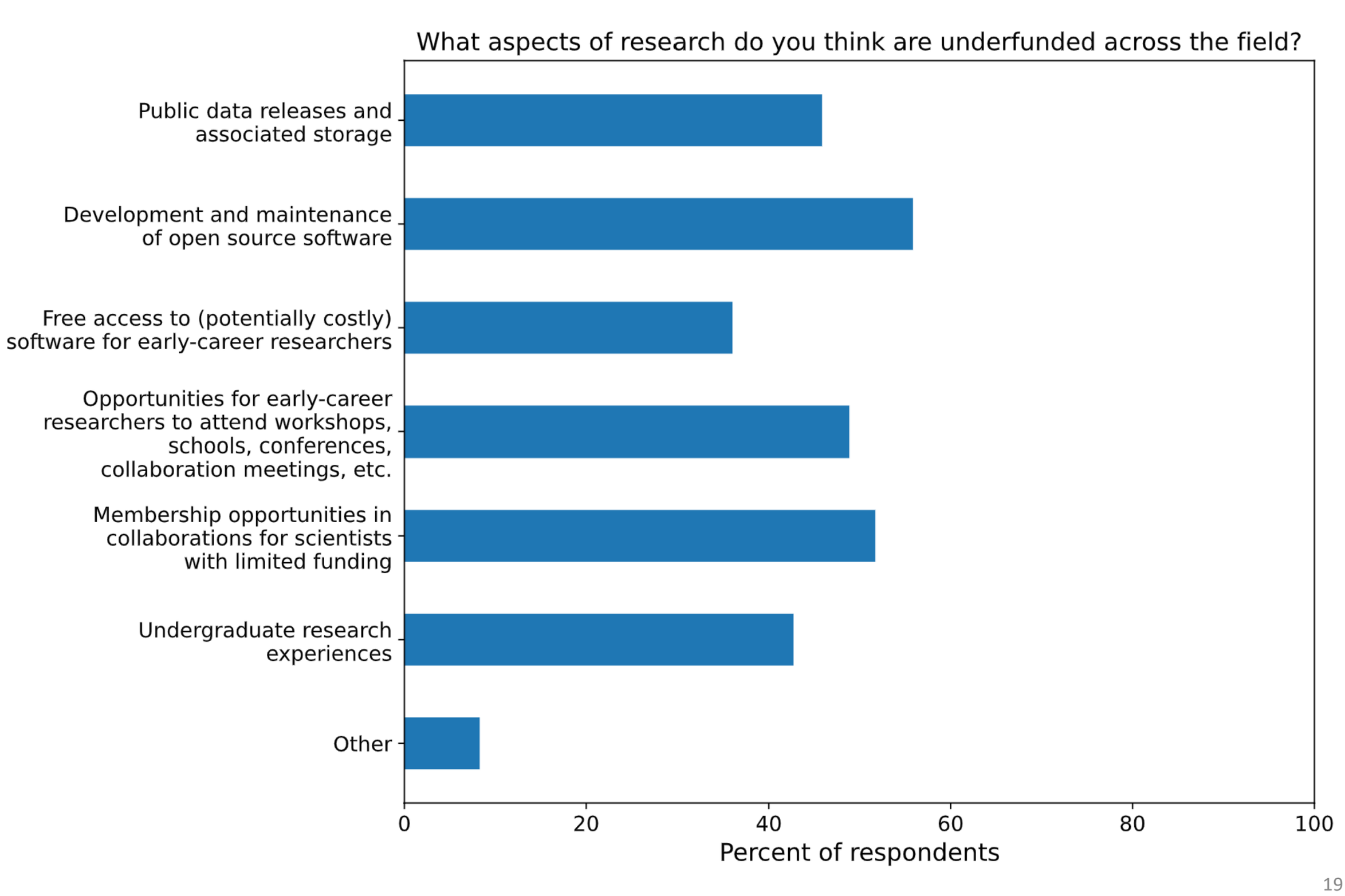



Which of the following data/software/analysis code do you think should be made open source alongside published results?
Raw experimental data for all results
Raw experimental data only for important / controversial results
Minimally processed (ready for analysis) data
Data/results as it appears in publications
Publication-specific analysis code and simulations
Fully corrected and reconstructed data/Legacy samples
Other
I don't know/ Not applicable
0
20
40
60
80
100
Percent of respondents


What aspects of research do you think are underfunded across the field?
Public data releases and associated storage
Development and maintenance of open source software
Free access to (potentially costly) software for early-career researchers
Opportunities for early-career researchers to attend workshops, schools, conferences, collaboration meetings, etc.
Membership opportunities in collaborations for scientists with limited funding
Undergraduate research experiences
Other
0
20
40
60
80
100
Percent of respondents

Thank-you for your attention!

Any questions?

Happy Snowmassing!