

VIEWPOINT

Cernoises and Horrible Cernettes: A history of women at CERN 1954-2017

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The European Organisation for Nuclear Research (CERN) was founded in 1954 by a group of men seeking to explore the fundamental building blocks of our Universe. Since then, they and a host of international scholars have succeeded, exemplified by the discovery of the Higgs boson in 2012 and numerous Nobel Prize awards. But running parallel to the 'great men' of high-energy physics, is the untold story of the women of CERN. The organisation is an elite institution, and can thus provide insight into why numbers of women remain low in all facets of its work (except professional administrative). This article explores the role of women at CERN, both scientists and non-scientists, drawing on archival research from the organisation's collection in Geneva and interviews, providing an analysis of why gender diversity is still one of the puzzles left for this elite space to solve.

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Institutional factors have been a large part of what has kept women outside of elite science structures. In the UK alone, 17% of science professors are female and 7% of the Royal Society's self-electing fellowship is female, demonstrating that although more women are entering science, there are few women at the top.¹ This article considers the role of women, both scientists and non-scientists, at the elite science institution, the European Organisation for Nuclear Research (CERN). I became interested in CERN while visiting their archives for doctoral research from 2011 to 2015, an exciting period for the organisation spanning several new discoveries and increased media attention. But as I met with female and male interview subjects and worked in the archives, I could not help notice the lack of women in the historical self-presentation of CERN. One of the things that excites me and many others about CERN is its diverse makeup, bringing together people from all over the world to work on peaceful science. The organisation is proud of this, and diversity in science is relevant as never before after Brexit and similar movements call into question European scientific collaboration. But where were the women? From the paintings of Director Generals to the artists in residence, from the busts dotted around the buildings to the authors represented by the library, CERN seemed to only lean into its *history*. From working in the archives, I knew it was not the case that the organisation had not welcomed women. So I set out to match what I found on the ground with *her*storial documentation.

Founded in 1954 as a distinctly peaceful Cold War project of its time, the European laboratory quickly became the epicentre of learning and research into the Standard Model in physics, a scientific paradigm concerned with understanding the basic building blocks of the Universe and so-called blue-sky non-applied science. In 2014, the organisation discovered the Higgs boson, a particle connected to how matter acquires mass, as predicted by the Standard Model, and immediately became headline news again. Much attention was paid to the discovery, the exciting future work it might open up in science, and the fact that the predictions made decades ago by the laboratory had been found to be true. At the same time European austerity budgets and instability concerned many. Less critical attention has been paid to the lack of women at CERN, and why this might be at odds with the organisation's own free-spirited cutting-edge approach to research. CERN has long been a place that has gathered people of (almost)² all ethnicities, religions, and political backgrounds together, but

women have been consistently underrepresented within its history. This article explores why and how this may have happened, taking as a point of departure the modern and contemporary history of the organisation, and the role of female scientists and non-scientists within CERN.

The minority

There have always been few women at the European Organisation for Nuclear Research (CERN). In this, it is not alone as regards disparity in numbers, with women vastly underrepresented in many areas of STEM, especially the ‘hard sciences’ and non-applied research-heavy areas. However, CERN is a particularly valuable space to explore for anyone interested in the lack of women in science, because it is an elite and large institution at the forefront of modern research. CERN is an expensive and exclusive organisation of modern science, confident of its importance in the world. As former Director General Heuer put it, the Higgs boson ensured that CERN has “found the reason why we can physically exist.”³ As for women, staff numbers are hard to establish but women have remained less than 20% in the last twenty years. According to the CERN Personnel Statistics, from 2013, 17.22% of staff were female. This is broken down into professional categories. Of research physicists; 18.08% are female, in scientific and engineering work; 10.06%, in technical work; 7.79%, in manual work there are no women and in professional administrative work; 73.91% are female.⁴ CERN uses the statistic of “20% female staff”, but as this breakdown shows this is a proportionally large number. As the administrative sector is dominated by women at over 73%, this number brings up the total, as would cleaning or cooking staff who are also primarily female.⁵ In comparison, there are people from all over the World at CERN, representing vast cultures, religions and ethnicities. In other words, CERN is a world where women are the minority figures.

