PROCEEDINGS OF SCIENCE

Diversity & Inclusion Initiatives by the LHC Experiments

Steven Goldfarb[a,*]

[a] *School of Physics, University of Melbourne, Tin Alley, Parkville VIC 3052, Australia*

E-mail: steven.goldfarb@cern.ch

These proceedings report on the organisation and a sample of recent activities of the various Diversity and Inclusion offices in the four major Large Hadron Collider (LHC) experiments. We briefly describe CERN's historical role as an example of international diversity in science, then discuss how additional efforts by the experiments have positively affected the research, as well as establishing an important example to current and future generations. In addition to descriptions of initiatives by the LHC collaborations, we present some important progress by the CERN D&I Programme, including initiatives launched in cooperation with the LHC collaborations and/or with other dedicated CERN entities, such as Women in Technology, LGBTQ+@CERN, the Disability Network and the Supporting Neurodiversity at CERN Network. Each one of these initiatives moves the laboratory and its experiments one step closer toward creating an equitable environment allowing all parties a chance to contribute their own individual strengths toward advancing fundamental research and making an important and lasting impact on society today.

12th Large Hadron Collider Physics Conference (LHCP2024)
3-7 June 2024
Boston, USA

[*] Speaker

PoS(LHCP2024)140

1 Introduction

Diversity has always been an essential component of science [1]. The establishment of any measurement requires communication of the results to others for verification. The more diverse the verification methods, the better one can establish the universal aspects of the measurement. Furthermore, scientists coming from a variety of social, economic, cultural, national and linguistic backgrounds, and/or bearing different physical or mental capabilities, often approach problems in different manners and might propose different solutions, adding to the strength of the research.

While these considerations continue to drive the need for diversity in particle physics, today, it is the size, cost and complexity of our experiments that have pushed us to embrace international diversity on a larger scale than ever before. The Large Hadron Collider (LHC) collaborations require the participation of thousands of collaboration members from institutes located around the globe. As an example, the ATLAS Collaboration [2] comprises 251 institutes from 41 countries, and its roughly 5,900 members cover more than 100 nationalities.

The participants of the LHC experiments have quickly learned to embrace the value of this international diversity. The breadth, scope and strength of the physics results coming from the four major LHC collaborations has been outstanding, far exceeding expectations. This includes discovery of the Higgs boson [3] – an effort we were warned not to waste time pursuing [4] – as well as a plethora of Standard Model precision measurements, hadron discoveries, heavy-ion physics, and searches for new physics.

Yet, while an even more extensive physics programme approaches, notably with the upcoming High-Luminosity LHC Upgrade [5], the experiments continue to neglect the potential of a wide spectrum of contributing scientists. We also fail to give many of those who are trying to contribute a fair chance to do so to their full potential. By not embracing the full spectrum of our collaboration members, we risk not only to waste talent and to operate in a sub-optimal manner, but also to lose our positions as role models in a world that could truly benefit from the existence of successful EDI leadership.

Fortunately, over the past decade, particle physicists have learned more and more to recognise the need for improving EDI in our field. Major conferences, such as LHCP [6], ICHEP [7] and CHEP [8], are including talks, dedicated sessions and even plenary presentations on EDI in their agenda. The larger LHC collaborations now have appointed positions, contacts, coordinators and offices to help serve their members concerning EDI matters. These proceedings will give an overview of current efforts of the four major LHC collaborations, briefly describing their organisation and providing a glimpse of their current activities. We will also give a brief overview and touch on some recent activities of the CERN D&I Programme [9].

2 LHC Collaboration Programmes

2.1 LHC Point 8 – LHCb

2.1.1 The LHCb ECGD Office

D&I initiatives for the LHCb Collaboration [10] are overseen by their Early Career, Gender and Diversity (ECGD) Office [11]. The office is run by ECGD Officers serving two-year terms. These are scientists in more senior positions, who are meant to coordinate activities and to handle

any confidential matters that come to the office. There are also Early Career (EC) Representatives who are elected by the LHCb EC community to listen and report its needs to the collaboration leadership. The EC representatives meet periodically with those of other CERN collaborations and one of the representatives attends LHCb Collaboration Board meetings.

