At the Edge of their Universe:
Artists, Scientists and Outsiders at CERN

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ABSTRACT

This thesis explores the historical and contemporary practices of cultural engagement and management at the European Organisation for Nuclear Research (CERN). It considers the history of art at CERN, and the role of the artists who have engaged with the organisation. Furthermore, it traces CERN's history from the beginning of the organisation in 1954 to the contemporary art programme Arts@CERN, including the artist-in-residency competition Collide@CERN (both initiated in 2011). Approaching the topic from an interdisciplinary angle, the thesis utilises art history, science history, critical studies of branding and public relations, science communication and various theoretical disciplines in order to understand why selected artists are being invited to collaborate with CERN today. My original contribution to knowledge is a case study showing the institutional nature of SciArt (an art genre that combines art and science) at CERN, connecting this to the institutional use of art and artists as public relations.

DECLARATION

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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INTRODUCTION

> Artists and scientists could benefit from facing the critics together [because] art and science face questions of what it is all about and what is the money for.
>
> Ars Electronica Director Gerfried Stocker, Collide@CERN lecture, 21.05.2012.

> Will Self: "This [CERN] secretariat sounds like something out of Kafka..."
> CERN staff: "No no no!!!"
>
> Will Self, "Will Self Orbits CERN", BBC Radio 4, 6.01.2015.

Artists have been inspired by the European Organisation for Nuclear Research (CERN) for decades.[1] This thesis asks why this scientific institution engages with the arts, and what the role of artists at CERN can tell us about contemporary SciArt; a genre of art that includes science in some form and is often, this thesis argues, deeply institutional in its structures. Situated in the outskirts of Geneva in Switzerland, CERN operates the world's largest particle physics laboratory. The organisation was founded in 1954, as one of Europe's first joint scientific ventures, by a small group of international scientists.[2] The goal was to unite European scientists after the Second World War, and to allow them to share the increased cost of nuclear science and accelerators.[3] CERN explores the Standard Model, a theory of particle physics that is concerned with nuclear interactions, and seeks to classify all subatomic particles in order to understand the basic building blocks of the universe. The organisation was founded in the mid-twentieth

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[1] The acronym CERN is derived from the French 'Conseil Européen pour la Recherche Nucléaire', and was first used in 1952. At the time, pure physics research concentrated on understanding the atom and its properties, hence 'nuclear'. Today, CERN's main area of research is particle physics, and some scientists refer to CERN more casually as the European Laboratory for Particle Physics. From Armin Hermann, John Krige, Ulrike Mersits and Dominique Pestre (eds.), *History of CERN, Volume I* (Amsterdam: Elsevier Science, 1987), 212.

[2] Raoul Dautry, Paul Auger and Lew Kowarski from France, Edoardo Amaldi in Italy and Niels Bohr from Denmark. Hermann et al., *History of CERN, Volume I*, v; 101-104; 414-415; 524.

[3] The first official proposal for CERN was made to the European Cultural Conference in 1949. The next stage came at the fifth United Nations Educational, Scientific and Cultural Organisation (UNESCO) General Conference in 1950, where American physicist and Nobel laureate Isidor Rabi spearheaded the proposal. The first resolution to establish CERN was made at an intergovernmental meeting of UNESCO in Paris in 1951. Two months later, eleven countries signed to establish the first CERN council. This is discussed throughout Hermann et al., *History of CERN Volume I* and in "About CERN" (including the CERN timeline), CERN website (undated): http://home.cern/about (accessed 5.04.2016).

century to make Europe the centre of high-energy physics.[4] Since that time, artists have been inspired by the organisation.

CERN is often defined as one of the most important scientific experiments of our time.[5] Today, it receives most of its funding from twenty-one European member states and Israel. CERN's annual budget was £786 million in 2014 and its money comes from private research organisations as well as the member countries.[6] The organisation has 2,513 permanent staff members, while it is estimated that half of the world's particle physicists are involved through their universities or institutions.[7] CERN's influence is also intertwined with the European Union (EU), regional-governmental and non-governmental organisations. International relationships are also manifested in the United Nations (UN), where CERN was granted observer status as a non-governmental organisation in the general assembly in 2013, allowing it the right to participate in the discussions and attend sessions. The artists who arrive at CERN today are entering a partially independent non-governmental organisation as well as a laboratory.

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[4] "At the end of the Second World War, European science was no longer world-class (…) a handful of visionaries imagined creating a European atomic physics laboratory" quote from "About CERN" (History of CERN timeline; 1949), CERN website (accessed 5.04.2016).

[5] CERN has increasingly been in the public eye throughout the twentieth century, as exemplified by countless articles about the organisation in mainstream press, for example Suzanne Moore, "After the Higgs Hype, CERN Still Has as Much Purpose and Passion as Ever", *The Guardian* (8.11.2013): https://www.theguardian.com/science/2013/nov/08/after-higgs-hype-cern-still-has-purpose (accessed 21.03.2016) and Dennis Overbye, "Coming Soon: Heroes of the Higgs", *The New York Times* (25.02.2014), page D3 of the New York edition. When the Large Hadron Collider (LHC) started up in 2008 the ATLAS (CERN project) website went from half a million hits in 2005 to 1,26 million hits. During the week of the LHC startup the website received as many visitors as the whole of the last year. This information is from Pauline Gagnon, "At Last, Particle Physics is in the Public Eye!" ATLAS e-news website (29.09.2008): http://atlas-service-enews.web.cern.ch/atlas-service-enews/2007-8/features_07-8/features_mediaday.php (accessed 21.03.2016). When the Royal Society was deciding what topic to choose for one of its first popular science public lectures in 1990, open to anyone, they recommended a meeting on the results from the Large Electron Positron Collider (LEP) at CERN. This was backed by the Committee on the Public Understanding of Science (COPUS) (Royal Society, Hooke Committee papers, minutes HC/8(90): C/24(90), 10 Jan 1990). This is one example of how CERN engages with popular science and media. Throughout the thesis more examples are discussed.

[6] For a full overview see "Budget overview" on the CERN website 'Resources' section: http://press.cern/facts-and-figures/budget-overview (accessed 20.03.2016).

[7] This breaks down into engineers and scientists (1,033), technicians (885), administration and office staff (401), 'craftsmen' (117) and research physicists (77). In addition there are apprentices (21), students (315), fellows (566) and paid associates (372). Furthermore, physicists, engineers and other specialists (11,726) use CERN's facilities, in particular the colliders. CERN press office, "Facts and Figures 2014": http://press.web.cern.ch/facts-and-figures/facts-and-figures-2014 (undated, accessed 26.06.2015).

Recently CERN has attracted significant mainstream media interest after discovering the Higgs boson in 2012, a particle thought to explain why some fundamental particles have mass.[8] This led to CERN scientist Peter Higgs winning a Nobel Prize in physics alongside theoretical physicist François Englert in 2013. CERN has been covered closely by mainstream British media, as highlighted throughout this thesis.[9] The British government and media personalities have also emphasised its importance to education and the economy.[10] Brian Cox in particular has boosted applications to study physics at British universities, with the "Cox effect" bringing in an increasing stream of young enthusiasts to the field.[11] The University of Manchester, where Cox lectures, estimates that applications to study physics have increased by 52% since his public engagement activities started in 2008.[12] His first British Broadcasting Corporation (BBC) series for example, 'The Big Bang Machine', reached a total of 1.23 million people. The success led to three further programmes, and the mini-series 'Wonders of the Solar System', which attracted over three million viewers. Cox also hosts the popular annual 'Stargazing Live' broadcast about astronomy at Jodrell Bank Observatory (owned by the University of Manchester) and co-hosts 'The Infinite Monkey Cage', a radio show about science.

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[8] Aad et al. (The ATLAS collaboration), "Observation of a New Particle in the Search for the Standard Model Higgs Boson with the ATLAS detector at the LHC", *Physics Letters B* 716, no. 1 (17.09.2012): 1–29.

[9] Examples from mainstream news coverage include Suzanne Moore, "After the Higgs hype, CERN still has as much purpose and passion as ever", *The Guardian* (8.11.2013); Brian Cox' TED talk, "CERN's supercollider", TED (March 2008): https://www.ted.com/talks/brian_cox_on_cern_s_supercollider?language=en (accessed 27.02.3016); Will Self's BBC Radio 4 series about CERN, "Self Orbits CERN", BBC Radio 4 (5-9.01.2015): available via BBC iPlayer: http://www.bbc.co.uk/programmes/b04xxvtb/episodes/downloads (accessed 27.02.2016); BBC Horizon programme, "The Hunt for the Higgs: A Horizon Special", BBC Two (last shown 27.10.2015); The screening of the documentary *Particle Fever: The Hunt for the Higgs Boson* on BBC Storyville (and other national networks) (last shown 16.102014); "Click: CERN" (broadcasted first 20.02.2016): http://www.bbc.co.uk/iplayer/episode/b071gnr0/click-cern (accessed 28.02.2016).

[10] John Baylis and Kristan Stoddart, *The British Nuclear Experience: The Roles of Beliefs, Culture, and Identity* (Oxford: Oxford University Press, 2010), 42-60; 170-185.

[11] The University of Manchester has a dedicated webpage about the "Cox effect": "'The Brian Cox effect' rejuvenates physics in Britain" (undated): http://www.physics.manchester.ac.uk/our-research/research-impact/brian-cox-effect/ (accessed 27.02.2016). For an analysis of the "Cox effect", see Felicity Mellor, "Is the 'Cox effect' good for us?" *Physics World* (10.2012): 19.

[12] Numbers are from the University of Manchester, "'The Brian Cox effect' rejuvenates physics in Britain".

When the Higgs boson was located in 2012, interest in high-energy physics increased. In the last three years, other CERN-affiliated physicists have set out to explain the Higgs boson in popular physics books. There have been more than twenty books written in English about the Higgs discovery alone. Examples include Lisa Randall's *Higgs Discovery: The Power of Empty Space,* Jon Butterworth's *Smashing Physics: Inside the World's Biggest Experiment,* Sean Carroll's *The Particle at the End of the Universe: The Hunt for the Higgs and the Discovery of a New World,* Michael Krause's *CERN: How We Found the Higgs Boson* and Ian Sample's *Massive: The Higgs Boson and the Greatest Hunt.*[13] Two of the most widely read scientific journals in the world, *Nature* and *New Scientist*, have featured short overviews of Collide@CERN and interviews with some of the artists.[14] In 2013 the *Financial Times* dedicated its entire weekend issue to the future of the Higgs boson and high-energy physics, and *The Guardian* and *New Statesmen* have both published long analyses about CERN.[15] The media interest leading up to the Higgs boson discovery, and the "Cox effect", have situated this thesis in a time of change for CERN.

In this thesis I seek to provide an analysis of the art programme at the laboratory, CERN's new cultural policy, and the current artist-in-residency programme, Collide@CERN. The latter is an art competition organised with Ars Electronica, an organisation based in Linz, Austria. It was founded in 1979 and dedicated to blending art with science.[16] Collide@CERN is part of CERN's new umbrella project Arts@CERN

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[13] Lisa Randall, *Higgs Discovery: The Power of Empty Space* (London: The Bodley Head, 2012); Jon Butterworth, *Smashing Physics: Inside the World's Biggest Experiment* (London: Headline Publishing Group, 2014); Sean Carroll, *The Particle at the End of the Universe: The Hunt for the Higgs and the Discovery of a New World* (London: Oneworld Publications, 2013); Michael Krause, *CERN: How We Found the Higgs Boson* (World Scientific Publishing Company, 2014); see also Ian Sample, *Massive: The Higgs Boson and the Greatest Hunt in Science* (London: Virgin Books, 2013); Jim Baggott, *Higgs: The Invention and Discovery of the 'God Particle'* (Oxford: Oxford University Press, 2012).

[14] Michael John Gorman, "Arts: The Third Culture", *Nature* 501, 216 (12.06.2014): accessed online: http://www.nature.com/nature/journal/v510/n7504/full/510216a.html?WT.ec_id=NATURE-20140612 (accessed 9.03.2016); Andrew Purcell, "Dance work shows how physics and art Collide@CERN", *New Scientist* online (12.10.2013): https://www.newscientist.com/article/dn24327-dance-work-shows-how-physics-and-art-collidecern/ (accessed 9.03.2016).

[15] Higgs issue of the *Financial Times* (7/8.07.2012); *New Scientist*, Special Higgs edition, no. 2873 (14.07.2012); Suzanne Moore, "After the Higgs hype", *The Guardian.*

[16] Ars Electronica started in 1927 as the International Bruckner, as a festival for art, technology and society. Scientist and digital arts pioneer Herbert W. Franke was one of its founders. Today Gerfried Stocker is artistic director, and he continues to be involved in person at CERN. In addition to the

and is shaped by the new CERN policy for cultural engagement, "Great Art for Great Science", both started in 2011. It is one of many competitions and residencies in the SciArt field, a genre which is examined through Arts@CERN within this thesis. In order to make the case for CERN as more than a scientific site – namely a social, cultural and political laboratory – I have utilised interdisciplinary methods and literature in order to examine the organisation's engagement with the arts. I have specifically used visual analysis, interviews and archival research methods, and utilised literatures of art history, science history and science communication, as detailed in the literature review and methodology.[17]

Unless otherwise specified, when I write 'CERN' in this thesis I mean the managerial core team who spend much of their time and energy on-site in Switzerland. This includes the Director General's team under Rolf-Dieter Heuer (Fabiola Gianotti took over in January 2016), the CERN Communications Group (a public relations office) led by James Gillies, the CERN Council (which is made up of one government official and one scientific delegate from each member country), the scientific policy committee (which makes recommendations for the laboratory's scientific programme) and the finance committee, made up of official representatives from member states and the eight heads of departments (Beams; Engineering; Finance, Procurement and Knowledge Transfer; General Infrastructure Services; Human Resources; Information Technology; Physics; Technology).[18] Defining CERN is a complex task, because it involves national governments and their interests, as well as many fields of science and engineering, bureaucrats, administration, and the public relations office. In addition I am writing about the culture of CERN, which encapsulates its staff and associates. I do not suggest that all CERN staff are to be held accountable for everything that happens there, but the culture and scope of the organisation is important for this thesis because the arts programme and policy is undertaken on behalf of everyone at CERN.

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continuation of the annual festival, Ars Electronica runs a media centre, museum and a technology laboratory. Since 1987 the organisation has awarded the Prix Ars Electronica, generating publicity for cyber-arts, digital arts, and SciArt.

[17] For a discussion of the importance of the visual in understanding the past see Ludmilla Jordanova, *The Look of the Past: Visual and Material Evidence in Historical Practice* (Cambridge: Cambridge University Press, 2012).

[18] CERN, "The Structure of CERN", CERN website (undated): http://home.web.cern.ch/about/structure-cern (accessed 02.06.2015).

Individual points of view are important to consider in this analysis, but the current art programme, Arts@CERN, is closer to the elite decision-makers at the top of the organisational hierarchy than to most of the scientific CERN staff. The thesis argues that complying with CERN's own narrative influences the work of the artists at CERN. While they play the role of the independent layperson, the insider status they achieve after winning a Collide@CERN competition affects their autonomy, their choices, and their artwork. The following chapters present CERN through the eyes of artists and other laypeople, by looking closely at the visual culture of the organisation's historical and contemporary existence. By analysing the art inspired by CERN, this thesis explores questions of institutional structures and representation beyond the scientific research at CERN. By looking at CERN as a site, as a semi-independent international non-governmental organisation, and as a place of work and production, an alternative view of the laboratory emerges, in contrast to the contemporary discourses of SciArt and popular science. This thesis provides a different view of CERN, which should be of interest to science historians, to art historians and artists interested in SciArt. Why are there artists at CERN right now? Why does so much CERN-inspired art look the same? What are the funding structures behind SciArt? These and other questions are addressed throughout the thesis through close readings of artworks and artists' experiences at CERN. Asking these questions is important as the institutional nature of SciArt has not been studied before, and the case study of CERN can provide insight into the genre. The potential of the layperson's perspective, including that of artists, is therefore necessary to assess the culture in which the scientific work is created.

0.1 Methodology

In this section I address the methods and approaches used in this thesis. In this thesis the methodological approach has been a combination of on-site visits to CERN, interviews, archive research and use of interdisciplinary literatures. The latter are reviewed in detail in the 'Literature review' section below. The methodology was screened by the University of Manchester doctoral research ethics committee (this is mandatory).[19] It

[19] Research ethics at the University of Manchester: http://www.manchester.ac.uk/research/environment/governance/ethics/ (accessed 5.04.2016).

was accepted as a thesis without any specific issues relating to ethics (i.e. no vulnerable persons, or confidential, controversial material was involved).

I first became interested in CERN's contemporary art programme after hearing it mentioned briefly as an example of SciArt by the art historian Martin Kemp in a lecture at the University of Manchester. I started reading about SciArt and found that most of the literature was very biased, as it was both very celebratory of the genre and often produced by institutions that support SciArt, such as CERN and the Wellcome Trust. Most studies of science and science history have been written by science historians. My academic background as an art historian allows me to bring a different perspective (albeit an inter-disciplinary one) to this topic. I acknowledge that herein sits one of the interesting complexities, and possible limitations, of studying a scientific subject as an art historian, but my use of the interpretive analytical framework discussed below will present a new way of approaching "big science" organisations and their power structures, as well as presenting one of the first critical analyses of SciArt.

While utilising some methodologies from the social sciences, my focus has been on CERN's art history.[20] The art historical methodology runs throughout the thesis in its investigation of CERN's artworks, artists and archives, and is used in the close reading and analysis of the artworks at CERN.[21] I have examined the qualities, nature and narratives of artistic production through textual analysis, looking at the role of the artist and examining the networks that artists meets in the SciArt world, and at CERN. Most of the artworks, artists and projects are examined in the context of their time, respecting the creator's motivation whilst considering the desires and prejudices of patrons and sponsors. I have utilised comparative analysis of iconography (the visual images and symbols in a work of art) of artworks from different time periods to contrast and compare how a new project such as the artist residency Collide@CERN differs from earlier interventions.

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[20] For an introduction to social science methodologies, theories and concepts see John Gerring, *Case Study Research: Principles and Practices* (Cambridge: Cambridge University Press, 2006); with David Collier, *Concepts and Method in Social Science: The Tradition of Giovanni Sartori* (London: Routledge, 2009); *Social Science Methodology: A Critical Framework* (Cambridge: Cambridge University Press, 2001).

[21] For an introduction to art historical methodology see Anne D'Alleva, *Methods and Theories of Art History* (London: Laurence King Publishing, 2005).

I visited CERN a total of three times, photographing and examining a number of artworks each time.[22] I could move alone on-site with a researcher's visitor badge, but due to security restrictions below ground I did not visit there (it is unlikely that there would have been any artworks to see, and no one I spoke to could think of any). When possible, I was in touch with the artist or the artist's family for more information about the process of making the artwork, which is utilised throughout the thesis. I am indebted to the kindness of the families of artists who have passed away for sharing memories.

I conducted formal interviews with current and former CERN staff throughout the visits I made to CERN. This was done in a semi-structured way, where I covered a list of questions, but moved off those topics if the interviewee brought up something worth pursuing.[23] The people I spoke to are all in relatively senior positions. Nevertheless, I did manage to ask them about how the art programme started, the role of art and culture at CERN, and the use of art as public relations (PR). I spoke to two senior PR people, James Gillies, current head of PR, and Roger Anthoine, who was the editor of the *CERN Courier* in the 1950s-'70s and head of communications at the time. Gillies followed up on email, and responded to questions about new artworks and popular culture products made in the last three years. Anthoine kindly dedicated over two hours to speak with me about his time as a PR officer. I also spoke to and emailed with Ariane Koek, initiator and organiser of the art programme. She shared her thoughts on the art programme and why it was needed at CERN. In addition I spoke to CERN staff members Alexander Brown (various roles in CERN PR, including social media), archivist Anita Hollier, head of diversity and equality Geneviève Guinot, and A Toroidal LHC ApparatuS (*sic.)* (ATLAS) spokesperson Claudia Marcelloni in order to get perspectives on art from various parts of the organisation. I reached all the interviewees through email, and met them in person or through Skype (an application that provides free messages and calls over the Internet). All interviewees signed consent forms and were recorded, except for informal talks and meetings. Interviews are referenced as "Røstvik interview with x; date." Transcripts and sound files could be deposited in the

[22] The visits were made possible by the generous University of Manchester School of Arts, Languages and Cultures fund for postgraduate research travel.
[23] On semi-structured interviews see Michael Lewis-Beck, Alan E. Bryman, Tim Futing Liao, *The SAGE Encyclopedia of Social Science Research* (London: SAGE Publications, 2003), 1020-1095.

CERN archives, when an agreement about how this is to be done is reached with the organisation, but this was not part of any agreement in order to interview any of the individuals and is not mandatory from CERN's perspective. Any deposit would be done only if the material would be of interest to anyone else (especially relevant to the interview with Roger Anthoine as an 'oral history' type file for CERN). In the end, only a small amount of this material is cited in the final thesis as the interviews mainly provided background information about CERN and the way it works. Nevertheless, they were a key part of understanding (some parts of) the organisation's attitude to the arts.

Finally, the thesis utilises archival material from CERN. This is held on-site in Meyrin in the CERN archives in the main building. In order to use the material I had to sign a declaration (Operational Circular no. 3 annex I) detailing the research project, and declaring to not quote from the material without prior and written permission from the CERN archivist, to not paraphrase material in greater detail than essential, to give credit to the CERN archives when sources were used, to send two copies of any publication resulting in the work (voluntary for doctoral thesis) to CERN, use copies of material only for scholarly purposes and not share them with anyone else without CERN's consent, and, finally, not hold CERN liable to anything arising from my work in the archives. The CERN archives include files of letters, photographs, reports, documents and more created or received by former Director Generals and other senior staff, by CERN committees, departments and some scientists' personal papers and correspondence. It was originally conceived as a support for writing the history of CERN, and launched in 1979. Many of the papers are currently being digitised, and are available on the steadily growing CERN archive database, where one can search through committee papers, images and administrative papers.[24] CERN's thirty-year confidentiality clause, introduced after the first History of CERN project, has proved less difficult to work around than expected, as interviews and visits have filled in some missing pieces. Nevertheless, as CERN historian John Krige has put it, the rule "seriously hampers archive-based studies of the laboratory" and makes it difficult to find all the artists who visited the site, even though it is a normal restriction for a large

[24] CERN archive database: http://cds.cern.ch/collection/CERN%20Archives (accessed 27.02.2016).

international organisation to put in place.[25] The current archivist, Anita Hollier, has been extremely helpful throughout the writing of this thesis, meeting in person and answering emails. I spent my week-long visits to CERN in the archives, and with Hollier's help found images and information about artist visits on-site, PR material and documents about the cultural aspects of CERN. The archives are large, and still being catalogued, so it could not be a complete survey of all the material available. Nevertheless, many of the findings have made their way into the thesis, in particular the third chapter that surveys the art history of CERN.

In addition to undertaking research in the historical archives,CERN's website and social media output, run by the Communications Group (the PR office), are also examined, providing insight into the workings of the contemporary organisation and revealing how it generates a narrative for public consumption. Its Twitter ('@CERN') and Facebook ('CERN') accounts are freely available to view, with or without signing up as a member of the social media platform.[26] These texts communicate new findings, historical 'funfacts', news coverage, celebrity visits, job opportunities, calls for papers and event information. The texts are written by Communications Group staff through the main CERN accounts, so there are no names attached to the individual messages. Arts@CERN's own social media accounts ('@ArtsAtCern' on Twitter; 'Collide@CERN' on Facebook) and website (Arts@CERN: http://arts.web.cern.ch) already holds a lot of information about the art programme, and have been utilised here due to the lack of traditional literature about it. I engage with these official narratives critically, and approach them as any other text produced by the organisation. Ariane Koek, and her various interns and assistants, run these platforms and update them with news about artists' visits, the residency competition, art events at CERN, links to Koek's blogposts and quotations from CERN artists. Keeping in mind the changing and

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[25] John Krige, "Distrust and Discovery, The Case of the Heavy Bosons at CERN", *Isis* 92, no. 3 (Sep 2001): 517 note 1.'

