

Snowmass2021 - Letter of Interest

Creating inclusive collaborations

Thematic Areas: (check all that apply /■)

- (CF1) Dark Matter: Particle Like
- (CF2) Dark Matter: Wavelike
- (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: Complementarity of Probes and New Facilities
- (CF7) Cosmic Probes of Fundamental Physics
- (Other) Community Engagement Frontier/CommF3: Diversity & Inclusion

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Abstract: In recent decades, the field of experimental particle physics has seen increasingly large collaborations forming due to the challenges of designing, constructing, and operating ever larger experiments. Larger collaborations should lead to more diverse collaborations, but equitable inclusion of scientists from diverse backgrounds is something with which our field has often struggled. It is thus crucial to create a welcoming and supportive culture within the science community — and within each collaboration — such that its members feel safe to share their ideas, as well as efficiently and productively contribute to the success of the experiment. To this end, the LUX-ZEPLIN (LZ) collaboration formally instituted an Equity and Inclusion (E&I) committee in 2018, composed of a subset of professors, post-docs, and graduate students, to ensure a safe work space for all collaboration members. In this letter, we make use of lessons learned from our experience with a dedicated E&I committee to share efforts extendable to other currently large collaborations, and also to future collaborations as the direct detection dark matter community is currently planning for bigger Generation-3 (G3) experiments which will combine G2 collaborations, increasing the importance of an inclusive and equitable community. Through the Snowmass process, we seek collaboration and ask for input from other groups in the physics community on how we can all continue to create a more welcoming and supportive culture.

The field of physics has largely failed to provide equitable opportunity to all who have the desire to perform physics research. This is evident in a number of ways, perhaps most clearly in the extreme underrepresentation of gender and racial identity, and sexual orientation in the physics community [1] [2]. This problem also exists in society at large, but as physicists, we have a particular ability and obligation to address inequities in our field as much as possible. This is not to say that efforts to address these problems are completely lacking. In fact, recent efforts to improve the gender balance of undergraduate physics education have shown some promise [3], but these benefits do not extend to all marginalized groups. We must remember that problems of inequity in our field will not solve themselves, and that we will have to confront them head-on, every day, likely well into the future. As the direct detection dark matter community is currently planning for larger Generation-3 (G3) experiments, endeavoring to resolve this inequity issue becomes crucial as it will be capital to the scientific success of these G3 experiments. It is imperative that all of physics and, for the purposes of this LOI, physics collaborations, incorporate best practices to make their collaborations spaces where all members feel safe to share their ideas, and are able to efficiently and productively contribute to the success of their experiments.

The LZ collaboration is a large international collaboration of approximately 392 scientists across 32 universities and 9 National Laboratories from the United States, the United Kingdom, Portugal, and South Korea [4]. In 2018, the LZ collaboration joined a growing number of other science collaborations and formally instituted an Equity and Inclusion (E&I) Committee, composed of professors, postdocs, and graduate students, to proactively discuss and act upon ways to support a more equitable collaboration. While the committee is not expert on these topics, several programs have been implemented that align with advice and best practices from experts in the field. Below are a few of the initiatives of this committee that could be applicable to other collaborations.

1. **COLLABORATION OMBUDSPERSONS:** Two collaboration-wide ombudspersons installed by the E&I committee provide a resource to any collaboration member needing guidance on conflict resolution or harassment. The ombudsperson system has benefited LZ in a number of ways. All collaboration members can, in confidence, report problems or seek guidance from designated senior collaboration members, with the goal of resolving issues early before they become even more serious. Having two ombudspersons gives collaboration members an option of whom to contact, provides for overlapping terms which enable a smooth hand-off, and also provides for both a US- and a Europe-based ombudsperson to account for differing legal standards and rules. The overlapping terms also help maintain institutional memory of past issues and how they were (or weren't) resolved. LZ is not the only collaboration with a system like this, and we believe an informal network of ombudspersons within the physics community would enable us all to learn from one another, identify common problems in the physics culture, and consider how to address unique challenges that arise in large international collaborations, especially those with significant field work.
2. **CODE OF CONDUCT:** The LZ E&I committee wrote a Code of Conduct, which was adopted by the full LZ collaboration, that details the expectations for all community members when communicating with collaborators or attending LZ events. Since the nature of our experiment requires collaboration members of many different career stages to work and live together at the experimental site at the Sanford Underground Research Facility (SURF) [5] in South Dakota, the E&I committee has also helped to establish house rules that ensure welcoming and equitable behavior in the collaboration-managed living spaces. Periodic check-ins with those on site using anonymous surveys also help to identify any issues before they become more problematic.
3. **EDUCATING OURSELVES AND OTHERS:** Self and group education on sources of and ways to address inequity is critical. LZ has an external speaker series during our bi-annual collaboration meetings, featuring speakers who are well trained in EDI topics, many of whom also engage in EDI-related