2.1.2 LHCb ECGD Activities

The ECGD holds periodic meetings among its members and reports to the collaboration during the plenary sessions of LHCb Collaboration weeks. Topics more recently discussed during LHCb Week have included mentoring, paternity/maternity leave, career options outside HEP, career paths inside HEP, sexual harassment, women in STEM, representation of "young" people in the collaboration, working from home during a pandemic, mailing lists, accessibility & support for colleagues with physical disabilities, geographical representation of responsibilities, work/life balance, mental health and the effects of climate change.

Participation of the LHCb ECGD office in CERN-wide activities has included contributions to the development of an LHC Soft Skills Workshop in January 2024 [12], a Mentoring@CERN programme held in April-May 2024 [13] designed to match mentors and mentees with an existing affiliation to CERN, irrespective of their age, career level or geographical location, and a series of LHC Job-Matching events, such as the one held in May 2024, designed to match EC job-seekers with potential employers on LHC experiments [14]. The LHCb ECGD office also actively supports the Laura Bassi initiative, a programme developed by physicists Anja Beck and Janina Nicolini "to bring together LHCb colleagues interested in tackling the underrepresentation of women in HEP, to promote discussion and ideas on related issues and to provide an informal network to colleagues."

2.2 LHC Point 5 – CMS

2.2.1 The CMS Diversity & Inclusion Office

D&I initiatives for the CMS Experiment [15] are overseen by their Diversity & Inclusion Office [16], which was founded in 2017 "to foster a working environment where all members of the Collaboration can thrive and bring in their talents, irrespective of age, career status, employment situation, institutional affiliation, geographical location, nationality, gender, ethnicity, family situation, sexual orientation, or disabilities."

The mandate of the CMS D&I Office is to advise management and individuals on diversity related matters; propose actions to promote diversity and create awareness; monitor and record statistical information related to diversity; actively listen to Collaboration members' concerns; report regularly to the Collaboration about status and progress of diversity-related issues; collaborate with relevant bodies outside CMS such as the CERN Diversity & Inclusion Programme. Current co-chairs of the office are Johan Bonilla and Anne-Marie Magnan. More information can be found on the office's public TWiki pages [17].

2.2.2 CMS D&I Office Activities

The CMS D&I Office collaborates with the CMS Outreach & Communication group to create content for both internal and public communication concerning relevant matters. This includes increasing awareness of events, such as LGBTQ+ in STEM Day and the International

Day of Women and Girls in Science. For the latter celebration, the office organised a video blog on the CMS public web site, the Cylindrical Onion, with input from women in the collaboration.

The D&I Office has also developed a Diversity & Inclusion Handbook in the style of an online flip-book and, for those with colour vision deficiency, a recommended Colour Palette to be used for histograms published by the collaboration. In addition, the CMS D&I Office compiles and presents statistics on the age and gender composition of the collaboration, in order to monitor progress of the inclusion of women.

2.3 LHC Point 2 – ALICE

2.3.1 The ALICE Diversity Office

D&I initiatives for the ALICE Experiment [20] are overseen by their Diversity Office [21], which has three coordinators, one of whom is a representative member of ALICE Juniors [22], early career scientists in the collaboration. The mandate and scope of the D&I Office is to advise collaboration members and management about diversity matters, promote diversity initiatives and maintain diversity web pages, monitor diversity issues, collect and analyse relevant collaboration data, report periodically to the collaboration, and liaise with diversity offices at CERN and in other LHC experiments.

ALICE Juniors have three Collaboration Board (CB) representatives. Each serves a two-year term, which includes the right to vote. They act as liaisons to the Junior community, reporting on key decisions made by the CB and addressing issues relevant to the Juniors. One of the Junior representatives is required to be a student, assuring a voice for the students.