As with the general numbers of women in science, there are fewer women at the top in general. The first female director of CERN, Fabiola Gianotti elected in 2016, is an exception to the rule. Before and parallel to her election, CERN introduced bias training and more support for minority groups, along the lines of many elite scientific institutions at the time. From this we can see that institutional bodies in science often have good intentions for its female workforce, but that its historically unbalanced gender makeup is causing a delay in progress. It is a case of what feminist historian of science Margaret Rossiter has termed “official encouragement paired with institutional discouragement.”⁶ Historian of physics Karen Barad has argued that pure science’s focus on speed, competition and large machines is inherently masculine, and that the men who have set the agenda for the science decades ago

thus still decide what direction the field is going in.⁷ In spite of these obstacles, we should recognise the work done by women at CERN, whether scientists or not.

Cernoises

Historically it has been the CERN Women's Club that has been the first point of call for "Cernoises".⁸ Established in 1974, the club has a short but interesting history, including the first arts and crafts project within the organisation. Renie Adams (now Lady Adams), the wife of the former Director General of CERN, John Adams, campaigned to get a space for the wives of CERN staff to meet. This idea was not met with any interest or support from the scientific community, as the focus was on housing the "keen young physicists" on-site. Whilst continuing to look for "a meeting room, a barrack – any space whatsoever...", Adams created a group of volunteers to welcome new women, often in their own homes over coffee. Another CERN wife pioneer, Pat Pattison, started advising newcomers about where to find good doctors, dentists and schools.⁹ There is no mention of female physicists, engineers or staff in this group. This was a space for non-scientists. The club provides both friendship and "synthetic sisterhood" for the organisation, consistent in simulating connections between women through superficially inclusive language based on the assumed similarities within the female gender.¹⁰ Offering cooking, walking, arts and language courses the Cernoises are unapologetic in their focus on traditional female interests mirroring the performed gender in physics happening next door.¹¹ The culture of physics has also been identified as deeply ingrained in heterosexual behaviour. As Traweek has asserted, heterosexuality amongst high-energy physicists is "compulsory", and they expect to find women who will understand their particular work situation, sharing their husbands with the "sexy machines" on-site all the time.¹² As late as 2016, lesbian, gay, bisexual and trans (LGBT) staff at CERN have been banned from becoming an official group (in order not to promote an ideology, while CERN reported that there will be a new category of "informal networks" from 2016 where the LGBT club will be the first member) and have had their posters defaced with biblical texts and words like "pig" on the CERN site on a regular basis (close-circuit television (CCTV) has shown that this has been carried out by CERN researchers).¹³ Director General Heuer was so concerned that he issued a CERN-wide warning condemning the harassment in 2015. This culture creates a community in which, since not all women are physicists, the majority of women at CERN have been wives or partners. Since CERN's increased activity in the public domain post-Higgs, the lack of diversity amongst its staff is seen as an embarrassment for the otherwise modern organisation, as exemplified by the public interest in the harassment of the

CERN LGBT group after the story broke in *The Sunday Times*. Identifying this as a problem for the field, science educators and media alike have tried to ensure more focus on women in physics. However, the focus is often popularised, as with *Sciencegrrl* events and public lectures geared towards women, rather than on the issues that face women already in the field.¹⁴ This current situation is changing, but remains deeply rooted in a distinctly male-dominated institutional history.