[26] On using Twitter and Facebook as part of research, see John H. Parmelee and Shannon L. Bichard, *Politics and the Twitter Revolution: How Tweets Influence the Relationship Between Political Leaders and the Public* (Plymouth: Lexington Books, 2012); Nasrullah Memon and Reda Alhajj, *From Sociology to Computing in Social Networks: Theory, Foundations and Applications* (New York: Springer, 2010); Helen Rogers, "Blogging our Criminal Past: Social Media, Public Engagement and Creative History", *Law, Crime and History* 1 (2015), 54-76; Jill Walker Rettberg, *Blogging,* first published 2008. (Cambridge: Polity Press, 2013).

contemporary world of the CERN art programme, the thesis furthermore uses many Internet sources because, increasingly, this is the only communication from and about Arts@CERN available. The social media emanating from CERN and the art programme is analysed in the same way as a more traditional printed publication, taking account of its origin in the press office, its circulation and audience (this can be examined through the 'likes' and 'retweets' individual posts receive), and its timing. Traditional archive materials and texts from fast-paced social media platforms afford equally valuable insight into the role of PR in the art projects at CERN.

Examining a scientific organisation's art history brings up questions of objectivity and subjectivity in relation to research methodologies. The methodologies used in this thesis draw on facts, but also on interpretations of textual, visual and oral evidence through an art historical lens. My analytical framework was primarily inductive; observing and analysing texts and visual culture, looking for patterns in the data, and applying literature and theory to the findings in order to answer the project question. My interview objects all had their own experiences that colour their perspective. Using this type of material can thus have limitations, and might seem untraditional if read by someone from a science or science history background. Visual analysis also draws on knowledge, prejudices and observations, but it is nevertheless a helpful way of understanding individual artworks. These types of evidence have been important in this thesis. CERN has a thirty-year confidentiality clause at work in its archives. Interviews and site visits were thus the best way to get insight into the more recent history. Within the financial limits and time constraints of this project, I have explored as many points of view and sources as possible, and the reader should be enabled to critically understand the complicated and varied materials that make up the story of CERN in this thesis.

In summary, by utilising a methodology of on-site visits and art historical analysis, interviews with staff members and archival work, the thesis uses a whole array of historical and contemporary primary sources that have not been brought together in this way before. This, as well as the use of an interdisciplinary literature, is the collection of materials that the thesis is based on.

0.2 Literature review

The literature discussed below draws from many disciplines and builds the foundational academic context for this thesis. For clarity, I have divided this section into groups of respectively: art history and SciArt, history of science, science communication and branding, sociology and anthropology, and feminist theory. A complete survey of each area is not within the scope of this thesis, but the following shows the interdisciplinary nature of this project and the literatures it draws on to explore the arts at CERN.

0.2.a Art history and SciArt

Art history, the study of objects of art (including performance and intangible objects) in historical contexts affords a way of examining CERN as a patron of the arts, as well as a source of inspiration for artists. Of course, artists have always had patrons, but scientific institutions are relatively new to this role.[27] Art historical literature examines the relationships between artists and institutions, exploring the dynamics between the two. There have been several surveys of the major developments in art in the twentieth and twenty-first century, such as art historians David Hopkins' *After Modern Art 1945–2000,* Donald Preziosi's *The Art of Art History,* and Michael Archer's *Art Since 1960*.[28] These present broad overviews alongside case studies of Modernist, Postmodern and contemporary art, with open-ended conclusions as to where various movements are going. Taking as a point of departure that contemporary art, in its many manifestations, is complex, both Hopkins and Archer sought to break down and explain the ideas behind the various movements of the time. These surveys help situate the CERN artists in a contemporary art world that is institutional, hierarchical and driven by commercial and PR interests, as well as a dedication to creativity and creation. Art history can thus assist us in making sense of the many ideas that have inspired CERN art today, especially the commercialisation of the field and new-media arts. However, such surveys have not explored the role of the artist in the scientific institution, a gap that this thesis addresses through its focus on institutional SciArt at CERN.

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[27] Marjorie Garber, *Patronizing the Arts* (Princeton: Princeton University Press, 2008), 1-5.
[28] David Hopkins, *After Modern Art 1945–2000* (Oxford: Oxford University Press, 2000); Donald Preziosi, *The Art of Art History*, first published 1998 (Oxford: Oxford University Press, 2009); Michael Archer, *Art Since 1960,* first published 1997 (London: Thames & Hudson, 2002).

In comparison to these surveys that were written by art historians and focused on explaining artworks and movements, Hal Foster, Rosalind Krauss, Yve-Alain Bois and Benjamin H. D Buchloh's *Art Since 1900* collected the voices of art historians who were also prominent art critics.[29] Through their work as editors in the journal *October,* which focuses on contemporary art and criticism, their approach to the twentieth and twenty-first century was shaped by each author's specific expertise. Instead of presenting a complete survey of Modernism, Postmodernism and contemporary art, the authors rejected such labels as unhelpful, and chose instead to discuss individual works, artists and events in separate chapters. Krauss and Yve-Alain Bois focused on artists from so-called Modernist and Postmodernist movements and engaged in a critical debate about style. Buchlon saw the Dadaist and avant-garde as crucial to the contemporary struggle of artists who fought the culture industry, whereas Foster emphasised the psychoanalytic themes in his examples. In the round-table discussion that concludes the book, Foster asks his colleagues: "Are there plausible ways to narrate the now myriad practices of contemporary art over the past twenty years?"[30] With some apprehension about this, the authors introduced their readers to the idea of a fragmented art world, and a fragmented discipline. The art programme at CERN is dominated by new-media artists who use technology in their practice and engage closely with new developments in high-energy physics. This type of SciArt is certainly a part of the fragmented art world that contemporary art historians describe, but it is also connected to larger structures beyond the arts, especially institutions, markets and funders. This thesis responds to Foster's question about how to narrate the vast landscape of contemporary art by focusing on a specific example, Arts@CERN, and putting it into the wider context of a narrative of institutional PR goals.

The recent growth and definition of the contemporary art form SciArt poses similar questions. The term originated with the launch of the funding programme for collaboration between scientists and artists set up by the Wellcome Trust in 1996, as discussed in the second chapter of this thesis. As a movement, SciArt is also fragmented and complex, its participants have many different interests, including commercial

[29] Hal Foster, Rosalind Krauss, Yve-Alain Bois and Benjamin H.D Buchloh, *Art Since 1900: Modernism, Antimodernism and Postmodernism* (London: Thames & Hudson, 2012).
[30] Foster et al., *Art Since 1900*, 679.

interests. The term loosely refers to artists who combine some form of scientific research, knowledge or methodology (including working with or taking advice from scientists) with art, but has not yet been clearly defined in art historical scholarship. SciArt programmes are often funded by scientific institutions (CERN, the National Aeronautics and Space Administration (NASA), the Wellcome Trust and other examples are explored in the second chapter), in exchange for specific artworks at the end of residencies and projects. Arts@CERN functions differently, focusing on the process rather than the artistic outcome. Because of its short history and the institutional nature of its origins, critical literature about SciArt is lacking. Nevertheless, art historians have been examining the visual cultures of science in history. Barbara Stafford's scholarship has explored the links between the biological and physical sciences as they relate to the arts. Stafford has focused on the relationships between the seemingly separate spheres of art, science and history, examining how nature was perceived by artists in the Enlightenment and the historical visualisation of information technology.[31] Bredekamp, Dankel and Schneider are also interested in these questions, examining how, in science and technology, images are used to depict ideas, data and reactions.[32] They argue that these images are conceptual and could therefore be analysed as art works, productive agents and objects that generate knowledge. While Martin Kemp's articles for the scientific journal *Nature* are written from the perspective of an art historian, they are consice overviews (500-600 words) that do not attempt to probe in detail the background to the collaborations.[33] Kemp's scholarship provides an overview of the historical links between art and science, but does not deal with the economic, cultural or social backgrounds influencing artists' engagement with science today.[34] Kemp has written about artists and scientists, and to a lesser extent SciArt, but focuses on the artists rather

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[31] Barbara Stafford, *Voyage into Substance: Art, Science, Nature and the Illustrated Travel Account, 1760-1840* (MA; Cambridge: MIT Press, 1984); Stafford, *Artful Science: Enlightenment, Entertainment and the Eclipse of Visual Education* (MA; Cambridge: MIT Press, 1994); Stafford, *Beyond Productivity: Information Technology, Innovation and Creativity* (Washington D.C: National Academy Press, 2003).
[32] Horst Bredekamp, Vera Dankel, Birgit Schneider, *The Technical Image: A History of Styles in Scientific Imagery* (Chicago: University of Chicago Press, 2015).
[33] Martin Kemp, *Visualizations: The Nature Book of Art and Science* (CA; Berkeley; Los Angeles: University of California, 2000).
[34] Martin Kemp, *Christ to Coke: How Image Becomes Icon* (Oxford: Oxford University Press, 2011); *Seen/Unseen: Art, Science and Intuition from Leonardo to the Hubble Telescope* (Oxford: Oxford University Press, 2006); *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven: Yale University Press, 1990).

than the institutional or socio-political contexts they are situated in. Siân Ede provides a more detailed survey of SciArt in *Art and Science,* which argues that in the last decades the public has known more about contemporary science than they do about contemporary art.[35] Ede provides a survey of the SciArt scene (which I discuss in chapter two), focusing on concepts of beauty, the environment and mythologies, but does not examine the institutions behind the collaborations. To the contrary, her point of departure is an enthusiastic celebration of the field, and she argues that: "artists don't 'do' prettification, product or propaganda for the public understanding of science."[36] This is in direct contrast to my findings in this thesis, which focus on a specific SciArt case study rather than the whole field. One of the benefits of looking closely at a SciArt project like Arts@CERN is that one can draw out the institutional, socio-political and financial contexts that influence the artist and the creation of the artwork. Ede's overview is a helpful introduction to SciArt, whereas this thesis engages with the field through a case study in order to critically examine the networks involved in one project. Art historian Caroline A. Jones and science historian Peter Galison expanded the discussion of science and art further in *Picturing Science, Producing Art,* where they invited an interdisciplinary group of scholars to comment on the boundaries of art and science.[37] Art historian Svetlana Alpers argued that art history and artists often discriminate art styles and projects "because it is scientific".[38] The use of new-media art genres in SciArt is one example. Artists may think that CERN expects them to engage with technology, and thus chose their medium accordingly. The consequences of this are discussed further in chapter four and five. These works examine the history of the collaboration between artists and scientists, and of SciArt, but they do not question the larger social, political or economic factors that might drive such collaboration. Instead they focus on analysing the art works themselves, which is no doubt an important part of art history, but nevertheless leaves out the larger contexts. It would certainly have been possible to provide a more traditional reading of the Arts@CERN artworks, but this

[35] Siân Ede, *Art and Science* (London; New York: I.B. Tauris, 2005), 1-3.
[36] Ede, *Art and Science,* 3.
[37] Peter Galison and Caroline A. Jones (eds.), *Picturing Science, Producing Art* (New York; London: Routledge, 1998).
[38] Svetlana Alpers, "Style is What You Make It: The Visual Arts Once Again", in Berel Lang (ed.) *The Concept of Style,* first published 1979 (Ithaca: Cornell University Press, 1987), 137-62, quote on 138.

thesis seeks to expand the analysis by engaging in the socio-political, PR and economic structures surrounding the collaboration. Arts@CERN, and SciArt, is certainly about art and science, but this thesis argues that it is also about so much more.

In addition to general surveys of art and science, the following scholars have explored the links between art and physics in the twentieth century. In the edited volume *British Art in the Nuclear Age* artists' engagement with nuclear culture in particular is explored.[39] Revisiting the Cold War through the perspective of art history, the nine contributors write about artists' ambivalent feelings towards contemporary science and technology. Spanning the years of CERN's inception, the case studies show how artists (like other laypeople) worked on the boundaries of hope and despair, beauty and horror. Their artworks negotiated the realities of places such as Hiroshima, yet celebrated the peaceful potential of nuclear energy.[40] These artists worked with and against science, both defying and defining terms such as 'nuclear aesthetics'. When *TIME* magazine asked: "How should a modern artist react to the atomic age?" in 1952, artists responded in a myriad of ways, from painting apocalyptic landscapes to collaborating with nuclear physicists. While the volume revisits some Cold War scholarship, it is unique in its focus on contemporary visual interpretations. For example, Jolivette examines the Festival of Britain through the eyes of artists and Spencer discusses Prunella Clough's 'Urbscapes' as covert resistance to a confusing media landscape and propaganda.[41] The artists discussed in the book emerge as illustrators, political actors and horrified spectators. Their reactions spanned the human spectrum, and closely mirrored the feelings of awe and horror felt in the European public at large. *British Art in the Nuclear Age* deals with the perspective of artists at the time of CERN's foundation, and makes clear that they did not all view high-energy physics and nuclear culture (these concepts were often conflated in the media during the Cold War, as the book explores) as strictly positive or negative. The edited volume gives an insight into the links between arts and sciences from the 1950s to 1970, the foundational period of CERN. Showing how artists

[39] Catherine Jolivette (ed.), *British Art in the Nuclear Age.* (VT; Burlington: Ashgate Publication Company, 2014).
[40] Robert Jacobs (ed.), *Filling the Hole in the Nuclear Future: Art and Popular Culture Responds to the Bomb* (Plymouth: Lexington Books, 2010).
[41] Jolivette, "Representations of Atomic Power at the Festival of Britain", 103-127; Catherine Spencer, "Covert Resistance: Prunella Clough's Cold War 'Urbscapes'", 171-195, both in Jolivette (ed.), *British Art in the Nuclear Age.*

in the mid-twentieth century approached nuclear topics, the volume expands on the small field of art history that directly engages with physics through a methodology that utilises interdisciplinary literature, archive research and interviews.

Gavin Parkinson, also writing about the twentieth century, has explored how Surrealism drew on the language of Relativity and Quantum mechanics in order to validate and authorise its artistic ambitions.[42] Showing that as early as 1918 popular science books and articles about quantum mechanics made their way into radical artist networks, Parkinson explored some of the earliest links between art and physics. The Surrealists' "interwar enthusiasm for the atom" turned into scepticism during the Cold War (with the exception of Salvador Dalí, whose scientific interest transformed into mysticism).[43] Jolivette's edited volume, alongside Parkinson, shows how artists' twentieth-century fascination with the growing and exciting field of high-energy physics transformed during and after Hiroshima, Nagasaki and the Cold War. This is the context in which to understand both artists and the public's attitudes to CERN, ranging from fear of destructive forces to interest in new scientific developments. With every success story (nuclear fusion, the Higgs boson discovery) or catastrophe (Hiroshima, Fukushima) that penetrated the media, artists' interest and attitudes towards nuclear and high-energy physics have changed. Furthermore, this scholarship shows how artists, and other laypeople, had access to plenty of information about the developments of "big science" and the institutions of high-energy physics. Like today, popular science, popular culture and the media covered stories about key discoveries, interesting scientists and the foundation of major organisations such as CERN.[44] However, this research on the relationship between artist and scientists in the twentieth-century does not question the institutional nature of art that engaged with science at the time. As organisations such as CERN have grown, the relationships between artists, scientists and the larger structures above them become pertinent. This thesis, rather than focusing solely on CERN artists' relationships to individual scientists or scientific knowledge, examines the links between artists and the institutional system in SciArt.

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[42] Gavin Parkinson, *Surrealism, Art and Modern Science: Relativity, Quantum Mechanics, Epistemology* (New Haven; London: Yale University Press, 2008), 177-181.
[43] Parkinson, *Surrealism, Art and Modern Science,* 201.
[44] Parkinson, *Surrealism, Art and Modern Science,* 202.

There has been little scholarly writing about contemporary SciArt. The exception to this came from former practising physicist Arthur I. Miller, who examined the contemporary culture of what he names artsci in *Colliding Worlds: How Cutting-Edge Science is Redefining Contemporary Art*.[45] Miller examines, mainly through interviews, why artists are working with scientists today. This includes some interviews with CERN artists and staff; the first winner of the international art residency competition Julius von Bismarck, James Gilles from PR and Ariane Koek. Miller makes some critical comments about the hierarchical nature and controlling atmosphere of the CERN art programme, but as his work is a broad survey of all 'artsci', he does not go into further details.[46] Rather, he explores the work von Bismarck and others have made at CERN as an art critic. This thesis seeks to probe deeper into the details of why the CERN art programme was started and how it has been used for PR, as well as drawing on the history of art at CERN. Miller's book nevertheless signals an interest in the topic that was started in the mid-nineties with the Wellcome Trust project.

In addition to SciArt surveys, organisations that have hosted SciArt projects can provide us with an institutional understanding. The Wellcome Trust's evaluation of its own pioneering SciArt programme showed that despite the success of the scheme, artists received more benefits from the exchange than scientists.[47] From 1996 to 2006, the scheme funded more than 120 artists with £3 million worth of awards to do SciArt. It was considered to be the starting point for the genre of SciArt, and thus established Britain as a centre of the field. The review of the entire scheme found that as a consequence of the Wellcome initiative, SciArt had "generated a strong brand name", and had succeeded in the Wellcome Trust's goals of achieving "high-level impact" in

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[45] Arthur I. Miller, *Colliding Worlds: How Cutting-Edge Science is Redefining Contemporary Art* (London: W Norton & Company, 2014).

[46] Miller covers CERN in *Colliding Worlds,* 137-165; 313-342. He critiques Collide@CERN for failing to reach its goal of engaging physicists as much as artists (149). Interview with Miller, 12.01.2014 at the Wellcome Trust, London.

[47] Paul Glinkowski and Anne Bamford, "Insight and Exchange: An evaluation of the Wellcome Trust's Sciart programme" (London: The Wellcome Trust, 2009), 5. The Arts Council responded to early SciArt programmes by trying to place artists "back in the driver's seat", and joined the Wellcome Trust in its pioneering SciArt scheme as part of the drive towards this. The scheme, while found largely successful by Glinkowski and Bamford, did not completely succeed in doing this. See Bronac Ferran, "Creating a Program of Support for Art and Science Collaborations", *Leonardo* 39, no. 5 (2006), 442-445, the Arts Council is discussed on 443.

the art world and media.[48] Arts@CERN is also dedicated to generating a strong brand name for itself and for CERN, and it has goals of creating public engagement and impact in both the art world and in mainstream media. Thus, Arts@CERN is a traditional SciArt project in the sense that it is not only about creating artistic outcomes, but also PR outcomes. The Wellcome Trust's catalysing scheme is discussed further in chapter two as part of a survey of the history of SciArt.

In 1995 the Policy Studies Institute published *Culture as Commodity*. It found that the arts sector contributed significantly to the British economy, and urged future policy makers not to ignore the economic potential of culture.[49] Later, Arts Council England reviewed the "impact factors" of the cultural sector and the arts, with a strong focus on economic and social aspects.[50] This was part of the European focus on becoming a knowledge-based economy, and echoes in the British funding of both CERN and SciArt programmes as part of nation's interest in knowledge (specifically science) as a commodity.[51] But the Wellcome Trust and other institutions' evaluations of their own SciArt schemes can be rather one-sided, with little input from scientists or artists. This thesis does not present the institutional (CERN) narrative of SciArt, but instead questions the underlying goals of SciArt projects at CERN. The strong SciArt brand, defined as a success in the review of the Wellcome Trust's programme and today

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[48] Glinkowski and Bamford, "Insight and Exchange…", 5.

[49] Bernard Casey and Rachael Dunlop; Sara Selwood, *Culture as Commodity: The Economics of the Arts and Built Heritage in the UK* (London: Policy Studies Institute, 1996). Many of the underlying ideas are explored in Victor A. Ginsburgh and David Throsby (eds.), *Handbook of the Economics of Art and Culture* (Amsterdam: North-Holland, 2014).

[50] Michelle Reeves, *Measuring the Economic and Social Impact of the Arts* (London: Art's Council England, 2002); Cebr (business consultant), "The contribution of the arts and culture to the national economy: An analysis of the macroeconomic contribution of the arts and culture and of some of their indirect contributions through spillover effects felt in the wider community", *Report for Arts Council England and the National Museums Directors' Council* (May 2013), available online through the Arts Council: http://www.artscouncil.org.uk/media/uploads/pdf/CEBR_economic_report_web_version_0513.pdf (accessed 4.03.2016). The latter report found that the arts sector accounted for approximately 0.4% of UK GDP and 1.1% of total UK employment (3), and suggested private and public investment in arts and culture as a catalyst for economic regeneration after the recession (6).

[51] Chris Collinge and Adreene Staines, "Rethinking the Knowledge-Based Economy", *Built Environment* 35, no. 2 (2009), 165-172. The importance of a knowledge-based economy was also stressed at the European level in the "Lisbon Agenda" action plan in 2000 (no written record, discussed in Collinge and Staines).

trickling out to mainstream audiences, for example in coffee table books, is the main focus of my analysis of the SciArt phenomenon in chapter two.[52]

The critical investigation of the commercialisation of art is another body of literature that I engage with in the thesis. This research engages with the field of art history, and asks how the value of art is decided, and by whom. Long before Pierre Bourdieu introduced the notion of cultural capital, the value of culture and art had become a commodity for many organisations.[53] The contradiction between the large and successful art market, and the selling of "things that have no price", is something that non-applied science also struggles with.[54] A "circle of belief" is needed in order to sell the valueless object, whether it is an art performance or a particle.[55] Being in 'the circle' that determines value becomes important. As artist and writer Martha Rosler remarked, the art world is not a linear hierarchical pyramid, it is rather a "set of interlocking rings, some close to the centre, others further away."[56] Bourdieu and Rosler's remarks echo in the relationships between artists and CERN, and are investigated throughout this thesis. Linking these literatures shows how SciArt creates value in art and in science, through the deliberate focus on its PR potential for promoting "things that have no price."

Some artists have also questioned the socio-political and economic structures within the art world, pushing against the institutions and people who seek to use their art as products for brand building. Andy Warhol played with popular culture, reproduction and genre, showing how the status of art hinged on reputation and finances, as well as the qualities of "high art".[57] The emergence of Outsider art (a loose term for people who do not come from traditional art school backgrounds and may be self-taught), and recently do-it-yourself (DIY) culture, further collapsed the notion of production value

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[52] Publishers Thames & Hudson have carved out a special market in SciArt coffee table books: Stephen Wilson, *Art + Science Now: How Scientific Research and Technological Innovation are Becoming Key to 21st-Century Aesthetics* (London: Thames & Hudson, 2010); Myers, *Bio Design: Nature. Science. Creativity* (London: Thames & Hudson, 2014); Andrew Brown, *Art & Ecology Now* (London: Thames & Hudson, 2015).
[53] Pierre Bourdieu, translated by Richard Nice from French, "The Production of Belief: Contribution to an Economy of Symbolic Goods", *Media, Culture and Society* 2 (1980), 261-293. Extract from *Actes de la Recherche en Sciences Sociales* 13 (1977), 3-43.
[54] Noah Horowitz, *Art of the Deal: Contemporary Art in a Global Financial Market* (Princeton: Princeton University Press, 2014).
[55] Bourdieu, "The Production of Belief…", 264.
[56] Martha Rosler, "Money, Power, Contemporary Art", *The Art Bulletin* 79, no. 1 (1997), 20.
[57] Arthur C. Danto, *Andy Warhol* (New Haven; London: Yale University Press, 2009).

and hierarchies, with a playful critique of capitalism brought forth by a focus on anonymity and low-cost materials.[58] In the 1960s and '70s there were strong hopes of art acting as a revolution, free from financial constraints (groups such as the Pre-Raphaelite Brotherhood and nineteenth-century Bohemian circles had hoped for this earlier). But despite these hopes, the art market kept growing. In fact, Outsider art is today highly sought after in the art market.[59] In comparison, counter-culture protests are lacking from SciArt. We will not find any of these discussions at CERN, but this does not mean that artists who are not part of the official Arts@CERN programme are not interested in these questions, as I explore in the final two chapters and conclusion.

