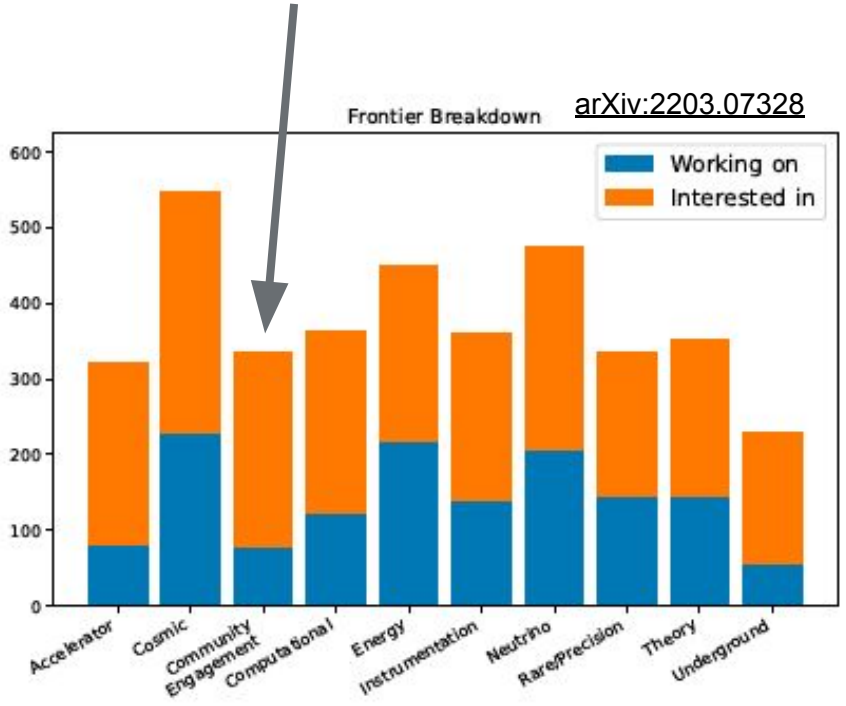
HEP Community Engagement

Selected Key Community Engagement Frontier Recommendations

July 19th, 2022

CEF: Community Engagement Frontier

Frontier Report
CEF Contributed Papers



CEF01: Applications & Industry

CEF02: Career pipeline & Development

CEF03: Diversity Equity & Inclusion

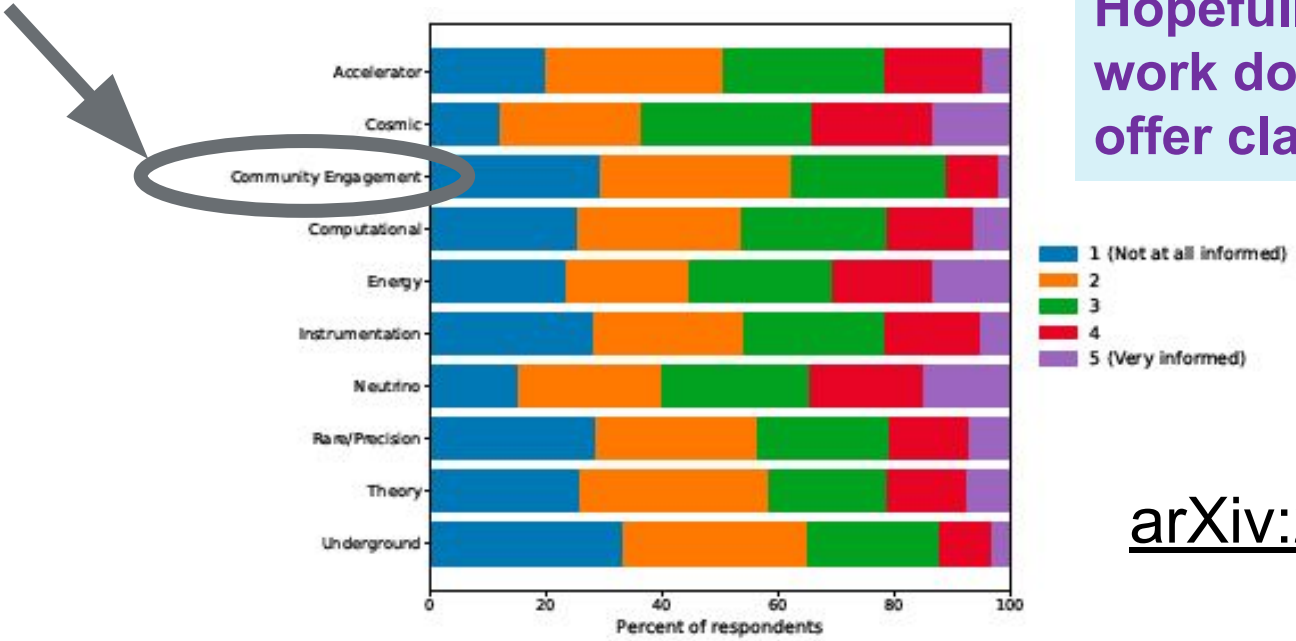
CEF07: Environmental & Societal Impacts

CEF06: Public Policy & Government Engagement

CEF05: Public Education & Outreach

CEF04: Physics Education

How informed folks felt about future direction in Community Engagement



Hopefully, the body of work done in CEF will offer clarity & direction

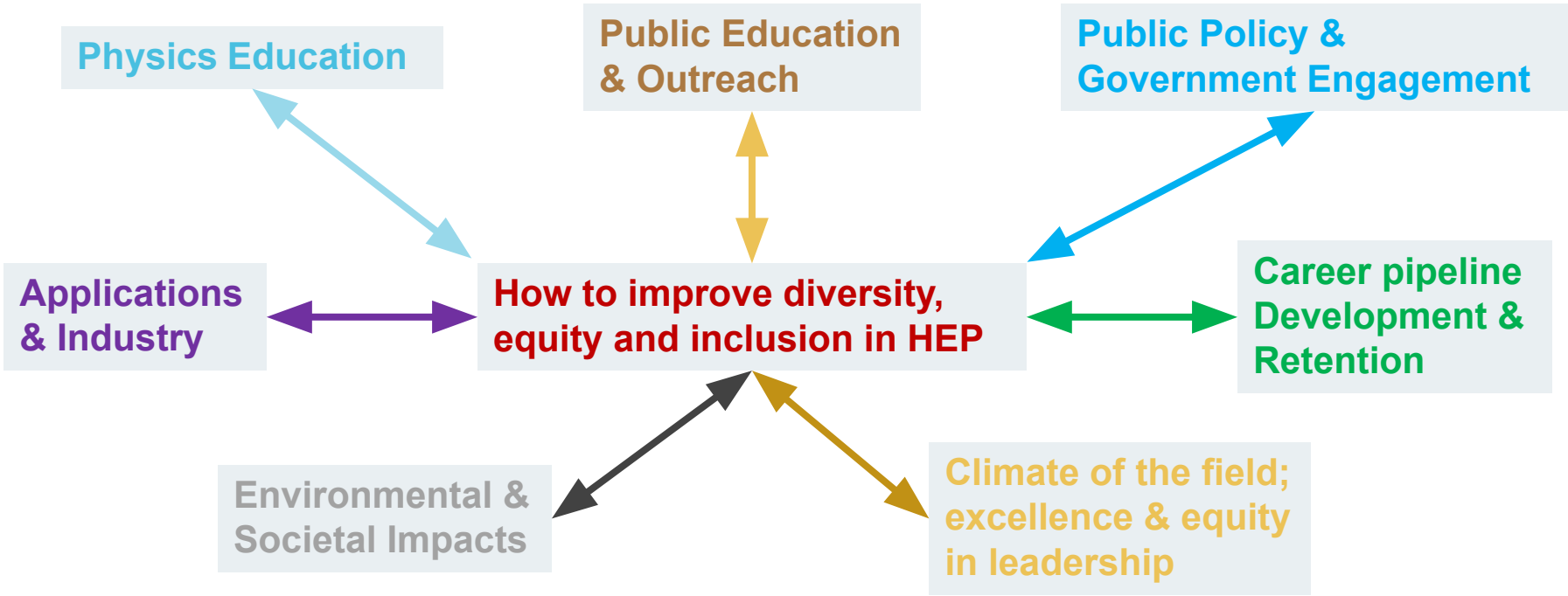