The Report on Women in Scientific Careers at CERN

In its sixty-year history, CERN has never been more vocal about diversity than it is now, warning researchers not to engage in harassment of minorities.¹⁵ However, in 1980, CERN staff member Professor Mary K. Gaillard wrote a *Report on Women in Scientific Careers at CERN*.¹⁶ It did not reach mainstream media, but is the only example of anyone at CERN questioning the gender imbalance at any time before the Diversity and Equality group. In Gaillard's report, it became clear that many women were turned down for work in favour of men (despite being more qualified), had worked without pay (as was Gaillard's own experience), and/or were expected to stop working while their husbands climbed the scientific career ladder.¹⁷ Her report is still relevant. There has not been a female senior theorist, and no woman was hired as senior scientific staff until 1994. This emerged in Gaillard's work but also in subsequent analyses.¹⁸ Gaillard comments that the reactions to her findings in 1980 were "very mixed", with many complimenting her for a professional output and others remaining silent. At the time, she received "no official reaction" and "no immediate effect" regarding the report, and she cannot remember any comments from the public relations office. While Gaillard thinks Director General Gianotti signals a breakthrough and that circumstances have improved for women, she believes CERN in particular is "a little slow to catch up."¹⁹ Head of Diversity Guinot commented: "this report is certainly an interesting snapshot of the situation of women at that time and some of the comments are probably still valid (e.g. around cultural changes), since the field is still dominated by men. Some comments on stereotypes in society are also still valid to a certain extent (...)"²⁰ Today CERN is aware of these issues. The CERN Ombudsman has questioned whether the disproportional number of cases involving women is related to their percentage in the organisation. The Ombudsman concluded:

It seems obvious that the more masculine the culture of an Organisation, the more difficult it is for women. As a

consequence, it is essential to follow the Code of Conduct which guarantees full impartiality towards genders. As the result for CERN demonstrates, everyone must make greater efforts in the pursuit of the natural, respectful workplace.²¹

As with many male-dominated organisations, the mere existence of an equality and diversity policy ensures that CERN is doing something, but does not mean that the culture will change automatically as a consequence. For example, some CERN researchers are still harassing their LGBT colleagues, despite the warning from the Director General in 2015. bell hooks (*sic.*) examined how “white guilt” can constitute a performance amounting to little more than superficial statements of shame relating to racism.²² In the same way, organisations that actively admit to having a diversity problem are also performing a statement without guarantee of action. Disguising guilt, shame is an effective tactic for avoiding blame. Sarah Ahmed has extended this argument, stating that when a group made up of white men (her examples are the police and national governments) confess their racism or sexism, this does not automatically mean that there is a will to understand or change the problem.²³ As a way to improve what Jocelyn Bell Burnell called “a shocking situation” about and at CERN in 2013, the programmes Juno and Athena Scientific Women’s Academic Network (Athena SWAN) have been started.²⁴ But so far this has not led to much change in the numbers of women within high-energy physics. Gianotti could indeed signal a change, as could the official CERN stance on the importance of diversity today. The organisation dedicated its first activity as a UN observer to the question of women in science, while not addressing CERN specifically.²⁵ While this marks progress, it is not true that CERN and the LHC “run on woman power”, as the organisation claims.²⁶ But even if CERN’s demographic makeup improves in the future, nothing can change the historical realities of this male space. Adams’ struggles to secure one room for the Cernoises shows how little of a priority they were at the time. They were minorities in a highly specialised and male-dominated field, an experience that would mirror some of the CERN artists. Today, women and minorities are a focus for improving the organisation’s image, spearheaded by the first female Director General.

Conclusion

CERN is more than high-energy physics. Within the last ten years it has introduced an artist-in-residency program, and emerged as an influential scientific diplomat (exemplified by its presence at Davos and in the UN).²⁷ In the case of the former, it is engaging in a clever interaction with the arts at the time when its future is more insecure than ever, due to

instability in Europe and austerity cuts in many governments. As with many art and science fields, CERN has systematically failed to include both women and people of colour in its early years. But it has the potential to significantly challenge scientific culture through embracing topics that challenge the status quo, especially through the arts. As some of the respondents to the Wellcome Trust's evaluation of 'SciArt' (art inspired by or engaging with the sciences in some way) made clear, the combination of art and science "would be good" in part because it "might make science less male."²⁸ Why 'male' science should be a 'bad thing' is not explained, but it might allude to the public's perception of science as inherently masculine. Conversely, it is not clear what a 'feminine' science would look like, although some feminist scholars of science have argued that a feminist science (which is not necessarily the same as a 'feminine' science as opposed to 'male') would help make science fairer and more balanced.²⁹ As we saw when we explored the role of Cernois at CERN, gender remains a public issue for the organisation, making this moment in time such an exciting opportunity for CERN. With a new female Director General and an invasion of artists, CERN might have the chance to change to finally become the peaceful and diverse dream it was built upon as the first Cold War raged.