Artists at CERN are also part of a wider art economy. Despite the economic crisis hitting Europe in 2008, the art market boomed.[60] Numbers from 2014 show that global auction turnover reached a historic level of $15.2 billion, an increase of 26% from 2013.[61] The growing museum market and increased investment in art made by wealthy individuals, institutions and companies have driven art prices to record-high levels.[62] Artists were often the first to critique this institutionalised state of affairs, whilst having to collaborate within power structures in order to make a living.[63] I compare the CERN artists with artists in similar SciArt positions funded by the Wellcome Trust and Ars Electronica (the latter partnered with CERN in some of its cultural projects). These SciArt counterparts reveal similarities in the type of artists attracted to such projects, the genre of art produced, and the politics between individual artists and larger organisations. I use the Art Market Monitor of Artron (AMMA) and Artprice's 2014 Art Market Report to contextualise the group of artists at CERN with groups of successful artists in the wider art world.[64] This annual report focuses on the monetary value of

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[58] Camilla Mørk Røstvik, Thomas Palmelund Johansen, "Craftivism: Stitching up a Political Protest", *Slagmark – Tidsskrift for Idéhistorie* 71 (Spring 2015) (available in English and Danish).
[59] James Tarmy, "How a self-taught artist can sell for $250,000", *Bloomberg Business* (8.01.2016).
[60] Noah Horowitz, *Art of the Deal: Contemporary Art in a Global Financial Market* (Princeton: Princeton University Press, 2014).
[61] Artprice (world leader in art market information), "Artprice: Global Art Market Annual Report: 26% growth in 2014" (3.03. 2015).
[62] Horowitz, *Art of the Deal: Contemporary Art in a Global Financial Market,* xiii.
[63] Alexander Alberro and Blake Stimson (eds.) collected over twenty artists opinions on this in *Institutional Critique: An Anthology of Artists' Writing* (MA; Cambridge; London: The MIT Press, 2009).
[64] Artprice and AMMA (Art Market Monitor of Artron), "The Art Market in 2014", available online: http://imgpublic.artprice.com/pdf/rama2014_en.pdf (accessed 26.03.2016).

artists in international sales around the world. AMMA has been criticised for this focus, but is nevertheless eagerly anticipated by galleries, auction houses and art institutions yearly.[65]

0.2.b History of science

Historians of science have written extensively on the history of physics. The science was studied by the Ancient Greeks ('physis' means 'nature') and up until the nineteenth-century as natural philosophy. In the eighteenth- and nineteenth centuries the laws of mechanics, thermodynamics, magnetic fields and atomic theory were developed. In the twentieth-century the so-called birth of modern physics ushered in an era of radiation and X-ray experiments and Albert Einstein's theory of relativity and quantum mechanics. More recently, quantum field theory and the Standard Model have been explored. CERN has played a key role in the latter two explorations, but draws on the long history of fundamental physics in its work.[66] Several historical accounts of physics focus heavily on success stories, discoveries, Nobel Prizes and prominent scientists. Written by physicists, they are often internal accounts of the field. This has been criticised by historians of science as positivist historiography: an account of the past presenting an inevitable progression towards truth.[67] Thomas Kuhn, in *The Structure of Scientific Revolutions,* wrote about paradigms of concepts and practices that define a

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[65] For an analysis of the art market from artists' perspectives see Hans Abbing (ed.), *Why Are Artists Poor? The Exceptional Economy of the Arts* (Amsterdam: Amsterdam University Press, 2002). Abbing discusses the paradox of the arts successful operation in the marketplace versus the poverty of artists. He also questions the institutional and governmental support of the arts as ineffective and the public notion that price does not reflect quality, finding that artists are often used without being paid or acknowledged.

[66] Jed Z. Buchwald and Robert Fox's (eds.) *The Oxford Handbook of the History of Physics* presents a helpful guide to the scientific revolutions made throughout the history of the changing field, whereas CERN physicist Frank Close focuses more closely on recent history, including CERN. Jed Z. Buchwald and Robert Fox (eds.), *The Oxford Handbook of the History of Physics* (Oxford: Oxford University Press, 2013); Frank Close, *A Very Short Introduction to Nuclear Physics* (Oxford: Oxford University Press, 2015)*;* Close, *A Very Short Introduction to Particle Physics* (Oxford: Oxford University Press, 2004).

[67] C. T. McIntire, *Herbert Butterfield: Historian as Dissenter* (New Haven: Yale University Press, 2004), 2015; Nick Jardine, "Whigs and Stories: Herbert Butterfield and the Historiography of Science", *History of Science* 41 (2003), 125-140, at 127-8.

scientific discipline at a particular time.[68] These concepts and practices included what was observed, how experiments were conducted, and what predictions were made in specific scientific experiments, thus examining the ways in which knowledge was 'made' as opposed to how scientists 'found' truth.[69] Kuhn's approach, in turn, has been criticised as a perspective that does not appreciate the goals of science, a critique often argued by scientists.[70] A schism still exists between those (including many scientists) who adhere to a triumphalist narrative of physics as a succession of heroic discoveries, and historians of science who broadly question this account of how science is created. Iwan Morus, in *When Physics Became King,* presents a history of the field that takes account of socio-political and cultural contexts.[71] He shows the relatively new field of physics (about two hundred years old) as a science that has always struggled to achieve legitimacy in the scientific community and with the general public. Tracing how physicists (a term that did not appear in English until the 1830s) went from being an unknown subgroup to being regarded as holding the keys to unlocking nature's building blocks, Morus shows that every step of the way was about winning social acceptance for their work.[72] As explored in this thesis, to be seen as legitimate is still a major concern for CERN. This ties into the role of the artist and SciArt as PR and public engagement for the organisation today. Historians of physics have also found a strong link between the field's need to justify itself and its relationship to science journalism.[73] My discussion of the role of the BBC in particular in CERN PR expands on this literature, and connects it to the journalism that covers SciArt.

During CERN's lifetime, scientists and historians have explored the organisation's history, often focused on the large machines on-site, such as the LHC. There have been a number of 'insider' historians who wrote CERN's history. Historian Maurice Goldsmith and Edwin Shaw (CERN head of PR for nine years in the 1970s)

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[68] Thomas Kuhn, *The Structure of Scientific Revolution,* first published 1967. (Chicago: University of Chicago Press, 1996). Paul Horwich (ed.), *World Changes* (Boston: MIT Press, 1993) presents discussions about Kuhn's work, including reflections by Kuhn.
[69] Kuhn, *The Structure of Scientific Revolution,* 10.
[70] Edward Harrison, "Whigs, prigs and historians of science", *Nature* 329 (1987), 213-14.
[71] Iwan Rhys Morus, *When Physics Became King* (Chicago: University of Chicago, 2005).
[72] Morus, *When Physics Became King,* 3.
[73] Martin W. Bauer and Massimiano Bucchi (eds.), *Journalism, Science and Society: Science Communication Between News and Public Relations* (London: Routledge, 2008).

collaborated on *Europe's Giant Accelerator: The Story of the CERN 400 GeV Proton Synchrotron*, presenting a history of this machine.[74] Science journalist Robert Jungk included CERN in his volume on revolutionary science equipment *The Big Machine,* covering a time when "retired professors were treated like princes" and providing some insight into the big personalities that founded CERN.[75] CERN physicists Herwig Schopper and Luigi Di Lella provided a newer survey of discoveries and machines in *60 Years of CERN Experiments and Discoveries*.[76] These books present a series of success stories and arrivals of new machines, but do not explore the social or cultural aspects of the laboratory. For this, we need to turn to more analytical and sociological historical accounts of the field of physics in general.

Historian of physics Peter Galison, in his philosophical analysis of machines in physics, argued that beliefs and action took place in a "trading zone" between people, machines and knowledge production.[77] There is also a selection of laboratory histories that make for interesting comparison to CERN's culture. As they span the same timeframe as CERN, as well as including thoughts on culture and arts, I have focused on the history of arts and crafts at Fermilab, Brookhaven National Laboratory and Los Alamos. [78] These historical overviews show that CERN is not the first high-energy physics laboratory to engage with artists. But CERN sticks out in the history of physics laboratories by utilising artists and art as PR, compared to other laboratories' use of art mainly as a community-bonding exercise or creative endeavour.

The third Director General of CERN, Cornelis Jan Bakker, initiated the definitive work about the organisation four years after CERN's establishment. The first report was produced in 1961, and it was based on CERN physicist Lew Kowarski's

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[74] Maurice Goldsmith and Edwin Shaw, *Europe's Giant Accelerator: The Story of the CERN 400 GeV Proton Synchrotron* (London: Taylor and Francis, 1977).
[75] Robert Jungk, *The Big Machine* (New York: Charles Scribner's Sons, 1968), 22.
[76] Herwig Schopper and Luigi Di Lella, *60 Years of CERN Experiments and Discoveries* (Singapore: World Scientific Publishing Company, 2015).
[77] Peter Galison, *Image & Logic: A Material Culture of Microphysics* (Chicago: Chicago University Press, 1997).
[78] Lillian Hoddeson, Adrienne W. Kolb and Catherine Westfall, *Fermilab: Physics, the Frontier, and Megascience* (Chicago: University of Chicago Press, 2008); Robert Crease, *Making Physics. Biography of Brookhaven National Laboratory, 1946–1972* (Chicago; London: University of Chicago Press, 1999); John Hunner, *Los Alamos: The Growth of an Atomic Community* (Norman: University of Oklahoma, 2014); Los Alamos Arts Council has a historical overview of the art projects on-site on their websites: http://losalamosartscouncil.org (accessed 28.02.2016).

"recollections".[79] On 18 May 1972 Director General John Adams announced the CERN History Project. The project was started by Margaret Gowing, lecturer in contemporary history at the University of Kent, alongside the then retired Kowarski and CERN staff Monique Senft and Simon Newman. While this group collected a vast array of materials, they abandoned the project in a couple of years. Gowing and her team had conducted over fifty interviews by the time the project stopped, many of which were deemed "indispensable" by the next history study team.[80] Colleagues and members of Gowing's team refer to high levels of stress, poor health and discouragement from CERN as reasons for abandoning the project.[81] In letters to colleagues at CERN, Gowing describes her work at CERN as a time that "makes me feel ill."[82] Lessons were learned that made the second CERN history project smoother to run. The new team arrived in the 1980s and produced the three volumes of the history of CERN, compiled by historians of science Armin Hermann, John Krige, Ulrike Mersits and Dominique Pestre, with part-time contributions from physicists Lanfranco Belloni and Laura Weiss.[83] Pestre later described CERN as a "powerful organisation" that they "never became part of". He noted the "striking atmosphere" of CERN scientists arguing as if they "knew everything and us nothing", making the work itself "hostile territory". Pestre also remembers that in the 1980s CERN was overwhelmingly "white, male, physicists, engineers, talking about business".[84] This feeling is echoed by many of the CERN artists' experiences of working with the organisation, and is discussed in the fifth chapter.

The first volume of the CERN history books, *Launching the European Organization for Nuclear Research*, lays out the events that led to the foundation of CERN and its first twelve years as an organisation. It does not analyse the PR office, but discusses the problems of convincing laypeople to support CERN in the early period.

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[79] Oral history transcript of Dr Lew Kowarski by Dr Charles Weiner at the American Institute of Physics, New York (20.03.1969).
[80] "Study team for CERN history – Progress report, 1–2", CC/1498/Draft, Committee of council Appendices I to draft minutes (22.08.1983). CERN Archives, Geneva.
[81] Thanks to Jeffrey Hughes, John Krige and Dominque Pestre for sharing their views on this in meetings and via email in early 2015.
[82] Gowing to Kate and Lew Kowarski (20 May 1977): "I have tried not to think of CERN because, as so often in the past, it makes me feel ill…" Margaret Gowing archives, History of Science Museum, Oxford (no catalogue number). Many thanks to Stephanie for helping me access the archive.
[83] Armin Hermann, John Krige, Ulrike Mersits and Dominique Pestre (eds.), *History of CERN, Volume I–III* (Amsterdam: Elsevier Science, 1987, 1990 and 1996).
[84] Røstvik interview with Dominique Pestre, 12.03.2015, University of Manchester.

The second volume, *Building and Running the Laboratory,* continues the history to the mid-1960s, when the decision to add the second generation of accelerators (the 600 MeV Synchro-cyclotron and the 28 GeV Proton Synchrotron) was made. It considers the institutional, political and financial infrastructure needed to make this happen, and the ways in which the CERN system functioned as the organisation grew. The third volume covered the history up until the late 1970s, analysing CERN's relationship to the complex network of governments, scientists, member states and politicians that effectively decides its fate. It also provided information about the newer machines and breakthroughs from CERN's scientific work. The books show that across the late twentieth-century CERN acquired huge cultural prestige within science and beyond, a topic that is expanded upon in this thesis through the case study of Arts@CERN. The team had a tendency to discard analyses for the vast history they were trying to tell. As Krige, responding to comments about the "official" nature of the first volumes, explained: "We cannot then deny the claim (or accusation?) that what we have presented in these volumes is an official history of sorts."[85] In the last volume, scientists have written the chapters on physics and engineering, rather than the historians. The books were all written in English in order to "secure it the widest possible readership", beyond CERN staff.[86] The *History of CERN* books are used throughout the thesis for factual information and dates, and are still a resource for any historian interested in high-energy physics institutions. Nevertheless, as "an official history of sorts", they do not discuss many social, political or cultural aspects, a gap that this thesis will add to the scholarship on CERN.[87]

Other historians have explored specific questions referring to the organisation, while none has tried to give a general overview before or after the CERN history project. Krige went on to write more about CERN in his own scholarship, often on specific machines, events and individuals.[88] His paper "Distrust and Discovery: The Case of the

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[85] Krige, *History of CERN, Volume III,* vii.
[86] Hermann et al., *History of CERN*, *Volume I*, ix.
[87] Hermann et al., *History of CERN, Volume III,* vii.
[88] See for example John Krige, "American Foundations, European Physics and European Security during the Cold War", in Dag Avango and Sverker Sörlin (eds.), *Science and Foreign Policy. Contemporary and Cold War Contexts* (Stockholm: Swedish Institute for International Affairs, 2011); Krige, "Isidor I. Rabi and CERN", *Physics in Perspective* 7:2 (2005): 150–64; Krige, "Distrust and Discovery: The Case of the Heavy Bosons at CERN", *Isis* 92, no. 3 (Sep 2001): 517–40.

Heavy Bosons at CERN", has been particularly relevant to this thesis as it discusses CERN's use of PR in the context of new discoveries.[89] Writing with a science policy perspective in mind, physicist Ben R. Martin and sociologist John Irvine produced a series of papers examining the ways in which one could assess whether or not the laboratory had failed or succeeded in its aims.[90] In "CERN: Past Performance and Future Prospects I–III", they reviewed CERN's position in the world of high-energy physics, the scientific performance of its accelerators, and the future of the laboratory. Constructing a model of key themes, Martin and Irvine wanted to evaluate CERN based strictly on its scientific output in order to present a methodology for evaluating "big science" (the papers won them the 1997 Derek de Solla Price, awarded by the International Society for Scientometrics and Infometrics).[91] They were criticised for this by Krige and Pestre, who disliked the lack of historical, contextual and discursive analysis.[92] This discussion remains a source for understanding the differences between a scientific versus historical or contextual analysis of CERN. Irvine and Martin are focused on discoveries, breakthroughs and successes, whereas Krige and the history team also analyse some of the social context. We find this debate reiterated in the popularity of high-energy physics and the "Cox effect" today, and in the critique often made by social historians such as Krige.[93]

The history team examined the social aspects of CERN as well as the scientific discoveries, subscribing to the broad ideas of constructivism, which holds that science is

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[89] Krige, "Distrust and Discovery: The Case of the Heavy Bosons at CERN", 517–40.
[90] John Irvine and Ben R. Martin, "CERN: Past Performance and Future Prospects I–III. CERN's Position in World High-Energy Physics", *Research Policy* 13 (1984); Irvine and Martin, "Basic Research in the East and West: A Comparison of the Scientific Performance of High-Energy Physics Accelerators", *Social Studies of Science* 15 (1985): 293-394.
[91] "Big science" is a science historical term that describes large-scale scientific projects funded by governments. First discussed by Alvin M. Weinberg, "Impact of Large-Scale Science on the United States", *Science* 134, no. 3473 (21 July 1961): 161–64. For a discussion of the classic definition and parameters of "big science", see Bruce Hevly, "Reflections on Big Science and Big History", in Peter Galison and Bruce Hebley (eds.) *Big Science: The Growth of Large-Scale Research* (Stanford: Stanford Univ. Press, 1992), 355–63.
[92] Krige and Pestre, "A Critique of Irvine and Martin's Methodology for Evaluating Big Science", *Social Studies of Science* 15, no. 3 (Aug 1985): 525–39.
[93] Graeme Paton, "'Brian Cox effect' leads to surge in demand for physics", *The Telegraph* online (11.03.2013): http://www.telegraph.co.uk/education/universityeducation/9793822/Brian-Cox-effect-leads-to-surge-in-demand-for-physics.html (accessed 19.03.2016).

socially constructed.[94] This research paradigm was challenging to Irvine and Martin, and is still criticised by scientists for its focus. The critique of constructivism in the scholarly field of science history came to a head in the heated 'science wars', a series of intellectual disputes between scientific realists and those who subscribed to the idea of science as social.[95] In 1996, mathematician Alan Sokal published a now infamous hoax paper, "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity" in the non peer-reviewed cultural studies journal *Social Text*.[96] Seeking to "flatter the editors' ideological preconceptions", the impressive but nonsensical paper was revealed as a hoax by Sokal.[97] The affair increased the tensions between advocates of the "strong programme" of the sociology and history of science, and those who accused constructivism of being trendy, untruthful and wasteful.[98] While not everyone subscribes to one of these two paradigms, the schism created by the "science wars" in the mid-nineties did make the relationships between many groups of social scientists and scientists tense. In this light, SciArt and Arts@CERN can be seen as a bringing together of two groups of professionals in order to create peaceful collaborations. Exactly at the time that the "science wars" raged, the Wellcome Trust initiated its SciArt scheme, showing that scientists have indeed collaborated with non-scientists throughout these debates. CERN artists, who often include social elements in their work, transcend the debate and make it possible for scientists to discuss these topics without subscribing to the "strong programme". This role of the artists at CERN and elsewhere is discussed throughout the thesis.

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[94] For an overview of the paradigm, covering constructivism's rise and tensions, see Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science,* first published 1998 (Cambridge; New York: Cambridge University Press, 2005).
[95] For a look at the historical roots of this debate, see Gerald Holton, *Science and Anti-Science* (MA; Cambridge: Harvard University Press, 1998).
[96] Alan D. Sokal, "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity", *Social Text* 46/47 (spring/summer 1996), 217-252.
[97] Sokal, "A Physicist Experiments with Cultural Studies", *Lingua Franca* (May/June 1996). Sokal, with Jean Bricmont, went on to further explore the debate in *Impostures Intellectuelles* (Paris: Odile Jacob, 1997), which was later translated and widely discussed in English; *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York: St Martin's Press, 1999). Sokal revisited the affair in *Beyond the Hoax: Science, Philosophy and Culture* (Oxford: Oxford University Press, 2008).
[98] The "strong programme" promotes the idea of science as socially constructed, including examinations of false breakthroughs rather than a history of science focused on success. Golinski, in *Making Natural Knowledge,* explores the tensions and discussions surrounding the "strong programme" approach.

In all of this literature on the history of physics, laboratories and CERN, there is no discussion about the ways in which artists engage with this field. While some of the above literatures include facts about artists' visits and works, there is, to my best knowledge, no rigorous analysis of what these interactions might have meant or how they came about. This thesis' examination of the art programme at CERN fills the gap in the scholarship as regards to the relationships between artists and scientists in scientific institutions, and in contemporary science history.

0.2.c Science communication and branding

The scholarly study of science communication provides a context for understanding CERN artists as laypersons, professionals and individuals in a unique environment. Gregory and Miller explored why the public understanding of science matters, the nature of science in public culture and popular science, science in politics, 'anti-science' sentiments and, ultimately, science as power.[99] Five years later, Yearley provided an extensive overview of the scholarly work that focused on these questions, including actor-network theory, gender studies, and reflexivity.[100] Discussing the influence of scientific culture on law, politics, policy, and public relations, Yearley concluded that the public understanding of science was about power and who had access to knowledge production. His analysis, rooted in a socio-political approach, discussed science as a powerful language, which extended clear privileges to those who spoke it. The artists at CERN, at different stages of 'literacy', often faced these power politics.[101] Historians and sociologists of science, Barnes and Edge, have identified that science does not validate itself, but is bound up with: "factors such as the degree of trust and authority possessed by its bearer, or by the institutions which sustain him and assert his

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[99] Jane Gregory and Steve Miller, *Science in Public: Communication, Culture, and Credibility* (Cambridge: Basic Books, 1998).
[100] Steven Yearley, *Making Sense of Science: Understanding the Social Study of Science* (Thousand Oaks: SAGE Publications, 2004).
[101] For a discussion about the literacy question in science communication see Morris H. Shamos, *The Myth of Scientific Literacy* (New Brunswick: Rutgers University Press, 1995); Henry H. Bauer, *Scientific Literacy and the Myth of the Scientific Method* (Illinois: University of Illinois Press, 1994); Alan Irwin and Brian Wynne, *Misunderstanding Science? The Public Reconstruction of Science and Technology* (Cambridge: Cambridge University Press, 1996).

competence and legitimacy."[102] This thesis provides a clear example of the role of science communication, trust and PR in 'selling science', a theme that Dorothy Nelkin wrote about extensively.[103] Nelkin questioned what science was, or appeared to be, in the media, and who or what is responsible for its public image. She was also an early observer of the phenomenon of scientists as advocates for their profession and as public relations specialists. Today, Brian Cox is a proud proponent of science advocacy, and as this thesis explores, so are many of the artists affiliated with CERN. Some of this media interest in CERN is specific to Britain, as explored by Friedman, Dunwoody and Rogers, Stuart Allan and the Wellcome Trust.[104] Coverage of science in popular media, often 'planted' by scientific organisations, is part of the contemporary presentation of science that artists see as members of the public. Mellor has shown how the intertextuality of popular science books causes images of science which are supportive of scientists' interests to continue to circulate in public discourse despite the alternative images thrown up by public scientific controversies reported in the news.[105] Hilgartner explored the "unobtrusive army of science advisors", and science's struggle to credibly convey complex information.[106] Finding that science advisors, among whom we can include CERN's press officers, play a crucial role in the politics of contemporary societies through their work with governments, Hilgartner cautioned against passively accepting their work as disinterested and objective.[107] More recently, Bucchi and Trench invited several scholars to examine how non-expert audiences learn about and engage with science.[108] Scholars of advertisement, Besley and Nisbet, have summarised and extended

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[102] Barry Barnes and David Edge, *Science in Context: Readings in the Sociology of Science* (Milton Keynes: Open University Press, 1982), 5–6.
[103] Dorothy Nelkin, *Selling Science: How the Press Covers Science and Technology,* first published 1987 (New York: W.H. Freeman & Co. Ltd., 1995).
[104] Sharon M. Friedman, Sharon Dunwoody and Carol L. Rogers, *Scientists and Journalists: Reporting Science as News* (New York: Free Press, 1986); Stuart Allan, *Media, Risk and Science* (Buckingham: Open University Press, 2002); Wellcome Trust, *Science and the Public: A Review of Science Communication and Public Attitudes in Britain* (London: Wellcome Trust, 2000).
[105] Felicity Mellor, "Between Fact and Fiction: Demarcating Science from Non-Science in Popular Physics Books", *Social Studies of Science* 33, no. 4 (2003), 509-538.
[106] Stephen Hilgartner, *Science on Stage - Expert Advice as Public Drama* (Stanford: Stanford University Press, 2000), 3.
[107] Hilgartner, *Science on Stage,* 146-150.
[108] Massimiano Bucchi and Brian Trench (eds.), *Routledge Handbook of Public Communication of Science and Technology,* first published 2008. (New York: Routledge, 2014).

studies of scientists' own views of the public, the media and the political process.[109] Their analysis of Anglo-American scientists revealed that many individuals in the science, technology, engineering and mathematics (STEM) fields believed that the public is uninformed about science in general and thus prone to making mistakes in business, policymaking and government. Critical of this, scientists tried to solve the issue by being increasingly involved in media and found the relationship to journalists important. These scholars of science communication have questioned the links between science and politics, science and the law, science and the media and more, but they have not investigated the position of the art world and artists in 'selling science', a gap that this thesis seeks to address through exploring the history of CERN's PR office (chapter one) and its engagement with the public through arts (chapter four and five).

The critical literature about branding is also utilised in this thesis to explore how CERN and Arts@CERN seeks to promote its brand. In *No Logo*, Naomi Klein investigates corporate culture and its use of selling techniques.[110] The book is useful when thinking about CERN as a corporate culture in itself, with artworks and projects selling the "courageous" mission statement of the organisation through brands and logos.[111] Klein focused on large corporations such as Nike and McDonalds, heavily criticising the use of sweatshops and the corporations' abuse of copyright laws, people and the environment. CERN is a completely different context and culture, but Klein's writing about the importance of brands to sell ideas, lifestyles, and knowledge is relevant to this thesis' discussion of the commercialisation of SciArt.