scientific research. Past talks have focused on effective diversity programs [6], understanding implicit bias [7], understanding and working with the Lakota community near SURF [8] effective outreach programs to underprivileged community members [9], and identifying and addressing current and historical inequity in undergraduate education by analyzing student educational achievement [10]. To support the Strike for Black Lives [11–13], members of the E&I committee facilitated a structured discussion on systemic racism, using the APS TEAM-UP report [3] as a guide.

4. **OUTREACH:** The LZ collaboration participates in the annual Neutrino Day community outreach program [14], which highlights research occurring at SURF. LZ is working towards participating in further outreach to students in the Davis-Bahcall Scholars program [15, 16] and to local Lakota students.
5. **COLLABORATION GOOD CITIZEN AWARDS:** The LZ ombudspersons instituted a bi-annual award called the LZ Good Citizen Award. This award recognizes individuals who go above and beyond their collaboration duties to make our community a more helpful and equitable place. This helps signal to collaboration members that these types of contributions to the community are valued.

The above items promote a more welcoming and supportive culture within the LZ collaboration, but more remains to be done. We would like to learn from other groups in the physics community, as well as share our experiences, and together, define a strategy that will work best for the future experiments. We believe that every science collaboration should be grappling with these issues. Future large-scale physics collaborations, including those associated with Generation-3 dark matter experiments, will be increasingly diverse. We as physicists have a moral imperative to create a welcoming and equitable environment in our community, so that all members may participate fully and thrive.

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- [1] Anne Marie Porter, Rachel Ivie, *Women in Physics and Astronomy*, 2019 American Institute of Physics, March 2019
 - [2] Rachel Ivie, Garrett Anderson, and Susan White, *African Americans & Hispanics among Physics & Astronomy Faculty*, American Institute of Physics, July 2014
 - [3] M. James, E. Bertschinger, *et al.*, *The AIP National Task Force to Elevate African American Representation in Undergraduate Physics & Astronomy, THE TIME IS NOW: Systemic Changes to Increase African Americans with Bachelor's Degrees in Physics and Astronomy*, American Institute of Physics, 2020
 - [4] B. J. Mount *et al.*, *LUX-ZEPLIN (LZ) Technical Design Report*, arXiv:1703.09144, 27 March 2017
 - [5] J. Heise, *The Sanford Underground Research Facility at Homestake*, AIP Conf. Proc. 1604 331-344 (2014), (Preprint arXiv:1401.0861)
 - [6] Frank Dobbin “What makes diversity programs work?” LZ Collaboration Meeting, July 19-21, 2018
 - [7] Kim Shauman “Implicit bias and its impact on diversity” LZ Collaboration Meeting, January 27-28, 2019
 - [8] Jace DeCory “Unci Maka tells her story” LZ Collaboration Meeting, July 15-17, 2019
 - [9] Jaelyn Bell, LZ Collaboration Meeting, January 6-8, 2020
 - [10] Timothy McKay “SEISMIC: Equity & Inclusion as Design Goals for STEM Education Reform” LZ Collaboration Meeting, July 13-16, 2020
 - [11] <https://www.particlesforjustice.org/>
 - [12] <https://www.shutdownstem.com/>
 - [13] <https://www.vanguardstem.com/>
 - [14] <https://www.sanfordlab.org/neutrinoday>
 - [15] <https://www.sanfordlab.org/feature/davis-bahcall-scholars>
 - [16] <https://doe.sd.gov/scholarships/DAVIS-BAHCALL.aspx>

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