arXiv:2203.07328

CEF: Body of work in the last ~2.5 years

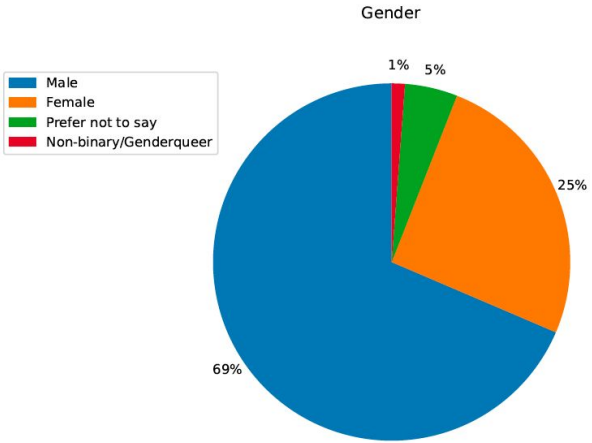
- **Scope**
  - All aspects of HEP engagement
- **Materials**
  - Over 100 LOIs, surveys, town hall meetings, panel discussions, invited experts, workshops, group meetings
  - 35 contributed papers
  - 7 topical group reports
  - One frontier report
- **Suggestions & recommendations for**
  - Funding agencies
  - Education & research institutions
  - Professional societies
  - Research collaborations
  - Individuals

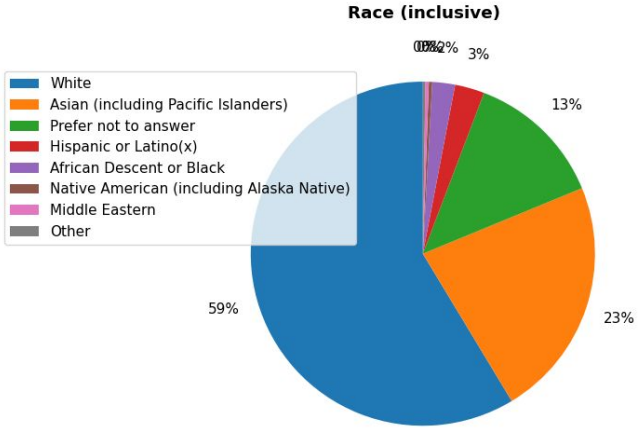
We cannot cover all the work in this session. We will discuss one cross-cutting topic. The scope of the CEF body of work is much broader than shown here today.