Similarly, scholars and historians of PR have provided examples of the use of arts and culture to sell knowledge. Both Butterick and L'Etang, in their critical introductions to PR, have shown how organisations communicate deliberately with the world in order to gain social, cultural and financial capital.[112] Promotional culture has been analysed as one where the symbolic power of branding has defined entire

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[109] John C. Besley and Matthew Nisbet, "How Scientists View the Public, the Media and the Political Process", *Public Understanding of Science* (30.08.2011).
[110] Naomi Klein, *No Logo,* first published 1999 (London: Fourth Estate, 2010).
[111] Klein, *No Logo,* 24.
[112] Keith Butterick, *Introducing Public Relations: Theory and Practice* (London: SAGE Publications, 2011); Jacquie L'Etang, *Public Relations: Concepts, Practice and Critique* (London: SAGE Publications, 2007).

economies.[113] Defined as "the management of communication between an organization and its publics", PR is an important practice for all science organisations.[114] As explored in chapter one, CERN's PR office has been active since the beginning of the organisation in 1954. Since the 1950s mass communication channels such as television changed the ways in which PR was done, exemplified by CERN's long relationship with the BBC and other national broadcasters. Later, social media, in particular Twitter, further revolutionised the speed at which organisations could reach their audience. Grunig and Hunt connected all forms of PR to propaganda: "Public Relations severs a propaganda function (…) Practitioners spread the faith of the organisation involved, often through incomplete, distorted or half-true information."[115] Histories of companies such as Royal Dutch Shell, Lufthansa, and British Petroleum have also shown the importance of PR for growth and reputation.[116] Both the oil and aviation industry 'sells' products that both scare and delight the public, thus making PR a crucial part of convincing laypeople of the products' safety and value – and, in turn, justifying the cost of basic scientific research in physics that (its proponents claim) indirectly spawns these technologies. Arts and culture have played a part in selling organisations' products for a long time, and were recently explored in a special issue of the journal *Arts Marketing,* where the authors emphasised the importance of visual culture for successful branding today.[117] With a rare interdisciplinary focus, Sharon MacDonald examined the Science Museum in London in order to expose the construction and display of public science there.[118] MacDonald found that making science accessible was often associated with making science "'fun', 'enjoyable' and 'user-friendly", a strategy that was also adopted by CERN, as explored in the second chapter. The so-called soft power of the arts can be

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113 Aeron Davis, *Promotional Cultures: the Rise and Spread of Advertising, Public Relations, Marketing and Branding* (Cambridge: Polity Press, 2013).
114 James E. Grunig and Todd T. Hunt, *Making Public Relations* (New York: Holt, Rinehart and Winston, 1984), 8.
115 Grunig ans Hunt, *Making Public Relations,* 21.
116 Jan Luiten van Zanden, Joost Jonker, Stephen Howarth and Keetie Sluyman, *A History of Royal Dutch Shell* (Oxford: Oxford University Press, 2007); Jens Muller and Karen Weiland, *Lufthansa and Graphic Design: Visual History of an Airline* (Zürich: Lars Müller Publisher, 2011); J.H. Bamberg, *The History of the British Petroleum Company 2 Volume Set* (Cambridge: Cambridge University Press, 2010).
117 *Arts Marketing: An International Journal: Special Issue: Brands in the Arts and Culture Section* 4, no. 1/2 (2014).
118 Sharon MacDonald, *Behind the Scenes at the Science Museum* (Oxford; New York: Berg, 2002).

transformed into tangible, and financially lucrative, outcomes if utilised correctly.[119] This literature on branding is used to examine the use of art and artists as communication tools at CERN in this thesis. While the current literature on branding includes writing about the arts, there has not been a review of the links between art and science as it relates to marketing. The case study of CERN artists bridges this gap and expands the critical scholarship on branding to include the use of art and culture as PR in science organisations.

0.2.d Sociology and anthropology

Sociologists and anthropologists have written extensively about the sciences. The sociology of scientific knowledge (SSK) examines science as a social activity, including the political, cultural, historical and economic factors that shape it.[120] Examining the sociological explanations for science, SSK scholarship included studies of scientific controversies and social rules. The "strong programme" of sociology is often connected to SSK, promoting examination of false scientific theories as well as the success stories. It also promoted the idea that all knowledge contains some social context in its creation. These ideas are associated in particular with David Bloor, Barry Barnes and John Henry, often referred to as the "Edinburgh school".[121] There is also a "Bath school" associated with Harry Collins, which subscribes to the "strong programme", but emphasises social

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[119] Joseph S. Nye, *Soft Power: The Means to Success in World Politics* (New York: PublicAffairs, 2005). Leanne Hoogwaerts has analysed Nye's book as it relates to the arts, "What role do museums and art institutions play in international relations today and specifically in the development of what Nye called "soft power"?", paper at the Arts as Cultural Diplomacy Conference (14.08.2012), paper available online: http://www.culturaldiplomacy.org/academy/content/pdf/participant-papers/2012-08-acd/what-role-do-museums-and-art-institutions-play-in-international-relations-today-leanne-hoogwaerts.pdf (accessed 2.03.2016). Hoogwaerts found that "soft power" could have immense power in international relations (both positive and negative), via loans between museums, artists' visits and museum exhibitions about difficult topics (11-12). Nye and Hoogwaerts both advocate for thinking about "soft power" as an actual power in international relations.

[120] Key scholars include David Bloor, Barry Barnes, John Henry, Donald A. MacKenzie, Harry Collins, Steve Fuller, Thomas Kuhn, Bruno Latour and Derek J. de Solla Price.

[121] David Bloor, *Knowledge and Social Imagery,* first published 1976 (Chicago: University of Chicago Press, 1991); Bloor and Barry Barnes, *Scientific Knowledge: A Sociological Analysis* (Chicago: Athlone and Chicago University Press, 1996); Barnes, *Scientific Knowledge and Sociological Theory* (London; Boston: Routledge, 1974); Henry, *The Scientific Revolution and the Origins of Modern Science,* first published 1997 (New York; Basingstoke: Palgrave Macmillan, 2002).

studies of laboratories and experiments.[122] The various schools of SSK have been criticised by French theorists who subscribe to Actor-Network theory (ANT).[123] ANT scholars argued that SSK was too reductionist and too centred on the human universe, as opposed to machines and even animals. ANT includes objects as parts of the social networks that are studied, and is thus useful to this thesis in that it opens up for the consideration of artworks as part of the social makeup of CERN.[124] Criticised for suggesting that objects and animals could have agency-like properties, ANT's "material-semiotic" method is still being debated.[125] Key ANT scholars, such as Bruno Latour and Michel Callon, have produced an extensive theoretical and analytical output that challenges binaries (modern and pre-modern, nature and society, human and non-human, etc.) and examines objects of scientific study as socially constructed.[126] Both SSK and ANT scholarship informs this analysis of CERN as a site of knowledge production and a network of knowledge. In this thesis, an analysis of CERN's art and PR programmes are put into the context of the organisation as a social structure with its own particular aims, which reach beyond the scientific field and into the public, social and cultural domain.

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[122] Harry Collins and Trevor Pinch, *Frames of Meaning: The Social Construction of Extraordinary Science* (London: Routledge, 1982); Collins, *Changing Order: Replication and Induction in Scientific Practice,* first published 1985 (Chicago: University of Chicago Press, 1992); Collins and Robert Evans, *Rethinking Expertise* (Chicago: University of Chicago Press, 2007); Collins, *Tacit and Explicit Knowledge* (Cambridge: University of Chicago Press, 2010).

[123] Collins and Yearley covered the debate from the SSK perspective in "Epistemological Chicken" in Andrew Pickering, *Science as Practice and Culture* (Chicago: University of Chicago Press, 1992), 301-326. Michel Callon and Bruno Latour responded in the same book in "Don't throw the baby out with the Bath School! A reply to Collins and Yearnley" in Pickering, *Science as Practice and Culture,* 343-368.

[124] Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford; New York: Oxford University Press, 2005).

[125] Andrea Whittle, "Is Actor Network Theory Critique?", *Organizational Studies* 28, no. 4 (April 2008), 611-629; Corpataux José and Crevoisier Olivier, "Lost in Space. A Critical Approach to ANT and the Social Studies of Finance", *Progress in Human Geography* online (24.09.2015): http://phg.sagepub.com/content/early/2015/09/27/0309132515604430.1.full (accessed 28.03.2016).

[126] Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Los Angeles: SAGE Publications, 1979); Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (MA; Cambridge: Harvard University Press, 1987); Latour (translated by Catherine Porter), *We Have Never Been Modern* (MA; Cambridge: Harvard University Press, 1993); Michel Callon, John Law and Arie Rip, *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World* (Basingstoke: Macmillan, 1986).

This exploration of the institutional and organisational structures of SciArt at CERN both draws on, and contributes to, the sociology of organisations.[127]

The role of the perceived outsider, as discussed in the sociology of science, is relevant in the exploration of the intersections of power and culture at CERN. Robert K. Merton's writings on this dynamic broke new ground in arguing for the existence of social roles and status within and outside of science.[128] The concept of the Mertonian outsider is useful in determining the perceived cultural boundaries between artists and scientists. As this thesis examines, artists can form friendships, be inspired and learn at CERN, but they remain in an orbiting position around the seats of power and knowledge; namely the organisation and its scientific staff. However, Merton's sociological examination of insiders and outsiders does not automatically make sense of all the aspects of the relationships between art and science, and artists and scientists at CERN. Art and science are not polar opposites and do share, as many of the Arts@CERN collaborators argue, many similarities in the ways each discipline investigates truth and functions creatively. In Thomas F. Gieryn's boundary-work, the lines of separation between insider and outsider are not so firmly drawn. Arguing that "'science' is no single thing", Gieryn wrote that boundary-work "describes an ideological style found in scientists' attempts to create a public image for science by contrasting it favourably to non-scientific intellectual or technical activities."[129] In this thesis I examine CERN's interest in creating a public image with the experience of the artist in a space dedicated to scientific knowledge production. Focusing too much on the insider versus outsider politics of science could result in missing the communication

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[127] Mary Godwyn and Jody Hoffer Gittell (eds.), *Sociology of Organizations: Structures and Relationships* (London: SAGE Publications, 2012); Michael Jeremy Handel, *The Sociology of Organizations: Classic, Contemporary, and Critical Readings* (London: SAGE Publications, 2003); Amy S. Wharton, *The Sociology of Organizations: An Anthology of Contemporary Theory and Research* (Oxford: Oxford University Press, 2006); James D. Thompson, *Organizations in Action: Social Science Bases of Administrative Theory,* first published in 1967 (New Brunswick: Transaction Publishers, 2010).

[128] Robert K. Merton, "Insiders and Outsiders: A Chapter in the Sociology of Knowledge", *American Journal of Sociology* 78, no. 1 (July 1972): 9–47.

[129] Thomas F. Gieryn, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists", *American Sociological Review* 48, no. 6 (Dec 1983), 781-95; 781.

between people invested in CERN, as later scholars have argued.[130] For example, several of the artists examined in this thesis are as interested in high-energy physics as the scientists they meet, whereas some scientists worry about the consequences of CERN's findings. What ties both scientists and artist together is CERN. Through the eyes of artists, scientists and PR staff, CERN emerges as several different worlds, but also a single entity of authority and knowledge production.

This does not mean that artists are simply in or out, as explored by Haraway's critique and use of ANT. Refusing to pin down her scholarship within traditional boundaries, Haraway introduced the revolutionary text "The Cyborg Manifesto" as a reminder of the profound, messy and complex networks between humans and machines in science.[131] It is both an activist manifesto ("I'd rather be a cyborg than a goddess") and an analysis of the history of science that explores the boundary breakdowns between human and animal, animal and machine, and physical and non-physical in twentieth-century science. At CERN, a place occupied with finding and naming the non-physical, Haraway's cyborgs exist in the interactions between machines, humans and interpretations. However, the text's hope that the dualisms that structure patriarchy (human/animal, machine/animal, man/woman) could be broken down by techno-cultures has proved difficult to achieve. Haraway's "Cyborg Manifesto" is thus still relevant as dualities between and within physical and non-physical worlds continue to structure hierarchies within science (and beyond). As this thesis examines, CERN is a space full of these dualisms that create antagonistic relationships between people and within knowledge production. Some of these CERN dualisms hinge on whether or not a person subscribes to certain knowledge, whether persons interpret knowledge by an established

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[130] Charles Alan Taylor, *Defining Science: A Rhetoric of Demarcation* (Madison: University of Wisconsin, 1996); Jay A. Labinger and Harry Collins, *The One Culture?: A Conversation about Science* (Chicago: University of Chicago Press, 2010); Wiebe E. Bijker, Roland Bal and Ruud Hendriks, *The Paradox of Scientific Authority: The Role of Scientific Advice in Democracies* (Boston: MIT Press, 2009); Massimiano Bucchi, *Science and the Media: Alternative Routes to Scientific Communications* (London: Routledge, 2014); Peter Galison, *The Architecture of Science* (Boston: MIT Press, 1999); C.L. Palmer, *Work at the Boundaries of Science: Information and the Interdisciplinary Research Process* (New York: Springer, 2013); Steve Fuller, *Social Epistemology* (Bloomington: Indiana University Press, 2002).

[131] Several versions of the "Cyborg Manifesto" exist, originally published in 1983. The most recent update can be found in Donna Haraway, "A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s", in *The Haraway Reader* (New York: Routledge, 2004).

canon and whether or not persons commit to the culture of physics. Artists, as the thesis investigates, have faced challenges in crossing many of these boundaries.

Sociologists have also studied CERN. Karin Knorr Cetina visited Meyrin several times over many years exploring gossip production and creation on-site, amongst other topics.[132] Knorr Cetina questioned the laboratory's confidence, and the pressure this put on staff to find certain results in their data.[133] Questioning Western "knowledge societies", Knorr Cetina asked how science creates knowledge, and who has access to this. Her observations about the work being done at CERN, and the dedication of CERN staff to discovering the same narrative (whether bosons or dark matter), show us why laypeople may find the organisation different and/or difficult to work with. Focusing on CERN staff, Knorr Cetina did not examine non-scientific staff members or visitors' work at the organisation. Thus this thesis extends her questioning of the production of knowledge and the culture of high-energy physics on-site.

Anthropologist Sharon Traweek also engaged in an analysis of high-energy physics laboratories in the 1980s and 1990s.[134] Her studies of the high-energy physics community are based on fieldwork in the United States and Japan, but many of her observations are relevant to CERN. One of her key questions is about what 'knowing' is for physicists, a complex query that has resulted in several anthropological studies of scientists in their element.[135] She studied the social organisation and informal/formal cultures of high-energy physics by observing physicists' behaviour, clothing, language, interests and more. Having observed physicists for many years she wrote about their "extreme culture of objectivity", an idea that is revisited and explored in this thesis:

> … physicists construct their world and represent it to themselves free of their own agency, a description of an extreme culture of objectivity: a culture of no culture, which longs passionately for a world without loose ends, without

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[132] Karin Knorr Cetina, *Epistemic Cultures: How the Sciences Make Knowledge* (MA; Cambridge; London: Harvard University Press, 1999).
[133] Knorr Cetina, *Epistemic Cultures,* 216.
[134] Sharon Traweek, *Beamtimes and Lifetimes: The World of High Energy Physicists* (MA; Cambridge: Harvard University Press, 1988); Traweek, "Tradition in the Training of Novice Physicists in Japan and the United States", *Journal of Asian Affairs* 5, no.2 (1980): 135–48; Traweek, "High Energy Physics: A Male Preserve", *Technology Review* 87 (1984): 42–43; Roddy Reid and Traweek, *Doing Science + Culture* (New York; London: Routledge, 2000).
[135] Traweek, *Beamtimes and Lifetimes,* x.

> temperament, gender, nationalism, or other sources of disorder – for a world outside human space and time.[136]

Traweek's writings are relevant to this subject, as artists and scientists involved in the CERN art programme speak about objectivity and creativity.[137] Comparing her findings on the culture of physicists to the experiences of artists at CERN, shows the importance of social structures in scientific institutions. There are other case studies of sociological investigations of laboratory life, such as Latour and Woolgar's study of the Salk Institute, which showed how the daily activities of working scientists lead to the construction of scientific facts.[138] These sociological and anthropological studies provide illuminating examples of the scientists' view of CERN in the 1980s and 1990s, but they do not engage with the non-scientists on-site.

0.2.e Other theoretical approaches

Finally, feminist theory informs this thesis in its focus on equality and power dynamics. As this thesis explores, female artists in SciArt, and at CERN specifically, often remain outsiders cut off from networks, funding and influence. As CERN artists are overwhelmingly male, feminist art history can help us make sense of the institutional, societal and cultural reasons for this. In a pioneering essay Linda Nochlin asked: "why have there been no great female artists" in order to focus on the institutional and historical barriers that held women back from the profession.[139] Nochlin was one of the pioneering feminist art historians who were concerned with how art represented women, and how art historians represented female artists. Arguing for an art historical approach that rejects methodological presuppositions, she urged art historians to focus on subject

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[136] Traweek, *Beamtimes and Lifetimes,* 162.

[137] In this work Traweek engaged with the discourse about objectivity in the philosophy of science. In this thesis the philosophy of science is not discussed, but several of the discussions about the value of science originate in this field. Detailed treatment of these questions can be found in Alexander Rosenberg, *The Philosophy of Science* (London: Routledge, 2000), Barry Gower, *Scientific Method* (London: Routledge, 1997) and Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W.W. Norton, 1998). Questions about the value of science are explored in Helen Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton: Princeton University Press, 1990).

[138] Latour, Woolgar, *Laboratory Life: The Construction of Scientific Facts,* 40; 274.

[139] Linda Nochlin, *Why Have There Been No Great Women Artists?* (New York: Macmillan, 1971).

matter and the work before their eyes.[140] Griselda Pollock, another early feminist art history pioneer, challenged the pre-existing canon and wrote extensively on artists such as Mary Cassatt and Eva Hesse, which in turn made their bodies of work more publicly known.[141] Warning against a feminist art history that reinforced existing binaries between men and women, Pollock argued for a more diverse reading of the canon, which included sexual, racial and political contexts.[142] Ann Sutherland Harris provided a new canon of female artists, shining a light on forgotten women from history.[143] Hilary Robinson charted the debates that occurred in the intersection between second wave feminists and artists.[144] Together, these scholars provided evidence of the many ways in which the art world, historically, has not considered diversity as important.[145] Parallel to this, groups such as the anonymous collective, Guerrilla Girls, used the language of advertising to ask questions such as "Do women have to be naked to get into US museums?"(referring to the high proportion of female nudes combined with the lack of female artists displayed) and "When racism and sexism are no longer fashionable, what will your art collection be worth?"[146]

Feminist history of science also informs this thesis. The field developed in the 1960s, rooted in academic feminist scholarship.[147] Sue V. Rosser's overview of feminist scholarship in science provides insight into the field up until the 1980s, a period where CERN was growing rapidly.[148] Rosser's survey does not identify any scholars working

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[140] Nochlin, *Representing Women* (London: Thames & Hudson, 1999); Nochlin, *Women, Art and Power: And Other Essays* (New York: Harper & Row, 1989).
[141] Griselda Pollock, *Vision and Difference: Feminism, Femininity and the Histories of Art* (London: Taylor & Francis, 2003).
[142] Pollock, *Differencing the Canon: Feminism and the Writing of Art's Histories* (London: Routledge, 1999), preface: xv.
[143] Ann Sutherland Harris, *Women Artists 1550–1950* (Los Angeles: LA County Museum of Art, 1976).
[144] Hilary Robinson, *Feminism-Art-Theory 1968–2000* (London: Blackwell, 2001, revised ed. 2014). Robinson will publish an edited volume, *A Companion to Feminist Art* (London: Blackwell) in 2016.
[145] Many of these voices were included in Norma Broude and Mary D Garrard (eds.) three volumes about feminist art history: *Feminism and Art History: Questioning the Litany* (CA; Berkeley; Los Angeles: University of California Press, 1982); *The Expanding Discourse: Feminism and Art History* (CA; Berkeley; Los Angeles: University of California Press, 1992); *Reclaiming Female Agency* (CA; Berkeley; Los Angeles: University of California Press, 2005).
[146] The Guerrilla Girls have been important drivers of feminist art history, including their book *The Guerrilla Girls' Bedside Companion to the History of Western Art* (London: Penguin Books, 1998).
[147] Sarah S. Richardson, "Feminist philosophy of science: history, contributions, and challenges", *Synthese* 177, no. 3 (December 2010), 337-362; 338.
[148] Sue V. Rosser, "Feminist Scholarship in the Sciences: Where Are We Now and When Can We Expect A Theoretical Breakthrough?" *Hypatia* 2, no. 3, Feminism & Science, 1 (1987): 5–17.

on CERN, but situates the growing debate about the lack of women in science in the historical study of physics and other disciplines. More recently, Richardson surveyed the fields of feminist science history and philosophy in the 1990s and early 2000s, charting the immense criticism directed at the subject, especially the still overhanging accusation of being 'anti-science'.[149] In the 1990s, Evelyn Fox Keller and Helen E. Longino's *Feminism and Science* provided an introduction to feminist science theory and history.[150] It included what would become some of the major voices within the field in the following twenty years, discussed below. The volume found that feminist perspectives could reveal political aspects of the sciences, and the ways in which diversity matters in institutions. An introduction to feminist science history can be found in *Women, Science, and Technology: A Reader in Feminist Science Studies,* which surveyed the field, including many of the same key scholars such as Haraway.[151] Most of this literature looks at all science, whereas Anna T. Danielsson has explored the role of gender in physics education and Margaret Wertheim analysed the gendered history of the field.[152]

Exploring CERN with feminist theory has helped illuminate the power structures at work behind the scenes of the art programme, and is not only confined to the question of diversity in this thesis. Feminist history and philosophy of science, which is still a small field, has contributed to our understanding of many aspects of science, but there has been no feminist analysis of CERN or of the links between the arts, sciences and diversity in high-energy physics.[153] While this thesis is not a feminist analysis of CERN, or a history of women at CERN, various aspects of such themes are included throughout. Furthermore, the focus of feminist science studies on the social dimensions of science has led to improvements in the practices of scientific knowledge production, offering a

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[149] Richardson, "Feminist philosophy of science: history, contributions and challenges", 353.
[150] Fox Keller and Helen E. Longino, *Feminism and Science (Oxford Readings in Feminism)* (Oxford: Oxford University Press, 1996).
[151] Mary Wyer, Mary Barbercheck, Donna Cookmeyer and Hatice Ozturk, *Women, Science, and Technology: A Reader in Feminist Science Studies* (London: Routledge, 2013).
[152] Anna T. Danielsson, *Doing Physics – Doing Gender: An Exploration of Physics Student's Identity Constitution in the Context of Laboratory Work*, doctoral thesis (Uppsala: Uppsala Universitetet, 2009); Margaret Wertheim, *Pythagoras' Trousers: God, Physics, and the Gender Wars* (New York: W.W. Norton: 1997).
[153] Richardson, "Feminist philosophy of science: history, contributions, and challenges", 338.

view of the sciences that is socially inclusive.[154] Feminist science studies, with their insistence on the examination of power structures and inequalities, informs this thesis with a social consciousness and concern for the actors involved.

Fox Keller's seminal work *Reflections on Gender and Science* revolutionised the field of science history in the mid-eighties, and still challenges historians of "big science" to think about how the lack of diversity in science and what this means.[155] Keller's scholarship brought up questions of cause and effect as it relates to equality and knowledge production. She explored why objectivity and reason are characterised as male, and subjectivity and emotion as female, asking how these tropes affect the methods of scientific inquiry.[156] While Fox Keller did not write about CERN, her analysis is relevant to this thesis as it explores the perceived differences between the subjective arts and the objective sciences. Fox Keller asked if the "nature of science is bound up with the idea of masculinity."[157] This thesis expands upon that question in its exploration of SciArt by discussing questions of diversity at CERN, in SciArt and in Arts@CERN.

Margaret Rossiter's expansion of Robert K. Merton's 'Matthew principle' combines the sociological and feminist approaches used to investigate scientific culture. In sociology the principle refers to the phenomenon of accumulated advantage, inspired by the Bible reference to this in the Gospel of Matthew.[158] Rossiter added to the phenomenon in her 'Matilda principle', an effect that denies female scientists credit for their work. Rosalind Franklin, Lise Meitner and Jocelyn Bell Burnell are examples, but so are a number of anonymous women working throughout the sciences. Rossiter's work expands the problem of credit in the sciences to include and examine women, thus not only addressing gender balance but also power relationships. Sandra Harding, in her critique *The Science Question in Feminism,* reviewed whether androcentric science

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[154] Richardson, " Feminist philosophy of science: history, contributions, and challenges", 357-358.
[155] Evelyn Fox Keller, *Reflections on Gender and Science* (New Haven; London: Yale University Press, 1985).
[156] Fox Keller, *Reflections on Gender and Science,* 3-4.
[157] Fox Keller, *Reflections on Gender and Science,* 3.
[158] Merton, "The Matthew Effect in Science: Cumulative Advantage and the Symbolism of Intellectual Property", *Isis* 79, no. 4 (Dec 1988): 606–23; Margaret W. Rossiter, "The Matthew/Matilda Effect in Science", *Social Studies of Science* 23 (London: SAGE Publishing, 1993): 325–41.

poses a problem to knowledge production.[159] Karen Barad's "agential realism", a feminist epistemological intervention in understanding scientific practices, provides interdisciplinary thinking on gendered issues in knowledge production.[160] As a physicist, Barad is concerned not only with the social and cultural pressures that cause problems for women in her field, but also the ways in which physics itself can alienate women through its language and goals. This alienation can also be seen in the exclusion of certain types of scientists, artists and laypeople by CERN, a point that is further discussed in chapters one, two and five. In Londa Schiebinger's contribution to the feminist study of science, the question of gender in the institutions of science is fundamental. In books such as *The Mind Has No Sex? Women in the Origins of Modern Science,* she was part of the push towards understanding whether science itself is gendered.[161]

These theoretical analyses of science show how the sciences have been and are masculine and male spaces, an observation also made in this thesis in the case of CERN.