2.3.2 ALICE Diversity Office Activities

In addition to fulfilling the mandate described above, the ALICE Diversity Office organised Inclusive Workspaces Workshops [23] for their leadership, with the goal of enhancing self-awareness, developing strategies to overcome personal biases, learning how to foster a more comfortable environment for idea sharing, developing skills to handle instances of harassment and inappropriate behaviour, and promoting the comprehension of relationships and effective cross-cultural communication.

More recently, the Diversity Office began to promote well-being initiatives. This came on the heels of a 2023 CERN-wide survey led by ALICE Juniors seeking to understand the main stress triggers of personnel at the lab. The survey found that work/study was by far considered the most important trigger by 78% of those surveyed, when compared to environment (27%), relationships (36%), change (21%) and life events (38%). The initiatives seek to address solutions to relieve these factors.

2.4 LHC Point 1 – ATLAS

2.4.1 The ATLAS Diversity & Inclusion Contacts

D&I initiatives for the ATLAS Experient are overseen by the D&I Contacts [24]. There are four D&I Contacts, two of which are selected each year by the Collaboration Board (CB) Chair and endorsed by the CB to serve two-year terms. The terms thus “leap frog” each other ensuring a continuity of knowledge and expertise. The mandate of the D&I contacts, first proposed in 2016, is to act as contacts to the collaboration on D&I matters, handle comments, complaints and

requests discretely and confidentially, maintain contact with other similar groups at CERN and in HEP, maintain a list of D&I resources for the collaboration, evaluate and propose training, keeping up on the latest literature, periodically update information on the collaboration composition, and report to the CB chair, management and the collaboration.

As of the writing of these proceedings, the mandate of the D&I Contacts has been broadened by the ATLAS CB to include the development and oversight of an Equity, Diversity and Inclusion (EDI) office. Upon completion of the current Contacts' terms, they will be replaced by two Coordinators, who will adopt the new mandate and create the new office. Such an office will allow for more pro-active efforts by the team to implement EDI programmes serving the collaboration. It will also allow collaboration members an opportunity to receive official recognition for their contributions. The first EDI Coordinator will be elected early in 2025.

2.4.2 ATLAS D&I Contact Activities

Activities of the current D&I Contacts primarily fulfil the mandate described above, meeting with representatives of the other experiments, often through the CERN D&I Roundtable, acting as contacts to the collaboration and responding discretely to individual and group concerns. Periodic presentations to the collaboration have come in the form of plenary talks and lunch meetings during thrice-annual collaboration weeks. Most recently the Contacts partnered with the CERN D&I Programme to host an interactive play performed by the Specta(c)tor theatre forum group called "Coffee Machine: Who Rinses the Cups" [26], for ATLAS members attending a collaboration meeting, but open to anyone at CERN.

One of the primary activities of the ATLAS D&I Contacts over the years has been the compilation, analysis and publication of collaboration demographics statistics. These are typically presented at major conferences and provide a meaningful way to track progress of the inclusion of women in ATLAS, as a function of authorship, age, geography, responsibility, and leadership roles in the collaboration. The results are then published as proceedings or notes [27].

3 CERN D&I Programme

3.1 Overview

CERN established a D&I Programme in 2012 with the objective of embedding D&I principles in our processes, to raise awareness, and to provide accommodation and support across diverse communities. The Programme Leader hosts the D&I Roundtable, a periodic meeting attended by representatives of the LHC and other experiments, the Diversity and Inclusion Officers, Women in Technology (WIT) [28], LGBTQ+@CERN, CERN Disability Network [30], Supporting Neurodiversity at CERN (SNAC) [31] and the Staff Association.

3.2 Recent Initiatives

In 2021, the D&I Programme launched CERN's flagship diversity initiative with an aspirational target of "25 by '25", to increase gender and nationality diversity, especially within STEM. The Programme's many policy initiatives, actions and diversity networks oversight have resulted in D&I progress across a myriad of diversity dimensions, most recently in securing the Organization's support to raise the Pride Flag on the occasion of LGBTQ+ in STEM.