CEF: Focus this session on a cross-cutting topic



CSS participants

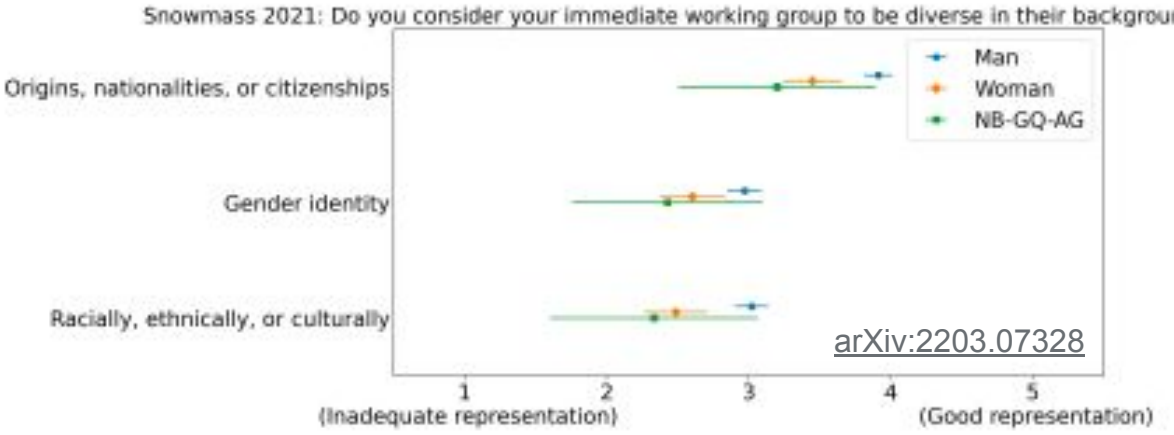




"Achieving gender equality is about disrupting the status quo, not just negotiating it"
Phumzile Mlambo-Ngcuka

Efforts are being made, although there is still a significant lack of diversity in our field, e.g. in 2019, 88 DOE Nuclear Physics-supported students received their Ph.D.'s. Only 5% were Black or Hispanic, nearly a factor of 7 below representation in the US population

Some folks need more convincing?



"[DEI] is a reality that should be deeply felt and held and valued by all of us." Ava Marie DuVernay

There is far more under-representation than could be expected from meritocracy

arXiv:2203.11523v2, arXiv:2203.11513v2, arXiv:2203.11518v2, arXiv:2203.11508v2 arXiv:2203.10393v1.

The Diversity–Innovation Paradox in Science

But what is DEI, really?

- It is not a box to check; It is not reverse discrimination
- It is an effort to ensure full participation; to improve the climate of the field
- Equitable sharing of education and research resources
- Moving away from rewarding privilege
- Moving towards cultivating potential and increasing mobility for all
- Building partnerships and enabling systemic approaches to increasing educational access and success for all

We don't want strategies that "offer a narrow, at-the-margins response to exclusion, which deflects attention from more central problems with the current system and invites zero-sum reactions to [DEI] efforts"

From Diversity to Mobility and Full Participation

How do we improve diversity, equity and inclusion in HEP?

In the following slides, we will go through a subset of CEF recommendations mostly related to this topic. Then, we will discuss:

- The issue of low community participation in CEF
- The implementation of CEF recommendations

CEF03: Diversity, Equity, & Inclusion

Recommendation: HEP communities must implement new modes of community organizing and decision-making that promote agency and leadership from all stakeholders within the scientific community.

- Responsibility of the Community
  - Education and exposure to build allyship
  - Evolve from passive support -> self-sustaining action
- Ensure Enfranchisement of DEI Bodies in Decision-Making Processes
  - Agency is crucial for successful DEI efforts
  - Formalize powers of DEI bodies (speakers, voters, approvals, etc.)
- Evolving Leadership Prioritizations and Perspectives
  - DEI == Excellence: practice what we preach, especially in leadership roles
  - Top-Down vs Bottom-Up: use the position at-hand to make local change

CEF03: Diversity, Equity, & Inclusion

TG Report

Link to Overleaf

Contributed Papers

- "Lifestyle and personal wellness…" arXiv:2203.08631
- "Accessibility in High Energy Physics…" arXiv:2203.08748
- "Strategies in [DEI] to Enhance the US Workforce…" arXiv:2203.08919
- "…[HEP] in Africa and Latin America" arXiv:2203.10060
- "In Search of Excellence and Equity in Physics" arXiv:2203.10393
- "How to Read the Snowmass White Papers on Power Dynamics, Informal Socialization in Physics Training, and Policing and Gatekeeping in STEM" arXiv:2203.11523 arXiv:2203.11513 arXiv:2203.11518 arXiv:2203.11508
- "Climate of the Field: Snowmass 2021" arXiv:2204.03713
- "…Marginalized Members in…Particle Physics…" arXiv:2206.01849

CEF04: Physics Education

Recommendation: We require a *robust education program in physics, mathematics and the sciences* for a compelling program of scientific discovery and must *provide students* across the demographic spectrum *ample basis of opportunity to enter particle physics* and ancillary fields to engage in and benefit from the science