In addition, I draw on Pierre Bourdieu's theories of cultural capital.[162] This theory refers to the non-financial assets that advance a person or an organisation, for example intelligence, physical appearance, creativity or education. I use these ideas to show how CERN is drawing on both scientific and non-scientific capital in order to capitalise on the art that has been inspired by its work. This lends itself to an institutional analysis of CERN as it relates to individual artists, and shows how the organisation's art programme is about far more than making art.

The literature utilised in this thesis thus draws upon several schools of art history, the history of science and physics, science communication and branding, sociology and

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[159] Sandra Harding, *The Science Question in Feminism: Industrial Policy in Europe* reprint ed. (Cornell University Press, 1986).

[160] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham; London: Duke University Press, 2007).

[161] Schiebinger has made many contributions to the feminist study of science: *The Mind Has No Sex? Women in the Origins of Modern Science* (MA; Cambridge: Harvard University Press, 1991); *Nature's Body: Gender in the Making of Modern Science* (New Brunswick: Rutgers University Press, 2004) and *Has Feminism Changed Science?*, first published 1999 (MA; Cambridge; London: Harvard University Press, 2001).

[162] Pierre Bourdieu, translated by Richard Nice from French, "The Production of Belief: Contribution to an Economy of Symbolic Goods", *Media, Culture and Society* 2 (1980), 261-293. Extract from *Actes de la Recherche en Sciences Sociales* 13 (1977), 3-43.

anthropology, and feminist theory. Each discipline lends new perspectives to the study of CERN, and is combined in new ways in this thesis.

0.3 Chapter overview

This thesis is structured in five chapters in which I discuss CERN's relationship to the arts. These chapters are divided into five themes: 'Image', 'Contracted', 'Pasts', 'Control', and 'Artists'. This structure zooms in on its subject, from the context of politics and science, to SciArt, to the history of art at CERN, the organisation's cultural policy, and finally a discussion of the artists at CERN today. This is followed by a conclusion that includes key findings and potential for future work.

The first chapter, 'Image. Situating CERN in a Time of Change, Marketing and Pressure', locates the non-scientist's role at CERN, laying the groundwork for understanding CERN artists' reactions and work at the organisation. Comparing their experience to other laypeople at CERN, the chapter introduces questions of hierarchy as relating to CERN. Artists meet with many of the same problems and interpretations as other groups, and through an overview of the PR narratives and branding of CERN, these themes are explored.

The second chapter, 'Contracted. SciArt, PR and the Values of Science', places art at CERN in the specific and contemporary context of SciArt. It examines how the field commercialises both science and art through an analysis of the history of SciArt and the art market, and through exploring whether CERN artists are contracted to CERN in a creative as well as financial manner.

The third chapter, 'Pasts. A History of Art at CERN', examines the history of art at CERN prior to the Arts@CERN programme. Rooted in archive material and interviews, it introduces artworks, artists and projects ranging from archaeology to architecture, performance to graffiti. In addition, I examine the smaller group of examples of art that critically engages with CERN. The chapter highlights how Arts@CERN produces many of the tropes of SciArt, yet other interpretations of the organisation are possible. The chapter includes a chronological "walk" through the laboratory, stopping for visual analysis and art historical examination of on-site artworks.

The fourth chapter, ‘Control. CERN’s Cultural Policy for Engaging with the Arts’, looks at the new CERN cultural policy named Great Arts for Great Science. First, it situates the policy in questions of timing, branding and media relationships in and beyond CERN. Second, the chapter provides a close reading of the policy itself in order to make clear its relationship to the local and international artist residency competition Collide@CERN. Finally, I discuss the artist-in-residency programme, including the creation of winners and losers in the new structure of the competition.

The final and fifth chapter, ‘Artists. The Collide@CERN Residency’, explores the Collide@CERN residency art and artists, against the backdrop of the analysis of CERN, SciArt, and branding developed in the previous chapters. Structurally, this chapter examines themes that I have identified as important to the seven winning artists and their experience at CERN: the type of artists who win the competition (demography, stage of artists’ career and art medium), the artist experience of CERN, the outcomes of the residency (lectures, interventions, art and networks), the artists’ confidence, and the benefit gained by the artists when accepting the residency.

Individually, the chapters focus on separate questions: Who is part of CERN’s official narrative today? What is the origin of SciArt, and how is the art form utilised at CERN? What does the history of CERN art tell us about the organisation? Why has CERN created a cultural policy and a cultural board? Who are the Arts@CERN artists, and what does their art and presence at CERN communicate? Together, these five chapters examine the role of artists and art at CERN.

CHAPTER ONE

Image. Situating CERN in a Time of Change, Marketing and Pressure

> Look here comes the missionary
> With his smallpox and flu
> He's saving them, the savages
> With the Higgs Boson Blues
> I'm driving my car down to Geneva
> I'm driving my car down to Geneva
>
> Nick Cave and the Bad Seeds, lyrics from "Higgs Boson Blues", 2013.

> As a layman I would now say, I think we have it.
>
> Director General Heuer, announcing the Higgs boson, 2012.

1.1 Introduction

When CERN's Director General Heuer announced the discovery of the Higgs boson at a CERN workshop/press conference in 2012, he used what he perceived to be the "language of laypeople" to triumphantly declare the breakthrough.[1] Heuer's happy expression; "I think we have it", was in turn picked up by all the major broadcasters, newspapers and social media sites in the world.[2] Whilst Heuer was co-opting the language of laypeople, artists used theirs to communicate a broad array of opinions about CERN. These opinions, both positive and negative, have also been communicated by other groups throughout CERN's history. These groups include CERN dissenters who disagree with the organisation's scientific mission, female staff members who protest against inequality, and conspiracy theory groups who seek to damage the organisation's reputation, as this chapter explores. CERN is a project that has attracted a lot of media and public attention, which is the reason for the organisation's long history

[1] Director General Heuer's announcement was followed closely by many mainstream news outlets. For example, the BBC live-streamed the event, "Higgs boson: "We have it"', BBC News website (4.06.2012): available online: http://www.bbc.co.uk/news/science-environment-18701200 (accessed 28.03.2016).

[2] A complete overview would take up hundreds of pages, but some examples (all online, as most included live-streams of the events from the conference in Meyrin) include BBC News ("Higgs boson: "We have it", 4.06.2012); *The Telegraph* ("Higgs Boson announcement from CERN: as it happened", 4.06.2012); *New Scientist* ("Celebrations as Higgs boson is finally discovered", 4.06.2012); *The Guardian* ("Higgs boson announcement: CERN scientists discover subatomic particle", 4.06.2012); *The New York Times* ("Physicists Find Particle That Could Be the Higgs Boson", 4.06.2012).

of PR. In this chapter CERN's history of public relations is presented for the first time alongside examples of the public's reactions to its work throughout the years. As exemplified by the Director General's use of layperson terms above, CERN has a long history of engaging directly with the public and the media. This chapter examines that engagement, as well as exploring the public and media interests and opinions about the organisation.

1.2 The history of PR at CERN

When the first Director General of CERN, Felix Bloch, took up his post in Geneva in 1954, his role entailed a lot of heavy administrative duties and a position that meant sacrificing much of his own scientific work.[3] He resigned the following year.[4] The case study of Bloch was an early hint of what was to come for staff at CERN: an increasingly bureaucratic structure which entailed working extensively with public engagement and the media. The goal of creating a "scientific spirit" in a "university-like atmosphere" proved difficult at the start. It did not get off of the ground until CERN committed to engaging with a broader audience than only physicists.[5] By the time Bloch had left, he had tried to impose a "scientific spirit". This was to be based on America's approach to academic research, which was embedded in military funding and national defence, business and patents, corporate profits and personal wealth.[6] But CERN had been sold to funders and European governments as a decidedly European, peaceful and collaborative project. The UN was calling for international scientific structures that could thaw tense post-war relationships and utilise science to improve the living conditions of mankind.[7] CERN, whose work had no immediate practical outcomes, would have to rely on the other focus: creating a peaceful, international and intellectual atmosphere completely divorced from any notions of danger, war or nuclear threats. In order to make the public

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[3] Letter from Bloch to Lockspeiser, 14.01.1955, CERN. Uncatalogued, but available in CERN History project in the CERN archives: CHIP-23-1: Directors-Generals of CERN (1954-1975).
[4] For a detailed account of Bloch's time at CERN see "The nomination of the first Director General and its aftermath", in Hermann et al., *History of CERN. Volume I,* chapter 8; and John Krige, "Felix Bloch and the creation of a "scientific sprit" at CERN", *Historical Studies in the Physical and the Biological Sciences* 32, no. 1 (2001), 57-69.
[5] Krige, "Felix Bloch and the creation of a "scientific spirit" at CERN", 58.
[6] Stuart W. Leslie, *The Cold War and American science. The Military-Industrial-Academic Complex at M.I.T and Stanford* (New York: Columbia University Press, 1993).
[7] Hermann et al., *History of CERN. Volume I,* 65.

associate CERN with the former and not the latter, PR became a cornerstone of the ways in which the young organisation communicated its worth to the outside world. As early as 1953, when the architect was still drawing up plans for CERN's physical presence in Meyrin, the founding group was pursuing PR goals. That year, a survey of all local libraries and periodicals was conducted in order to decide where to "place articles", and CERN had a stand at the Exposition d'Electricité in Geneva, which was open to everyone. The stand was so popular that the prepared descriptive leaflets were rapidly exhausted, and it was decided to create another brochure compromising official texts and explanatory comments.[8] One year later, the Public Relations Section officially became part of the Scientific and Technical Services at CERN, with key responsibilities including press releases, organising interviews, contacting international media outlets, preparing leaflets and distributing information. The need for a dedicated press office was felt to be important, owing to the rapid growth of CERN, and of its reputation throughout the world. It was seen as desirable that the dissemination of non-scientific and non-technical information concerning the organisation "should be given extremely close attention and should be closely linked with the general policy of the Organization."[9] The importance of PR "must not be underestimated" warned the early working group.

A draft of what was expected of the CERN press office included disseminating documents to member states and non-member states, preparing information booklets, spreading scientific knowledge from CERN in non-scientific circles, communicating with the non-scientific press, organising press conferences, keeping a full record of all material published about CERN throughout the world, organising public lectures, receiving official and non-official visitors, guiding visitors, and the laying of the foundational stone.[10] This was a success, and soon visits had to be limited to five half days a week in order to enable the staff to do other work besides showing visitors around the organisation.[11] By 1957 Scientific and Technical Services were struggling to carry

[8] Minutes from the eight session of the Council of CERN (14.01.1954): III: Progress Report of the Laboratory Group (by Lew Kowarski, 16.10 – 31.12.1953): minute 5 (Information), 29.
[9] CERN/192 Committee of Council 31.10.1956: The Public Relations Service, 1.
[10] CERN/192 Committee of Council 31.10.1956: The Public Relations Service, 1-3.
[11] CERN/235 Minutes of the seventh session of the CERN Council 28.06.1957: Progress report of the Director General and divisional directors, 5.

out all of their survey work on technical and scientific options at CERN, as well as doing PR. The PR section was therefore placed under the supervision of the Director General, renamed the Public Information Office (PIO), and allocated dedicated staff.

At the same time CERN focused on its peaceful credentials in its communication to the outside world. Victor Weisskopf, Director General from 1961–1966, was particularly active in the anti-nuclear peace movement and was appointed by Pope Paul VI to the Pontifical Academy of Sciences in 1975 specifically to address the problem of nuclear weapons. Likewise, the first Head of the PIO, Edwin Shaw, was crucial in cementing the relationship between CERN and the European public until he left the post in 1976. During his term of office he used his knowledge of journalism to treat the media "honestly and professionally", and by the '70s the PIO had a reputation for being very welcoming to the media.[12] Shaw was asked to help other European scientific organisations (European Southern Observatory, European Molecular Biology Organisation and European Physical Society) to improve their relationships with the media.[13] In 1959 Shaw helped establish the staff newsletter, *CERN Courier* (outsourced to the Institute of Physics Publishing in the UK in 1998), where he brought on-board professional editors and managing directors of scientific journals.

The *CERN Courier* (also known as the *Courier)* is a good place to start to understand what CERN staff thought about the organisation.[14] Letters and opinions have always been a part of the newsletter, expressing individual thoughts about their employer. In the eighties, the *Courier* conducted a readership survey that found that although 96% judged the newsletter to be excellent, "a few readers reacted strangely to what they perceived as an exaggeratedly pro-CERN bias". These readers protested that the *Courier*'s style was "too rosy", and the newsletter in turn defended its tone by recognising it as "part of our mission".[15] Thus, the *Courier* was itself a piece of internal PR, directed towards staff and the high-energy physics community. While the readers

[12] CERN, "Departure of Ted Shaw" (1976), CERN archives, available online: http://lib-docs.web.cern.ch/lib-docs/Archives/biographies/Shaw_ET.pdf (accessed 6.03.2016).
[13] "Departure of Ted Shaw" (1976).
[14] The online archive of the *CERN Courier*: http://cerncourier.com/cws/latest/cern (Accessed 28.03.2016).
[15] "Readership Survey", *CERN Courier* (November 1984), 38.

appreciated the tone of the publication, the few unhappy voices reveal that internal CERN people could also be critical of their employer's mission.

During the same period, CERN PR was thriving, and in 1984 it expanded to become the Public Relations Service. Four years later, the Director General gave the green light to start work on the visitor centre, and in 1994 the CERN souvenir shop opened (now also online). The CERN press office worked with new formats of PR to communicate its message, opening social media accounts and utilising films to communicate its message of peaceful science internationally. The press office's involvement with film making can be seen in their work on the films 'Matter in Question' (1960), 'Shadows of Bliss' (1973), 'Inside CERN (1974), 'At CERN: exploring the invisible' (1983) and 'Euro Big Bang' (1994).[16] These films include scientists explaining CERN's work, but also visually interesting sections of animations and drawings. Communication has in this sense always been creative at CERN. But this does not mean that it comments on or embraces all creative interpretations of CERN.

When I asked about CERN's official comment to Nick Cave's "Higgs Boson Blues", the current Head of Communications James Gillies wrote: "CERN appears a lot in popular culture and we generally do not make any comment."[17] In fact, as this thesis examines, CERN enjoys commenting on culture that engages with it, especially if there is something to be gained from the interaction. Gillies' comment unveils a hierarchy of PR that privileges certain interpretations of CERN over others. In general CERN is wary about sullying its hands with popular culture, but there are exceptions to this rule.[18] As explored in chapter three, the press office comments on certain genres and categories of art, whereas "Higgs Boson Blues" falls outside of their scope. Gillies' classification of the song as "popular culture" also exemplifies the organisation's attitude to interpretations of its work. Nick Cave is a highly respected musician, a prize-winning author and a popular celebrity. In this sense he is as much part of the elite art world as CERN artists like Antony Gormley, who is also famous. The difference is that Cave's

[16] The CERN archives' 'Film scripts' collection contains correspondence from the PIO to organisations such as the French film production company Compagnie Lyonnaise de Cinéma and private individuals in order to promote and distribute the various CERN films. It also contains various publications and reviews about the CERN films.
[17] Email from James Gillies to Røstvik, 6.11.2014.
[18] See for example below regarding Will.i.am and TV on page 78.

interpretation of CERN is communicated through the popular medium of a pop/rock song, rather than in an abstracted art form. Whether or not "Higgs Boson Blues" is worth CERN commenting on depends on the organisation's view of the arts. Invested in a "high art" programme focused on excellence today, CERN has clearly defined its view on the arts. CERN does not have time to comment on depictions of itself in "popular culture", but it does have time to create, manage and promote a traditional art programme. Fine art (including that which utilises modern technology) has a long history of promoting a patron or sponsor's interests, whereas popular art - being less likely to receive such patronage – is freer arguably to "speak truth to power" and to the institutions that wield it.[19] Furthermore, institutions and organisations have a long history of deeming popular culture unimportant, vulgar and unintellectual. Nick Cave's song provides a fascinating example of CERN drawing distinctions between "popular culture" and "high art" is, giving insight into its official view of the arts. It also reveals what CERN seeks to publicly engage with as part of its brand building. Focusing on quality rather than quantity, CERN's public engagement has been highly selective, in contrast to other scientific institutions that usually privilege quantity over quality.[20] Aware that public attention does not guarantee public support, CERN has built its brand identity in a careful manner.

1.3 Branding

Like any large organisation, CERN cultivates and manages a brand identity. Several writers have discussed the consequences of "selling science", questioning the relationship between research, PR, media and commerce.[21] Naomi Klein has argued that branding is one of the main drivers behind modern capitalism, especially in the selling of lifestyles and identities to a wide audience.[22] Jonathan Schroeder asserted that it is not

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[19] Adam Gopnik and Kirk Varnedoe, *High and Low: Modern Art and Popular Culture* (New York: Museum of Modern Art, 1993); Wesley Monroe Shrum Jr., *Fringe and Fortune: The Role of Critics in High and Popular Art* (Princeton: Princeton University Press, 1996).
[20] Rick E. Borchelt, "Public relations in science. Managing the trust portfolio" in Bucchi and Trench (eds.) *Handbook of Public Communication of Science and Technology,* 148.
[21] See for example Dorothy Nelkin, *How the Press Covers Science and Technology*, first published 1987. (London: W. H. Freeman & Co, 1995); Nicholas Russell, *Communicating Science: Professional, Popular, Literary* (Cambridge: Cambridge University Press, 2010); Bucchi and Trench (eds.), *Handbook of Public Communication on Science and Technology* (London: Routledge, 2008).
[22] Naomi Klein, *No Logo,* 5-56.

only managers and consumers who shape a brand together, but also the context of culture.[23] The symbolic gestures, performance, identity politics and aesthetics of an organisation are what make its brand.[24] Krige has written about CERN's tendency to publicise events before they are peer-reviewed, as in the case of the W and X boson discoveries of 1983, recognising this as a political as well as a scientific success.[25] These publicity decisions are also shaped by the culture of the organisation. CERN is legitimised only when others see its work. It used to be enough that scientists undertook this review, but today the validation process of a non-applied scientific project includes non-scientists and non-scientific issues. Reinforcing Krige's assertion that CERN has historically sought to improve its visibility through media campaigning, networking and marketing, the Higgs boson discovery was leaked to the media by the organisation prior to the announcement. Historically, CERN has built a brand on such success stories, alongside focusing on its atmosphere of creativity. For example, the size and international scope of CERN was both practical and one based on international diplomatic decisions.[26] The laboratory management made this pragmatic solution into a cleverly marketed image where every possible opportunity to enhance their profile was grasped.[27] These aspects are still celebrated at CERN today. For example, the anecdote of Jewish and Arab CERN staff who drink tea together, is frequently told.[28] Will Self, in his analysis of CERN for BBC Radio in 2015, added that: "the fact that it's a kind of international talking-shop where Palestinians and Israelis hold summer parties doesn't impress me, you get that in the world of Sudoku."[29] But CERN's PR system actively

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[23] Jonathan Schroeder and Miriam Salzer (eds.), *Brand Culture* (London: Routledge, 2005).
[24] For a discussion of cultural brand strategies in the global business world today see Jonathan Schroeder, *Brands: Interdisciplinary Perspectives* (London: Routledge, 2015).
[25] Krige, "The Public Image of CERN" in John Durant and Jane Gregory (eds.), *Science and Culture in Europe* (London: The Science Museum, 1993), 153–57.
[26] "Such a laboratory would not only unite European scientists but also allow them to share the increasing costs of nuclear physics facilities." CERN History Timeline on the CERN website: http://timeline.web.cern.ch/timelines/The-history-of-CERN (accessed 10.04.2016).
[27] Krige, "The Public Image of CERN", 153.
[28] The tea-drinking Jews and Arabs also appear in the documentary *Particle Fever,* the exhibition *Collider* and the CERN coffee table books.
[29] Will Self, "Self Orbits CERN: Episode 2, Bamboozled", BBC Radio 4 (first broadcast 6 January 2015). After Self's radio programme the BBC has produced many articles and programmes about the work of CERN in its traditional celebratory tone. The latest example is "Dancing in the Dark: The end of Physics?", first aired 17 March 2015. The documentary explored what will happen when the LHC switched on again in 2015. Self's radio programme should therefore be approached as a one-off in the relationship between the BBC and CERN.

tries to reinforce this image, inviting the public to share in its expert knowledge.[30] Ian Hacking asserts that as a large-scale scientific laboratory matures it becomes "a closed system" which is both irrefutable and "self-vindicating in the sense that any test of theory is against apparatus that has evolved in conjunction with it…"[31] Latour names the boundary between scientists and amateurs as an insider/outsider relationship. The insider's control over the obligatory passage points gives them the necessary access to be part of a closed network that produces specific knowledge.[32] If CERN is such a closed network, then PR becomes a crucial strategy for remaining a welcoming entity. Without the machines, information and rules that make up CERN, the public cannot fully access the network. The CERN press office can bridge some of these transparency gaps in the creation of an inclusive narrative. But the accepted CERN narrative is not the only version that exists. As the *Courier* reader survey showed, a minority of CERN staff did not accept the "rosy" depiction of the organisation's work. Likewise, some artists provide intriguing alternative readings of CERN. One such example from recent years is the song "Higgs Boson Blues", which we now return to in detail.

1.4 "Higgs Boson Blues"

In 2013, Nick Cave and his band The Bad Seeds released the single "Higgs Boson Blues."[33] Written and composed by Nick Cave and Warren Ellis, the lyrics engage in the media frenzy surrounding the discovery of the particle in 2012. In the song, singer Cave questions the Higgs boson, comparing and contrasting it to popular culture phenomena and narratives of social justice. The song sets the stage for a discussion about the Higgs boson centred on its potential value. The lyrics express concerns about the hierarchies and relationships within high-energy physics.

Cave's song is one example of art that engages with and is not endorsed by CERN. It sets out a confusing trajectory of associations for the organisation. The narrator claims ownership over the information through his passive-aggressive offer of

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[30] Merton describes this as the "Insider Doctrine" in "Insiders and Outsiders", 11–12.
[31] Ian Hacking in Andrew Pickering (ed.), *Science as Culture and Practice* (Chicago: Chicago University Press, 1992), 30.
[32] Latour, *Science in Action* (MA; Cambridge: Harvard University Press, 2008), 150; 182.
[33] Nick Cave and Warren Ellis, "Higgs Boson Blues", song from *Push the Sky Away* (France: Bad Seed Limited, 2013).

"teaching it" to the anonymous female "baby", presumably another layperson. The relationships and transformations of gender and mass are highlighted as Cave growls over Hannah Montana, the fictional teen princess character played by Miley Cyrus, who is now known for sexually explicit fashion, videos and dances. The television character Montana and the real woman Cyrus, are both utilised by media to create unrealistic representations of women; the former is a perfect teen girl, the other a sexually promiscuous superstar. Both represent parts of the real woman behind the characters that few people know.[34] The song explores characters as fictional and real, or as mass and non-mass, alluding to the Higgs boson's properties.[35] Finally, Cave ends on a haunting note: "And you're the best girl I've ever had. Can't remember anything at all." With this sentence Montana, Higgs and others become forgettable names. Cave's voice becomes feebler, smaller, disappearing into the background noise. It is decaying.