4 References

[1] D. Medin and C. Lee, *Diversity Makes Better Science, Association for Psychological Science,* Apr 2012 [https://www.psychologicalscience.org/observer/diversity-makes-better-science].

[2] ATLAS Collaboration at CERN [https://atlas.cern].

[3] Discovery of the Higgs boson at CERN [https://home.cern/science/physics/higgs-boson/how].

[4] J. Ellis, M. Gaillard, D.V. Nanopoulos, *A phenomenological profile of the Higgs boson*, Nuclear Physics B, Volume 106, 1976, Pages 292-340 [https://doi.org/10.1016/0550-3213(76)90382-5].

[5] High-Luminosity LHC [https://home.cern/science/accelerators/high-luminosity-lhc].

[6] 12th Edition of Large Hadron Collider Physics Conference [https://indico.cern.ch/event/1253590].

[7] 42nd International Conference on High Energy Physics [https://ichep2024.org].

[8] 27th Conference on Computing for High Energy Physics [https://indico.cern.ch/event/1338689].

[9] CERN Diversity & Inclusion Programme [https://diversity-and-inclusion.web.cern.ch].

[10] LHCb Experiment at CERN [https://lhcb.web.cern.ch].

[11] LHCb Early Career, Gender and Diversity Office [https://lhcb.web.cern.ch/ECGD_Office/ECGD-intro.html].

[12] LHC Soft Skills Workshop: On Networking, Proactivity and Enlarging our Circles of Influence [https://indico.cern.ch/event/1339889].

[13] Mentoring@CERN 2024 Programme [https://indico.cern.ch/event/1403179].

[14] LHC Job-Matching Event, May 2024 [https://indico.cern.ch/event/1391268].

[15] CMS Experiment at CERN [https://cms.cern].

[16] CMS Diversity & Inclusion Office [https://diversity-and-inclusion.web.cern.ch/networks/cms-diversity-office].

[17] CMS D&I Office Twiki [https://twiki.cern.ch/twiki/bin/view/CMSPublic/CMSDiversityOffice].

[18] CMS Women for Science blog [https://cylindricalonion.web.cern.ch/blogs/cms-women-science].

[19] CMS Exploring Diversity & Inclusion flip-book [https://heyzine.com/flip-book/00f6546b1c.html].

[20] ALICE Experiment at CERN [https://alice.cern].

[21] ALICE Diversity Office [https://alice-collaboration.web.cern.ch/DiversityOffice].

[22] ALICE Juniors [https://alice-collaboration.web.cern.ch/organization/juniors/index.html].

[23] S. Räsänen, *Training on inclusivity and cultural diversity in the ALICE Collaboration*, arXiv:2410.23740v1 [physics.soc-ph], Oct 2024 [https://arxiv.org/html/2410.23740v1].

[24] ATLAS Diversity & Inclusion [https://atlas.cern/diversity].

[25] CERN D&I Roundtable [https://diversity-and-inclusion.web.cern.ch/about/who-we-are/di-roundtable].

[26] Theatre Forum “Coffee Machine: Who rinses the cups?” by Specta(c)tor [https://www.specta-c-tor.ch/en/coffee-machine].

[27] ATLAS Collaboration, *Studies related to gender and geographic diversity in the ATLAS Collaboration*, ATL-OREACH-PUB-2023-001, 2023 [https://cds.cern.ch/record/2880107].

[28] Women in Technology [https://wit-hub.web.cern.ch].

[29] LGBTQ+@CERN Network [https://lgbtqcern.com].

[30] Disability Network [https://diversity-and-inclusion.web.cern.ch/networks/disability-network].

[31] SNAC [https://diversity-and-inclusion.web.cern.ch/networks/snac-supporting-neurodiversity-cern].