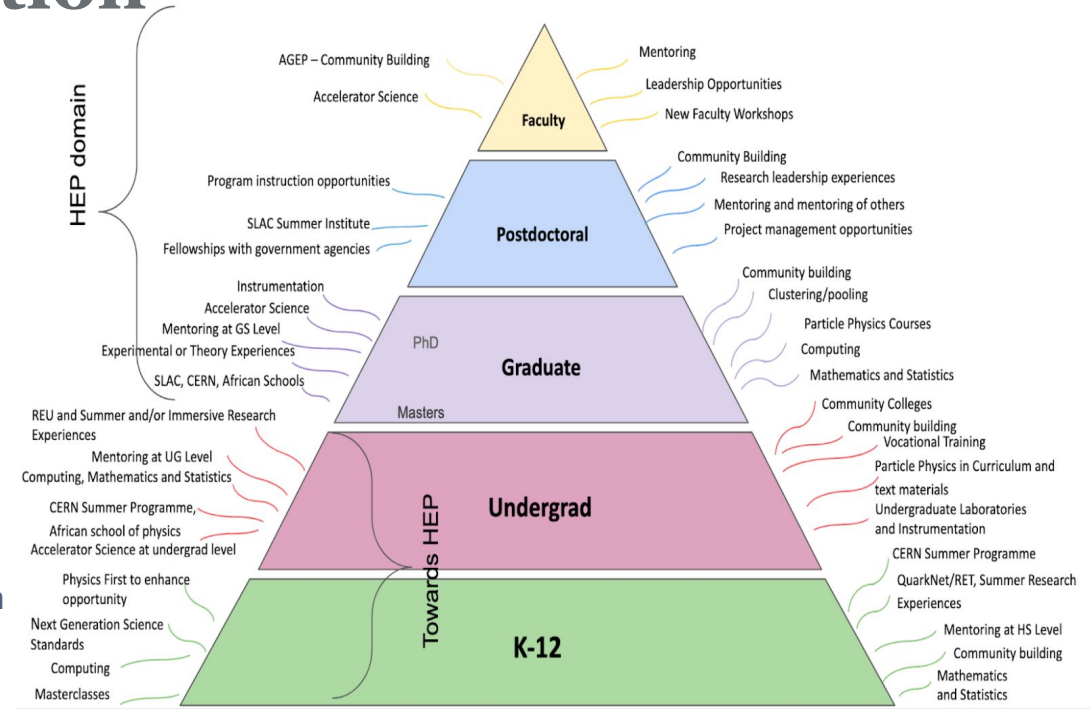
- Joint activities of academia and K–12 to *catch students with Physics interest early-on*
- Universities must *provide undergraduates* with more *complete picture of particle physics* trained researchers, realistic view of *common career paths* post baccalaureate and post graduate school including theory and experimental positions as well as non-academic careers
- R1 and non-R1 universities setup up *Masters Degree programs* in particle physics and related areas, such as hardware and software technology for Big Science experiments
- Graduate programs in particle physics should *normalize training for a broad range of STEM careers* (not self-teaching)
- Expand the benefits of *faculty collaboration and research opportunities across the broad spectrum* of academia and give equivalence: opportunities for all in technical and scientific leadership on projects and with appropriate recognition for contributions

CEF04: Physics Education

TG Report - Physics Education

Contributed Papers

- Particle Physics Outreach to K-12 and Opportunities in Undergrad Education – arXiv:2203.10953
- The Necessity of International Particle Physics Opportunities for American Education arXiv:2203.09336
- Broadening the scope of Education, Career and Open Science in HEP arXiv:2203.08809
- Transforming U.S. Particle Physics Education: A Snowmass 2021 Study arXiv:2204.08983



Evolution of HEP Education and Training

CEF05: Public Education & Outreach

Recommendation: Codify the importance of public engagement

- Laboratory contracts
- Faculty handbooks
- Professional society strategic plans
- Experimental collaboration constitutions
- Conferences and collaboration meetings
- Merit criteria for funding research
- Criteria for hiring, tenure, promotion, other reviews

CEF05: Public Education & Outreach

TG Report

https://www.overleaf.com/6722424812frjcgwkrqczk

Contributed Papers

- "The need for structural changes to create impactful public engagement in US particle physics" https://arxiv.org/pdf/2203.08916.pdf
- Public engagement section of "Building a Culture of Equitable Access and Success for Marginalized Members in Today's Particle Physics Community" https://arxiv.org/pdf/2206.01849.pdf

* Don't miss our panel "Communicating Science to Everyone" on Sunday, July 24, at 3:30 p.m. Pacific

CEF02: Career Pipeline & Development

Recommendation: the community should encourage a *global shift in perception:*
to expand access to industry-focused training
to engage a broader section of the student population

70%
leave HEP

Mentor
Evaluate trainee's strengths and mentor them toward relevant jobs

Train
Labs & experiments increase industry-focused training opportunities

Connect
Leverage HEP alumni to **destigmatize career transitions to industry**

Students
Without HEP research access

Change
Practices that block effective participation by PUIs and CCs

Boost
Paid training programs targeted at students without local HEP

Advocate
for **funding & pathways to participation** in collaborations

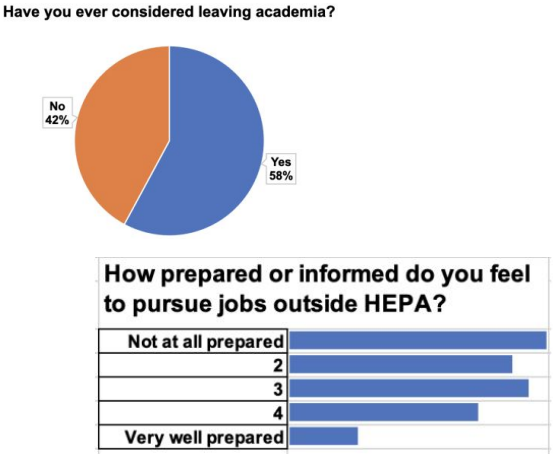
CEF02: Career Pipeline & Development

TG Report

Career Pipeline & Development Report

Contributed Papers

- Facilitating Non-HEP Career Transitions arXiv:2203.11665
- Enhancing HEP research in PUIs and CCs arXiv:2203.11662



Rethinking:

"Dropping out"
"leaving the field"
"teaching college"
"Undergraduate research"
And more...