Cave's "Higgs Boson Blues" is also art inspired by CERN, but it is not included in the official Arts@CERN canon. While Nick Cave's critically acclaimed song has not received official attention from CERN, Brian Cox did the job of presenting a scientist's view of the piece in the popular music weekly *Q Magazine*. Cox is also a former artist, a musician in the popular 1990s band D:Ream.[36] He commented:

> "Without the Higgs boson he [Nick Cave] wouldn't exist. So he should be rather happy it exists", suggests the prof. "He couldn't have written the song without it, so the 'Higgs Boson Blues' is a rather inaccurate thing to have. He would be a lot more miserable without it." Or would he?
>
> "Well he wouldn't because he wouldn't exist", adds Cox on reflection. "So he would neither be miserable or happy if the Higgs boson vanished. He'd just be a load of fragments travelling through the universe at the speed of

[34] In the months before Cave launched his new album, Cyrus was released from her Disney contract, which had tied her to playing the role of teenage 'good girl' Hannah Montana for years. Released from the contract, Cyrus took on another character whilst recording her first independent non-'Disneyfied' record. She publicly explored marihuana, bisexuality, sex and violence whilst dressed in a comic book-like pastiche of her former self. Cyrus became one of the biggest celebrities of 2013 and, through her music videos, is still prominent in popular culture. Barrie Gunter, *Media and the Sexualization of Childhood* (London; New York: Routledge, 2014), 136.

[35] CERN defines the Higgs boson as "one of two types of fundamental particles, and it's a particular game-changer in the field of particle physics, proving how particles gain mass." Cian O'Luanaigh, "The Basics of the Higgs Boson", CERN website (22.05.2014).

[36] D:Ream's most famous song was "Things Can Only Get Better" from 1994 and was used for the New Labour UK election campaign under Tony Blair, who won and became UK Prime Minister.

light. Maybe that should upset him."[37]

While the platform is entertainment and not pedagogy, his literal reading is one that explains human existence through CERN's work. In CERN's decision-making on what type of art to comment on, there is an opening to understanding what sort of product CERN sells and what branding this is enveloped in. "Higgs Boson Blues" is not art, but "popular culture", as Gillies, giving the official CERN view, defined it. The institution is thereby replicating an established relationship between the arts and its patrons. Genres such as pop/rock, graffiti, television, podcasts, popular science writing, crafts and others have all been criticised for not being serious, clever or important enough for serious consideration.[38] In the arts this is reinforced by scholarly art historical study of the traditional canon. CERN is not alone in supporting this hierarchy, as it is simply reinforcing a view of popular culture as something other than culture worth investing in and taking seriously. "I'm driving my car down to Geneva!!" warns Cave, but he will, without the help of the right people, find only what the first Collide@CERN residency winner Julius von Bismarck described as a "door in a mountain", remaining shut.[39] In a time of financial crisis, CERN is gearing up to fight for its future with strategic engagement and impact. "Higgs Boson Blues" is not part of this charge towards the future.

Physics has enjoyed being centre stage of Western science in recent decades.[40] At CERN, being in the public eye is a question of survival, as the organisation is funded by public money.[41] Today, CERN has to compete with many European "big science"

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[37] *Q Magazine*, "The Science of Nick Cave's *Higgs Boson Blues* by Professor Brian Cox", Q322 (2013).
[38] Irwin William and Jorge J. E. Gracia, *Philosophy and the Interpretation of Pop Culture* (Plymouth: Rowman & Littlefield, 2007); Brenda Jo Bright, *Looking High and Low: Art and Cultural Identity* (Tucson: University of Arizona Press, 1995); Berys Gaut and Dominic Lopes, *The Routledge Companion to Aesthetics* (London: Routledge, 2013), part II: Aesthetic Theory about the definitions of art (Stephen Davies, chapter 21), categories of art (David Davies, chapter 22) and the ontology of art (Guy Rohrbaugh, chapter 23). The classic text on taste, class and art is Pierre Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, first published 1979 (London: Routledge, 2013).
[39] Von Bismarck, first Collide@CERN lecture (25.09.2012).
[40] Clive Cookson, "The Shape of Physics to Come", *Financial Times: Physics Special,* 18.10.2013.
[41] Alok Jha, "One Year On From the Higgs Boson Find, Has Physics Hit the Buffers?", *The Guardian* (06.08.2013): https://www.theguardian.com/science/2013/aug/06/higgs-boson-physics-hits-buffers-discovery (accessed 28.03.2016).

projects for the same funding. Compared with when the organisation was founded, this underlies the organisation's public engagement strategy today. Reminiscing about the past, where funding was also hard fought for, but more flexibly spent and controlled, CERN affiliate and Nobel Prize winner Carlo Rubbia noted that "the 'Belle' epoch" of CERN had been a time when any idea, "however crazy it is", was considered for funding.[42] Today, each expansion and new idea has to be carefully fought and budgeted for. Science writer Jim Baggott has coined the term "Fairytale Physics" to start a discussion about how physics is becoming more and more expensive, and not providing real answers to real questions.[43] Baggott labels the tendency towards purity "a utopic attitude", with CERN as a notable example. He asked if there was a final reality for physics, or if the proliferation of data and machines will continue proliferating endless options.[44] Baggott argues that unless the field aligns itself with the medical sciences or other commercial opportunities, governments will start questioning the cost of high-energy physics, if not the science itself. The as yet undiscovered realities of CERN products are being sold today, often in advance before the ideas become real products. The potential for medical spin-offs is a strong focus for CERN.[45] The promise of products is a claim that is often difficult for non-scientists to evaluate, yet it is this claim that is increasingly legitimising CERN and the annual membership fee. In this discourse and economy of promise, the boundaries between actual and possible science is unclear.[46] Defining and explaining nature thus becomes a task for some specialist groups, whose promises many believe and whose equipment many trust.

While CERN is not a commercial organisation, its survival depends on being

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[42] Carlo Rubbia, *Infinitely CERN: Memories from Fifty Years of Research* (Place of publication unknown: CERN and Editions Suzanne Hurter, 2004).

[43] Baggott describes himself as pro-science and has written extensively on physics in a popular science format. He wants both CERN and non-applied physics to flourish, but with more results and less waste. Jim Baggott, *Farewell to Reality: How Fairytale Physics Betrays the Search for Scientific Truth* (London: Constable, 2013).

[44] Baggott, *Farewell to Reality*, xii.

[45] Marina Giampietro, "Accelerators for Medicine", CERN website/About CERN/Accelerators section (11.04.2013): http://home.cern/about/updates/2013/04/accelerators-medicine (accessed 31.03.2016).

[46] On the discourse and economy of promise see Kristin Hagen, Margret Engelhard and Georg Toepfer (eds.), *Ambivalences of Creating Life: Societal and Philosophical Dimensions of Synthetic Biology* (New York: Springer, 2015), 107; Bernadette Bensaude-Vincent, "Between the Possible and the Actual: Philosophical Perspectives on the Design of Synthetic Organisms", *Futures* 48, 23-31; Bauer and Bucchi, *Journalism, Science and Society*, 75.

commercially minded. It seeks to build ever-larger machines, and therefore it needs more financing. Thus, the organisation does not only work on pure theory, but also with pragmatic decisions for its own future. CERN is not only creating jobs, it is increasingly creating more of its produce; imagining itself as the only possible manufacturer, rendering others dependent on its work. CERN's intellectual capital and its constant drive for larger machines cannot, as is the case with any market, continue to grow unchecked forever. It is fighting for its own "happily ever after". Dependent on public money, CERN can only sustain itself through public and political support. With the inclusion of Israel as a member state in 2014, CERN is expanding beyond Europe. As Director General Heuer put it: "The E in CERN stands for everyone now, not just Europe".[47] However, countries such as Spain have recently struggled with paying the membership fee, in part due to the economic crisis.[48] The debt has now accumulated to fifty million euros, resulting in a small CERN delegation travelling to Madrid in order to discuss the increasingly difficult subject in 2013.[49] Thus, CERN needs the financial support of other member countries and funders more than ever. Popular culture, and its frequent anti-establishment attitude, can damage the relationship between CERN and the public. In this sense, "Higgs Boson Blues" does nothing for CERN's image, and was not found worthy of commenting on.

1.5 Image

In online media, images have become increasingly easy to produce, reproduce and spread.[50] Walter Benjamin and André Malraux both worked on expanding Marx's concept of mechanical reproduction. Benjamin, concerned about image and politics, wrote about the lack of "aura" in the reproduced image, whereas Malraux sought a more

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[47] Heuer at the European Physical Society Meeting EPS2011. Quoted by Jon Butterworth, "Lepton-photon, and some hadrons, in Mumbai", *The Guardian* (20.08.2011): accessed online: https://www.theguardian.com/science/life-and-physics/2011/aug/20/1 (accessed 9.03.2016).
[48] Miles Johnsen, "Spain on Collision Course with CERN", *Financial Times* (18.01.2013): http://www.ft.com/cms/s/0/089ccd76-618b-11e2-82cd-00144feab49a.html (accessed 28.03.2016).
[49] Spain has similar issues with the European Space Agency and the European Science Foundation, and it might pull out of the planned European Spallation Source in Scandinavia.
[50] Walter Benjamin, "Art in the Age of Mechanical Reproduction", *Illuminations*, first published 1936 (London: Pimlico, 1999); Andre' Malraux, "The Museum without Walls", *The Voices of Silence* (New York: Doubleday & Company, 1953).

democratic visual institution through the idea of an "invisible museum". Both these ideas can be extended to the age of the Internet, in which the boundaries in the discussions between those who feel authenticity is lost and those who celebrate its democratic nature are still in debate. This is a fact that both CERN and artists have to come to terms with quickly, and it is also a matter of PR. In this section I discuss the public image of CERN and the imagery it produces as it seeks to be seen as a holistic organisation.

Relying on images to sell a message can benefit scientists and CERN. In *No Logo*, Klein sums up the social media age before social media existed, stating: "Competitive branding became a necessity of the machine age – within a context of manufactured sameness, image-based difference had to be manufactured with product."[51] Images, combating "sameness", can set not only projects and people apart, but shape the way the media portrays and interacts with an organisation.[52] They function as symbols in art, presenting the viewer with directions about how to read the message. Images wrap around the everyday realities of doing physics, creating a glamourous image (**Fig. 1–4**).[53]

As in many large organisations visual guidelines are an important part of the actual branding policy. At CERN these were developed during the 2000s. We can get some insight into the importance of CERN's views on its own visual image through reading a statement from Director General Heuer:

> The visual image we project carries an important message about CERN to the world, and as our visibility grows it's increasingly important for that message to be that CERN is a modern and innovative organisation with a clear sense of its own mission. That is why we are launching a graphic charter for CERN to carry a unified and consistent image across all of our communications from business cards and letterheads to CERN's fleet of vehicles. (…) A graphic charter is a living resource that will evolve along with the organisation. Adoption of the charter will allow us to project a clean and coherent image to the world, worthy of the fundamental values

[51] Naomi Klein, *No Logo*, 6.
[52] Mellor, "Between Fact and Fiction…", 509.
[53] For a discussion of the everyday reality of making physics see Latour and Woolgar, *Laboratory Life.*

of the Organisation.[54]

As the statement reveals, the new policy is connected to the growing visibility of CERN, which has been mostly positive for the organisation. It sets out to ensure control and standardise forms. These visual guidelines expose the insecurities about image(s) at CERN and the wish for a "clean and coherent" message. Media training and visual guidelines help people who do not think "correctly" (scientific dissenters, critical journalists, questioning artists) or do not know what to think (seasonal workers, young scientists, journalists, mavericks) to have the right opinion. Referring to policy minimises the damage of individual outbursts. Furthermore, it is the responsibility of the CERN Communications Group to ensure that the visual guidelines are adhered to, making the visual branding of the organisation a question of PR.[55] Thus CERN seeks to engage the outside world in debate, but often only on its own terms.[56] Artists applying to work at CERN will have to engage with all of these branding strategies before they start their creative work at the organisation.

Since the Higgs boson discovery, CERN has won many prizes, each accompanied by images of white male scientists receiving them. These are symbols of success and proliferate CERN's image in the media.

[54] CERN Communications Group, "CERN Visual Guidelines": http://design-guidelines.web.cern.ch (accessed 26.06.2015).
[55] CERN Communications Group, "CERN Visual Guidelines."
[56] Peggy Phelan, *Unmarked: The Politics of Performance* (London; New York: Routledge, 1993), 6; 11.


Fig. 1–4 *Clockwise from top left: Heuer and Higgs (right) receive the Edinburgh International Medal; François Englert (left) receives the Nobel Prize for Physics; CERN receives the Prince of Asturias Award; CERN receives the UNESCO Niels Bohr Gold Award,* 2013-2015.

Public images of science make up non-scientists' impressions of what science is.[57] The CERN PR office used the corporate strategy of "placing articles" early in its history.[58] Today, CERN does not have to do all of this work alone. When the Higgs boson was discovered in 2012, mainstream media flashed up pictures from the PowerPoint presentation that announced the findings. Since its existence was confirmed by both the CMS (Compact Muon Solenoid) and ATLAS (A Toroidal LHC ApparatuS) experiments at CERN, there have been several attempts to visualise the Higgs, although only a few have made it into mainstream media. The now iconic media images (**Fig. 5–6**) are like works of abstract art: colourful explosions of lines radiating from a central point wihin the collider.

[57] Marcel C. LaFollette, *Making Science Our Own: Public Images of Science, 1910-55* (Chicago: University of Chicago Press, 1990).
[58] Minutes from the eight session of the Council of CERN (14.01.1954): III: Progress Report of the Laboratory Group (by Lew Kowarski, 16.10 – 31.12.1953): minute 5 (Information), 29.

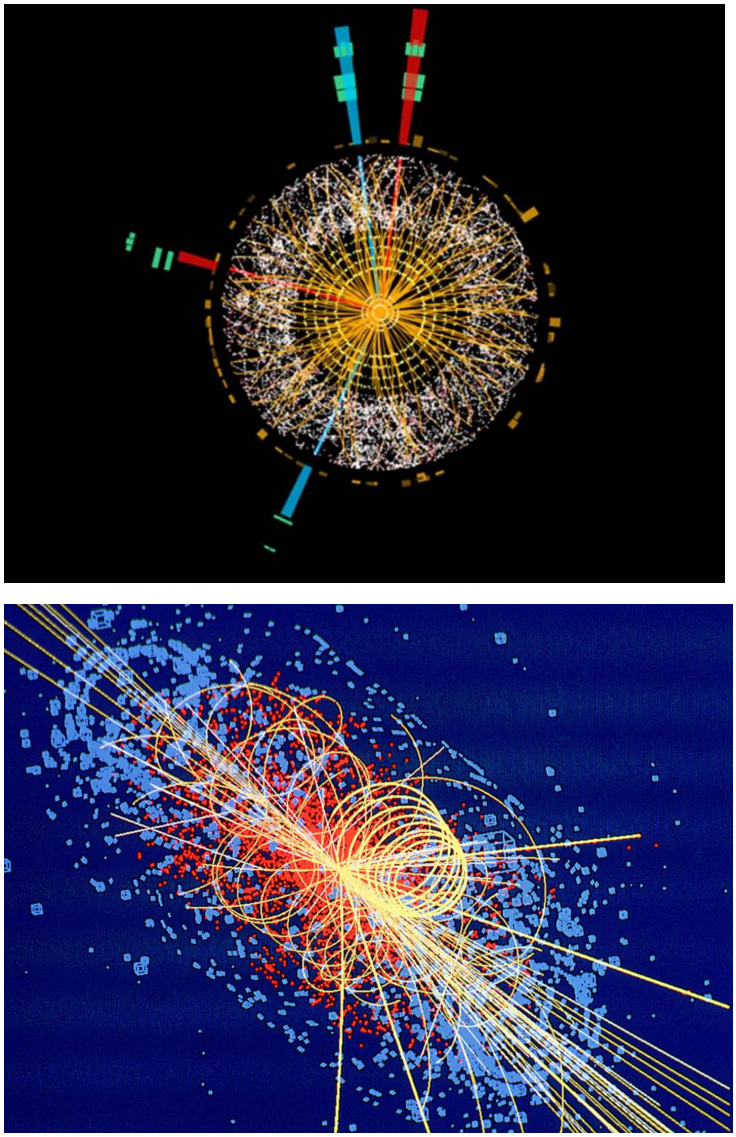

Fig. 5–6 *The Higgs boson, ATLAS; The Higgs boson, CMS, both CERN, 2012.*

Abstract and visually striking, these are the most circulated images to emerge from CERN since the discovery of the W and Z bosons in 1982, another Nobel-winning event.[59] As Chihwei Yeh has explored, the visualisation of the Higgs boson constitutes a

[59] For a discussion on the context surrounding the events leading up to the finding of the W boson, see John Krige, "Distrust and Discovery: The Case of the Heavy Bosons at CERN", *Isis* 92, no. 3 (Sep 2001): 517–40; G. Taubes, *Nobel Dreams: Power, Deceit and the Ultimate Experiment* (New York: Random House, 1986).

reality that is not visible, yet operates under the ideology of "seeing is believing".[60] The colours and structural makeup of the Higgs iconography can be traced down to graduate students who make the images based on complex graphs. These are then published on the CERN website free of charge to journalists and others who need to illustrate their stories about the phenomenon.[61] Thus the authors of the Higgs image rely on aesthetics, style and context, creating a tangible image for an invisible currency. The Higgs, sexed up in this way, becomes more than complex physics.[62] It becomes image. Images are relatable and recognisable, making CERN relatable and recognisable too.

Trademark objects such as the LHC and the Higgs boson are often used as brand deposits by CERN. A brand deposit adds value to a brand's "bank account", whereas a mistake results in a brand withdrawal.[63] While CERN is not a traditional business, it trades in the "commodities" of reputation, funding, image and other forms of cultural capital. CERN's reputation builds its brand, and its brand secures its place in history. Commitment to the overarching plan drives CERN, with smaller diversions valued for the loss or profit they make for the brand as a whole. As Traweek has observed:

> The members of the particle physics community are firmly committed to the international, supracultural image of science. Particle physicists from anywhere in the world are fond of remarking that they have more in common with each other than with their next-door neighbours. All of these physicists consider themselves members of an intellectual elite, perhaps the intellectual elite, because they believe particle physicists work alone at the frontiers of human knowledge.[64]

CERN's scientific images are part of this "international, supracultural image". The Higgs images are often attached to media stories about the Higgs discovery, but seldom

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[60] Chihwei Yeh, "Seeing is Believing: Constructing the Higgs Boson", in *Method: Science in the Making* 2 (Winter 2015).
[61] Yeh, "Seeing is Believing."
[62] On sexy science see Luca Carra, "The Sex Appeal of Scientific News" in Bauer and Bucchi, *Journalism, Science and Society,* 101-109; Frederick Thomas Attenborough, "Complicating the Sexualization Thesis: The Media, Gender and 'Sci-Candy'", *Discourse & Society* 22, no. 6 (2011), 659-676.
[63] Steve Jobs coined the phrase in Ken Segall, *Insanely Simple: The Obsession that Drives Apple's Success* (London: Portfolio, 2012).
[64] Traweek, "Cultural Differences in High-Energy Physics: Contrasts between Japan and the United States", in Sandra Harding (ed.), *The "Racial" Economy of Science: Towards a Democratic Future* (Bloomington: Indiana University Press, 1993), 398–407.

explained. In a laboratory steeped in the invisible, the visualisation of its discoveries, is an exercise in rendering its currency believable. This is not only good public education and communication, it is good PR.

1.6 Edutainment[65]

As part of CERN's PR in the twenty-first century, the organisation has become part of the recent shift towards entertainment and celebrity in high-energy physics. Krige notes that CERN's engagement events happen against a backdrop of an ongoing effort from the organisation to educate the public.[66] This gives CERN an opportunity to enhance its profile and divorce its audience from topics of controversy. As the author of its image, CERN's narrative is written by itself through a scientific and cultural branding strategy. It is one of the oldest recurring schemes in art history, utilised by royalty and the Vatican. High-profile examples include the Fundamental Physics Prize presented by Hollywood actor Morgan Freeman, won by CERN for their Higgs boson research, and Freeman's documentary *Through the Wormhole: Is There a God Particle?*[67]

Fig. 7 *The musician and international celebrity Will.i.am takes a selfie at CERN.*

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[65] Edutainment is a neologism that expresses the combination of education and entertainment.
[66] John Krige, "The Public Image of CERN", in Durant and Gregory (eds.), *Science and Culture in Europe,* 153–57.
[67] Geoffrey Sharp (director) and Morgan Freeman, *Through the Wormhole: Is There a God Particle?* (Discovery Science Channel; Revelations Entertainment, release date US: 20.03.2013). The 'God particle' is a nickname for the Higgs boson. This popular nickname originated in Leon M. Lederman and Dick Teresi's book, *The God Particle: If the Universe is the Answer, What is the Question?* (Boston; New York: Dell Publishing, 1993). Lederman had originally wanted to call the book *The Goddamn Particle*, as it was proving so complicated to locate and describe. His publisher's convinced him to use 'God' instead (explained in *The God Particle*, 22).

Superstar and musician Will.i.am (*sic.)* visited CERN in 2013 to explore its science and encourage young people to consider studying physics, as well as taking part in a choir performance with school children at a recorded Technology, Entertainment, Design extra (TEDx) event on-site.[68] His visit was documented by CERN and shared on social media, and in turn the artist borrowed CERN's intellectual capital in his future entrepreneurial and gadget-oriented work (**Fig. 7)**.[69] The characters of the popular puppet children's television show *The Muppets* (in the movie version), the cartoon *South Park* and comedy show *The Big Bang Theory,* have visited CERN in recent episodes.[70] The popular comedy series *That Mitchell and Webb Look* conducts one of its running gags, "A Prayer and a Pint", in the CERN canteen where the main character, a priest (David Mitchell), speaks to a scientist (Robert Webb): "The (…) boffins here at the Large Hadron Collider are up to something rather exiting, because they're trying to blow up the universe. Which I have to say (…), to a layman like me, it sounds like a terrible idea. So what's all that about?"[71] These are all mainstream comedy shows produced in America or Britain, all relying on its audiences to know what CERN is. In *The Muppets*, the intelligent characters have gone to work at CERN, where they explain to the other Muppets (and the movie audience) what is happening on the site. In *South Park* a powerful CERN magnet is stolen from the Large Hadron Collider in super-villain fashion, creating panic and a lot of jokes. In *The Big Bang Theory* the lead romantic couple plans to go to CERN for Valentine's Day (the joke is that the man is nerdy and academic, and his girlfriend cool and worldly). One of the other main characters, the

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[68] Technology, Entertainment, Design (TED) is an invitation-only event where leading thinkers and doers give lectures, often broadcast on social media. Its mission statement is "Ideas Worth Spreading". TEDx events allow organisers to create "TED-like" events at their site. TED, "About TED and TEDx", TED website (undated).

[69] "Will.i.am visits CERN", CERN account on YouTube (13.01.2014): https://www.youtube.com/watch?v=yq_cyjJz-OI; "Reach for the stars, with Will i.am. as special guest", TEDxCERN website: http://tedxcern.web.cern.ch/video/2013/reach-stars-william-special-guest (both accessed 26.05.2015).

[70] Disney, directed by James Bobbin, *The Muppets* (released 12.12.2012); Comedy Central Productions and Paramount Television, directed by Trey Parker, *South Park: Pinewood Derby* Season 13, episode 6 (first aired 15.04.2009); Chuck Lorre Productions and Warner Bros., directed by Mark Cendrowski, *The Big Bang Theory: The Large Hadron Collision* Season 3, episode 15 (first aired 9.06.2010).

[71] David Mitchell and Robert Webb, "A Pint and a Prayer" sketch, *That Webb and Mitchell Look* (2011), https://www.youtube.com/watch?v=BDxCuVsqLxc (accessed 25.06.2015).

neurotic, intelligent and awkward Sheldon, tries to get the girlfriend's place as he has dreamed about seeing the Large Hadron Collider. In *That Mitchell and Webb Look* episode, the joke circles on the contrast between religion and science. These television series are popular, showing how CERN has become a well-known institution outside of science, and how popular culture draws on CERN for comedic effect. In all these examples the scientific details are wrong (in the Muppet universe, the Large Hadron Collider is spinning, a move that would tangle and destroy the equipment), but the scientists are presented as cool-headed, intelligent and welcoming. CERN was not officially involved with these projects (this does not mean that it did not appear in an advisory role behind the scenes at some point), but the popular image that the organisation seeks to present is successfully represented on screen in these examples. They are PR successes.