When I set out to explore this topic, I wanted to square my expectations of CERN as a diverse working environment today with its inclusion (and exclusion, as it turns out) of women historically. I'm still not sure I completely believe that an organisation which has been so historically male-dominated can flip a switch and become a diversity champion, but I'd like to think that the women I did come across in the archival material at CERN would be very pleased with current goings on. When I left CERN after my last visit to the archives, I was certainly seeing the organisation in a different light. Perhaps an elite and important place like CERN does not welcome unwanted attention to these parts of its history, as it might indeed be bad PR. But that's not my take-away. Rather, CERN is strengthened immensely in my mind as a diverse and complicated employer in 20th century science history. Science is not a linear neat development, neither is diversity. In the face of cuts and a restless European political moment, CERN's history is an example of what happens when we work towards complexity together, rather than searching for that grand, clean PR narrative.

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Notes

¹ House of Commons Science and Technology Committee, “Women in Scientific Careers. Sixth report of session, 2013–2014” (06.02.2014).

² The African continent is least represented at CERN. Three countries have cooperation agreements (South Africa, Morocco and Algeria) and four have special scientific contracts (Rwanda, Ghana, Mozambique and Tunisia) with the organisation, but there are no observer states from the continent (these are Russia, Japan, America and India). Africa’s place in high-energy physics is changing rapidly, but it has historically been badly represented in the large laboratories of the world. Access to education, poverty, colonial history and war are some reasons, but one should note that Western laboratories have not done much to address this situation.

³ Heuer in YouTube video, “60 Years of CERN and Guinness World Records”, *Guinness World Records* account on YouTube (26.19.2015): <https://www.youtube.com/watch?v=923r6JYT8t4#t=33> (accessed 13.04.2017).

⁴ CERN Human Resources, “CERN Personnel Statistics 2013”, Human Resources Department website (January 2014): <https://cds.cern.ch/record/1703227/files/CERN-HR-STAFF-STAT-2013.pdf> (accessed 13.04.2017).

⁵ Britta Schinzel has questioned these numbers in “Gender and Ethically Relevant Issues of Visualizations in the Life Sciences”, *International Review of Information Ethics* 5 (Sep 2006). For the breakdown of personnel statistics at CERN as relating to gender see “Table 7B Users by Gender and Professional Category – 31.12.2013”, in CERN Human Resources“, CERN Personnel Statistics 2013.”

⁶ Margaret Rossiter, *Women Scientists in America: Struggles and Strategies to 1940* (Baltimore: John Hopkins University Press, 1982).

⁷ Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (California: Duke University Press, 2007).

⁸ CERN women’s club, “History of the club”, CERN Women’s Club website (undated): https://club-womensclub.web.cern.ch/Club-WomensClub/History_EN.html (accessed 13.04.2017).

⁹ Ibid.

¹⁰ Mary Talbot first wrote on the concept of “synthetic sisterhood” through a study of language in teenage girls’ magazines, as a focused interpretation of the sociolinguistic broader term synthetic personalisation where the process of addressing a mass audience is done through a language that seems to address individuals. Mary Talbot, “A Synthetic Sisterhood: False Friends in a Teenage Magazine”, *Gender Articulated: Language and the Socially Constructed Self* (New York: Routledge, 1995), 143–65.

¹¹ As Traweek has pointed out in *Beamtimes and Lifetimes: The World of High Energy Physicists* (Harvard: Harvard University Press, 1992) women in physics try to become androgynous in their aesthetic, whilst wives and partners do not.

¹² Sharon Traweek, “Bodies of Evidence: Law and Order, Sexy Machines, and the Erotics of Fieldwork amongst Physicists”, in Susan Foster (ed.), *Choreographing History* (Bloomington: Indiana University Press, 1995), 3.