Early Career Panel

Friday 7/22, 12:30 pm
Kane 220

6 HEP alumni panelists!

CEF01: Applications & Industry

Recommendation: Establish **multi-agency** programs that **consciously** create partnerships between National Labs, Academia and Industry

- Tools and techniques developed for HEP research in addition to accelerating scientific discovery will also benefit industry applications. Establish centers, consortiums etc. to create a mutually beneficial ecosystem in emerging technology areas – Quantum, AI/ML, Microelectronics.
- Academia, National Labs and Industry form a spectrum from foundational research, advanced instrumentation to mature production. Create roadmaps to accelerate technology readiness
- Establish programs that enable deep tech commercialization with appropriate incentives, funding and time scales (~5 years; $$$ funding). Consolidate and/ or establish entrepreneurial programs for employees across the National lab system
- Establish application driven engagement programs which have synergies with other funding agencies. Cross cutting programs enable translational technology research.
- Employ an all of DOE approach instead of lab silos for procurement of common industry tools and services

CEF01: Applications & Industry

TG Report

https://snowmass21.org/community/applications#cef01_topical_group_report

Contributed Papers

- Programs enabling deep tech transfer from National Labs
- Engaging and technology transfer with Scaleups
- Application-driven engagement with universities, synergies with other funding agencies
- Big Industry engagement to benefit HEP: Microelectronics Support from large CAD companies
- Transformative Technology for FLASH Radiation Therapy
- Nurturing the Industrial Accelerator Technology Base in the US

CEF06: Public Policy & Government Engagement

- Existing community advocacy activities are focused on communicating HEP research activities and status of executing P5 plan to policy makers
  - Attendees of the "DC trip" discuss other topics (technology transfer, STEM, …) to help contextualize the impacts of HEP research on society
- These activities are coordinated by a small number of community members
  - Fermilab Users Executive Committee, SLAC Users Organization, US-LHC Users Association, with input from APS DPF
- There is no mechanism to establish community consensus on legislative topics beyond funding
  - And some voices are not included in the funding discussion

PARTICLE PHYSICISTS

Value Diversity and Strive Toward Equity

Particle physicists understand the importance of having a diverse research community and fostering a sense of belonging among its current and future members. We are actively working to improve the climate for groups historically underrepresented in physics. These long needed changes to address systemic inequities are taking place throughout the community and wherever physicists work, including laboratory and university settings.

DARGENT Program, Fermilab

SAGE-S Summer Camp, SLAC

Community strategy to enable a diverse future

"What drives significant intellectual progress and breakthroughs is having a diverse pool of talents who bring in distinctive skills and perspectives. Through the Snowmass decadal planning process, the U.S. Particle Physics community is strategizing ways to ensure **equal access to education and career opportunities** for historically marginalized communities."

—Mu-Chun Chen (she/her/hers) University of California, Irvine

Recommendation: An HEP government engagement group should be formed to take ownership of strengthening connections to research societies (APS, AIP, AAAS, …) to facilitate advocacy for DEI, immigration, R&D, basic science reform, and other areas that impact HEP

CEF06: Public Policy & Government Engagement

TG Report

To read the report and provide feedback see our wiki - https://snowmass21.org/community/policy

Contributed Papers

- Non-Congressional Government Engagement https://arxiv.org/pdf/2207.00125.pdf
- Advocacy for Areas Beyond HEP Funding https://arxiv.org/pdf/2207.00124.pdf
- Congressional Advocacy for HEP Funding https://arxiv.org/pdf/2207.00122.pdf

www.usparticlephysics.org/

- The HEP users groups and DPF should provide the resources for continued growth and sustainability of the annual HEP Congressional advocacy effort.
- The users groups, DPF, laboratories and universities should work to expand advocacy to the federal executive branch and state and local governments.
- The HEP community should establish a group to work with other science and physics societies on advocacy for non-HEP funding issues.

CEF07: Environmental & Societal Impacts

Climate change is a DEI issue

- Particle physicists are likely to have an outsize impact on global climate change due to their carbon-emitting activities.
  - Facility construction, experiment operation, large-scale computing, travel….

- Climate change is leading to increases in conflict, population displacement, food insecurity, and will push millions of people below the poverty line.
- In developing countries, women are more vulnerable than men to the effects of climate change.
- Black/African American and Hispanic/Latino populations in the US will bear the brunt of climate change effects due to the areas they live in and industries they work in.

- Our recommendations around climate change will help ameliorate these differential impacts.

CEF07: Environmental & Societal Impacts

Labs should promote a diversity of membership and in their outreach initiatives to bring a variety of perspectives to the table.

- Fermilab regularly refreshes its Community Advisory Board membership to reflect the local community.
- LBNL partners with nonprofits to increase the participation of underrepresented groups in STEM.
- SURF works with tribal elders and local community leaders to include indigenous perspectives.
- SURF made specific commitments to regional Native American Tribes to respect and protect the heritage of the Black Hills.