The trend of PR through entertainment is not only driven by external projects seeking to interpret and culturally capitalise on CERN. It is also increasingly an internal focus at the organisation, exemplified by projects such as FameLab. Asking CERN staff the question: "Would you be able to explain your work to a non-specialist in just three minutes?", FameLab seeks to create comedy from science. In May 2013 the Swiss national final of FameLab saw six young CERN physicists compete to best explain their work in high-energy physics. FameLab itself has succeeded in making a formula that is fast-paced and easily digestible. The outcome for the young participants is, as the name suggests, fame. The lack of secure jobs for young physicists also means that edutainment could make their résumé stand out in a very competitive field.[72] As an international competition in the style of a reality-TV talent show, it seeks out the next generation of popular science presenters.[73] The finalists receive an additional weekend's worth of training from professional stand-up comedian, artist and television presenter Timandra Harkness, who previously visited CERN to make a BBC Radio documentary. With several famous physicists in mainstream media, as well as the general popularity of

[72] *CERN People* documentary series, "The Shrinking Field" (episode) (uploaded 2.09.2014), YouTube: https://www.youtube.com/watch?v=wcbBaKPuT4I&index=3&list=PLQTF-1oWnPbbXTkPYQG8Ak6OpntnkhqGK (accessed 5.04.2016). *CERN People* was produced by Liz Mermin and Crow Hill Films, and is further discussed in chapter three.
[73] The audience for FameLab is early career researchers, marketing teams and television/media production companies. The science competition is to speak at the Cheltenham festival in the UK.

reality-television, FameLab is a timely reminder of the turn towards edutainment and competitive career aspirations in the general field of science. Not content to be a "human computer", the participants seek recognition through competition, similar to the senior scientists' quest for the Nobel Prize.[74] One winner said:

> I'm very excited! (…) I'm really looking forward to (…) compe[ting] against other young scientists from across the globe. Winning the international final would be fantastic, but the real prize is getting another chance to bring science to a wider audience.[75]

The young man's interest in sharing science belongs to a generation of tweeters, who are passionate about physics and subscribe to rationalism. FameLab Switzerland has institutional backing from the Swiss Federal Institute of Technology (ETH Zürich) and the British Council, again emphasising how important science communication is for some European countries. FameLab and the many popular culture projects inspired by or working with CERN are expressions of a changing brand through boundary objects where information is interpreted by different communities.[76] CERN's PR does not simply come from the office in Meyrin anymore. It comes in new formats (television, stand-up, reality-TV setups) and is communicated by new voices (comedians, television writers and producers, Muppets). Artists, as we shall see, provide new formats, new voices and new captive audiences. While all of the above examples show how successful CERN's PR strategy has been over the years, they have been firmly cemented in popular culture representations in the late 1990s and early 2000s. Successful PR is about selling a brand, and growing the brand's audience. After having saturated comedy, television, film and stand-up, "high art" was an area that CERN had not successfully and publicly engaged with. There have always been artists who are interested in CERN art, parallel to popular culture engaging with the organisation. But CERN had not engaged with it in an active way. The successful popular culture examples of the 1990s and early 2000s

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[74] David Alan Grier, *When Computers Were Human* (Princeton: Princeton University Press, 2005).
[75] Alexander Brown, "FameLab Switzerland: A CERN PhD Student Triumphs", *The CERN Bulletin,* no. 23–34 (3–10.06.2013): 6.
[76] Susan Star and James Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Vertebrate Zoology 1907–39", *Social Studies of Science* 19, no. 3: 387–420.

showed the organisation that it was well known and even liked, bringing into focus new audiences and new formats.

1.7 Timing

The timing of CERN's expansion into "high art" was not accidental. The current Director General Rolf-Dieter Heuer has shaped the research facility outward with increasing public engagement, with more openness and media awareness.[77] He oversaw the discovery of the Higgs boson, the laboratory's sixtieth anniversary, the financial crisis and the start of Arts@CERN. Heuter has also seen the residency strategy become a sought-after avenue for artists, an exclusive experience to be competed over instead of the earlier open door policy. He has solidified the relationship between CERN and the press by giving interviews, hosting events and taking up a guest editor position in the only French newspaper of Switzerland, *Les Temps.* Heuer's presence in the artists' lectures has given gravitas and pomp to the occasion. In a time of austerity and competition, Arts@CERN is a free opportunity for the organisation. It champions exclusive winners, as does FameLab and the Nobel Prize system. An air of exclusivity, presented to a large mainstream audience, has become a core selling point for CERN as it approaches its future.

In the years before and after the Higgs discovery, the global debates about where the International Linear Collider (ILC) and/or the Compact Linear Collider Study (CLIC) will be located were long and difficult. The machines will rival the LHC and the possible hosts are narrowed down to Europe (CERN), USA (Fermilab) or Japan. The project is in the planning stages, with a proposed completion date of 2026. Heuer expressed interest in the project, arguing that Europe is now "the real home of physics", and that physics should remain there.[78] Indications point towards Japan being the likely

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[77] The Director General at CERN is appointed by the council, usually for five years, and has the role of managing CERN. According to CERN: "A directorate assists the Director General; he proposes its members to council. The Director General reports directly to the council. He can also propose to council any adjustment he deems necessary to meet the evolving needs of the research programme." The wording may change to accommodate the first female Director General from 2016. CERN press office, "The Structure of CERN": http://home.web.cern.ch/about/structure-cern (undated, accessed 26.05.2015).

[78] Rolf-Dieter Heuer, "Towards the Next Chapter", *Opinion* (CERN's online outlet for messages from the Director General and others) (25.11.2013); Heuer, "The Future is Just around the Corner", *Opinion* (07.02.2014).

choice, as the Japanese government is willing to financially contribute more than Europe or America. This will throw CERN's expansion plans off balance, and might affect their choice of future funding bids for large machines. This plays into what Traweek predicted over ten years ago. She observed that American and European scientists had let Japanese specialists join them, but at the time the former pay little interest to the Japanese politics of "big science". Traweek foresaw that this would change in the future, and with the realisation of ILC the Japanese high-energy physics community might indeed become what CERN is today.[79] Asian scientists are challenging the status quo, seeking not only to participate and pay for high-energy physics, but also launch and control projects.[80]

CERN's plans for the future are also tightly woven with the rings of the LHC, where particle collision and pure research in the aftermath of the Higgs boson discovery are the main focus. The cost of the new capacity of the machine is still being discussed, subject to international negotiation and focus of individual national governments. For example, Spain's drive to fund particle physics is not as aggressive as the UK's, where CERN is one of the "…highest priorities for the UK's particle physics programme for the next decade and beyond."[81] Depending on how quickly CERN manages to acquire the necessary capital to increase the energy of the LHC, it will start realising the European Strategy for Particle Physics set out by its member states.[82] It will ideally double the energy of the LHC compared to predicted 2015 levels, making its collision rate increase in order to explore the properties of the Higgs boson. The machine will be further updated in 2018 and will, according to CERN, remain the world's largest accelerator until at least 2030. Alongside the planned European Spallation Source and

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[79] Traweek, "When Eliza Doolittle studies 'enry 'iggins", in Stanley Aronowitz, Barbara Martinsons and Michael Menser (eds.), *Technoscience and Cyberculture* (New York: Routledge, 1996), 8.
[80] 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.
[81] The UK Department for Business Innovation & Skills, "Creating the Future: Vision for Science & Research, A Consultation on Proposals for Long-Term Capital Investment in Science & Research" (April 2014): 46.
[82] CERN Council, "The European Strategy for Particle Physics", CERN website (12.06.2013).

the expansion of CERN, the commercialisation of space travel and the continued push for genetic research, CERN will have a place in the future of "big science", perhaps through new machines.[83] However, whether or not CERN continues as one unit depends on how it can make its claims for importance in the near future. After the discovery of several particles in the last century and the Higgs boson in 2012, CERN is relying on PR to ensure its future. Artists step into this dynamic as they enter into a working relationship with CERN in a time when free, positive PR is needed. But as artists, they are not invested in the same narrative that the organisation is seeking to proliferate. On the contrary, as artists step into CERN, their role as non-scientists has more in common with other layperson groups' experiences of the organisation. In the following sections I explore how Cernoises (meaning CERN women who are usually non-scientific staff and/or wives and/or partners of CERN staff) and CERN dissenters approach the organisation, how the organisation interacts with them and how this influences CERN's PR strategies and public reputation.

1.8 Cernoises

CERN has never had anything approaching equality in numbers of female and male staff. Before looking at the role of female artists at CERN, we need to explore the institutional factors that are shaping the work environment for women at the organisation in general. In 2014, CERN announced that Italian particle physicist Fabiola Gianotti would take over as CERN Director General in 2016. In the organisation's sixty-year history, she is

Fig. 8 *Fabiola Gianotti was one of the runners-up for TIME magazine's person of the year award in 2012.*

[83] The European Spallation Source (ESS) is still in the planning stages, as a pan-European project similar to CERN. With seventeen member countries from Europe, based in Sweden and Denmark, the planned material science research facility will be using neutron scattering technique and focus on non-applied science. The commercialisation of space is manifest through planned and ongoing projects such as the public space travel programme Virgin Galactic, the Mars Colonisation project, and the Asteroid Mining programme. The increased push to decode and understand our genetics in the wake of the Human Genome Project also continues.

the first female in the role (**Fig. 8**). This is an important event in the narrative of female leaders in physics as the first of its kind and has been celebrated widely. Nevertheless, when we look at the general demographic makeup of the organisation, it reveals structures that will take longer to rectify and that present a big PR problem for the field, and for CERN. In the UK alone, 13% of scientists are women and 17% of science professors are female, demonstrating that although more women are entering science, there are few women at the top. [84] At CERN, 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.[85] 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.[86] As with the general numbers of women in science, there are fewer women at the top in general (Fabiola Gianotti is an exception to the rule). Geneviève Guinot, head of Diversity at CERN, wrote in an email: "women represent 20% of CERN's employees."

[84] House of Commons Science and Technology Committee, "Women in Scientific Careers. Sixth report of session, 2013–2014" (06.02.2014).
[85] 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 26.06.2015).
[86] 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."

Making the point that further improvements must be made, Guinot described: "the three E's scheme: E for Encouraging women to science, E for Employing them through equitable processes in all types of professions and positions – and E for Enabling them to give their best through a supportive work environment." Guinot explained that equality is a priority for the organisation. She pointed to several activities that show CERN's commitment to gender equality in particular: participation at the UN Beijing meeting on gender, local outreach activities, working with schools and a CERN-Google networking event on International Women's Day. In practical terms, CERN has been developing policies for work/life integration and family-friendly support, including providing on-site child-care facilities, career break fellowships and flexible working arrangements.[87] When asked about future goals, Guinot points to "the seven strategic objectives of the Diversity Programme (where) numbers 2 and 3 are referring to our activities regarding gender balance in our organisation."[88] From this we can see that CERN has good intentions for its female workforce, but that its historically unbalanced gender makeup is causing delay in progress. It is a case of what feminist historian of science Rossiter has termed "official encouragement paired with institutional discouragement."[89] Barad has argued that high-energy physics' 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.[90] In spite of these obstacles, we should recognise the work done by women at CERN. The role of female scanners, and the few female senior physicists and

Fig. 9 *Female scanners at CERN, 1962.*

[87] This is a controversial topic as staff members have been complaining about the lack of and quality of childcare prior to Gaillard's report. The on-site childcare is not free, and therefore not an option for everyone, especially low-paid or part-time workers.
[88] Røstvik, email exchange with Geneviève Guinot, 4.11.2014.
[89] Margaret Rossiter, *Women Scientists in America: Struggles and Strategies to 1940* (Baltimore: John Hopkins University Press, 1982).
[90] Karen Barad, *Meeting the Universe Halfway*.

individuals such as Fabiola Gianotti, have inspired many to make their home in the field (**Fig. 9**).[91] Nevertheless, from scanners to engineers, physicists to students, "a dozen women" is as high as it gets within the scientific groups within CERN.[92]

Most female CERN workers are in fact not scientists. Historically it has been the CERN Women's Club that has been the first point of call for "Cernoises".[93] 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.[94] 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.[95] 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.[96] 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",

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[91] For a discussion of the role of female scanners at CERN and elsewhere in high-energy physics see Jim Grozier, "The Rise & Fall of the 'Scanning Girl'", *BSHS Viewpoint,* no. 108 (Oct 2015).
[92] Pauline Gagnon (ed.), "Women in Science through the Decades", *CERN Courier* digital edition (23.02.2011): http://cerncourier.com/cws/article/cern/45134 (accessed 3.04.2016).
[93] 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 26.05.2015).
[94] CERN women's Club, "History."
[95] 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.
[96] As Traweek has pointed out in *Beamtimes and Lifetimes* women in physics try to become androgynous in their aesthetic, whilst wives and partners do not.

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.[97] 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).[98] 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.[99] This current situation is changing, but remains deeply rooted in a distinctly male-dominated institutional history.

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.[100] However, in 1980, CERN staff member Professor Mary K. Gaillard wrote a *Report on Women in Scientific Careers at CERN*.[101] It did not reach mainstream media, but is the only example of anyone at CERN questioning the gender imbalance at any time before the

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[97] 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.
[98] Jonathan Leake, "Gay Physicists Collide with Bigotry at CERN", *The Sunday Times* (20.03.2016), 6.
[99] *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.
[100] Leake, "Gay Physicists Collide with Bigotry at CERN", *The Sunday Times* (20.03.2016), 6.
[101] Mary K Gaillard, "Report on Women in Scientific Careers at CERN", CERN/DG-11 (08.03.1980).

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.[102] 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.[103] 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."[104] 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 (…)"[105] 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

[102] Gaillard, "Report…", 5–8.
[103] 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 26.06.2015). In 2014 I was interviewed by *Kilden*, a Norwegian Research Council group invested in exploring the role of women in science and research. In September 2014 the CERN Diversity Programme leader, Geneviève Guinot, contacted *Kilden* and stated I had made several mistakes and that she wished I had contacted her. *Kilden* forwarded this email to me and I proceeded to clear up misunderstandings. Guinot did not respond to my questions and sent me on to a generic website which I had already seen. The interviewer and editor from *Kilden* called her tone and angle "demeaning" and "backhanded" (translated from Norwegian). The full email correspondence is available as a transcript translated from Norwegian. The CERN Diversity Programme website which Guinot referred to is here: http://diversity.web.cern.ch/ (accessed 26.06.2015).
[104] Gaillard in email to Røstvik, 08.01.2015.
[105] Røstvik, email exchange/interview with Geneviève Guinot, 14.11.2015.

> genders. As the result for CERN demonstrates, everyone must make greater efforts in the pursuit of the natural, respectful workplace.[106]

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.[107] 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.[108] 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.[109] 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

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[106] Vincent Vuillemin, "Is the Number of Cases Involving Women Related to their Percentage in an Organization?", *CERN Ombudsman* blog (02.12.2012).
[107] bell hooks (*sic.)*, *Talking Back: Thinking Feminist, Thinking Black* (Toronto: Between the Lines, 1989).
[108] Sara Ahmed, "Declarations of Whiteness: The Non-Performativity of Anti-Racism", *borderlands e-journal* 3, no. 2 (2004).
[109] 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 27.03.2016). 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.

addressing CERN specifically.[110] While this marks progress, it is not true that CERN and the LHC "run on woman power", as the organisation claims.[111] 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.

1.9 Controversy

Gender is not the only PR problem for CERN when it comes to dealing with laypeople and self-defined "outsiders". In this section I explore other topics that serve as a context for the artists' experience at CERN. The organisation has, throughout its history, been criticised, sued and ridiculed. These reactions create an alternative narrative to the official PR version. Ranging from communist protests to environmental concerns, from terror to fears of the apocalypse, those who publicly disagree with CERN are few, but passionate. When controversy strikes CERN, the Communications Group is often silent. Before and after CERN started building its machines in the 1950s, local political group *Initiativ Communiste* strongly opposed the location of the laboratory and spearheaded the fight against the infant project. The opposition was defeated on 30 June 1953, with 16,538 voting for and 7,332 voting against in a local vote attended by political parties. The scientific circles of the area helped lobby other parties and saved the result from being nullified.[112] I have not been able to fully understand why the group so strongly opposed the idea of CERN, but keeping in mind the context of the place and time, it is likely that the nuclear danger was of concern. The *Initativ Communiste* may also have had concerns for the environmental impact of the machines, noise pollution and building site, which was also true for many local inhabitants. As is the case with nuclear power

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110 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 10.04.2016).

111 In a CERN Courier article 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).

112 Albert Picot, "Genève et le CERN", *Journal de Genève* (11.11.1959), 59.

plants, CERN and other high-energy physics organisations are often built in remote, unpopulated places of natural beauty. Environmental concerns thus go beyond the danger of radiation, and also become a reminder of the changes in the physical environment caused by buildings, tunnels, towers and roads. While governments are concerned with danger as far as radiation and health risks, Geneva and Switzerland did not pause long to consider the aesthetic impact on the small town of Meyrin, straddled by vast countryside and the glittering Swiss Alps. CERN takes its role as a producer of radiation seriously, policing the site and neighbourhood, water and air. The potentially dangerous ionising radiation created as a by-product of the study of the composition of matter is not at a significantly high level to be of risk to human health. CERN accounts for 1% of the radiation in the area, according to its own measurement. But neighbourhood complaints of noise and destruction of the countryside are still a topic of concern. To this end CERN tries to minimise sound pollution and add pleasant gardens and landscaping to its site, a focus artists are often included in.[113] The organisation is in active dialogue with its neighbours, in comparison to the strategies of silencing as seen with other issues.

When CERN scientist and Algerian-born Frenchman Adlène Hicheur was sentenced to five years for exchanging emails with Al-Qaeda in 2009, the press office at CERN were quiet.[114] Hicheur worked in a postdoctoral position and conducted research at CERN. He remained in custody without charge for over two years under French anti-terrorism laws. Hicheur received support, both emotional and financial, from nineteen physicists (including Nobel laureate Jack Steinberger) and other scientists, but no official recognition from CERN or the PR office. The alleged affiliation between Hicheur and Al-Qaeda was of a financial nature, but his lawyer maintains that the evidence was weak and that the treatment of his client was an injustice. Francesco Spano, a fellow particle physicist, called it "a Kafkian situation."[115]

[113] CERN Communications Group, "CERN and the Environment", pdf (Mar 2008).
[114] Hicheur's trial was in Paris in May 2012. He was sentenced to five years in prison for plotting terrorist attacks. He left prison less than two weeks into his sentence and decided not to appeal.
[115] James Dacey, "Physicist Convicted of Terrorism Leaves Prison", *Physics World* (16.05.2014).

Fig. 10 *Court drawing of the case against a former CERN employee on charges of connection to Al-Qaeda in 2009.*

The story received interest from the press and in physics media, but not nearly the fascination and fear spurred by other potential terrorist attacks on a large scale.[116] In contrast, information about the safety of CERN is easy to locate.[117] Concerns about the LHC's potential dangers were often discussed prior to the switch on in 2008. It prompted many discussions about high-energy physics and security, including legal debates.[118] Physicist Walter L. Wagner and cosmologist Luis Sancho (both non-CERN staff) tried to halt the LHC start-up due to concerns of danger. They wanted more documentation and scrutiny of the apparatus's safety, and filed against CERN and its American collaborators in Hawaii.[119] As the LHC Safety Assessment Group (LSAG) found, there was "no basis for any concerns about the consequences of new particles of forms of matter that could possibly be produced by the LHC",[120] the US Government dismissed the suit, commenting that the plaintiffs were "overly speculative and not

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116 Associated Press, "Former CERN nuclear physicist jailed for al-Qaida terrorist plot" (sic.), *The Guardian* (04.05.2012); Eric E. Johnson, "CERN on Trial: Could a Lawsuit Shut the LHC Down?", *New Scientist* (23.02.2010).

117 "The Safety of the LHC", CERN website CERN press office (undated): http://press.cern/backgrounders/safety-lhc (accessed 1.04.2016).

118 Michael Peskin, "The End of the World at the Large Hadron Collider?" *Physics* 1, no.14 (18.08.08); Dennis Overbye, "Asking a Judge to Save the World and Maybe a Whole Lot More", *The New York Times* (29.03.08); Joseph Brean, "Is the End Nigh? Science Experiment Could Swallow Earth, Critics Say", *National Post* (09.11.2008); Daniel Clery and Adrian Cho, "Large Hadron Collider: Is the LHC a Doomsday Machine?" *Science* 321, no. 5894 (2008), 1291.

119 "Sanco v. US Department of Energy et al.", Justia Federal District Court Filings and Dockets (21.03.08).

120 J. Ellis, J. G. Giudice, M.L. Mangano, T. Tkachev, U. Wiedemann (LHC Safety Assessment Group), "Review of the Safety of LHC Collisions", *Journal of Physics G* 34, no. 11 (5.09.2008), 15.

credible."[121] An appeal was also dismissed in 2010. Wagner and Luis were active in *Citizens against the LHC*, a group made up of mostly non-scientists who were deeply concerned about the consequences of CERN's work. In another legal attempt to stop the LHC switch on in 2008, a group of European citizens led by German biochemist Professor Otto Rössler filed a lawsuit against CERN in the European Court of Human Rights. It was rejected outright. In 2010, the German Court rejected a petition to halt the LHC's work without hearing the case.[122] A similar petition was rejected in the courts of Cologne in 2011 and the Court of North Rhine Westphalia in 2012.[123] All courts involved stated that the plaintiffs did not have plausible evidence for their statements.

Throughout these legal disputes, biochemist Professor Otto Rössler (who has never worked at or with CERN, and is not a physicist) has been the most public in his critique of the organisation.[124] He has appeared in a wide range of media, questioning CERN's science and policies. Rössler has warned against the creation of dark matter and the potential creation of black holes that could swallow up the universe. Media outlets sympathetic to CERN portray Rössler as a mad scientist or an isolated non-entity, with Butterworth on several occasions pretending not to remember his name or institutional affiliation.[125] Rössler, in his critique of CERN, is calm and coherent in his arguments, when facing the more defensive and aggressive stance of CERN staff. His concerns are real to him, but not to CERN. He has become a pathetic figure in the world of physics, someone the majority roll their eyes at. CERN deals with Rössler as the dissident that he is, combining silencing, criticism and ridicule as techniques to belittle him and his message. Calling him unintelligent and ill-informed is another way of drawing public attention to his non-CERN and non-physicist status, both utilised to frame him as

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[121] Dennis Overbye, "Government Seeks Dismissal of End-of-World Suit against Collider", *The New York Times* (27.06.08).
[122] Ruling of the German Court (in German): http://www.bundesverfassungsgericht.de/entscheidungen/rk20100218_2bvr250208.html (accessed 24.11.2014).
[123] Ruling of the Court of Cologne (in German): http://www.justiz.nrw.de/nrwe/ovgs/vg_koeln/j2011/13_K_5693_08urteil20110127.html (accessed 24.11.2014).
[124] After initial email contact, Rössler did not answer my request for an interview.
[125] Rössler is Professor of Chemistry at University of Tubingen (established 1477). It is alma mater to philosophers Hegel and Bloch, Professor Joseph Ratzinger (later Pope Benedict XVI) and ten Nobel laureates (amongst them Karl Ferdinand Braun for Physics in 1909). Rössler and Butterworth last met on TV, "Inside Story – CERN's Big Bang Test", *Al Jazeera English* YouTube channel (uploaded 1.04.2010): https://www.youtube.com/watch?v=ZvowxSJHlOc (accessed 1.04.2016).

another crazy conspiracy theory layperson. While there is no clear evidence to suggest that Rössler is correct in fearing CERN's work, it is his position as a dissenter that interests us here. There are echoes of Rössler not only in CERN artists' work with potentially controversial topics, but also in the way in which the organisation deals with critique in art.

CERN controversy is also found in Internet conspiracy theory groups, some connected to Rössler. The website *lifeboat.com* gathers scientific, moral and political arguments against CERN, its science and machines, in an attempt to "safeguard humanity." Its mission statement sets out an unusual goal:

> The Lifeboat Foundation is a non-profit nongovernmental organisation dedicated to encouraging scientific advancements while helping humanity survive existential risks and possible misuse of increasingly powerful technologies, including genetic engineering, nanotechnology, and robotics/AI...[126]

Most of the authors write under assumed names, airing views on science and the organisation they believe are causing real danger to the world. This is by no account the strangest CERN conspiracy. Other examples include a theory of the Director General Heuer being an "evil reptile."[127] *Lifeboat.com* wish CERN to cease all activity and have raised money in order to stop other potential dangers. Challenged as an extreme position, *lifeboat.com* nevertheless remains the largest organised dissenting group against CERN. There is, as discussed above, no one who publicly provides a middle ground. Often forced to leave science institutions due to their minority views, these scientists have made an underground movement of exiles. They do not fit the cold, clean, "extreme culture of objectivity" championed by the high-energy physics environment. CERN's Cold War roots are visible as this criticism regurgitates fears of the end of the world. While *lifeboat.com* provides an unusual view, it is nonetheless a platform where one can discuss fears about physics amongst other science enthusiasts. CERN's attitude to these controversies tells us something about the protective nature and heterogeneous culture of

[126] *Lifeboat*, "Mission Statement/About": http://lifeboat.com/ex/about (accessed 26.06.2015).
[127] YouTube user "2circles", "Director General of CERN is a Hostile Reptilian Shapeshifter", YouTube (09.01.2015) https://www.youtube.com/watch?v=fALOBVkJ1Gw (accessed 26.06.2015).

the organisation. This overview also provides background for understanding why some artists do engage with difficult topics as they relate to CERN, and why these interpretations in turn might not be welcome or commented on by the organisation's PR team.