¹³ Jonathan Leake, “Gay Physicists Collide with Bigotry at CERN”, *The Sunday Times* (20.03.2016), 6.

¹⁴ *Sciencegrrl* is a series of events that hopes to inspire women to choose and stay in high-energy physics work. Their inaugural lecture was given by Professor Brian Cox, on 10 October 2013 and sold out within days. However, with tickets at 25 pounds for adults, 10 pounds for under-18s and 50 pounds “for VIPs”, the event was not as open as it suggested. *Sciencegrrl* is based in Manchester and hosts regular events aimed at girls and women. Similar to CERN’s approach to gender questions the series of events does not focus on women’s issues but on physics.

¹⁵ Leake, “Gay Physicists Collide with Bigotry at CERN”, *The Sunday Times* (20.03.2016), 6.

¹⁶ Mary K Gaillard, “Report on Women in Scientific Careers at CERN”, CERN/DG-11 (08.03.1980), CERN archives.

¹⁷ Gaillard, “Report...”, 5–8.

¹⁸ Especially the CERN Colloquium (08.03.2011): Helene Goetschel, *Looking at High Energy Physics from a Gender Studies Perspective*. Slides available: <http://indico.cern.ch/conferenceDisplay.py?confId=129808> (accessed 13.04.2017). The full email correspondence is available as a transcript translated from Norwegian. The CERN Diversity Programme website: <http://diversity.web.cern.ch/> (accessed 13.04.2017).

¹⁹ Gaillard in email to Røstvik, 08.01.2015.

²⁰ Røstvik, email exchange/interview with Geneviève Guinot, 14.11.2015.

²¹ Vincent Vuillemin, “Is the Number of Cases Involving Women Related to their Percentage in an Organization?”, *CERN Ombudsman* blog (02.12.2012).

²² bell hooks, *Talking Back: Thinking Feminist, Thinking Black* (Toronto: Between the Lines, 1989).

²³ Sara Ahmed, “Declarations of Whiteness: The Non-Performativity of Anti-Racism”, *borderlands e-journal* 3, no. 2 (2004).

²⁴ Bell Burnell at CERN, “Women in STEM. Where Are We Now and How Can We Move?” 11.04.2013, video and transcript available from the CERN website: <http://cds.cern.ch/record/1625808> (accessed 13.04.2017). The aim of Juno, established in the early 2000s, is to recognise and reward departments that can demonstrate they have taken

action to address the under-representation of women in university physics and to encourage better practice for both women and men. The Athena SWAN is a charter to recognise and improve conditions for women in science, launched in 2005. The latter is a self-assessment exercise where the lower levels are not measured and can be minor changes.

²⁵ Kelly Izlar, "CERN Offers UN advice on Bringing Women into Science", *Symmetry Magazine* (4.05.2013): <http://www.symmetrymagazine.org/article/april-2013/cern-offers-un-recommendations-on-bringing-women-into-science> (accessed 13.04.2017).

²⁶ In the in-house publication *The CERN Courier*, Catapano sets out to explore "what makes these talented women tick, as well as an insight into their views on working in a 'man's world'." Problematically, he interviews only seven women, all senior. The rhetoric is positive and the title a populist assertion that is neither statistically, culturally nor scientifically correct. Paola Catapano, "LHC Runs On Woman Power", *The CERN Courier* (16.04.2008).

²⁷ On the history and contemporary state of power and scientific institutions see Jeremy Black, *The Power of Knowledge: How Information and Technology Made the Modern World* (New Haven: Yale University Press, 2015).

²⁸ Paul Glinkowski and Anne Bamford, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme* (London: Wellcome Trust, 2009), 99.

²⁹ Evelyn Fox Keller and Helen E. Longino, *Feminism and Science: Oxford Readings in Feminism* (Oxford: Oxford University Press, 1996); Nancy Tuana, *Race, Gender, and Science* (Indiana: Indiana University Press, 1989); Sandra Harding, *The Science Question in Feminism* (Ithaca; London: Cornell University Press, 1986); Londa Schiebinger, *Has Feminism Changed Science?* (MA; Cambridge; London: Harvard University Press, 1999).