CEF07: Environmental & Societal Impacts

TG Report

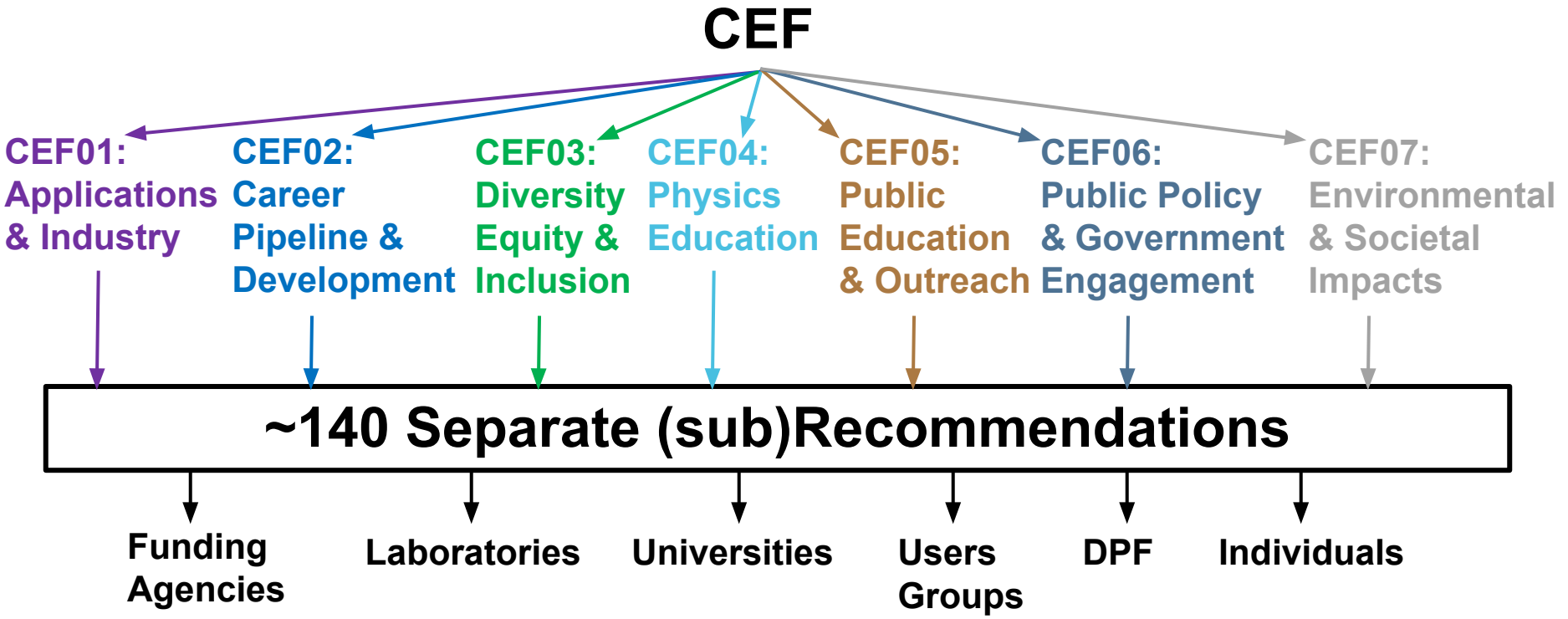
Link to Overleaf

Contributed Papers

- Climate impacts of particle physics
  https://arxiv.org/abs/2203.12389
- Local impacts of particle physics projects
  https://arxiv.org/abs/2203.07995

CEF Participation & Implementation

Another View of CEF



Snowmass Participation in CEF

Overall, there was very low participation by the HEP Community in CEF

- Vast majority of CEF work over last 2 years carried out by the small group of Topical Group Conveners, plus a handful of dedicated community members *almost all of whom were EC members*
  - e.g. most (but not all) CEF Contributed Papers were almost completely produced by the TG Conveners themselves (incl. organization, research, and writing)
- Despite our best efforts, we could not attract many people to get involved. Less a cross-cutting frontier as intended, but more an isolated set of activities by a small group of people.
  - Almost all of whom are also physicists interested in participating in other physics Frontiers
    - Largely prevented from doing so by burden placed on them by low CEF participation
    - Sacrificed opportunity to advance career research plans in order to do CEF work for health of the field on your behalf

Snowmass Participation in CEF

Overall, there was very low participation by the HEP Community in CEF

- Various reasons for low participation, some quite understandable
  - Lack of time
  - Career progression depends almost exclusively on research production, not at all on CEF
  - At least some level of "Someone else should do that because *I* have *important* research to do"
  - Note almost all of the non-convener contributors were EC

Snowmass Participation in CEF

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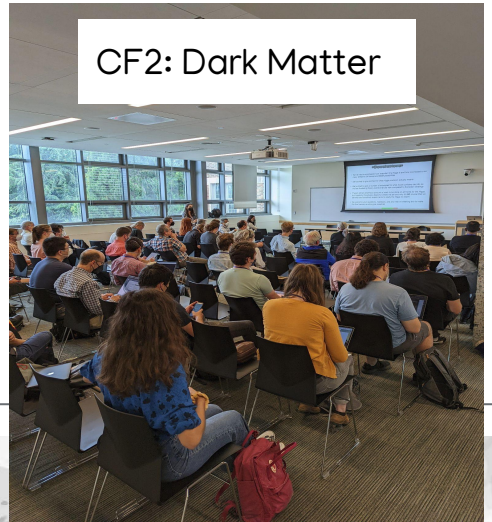
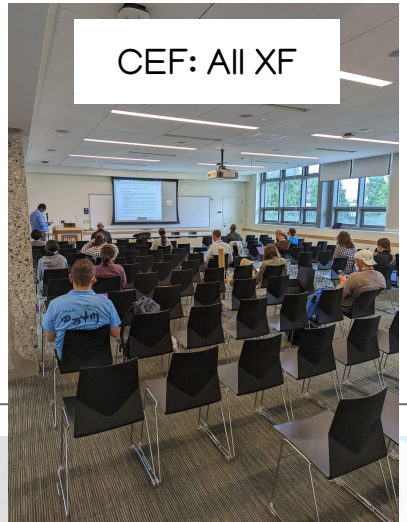




Snowmass Participation in CEF

How do we address the real concerns leading to low CEF participation?

- Convince people the work is important.
  - Few would openly disagree that any of the CEF work is unimportant.
  - Hopefully today's story and linked information will strengthen these convictions.
  - But as Steve indicated yesterday, individuals deciding to act respectfully, or taking the time to sign a letter to Congress alone won't cut it.
- Structural changes
  - **Establish rewards** (not just *awards*) for CEF work, e.g. make it part of hiring, grant decisions. i.e. consequences for doing nothing (don't have to do *everything*, but have to do *something*)
  - **Perhaps this is the first and last time CEF should be part of Snowmass**
    - Time/career development concerns are heightened during high-stakes planning and decision-making of Snowmass process
    - Snowmass presents the greatest barriers to large-scale CEF participation, forcing hard choices of which responsibilities to meet. CEF will almost *always* lose out to research interests in this high-stakes environment.

Snowmass Participation in CEF

For HEP to be healthy and grow

- The community must decide that ***<u>everyone's</u>*** participation in CEF is ***<u>required</u>***.
  - *Individually* through *personal action*
  - *Corporately* through *structural change*

CEF Implementation & Monitoring Progress

Somebody has to take responsibility

- Everyone agreeing CEF is important and committing to it is *necessary* but *not sufficient*
  - An Implementation plan must be developed
- Past Snowmass experience
  - 2014 P5 was charged with the responsibility of prioritizing the selection and implementation of a program of projects, based in large part on Snowmass recommendations
    - Worked exceedingly well over last 8 years for a consensus plan of physics projects
    - Mandate and membership not as well-suited to other areas of HEP such as CEF
      - e.g. Snowmass 2013 Communication, Education & Outreach Frontier
        - As a whole, neither P5 nor any other HEP organization took ownership of these issues
        - Despite the great efforts of some individuals and institutions, little overall progress on these recommendations since last Snowmass

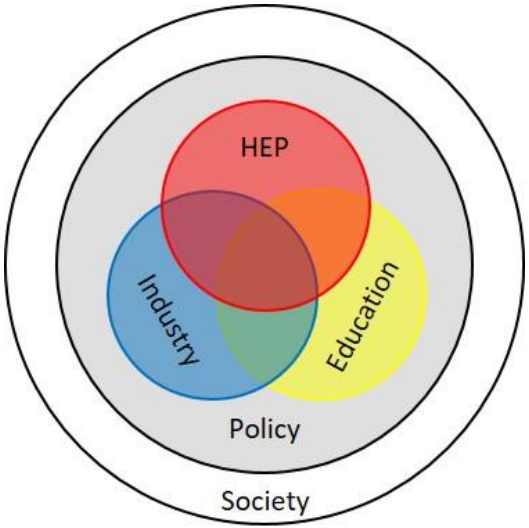
CEF Implementation & Monitoring Progress

Snowmass 2021 must be accompanied by US HEP establishing a structure for designating entities to take ownership of and responsibility for ensuring CEF recommendations are implemented and monitored for progress

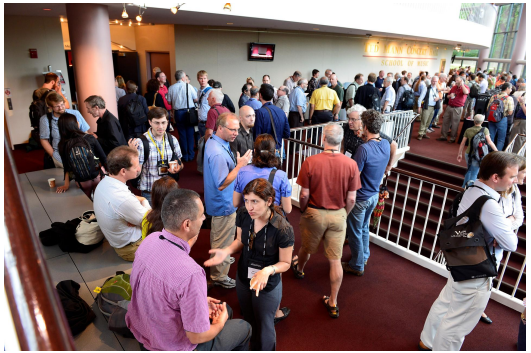
- One option: Expand P5 charge and membership to encompass CEF
  - P5 has been designed to prioritize (experimental) projects
  - May not be ideally situated in HEP ecosystem to handle CEF initiatives

CEF Implementation & Monitoring Progress

- Another option: Distribute responsibility informed by organization of CEF TG Recommendations into Overall Goals for 5 specific Target Communities for Engagement



- HEP Internal Engagement
  - Since DPF is most representative of the entire field, they may be best positioned to shepherd recs for HEP



HEP Internal Engagement

- The HEP community should institute a broad array of practices and programs to encourage stronger participation in HEP collaborations by faculty and students from non-R1 academic institutions. (CEF02 4.1-4.3,5.1-5.3,6.1-6.4; CEF04 6)
- HEP communities should employ the use of robust strategic planning procedures, including a full re-envisioning of science workplace norms and culture to prioritize and addresses community-related issues. (CEF03 F1,C1)
- HEP communities should implement new modes of community organizing and decision-making that promote agency and leadership from all stakeholders within the scientific community. (CEF03 F2,C2)

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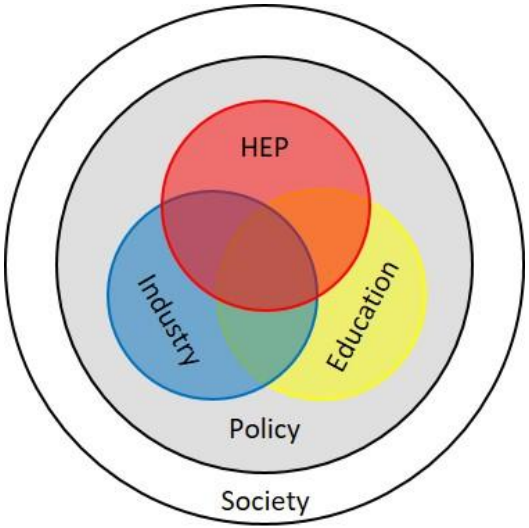
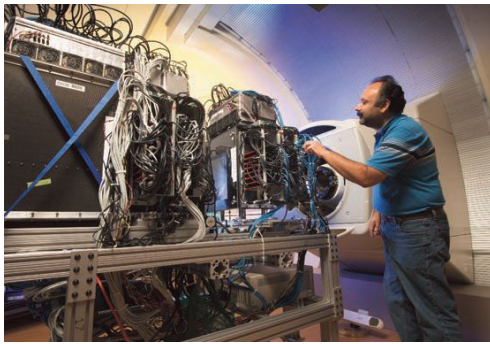


- Industry Engagement
  - Perhaps a partnership between the funding agencies, laboratories, and universities is needed to manage engagements with industry since that is where most of the direct relationships with industry are formed.



Industry

- Funding agencies and the national laboratories should implement policies and programs to foster technology transfer. (CEF01 1,2; CEF02 3.2)
- Laboratories and universities should pursue targeted partnerships with early stage scaleup companies on HEP projects. (CEF01 3,4)

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CEF Implementation & Monitoring Progress

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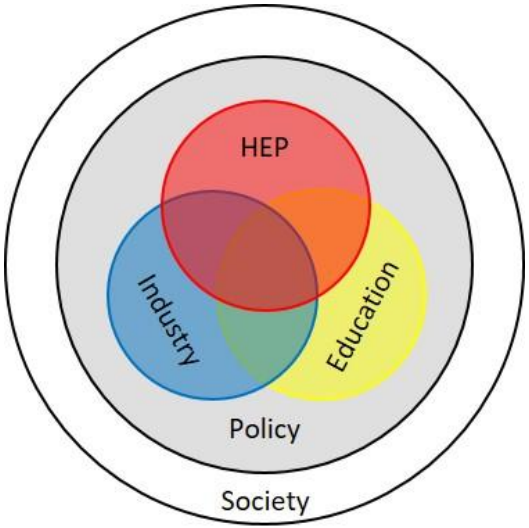

- Education Engagement
  - URA's membership of university administrations and role in connecting academia with labs could make it best suited to sponsor a team to work towards implementation of education initiatives.

Education

- Funding agencies, national laboratories and universities should work to provide more education and career opportunities for engineering and industry-focused research within HEP. (CEF01 5,6; CEF02 1.1-1.4,3.1,3.3; CEF04 7)
- HEP academia should work with K-12 teachers and students to create supportive local communities to nurture student interest in math and science. (CEF04 1)

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CEF Implementation & Monitoring Progress

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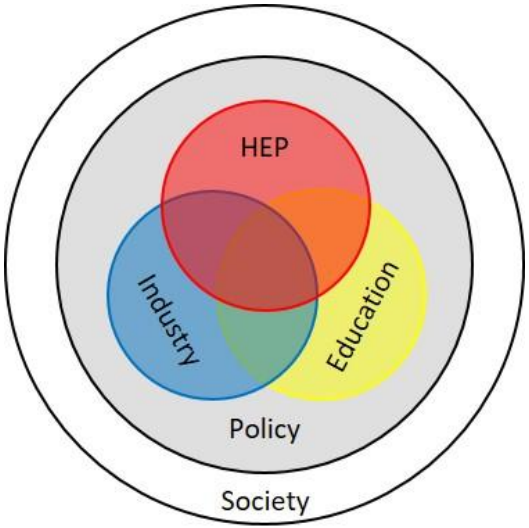

- Policy Engagement
  - Elected representative user groups that have led HEP funding advocacy efforts for decades should form the core of any new entity formed to expand policy efforts.

Policy

- The HEP users groups and DPF should provide the resources for continued growth and sustainability of the annual HEP Congressional advocacy effort. (CEF06 2-2.2,2.4-2.6,3)
- The users groups, DPF, laboratories and universities should work to expand advocacy to the federal executive branch and state and local governments. (CEF06 6,7)
- HEP should establish a group to work with other science and physics societies on advocacy for non-HEP funding issues. (CEF06 4)

CEF Implementation & Monitoring Progress

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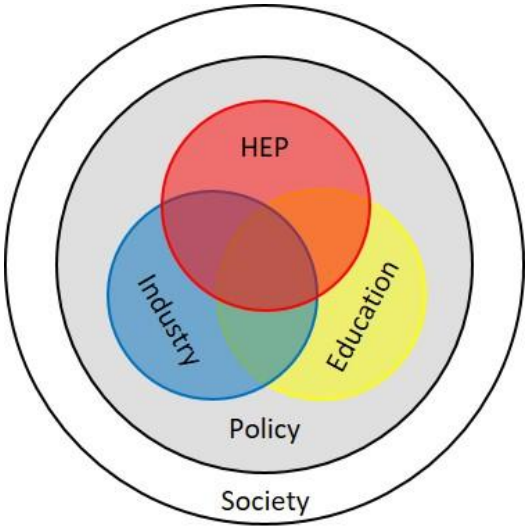


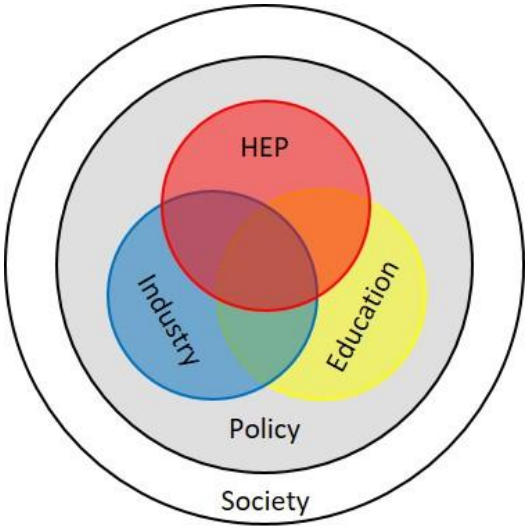
- **Broader Society Engagement**
  - As focal points for HEP public engagement, the labs themselves may be the ideal choice to manage the recommended programs directed at the broader society.

Society

- HEP should build lasting relationships with the full breadth of all of our supporting communities that are based on real two-way partnerships rather than transactional interactions. (CEF05 3; CEF07 7,9-13)
- HEP should build synergistic collaborations with the non-proliferation community that draw on a broader spectrum of funding sources for work on technologies related to nuclear non-proliferation. (CEF07 14-16)

CEF's Big Picture Goal for Snowmass 2021

- Our goal and hope is that by the end of Snowmass 2021, all of you will be convinced of and committed to the following propositions:



1. We all agree on the importance of everyone in HEP working together on CEF issues.
2. A structure for implementing and monitoring the progress of CEF recommendations must be developed.

- If we can make these statements a reality, then US HEP will be much stronger and healthier by the time we gather for the next Snowmass!