1.10 Conclusion

Is CERN a fairytale laboratory?[128] What is the context for artists coming to the organisation today? The work of locating the Higgs boson, defining high-energy physics, building networks to an international community, creating spin-off products, retaining an image in a time of financial uncertainty and battling conspiracies could change its reputation. The organisation is both a space of privilege and a site under attack. Supported by governments and private research organisations, CERN continues to push boundaries, yet remains tied to institutional, and often traditional, entities. Struggling with these limitations, PR becomes important. Built by a group of white men at the dawn of the Cold War, CERN has had to come to terms with competing laboratories, equal opportunity employment duties and the online world. Today, women and minorities are a focus for improving the organisation's image, spearheaded by the first female Director General. The Internet, with its damaging conspiracy theories and helpful edutainment outlets, can be both challenging and beneficial for CERN. Adapting to these changes, CERN has to maintain its sense of identity. The organisation's brand identity is maintained by the PR office. CERN's work, staff and outputs are changing, but it still seeks to present itself as an innovative business, educator and an inclusive space. Where can CERN find the image it needs as many of its old PR outlets fall out of fashion? In the next chapter, a discussion of the art world and SciArt provides one answer. As in "Higgs Boson Blues", the topic of CERN reaches far beyond science, into the art world. But CERN will only engage with the right type of art, and usually not "popular culture" (Will.i.am is one of few examples, who crosses the boundaries of performance art and pop music). In the next chapter we zoom in on the relationship between science and art in the contemporary SciArt field in order to understand how the

[128] Jim Baggott, *Farewell to Reality: How Fairytale Physics Betrays the Search for Scientific Truth* (London: Constable, 2013).

organisation is using the arts to sell its brand identity to the public.

CHAPTER TWO

Contracted. SciArt, PR and the Values of Science

> When history looks back at the twentieth century, she will see science and technology as its theme; she will find in the monuments of Big Science – the huge rockets, the high-energy accelerators, the high-flux research reactors – symbols of our time just as surely as she finds in Notre Dame a symbol of the Middle Ages. She might even see analogies between our motivations for building these tools of giant science and the motivations of the church builders and the pyramid builders.
>
> Alvin Weinberg, "Impact of Large-Scale Science on the United States", 161.

> You only love your collider
>
> Les Horribles Cernettes, lyrics from "Collider", 1994.

2.1 Introduction

This chapter examines SciArt, a novel art genre championed by CERN and other science institutions that combines science with the arts in some form. The genre has an institutional history similar to that of "big science", and I argue that it is in this context we should situate CERN's interest in the arts today. CERN can be considered as a technocratic micro-society, however the introduction of an arts programme was built on years of experience with artists.[1] Through a discussion of SciArt and the history of CERN's image building, this chapter aims to explore what the institutional backing for a "third way" – one mediating between the two opposed cultures of science and the humanities (as argued by C.P. Snow) – stood to offer to the organisation.[2] Where 'artsci' has been viewed by some of its more effusive advocates as a new avant-garde

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[1] See for example Michael Polanyi, "The Republic of Science: Its Political and Economic Theory", *Minerva* 1 (1962): 54–74. This is the classic defence of the absolute autonomy of science to govern itself even when spending public money. Recently many scientists have called for a "social contract" with society, such as Michael Gibbons, "Science's New Social Contract with Society", *Nature* 402 (1999): C81–C84; Colin Macilwain, "What Science is Really Worth", *Nature* 465 (2010), 682–84; Daniel S Greenberg, *Science for Sale: The Perils, Rewards, and Delusions of Campus Capitalism* (Chicago: University of Chicago Press, 2007); John M Ziman, *Prometheus Bound: Science in a Dynamic Steady State* (Cambridge: Cambridge University Press, 1994).

[2] The term "third culture" plays on C.P. Snow's assertion that Western intellectual life was increasingly being split into two cultures of science and literature/humanities. He argued this in a series of lectures in 1959 that were later published in *The Two Cultures,* first published 1959. (Cambridge: Cambridge University Press, 2012).

movement, I consider it rather as a compromise formation.[3] In a time of austerity, with squeezes on public funding for art and science, it seemed that their combination might offer benefits for both parties, as some argue for fairer science funding.[4] The combination of art and science budgets, marketing and knowledge can benefit both worlds. Furthermore, if CERN has an image problem, SciArt provides some solutions.

2.2 A history of SciArt

In this section I discuss why it is no coincidence that CERN is seeking a structural alliance with the art world right now. While both CERN and the art world depend on large sums of money to function, both can struggle to justify this to the public.[5] CERN has a £786 million annual budget, yet the organisation often promises to give its spin-off products away for free.[6] The portmanteau SciArt is the symbolic culmination of contemporary marketing strategies, created to benefit both the art world and the scientific field. Apart from the creative benefits from such collaborations, the art market remains a stable setting in a turbulent global financial market.[7] A global survey of the art market in 2014 reported a 26% growth in 2014 alone. Despite the deterioration of the European economy, the art market has enjoyed growth fuelled by investment, speculation, collectors and demand from the growing museum industry. Global auction

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[3] Arthur I. Miller, *Colliding Worlds: How Cutting-Edge Science is Redefining Contemporary Art* (London: W Norton & Company, 2014), 345.

[4] For example, Ian Stewart argues that the field of mathematics is more relevant than experimental theoretical physics such as that being done at CERN: "If ten per cent of the 9 billion dollars spent on CERN's Large Hadron Collider had been allocated to research in the mathematical sciences instead, the benefits to society would have been far greater and would have occurred more rapidly." Ian Stewart, "The Third Culture: The Power and Glory of Mathematics", *New Statesman* (21.05.2013).

[5] See for example Peter Timms, *What's Wrong with Contemporary Art?* (Kensington: UNSW Press, 2004); Lee Smolin, *The Trouble with Physics* (Houghton Mifflin Harcourt, 2006) about "pure" physics. Further criticisms of science can be found in Stanley Aronowitz, *Science as Power: Discourse and Ideology in Modern Society* (Minnesota: University of Minnesota Press, 1988); Derrick Jensen and George Draffan, *Welcome to the Machine: Science, Surveillance, and the Culture of Control* (VT: Hartford: Chelsea Green Publishing, 2004); Paul Feyerabend, *Against Method* (London: New Left Books, 1975).

[6] This is done through the CERN Knowledge Transfer Group: http://knowledgetransfer.web.cern.ch (accessed 11.03.2016).

[7] While the art market experienced a dip in 2008, it has remained relatively stable. As the auction house Christie's chief executive, Ed Dolman, said: "The turbulence hasn't hit our market as much as it has in other areas. There has been a surprising amount of cash moving round the market (…) This gives us a belief that the new buyers who have emerged are here, and here to stay." Dolman to Chris Irvine, "Financial Crisis: Contemporary Art Market Hit", *The Telegraph* (21.10.2008): http://www.telegraph.co.uk/culture/donotmigrate/3562365/Financial-crisis-contemporary-art-market-hit.html (accessed 29.03.2016).

turnover reached a historic level of $15.2 billion in 2014. Offering secure annual outputs, the price of art is again rocketing.[8] This stands in direct contrast to other markets, and to cutbacks in public expenditure, including the money spent on science.[9] I speculate that it is not just the financial buoyancy of the art market, but also the cultural capital it brings which makes art an attractive partner for the image-conscious CERN.

The specific term SciArt originated with the launch of the SciArt funding programme set up by the Wellcome Trust in 1996. In total, Wellcome has supported 118 projects with nearly three million pounds of funding. The programme responded to "a growing field of artists embarking on interdisciplinary practice in conjunction with scientists", and its original aims were to "fund visual arts projects that involved an artist and a scientist in collaboration to research, develop and produce work that explored contemporary biological and medical science."[10] From the Wellcome's fiscal catalyst came several other SciArt collaborations, quickly moving beyond the biomedical sciences and into non-applied fields as well. The combination has also been used as a historical narrative.[11] Larry Shiner asserts that the SciArt discourse that argues for a classical link to their terminology through "techne" and "ars" in antiquity cannot simply be translated to "art", or even "craft", analysing instead how both are socially constructed in certain periods of history.[12] In her personal blog, *The Beauty Quark,* Arts@CERN initiator Ariane Koek is often the first to point out these superficial connections. The CERN art programme values the process more than any specific

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[8] Numbers from AMMA and Artprice's 2014 report on the global art market: http://imgpublic.artprice.com/pdf/rama2014_en.pdf (2014) (accessed 9.03.2016).
[9] In 2010 the UK Government planned to cut the national research budget for the sciences, igniting the 'Science is Vital' campaign. For an overview of the post-recession public science budget plans and the protests against this see Stephen Curry, Jenny Rohn and Richard P. Grant, "Science is vital: five reasons to be angry about science funding", *The Guardian* (14.09.2015): https://www.theguardian.com/science/occams-corner/2015/sep/14/five-years-reasons-angry-science-funding-budget-cuts (accessed 11.03.2016).
[10] Paul Glinkowski and Anne Bamford, "Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart programme", The Wellcome Trust Publishing (Oct 2009).
[11] While not always using the term 'SciArt' specifically, some scholars have presented artists as science-artists. See for example Elaine Strosberg, *Art and Science* (New York: Abberville Press, 2001); Sean Caulfield and Timothy A. Caulfield, *Imagining Science: Art, Science, and Social Change* (Alberta: University of Alberta Publication, 2008).
[12] Larry Shiner, *The Invention of Art* (Chicago: University of Chicago Press, 2001), 19–20.

outcomes (for example artworks).[13] Nevertheless the CERN art programme is linked to the contemporary context of SciArt, with Collide@CERN residency winners speaking at conferences and events where SciArt is presented as a historical and defined genre.

Before the term SciArt was coined, the combination of arts and science was utilised for different strategies. The apparent innocence of the age before nuclear fission was discovered makes the early-twentieth-century scientific context radically different from that of today.[14] Artists such as Michael Frayn based stories on the moral dilemmas of the field. In his celebrated 1998 play, *Copenhagen*, he wrote about the meeting between Bohr and fellow physicist Werner Heisenberg and the problematic aspects of a scientists' conscience in a time of possible nuclear war.[15] Contemporary artists live in an age where the history of physics relates to a history of nuclear threat and bombs. Its effects are forever ingrained in the spaces of Los Alamos, Chernobyl, Sellafield, Nagasaki and Hiroshima. Some contemporary artists chose to engage in this difficult narrative. Finnish filmmaker Mika Taanila interrogates energy in the video installation named *The Most Electrified Town in Finland*, where he questions the right to literally charge a landscape with energy.[16] Following the construction process of a nuclear power plant in a Scandinavian landscape, the installation surrounds and invades the viewer with sounds and sights of a process that they cannot control or change. elin o'Hara slavick's (*sic.)* photographs of Hiroshima are, as she puts it, "attempts to visually, poetically and historically address the magnitude of what disappeared as a result of, and what remains after, the droppings of the A-bomb in 1945."[17] As images of loss and exposure to radiation, she exhibits objects from the Peace Memorial Museum in Hiroshima's

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[13] Ariane Koek, "Guest Post: Ariane Koek – Art and Science Conversations", *Cultural Value Project Blog* (8.12.2014): https://culturalvalueproject.wordpress.com/2014/12/08/guest-post-ariane-koek-art-and-science-conversations/ (accessed 11.03.2016).

[14] This is not necessarily historically correct, but it is the way this history has been reconstructed. Many authors have pointed out that this is a false reconstruction of reality, as the time before and after the nuclear bomb was one in which lay people were both wary and/or excited by the prospects of a nuclear world. For a discussion see Catherine Jolivette, *British Art in the Nuclear Age* (VT; Burlington: Ashgate, 2015); Jeffrey Hughes has asked why academics and the public are so interested in so-called nuclear culture in "What is British Nuclear Culture?", *British Journal for the History of Science* 45, special issue (Dec 2010): 495–518; Jonathan Hogg has questioned what the official and unofficial narratives of British nuclear culture were in *British Nuclear Culture: Official and Unofficial Narratives in the Long 20th Century* (London: Bloomsbury Publishing, 2016).

[15] Michael Frayn, *Copenhagen* (London: Anchor, 2000); BBC TV series.

[16] Mika Taanila, *The Most Electrified Town in Finland,* 2012. Three-channel video installation, 15 min loop, Col/BW, sound. The nuclear power plant is Olkiluoto 3.

[17] elin o'Hara slavick (*sic.)*, *Bomb After Bomb. A Violent Cartography* (Milano: Charta, 2007).

collection and encourages "ethical seeing".[18] The Wilson twins have also explored the dangers of nuclear science. Whilst visiting the abandoned village of Pripyat, they inadvertently captured flickering radioactivity on screen.[19] The area was hastily evacuated after the Chernobyl disaster in 1986, and is documented in the Wilson twins' ghostly photographs. These artistic interpretations are painful to view, yet also tap into the wonder and awe of man-made burnt landscapes.[20] They ask us to consider our own ethics in our meeting with nuclear issues. These examples are reminders of the political potential of SciArt (it is doubtful whether any of the above artists would subscribe to this genre). The following are examples of the more mainstream and official aspects of SciArt (meaning that the artists and people involved use the term SciArt).

The art school Central Saint Martins in London, started the first Masters programme in Art and Science as a: "pioneering postgraduate course (that) responds to a fast-emerging territory for interdisciplinary and collaborative art practice."[21] This signalled an increased interest from academia in SciArt. In America, Massachusetts Institute of Technology secured a $1.5 million grant from the Andrew B. Mellon Foundation for a new Centre for Art, Science and Technology (CAST).[22] At Harvard, physics student and Arts@CERN 2013 summer intern Mariel Pettee made a creative senior thesis, *Symmetry Breaking,* by using dance, sound and video to explore concepts including the Higgs boson.[23] In New York, SciArt pioneer Suzanne Anker runs a new laboratory for artists housed within the School of Visual Arts, offering classes that teach art students how to engage with "the scientific method".[24] Within academia the small but strong initiative *STEM to STEAM* pushes for the inclusion of art and design, as well as science, technology, engineering and maths, in the United States education agenda.[25] The British Arts and Humanities Research Council launched the research funding

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[18] elin o'Hara slavick's (*sic.)* website: http://www.elinoharaslavick.com/statement2.html (accessed 07.11.2014).
[19] Jane and Louise Wilson, *Pripyat, Ukraine* series, photograph and film, 2014. Film and photography.
[20] Catherine Jolivette (ed.), *British Art in the Nuclear Age* (VT: Burlington; Surrey: Ashgate, 2014), 1-19.
[21] "MA Art and Science", Central Saint Martins' website (undated): http://www.arts.ac.uk/csm/courses/postgraduate/ma-art-and-science/ (accessed 29.03.2016).
[22] "MIT Establishes Center for Art, Science & Technology (CAST)", *MIT News* (12.04.2012).
[23] Collide@CERN Newsletter June 2014. Pettee's video available on YouTube: https://www.youtube.com/watch?v=Xobq1pRTV34&feature=youtu.be (accessed 26.06.2015).
[24] School of Visual Arts website: http://www.sva.edu/faculty/suzanne-anker (accessed 26.06.2015).
[25] STEM to STEAM website: http://stemtosteam.org (accessed 29.03.2016).

initiative "Science in Culture", which has catalysed over fifty projects and is expected in the future to have the same impact on the academic SciArt scene as the Wellcome Trust's initial project.[26] In one of the project's workshops for experienced SciArt researchers, initiator of Arts@CERN Ariane Koek was present, thus opening doors into the elite fields of British art and funding for CERN. SciArt is driven by the UK and the US, and the academic interest in the genre shows that it is attracting interest.[27]

In addition to academic interest, popular culture and media are embracing the public interest in bridging the "Two Cultures", often traced back to C. P. Snow.[28] The makers of the 2014 film *Interstellar* received public attention for hiring theoretical physicist Kip Thorne as a scientific consultant for their Hollywood space movie. This led to screenings in the Science Museum in London, a book on *The Science of Interstellar* and the "… first time that a movie's black-hole visualisation started with Einstein's general relativity equations".[29] The popular news aggregator *Huffington Post* has its own "Art Meets Science" section, spanning everything from X-rays of paintings to mathematics on TV.[30] The dedicated SciArt journal, *SciArt in America,* started in 2013, has included pieces on CERN artists.[31] Art museums and festivals are also inviting scientists into their spaces. Some of the major exhibitions of the last ten years include the Kinetica Art Fairs, *Art & Science: Merging Art and Science to Make a Revolutionary New Art Movement* at GV Art Gallery in London, *Brought to Light: Photography and the Invisible* at MOMA San Francisco, the Wellcome Trust exhibitions, and NASA's

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[26] The AHRC "Science in Culture" website: http://www.sciculture.ac.uk (accessed 26.06.2015).
[27] There have been several dedicated SciArt conferences in the last few years, for example: *HumSci Workshop* arranged by the history of science centre at Imperial and Department of Physics at University College London (28–29.05.2013); *Art and Science* conference organised by the Association of Art Historians (28–29.06.2012); *Two Cultures* conference organised by York University (26.04. 2012).
[28] For a discussion about the "Two Cultures" debate see Guy Ortolano, *The Two Cultures Controversy: Science, Literature and Cultural Politics in Postwar Britain* (Cambridge: Cambridge University Press, 2009).
[29] Roger Highfield, "The Science of Interstellar", The Science Museum blog (undated). *Interstellar*, directed by Christopher Nolan and produced by Emma Thomas, Christopher Nolan and Lynda Obst, produced by Syncopy, Lynda Obst Productions and Legendary Pictures, distributed by Paramount and Warner Bros (released 26.10.2014). For a discussion on the links between Hollywood and scientists as advisers see David Kirby, *Lab Coats in Hollywood: Scientists' Impact on Cinema, Cinema's Impact on Science and Technology* (MA; Cambridge: MIT Press, 2011).
[30] The "Arts Meets Science" pages of the *Huffington Post*: http://www.huffingtonpost.com/news/art-meets-science (accessed 26.06.2015).
[31] *SciArt in America* blog and website: http://www.sciartinamerica.com (accessed 11.03.2016)

Earth as Art. In 2012 the international art biennale dOCUMENTA (*sic.*), curated by Carolyn Christov Bakargiev, included physicists in conversations about time and quantum mechanics.[32] Current exhibitions include the LHC-themed exhibition *Collider*, the Outsider art show *An Alternative Guide to the Universe* at the Hayward, and the ever-expanding success of *BODIES: The Exhibition,* which is a controversial and highly visual event showcasing plastinated bodies.[33] There are many other examples. Art & Science Collaborations Incorporation (ASCI) has been connecting scientists and artists since 1988. "BioArt", often considered the big sister of SciArt, has a place in the Oxford Dictionary of Art as the biology-based sector of science-based art. The Art Science Observatory seeks to help, fund and conduct research into artists and scientists working together, opening up beyond the medicine-focused Wellcome Trust.[34] In 2014 the University of Manchester offered funding that would "highlight the benefits of links between science and art."[35]As founder and editor-in-chief Julia Buntaine of *SciArt in America* noted:

> …things in the SciArt world seem to be heating up. Lately it has felt more and more like if there's one SciArt event I plan on attending, there's probably another one I'll be missing because of it. Although a source of occasional frustration, I am always delighted by these schedule overlaps, because it is surely a good sign and indicative of the growing presence of the SciArt dialogue.[36]

Buntaine is another SciArt specialist who does not produce science nor art, but rather makes the combination accessible and, ultimately, profitable.[37]

As a part of the blossoming of SciArt, several artist-in-residency schemes have emerged before and during the Arts@CERN programme: the Australian Network for Art

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[32] For a discussion of historical connections between museums and science see John Durant, *Museums and the Public Understanding of Science* (London: The Science Museum, 1992).
[33] John D. Lanton (ed.), *Controversial Bodies: Thoughts on the Public Display of Plastinated Corpses* (MD; Baltimore: Johns Hopkins University Press, 2011).
[34] The Art Science Observatory website: http://www.artscienceobservatory.org/#!about/c18s8 (accessed 26.06.2015).
[35] The University of Manchester, "Nancy Rothwell Award launched", The University of Manchester News Blog (23.05.2014).
[36] Julia Buntaine, "Editorial", *SciArt in America* (Dec 2013).
[37] While *SciArt in America* is a free publication, it encourages donations. Donors become SciArt Members and part of the SciArt Centre. For sixty dollars a year members have access to an exclusive mailing list, events and eligibility for an upcoming residency.

and Technology, ArtLab in Japan, the American Art Science Research Lab, The Arts Catalyst organisation, Arts/INDUSTRY at the John Michael Kohler Arts Centre in Wisconsin, The Banff Centre for the Arts in Canada, C3 Centre for Culture & Communication in Hungary, the American Centre for Art and Media, the Creativity and Cognition Research Studios in the UK, the Commonwealth Scientific and Industrial Research Organisation, the cultural studio Foam in Belgium, the Japanese Institute of Advanced Media Arts and Sciences, the Italian Interaction Design Institute in Ivrea, the Swedish Interactive Institute, the National Endowment for Science, Technology and the Arts in the UK, the New-Media Arts Fund in Australia, the National Science Foundation for Antarctic Artists and Writers Programme, SCIART studios in the UK, STUDIO for Creative Inquiry in America, Symbiotica at the University of Western Australia, and the V2 Organisation in the Netherlands. In addition to these projects, there are laboratory-based residencies, such as the short-lived NASA project in which the first and only winning artist, Laurie Anderson, was caught up in a public debate after she expressed controversial views about the space agency's mission.[38] Common for all of these SciArt projects is the institutional drive behind them, including national science organisations, museums, publishers, and in academia. While artists have always interacted with science, these new projects signal a tightening of the structures of SciArt.

All these projects have in common a fascination with and celebration of science through art. Funded by the private (charities, organisations, businesses) and public (universities, grants, bursaries) sectors, they are examples of a growing investment in the combination of the two. Arts and humanities budgets are being increasingly squeezed, and therefore working with the more affluent sciences leads to potential financial and network gains.[39] Artists are often brought in to comment on a specific scientific project

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[38] Arts Catalyst, "Laurie Anderson (Space Soon)", *Arts Catalyst* blog (12.09.2006). Anderson was given a $20,000 stipend to create a piece for NASA. In 2006, continuing his battle to rid the federal government of wasteful spending, Indiana Republican Chris Chocola, successfully amended the Science, State, Justice and Commerce annual appropriations bill "to prohibit federal funds from being used to employ an 'artist in residence' at NASA." The congressional report can be found at the NASA Watch website: http://nasawatch.com/archives/2005/06/nasas-first-and-last-artist-in-residence.html (accessed 29.03.2016).

[39] In the UK this is a growing concern. In 2008 the Arts and Humanities Research Council (AHRC) announced a "disappointing" spending review settlement, leading to cutting funding for postgraduates from 500 to 175 within one year, from Natasha Gilbert, "Universities Face Arts and Humanities Funding Cuts", *The Guardian* (17.01.2008):

or problem. In turn, they receive mentoring and (often) funding. In this sense they are contracted to fulfil a job description, bringing their expertise of the creative sector to the sciences. Artworks, lectures and events are the most common outcome of these collaborations, while some projects within the medical and biological sciences have had scientific outcomes, such as the glow-in-the-dark rabbit, Alba, created by artist Eduardo Kac by using jellyfish deoxyribonucleic acid (DNA).[40] Nevertheless, the field of SciArt generally focuses on the conversations between artists and scientists, rather than the outcome, in line with Arts@CERN.[41] But the project is not the first to invite artists to engage with a physics laboratory. The next section situates CERN in this history of physics and art.

2.3 Other laboratories

High-energy physics laboratories such as Fermilab, Los Alamos and Brookhaven make for useful comparisons to CERN through a shared context of politics, funding streams and scientific culture. As American physics laboratories, they are examples of the dominance of US science during the Cold War, which changed when CERN established itself in Europe as a research site in the 1950s.[42]

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http://www.theguardian.com/education/2008/jan/17/universityfunding.highereducation (accessed 29.03.2016). See also Mark Brown, "Arts and Culture Being 'Systematically Removed from UK Education System", *The Guardian* (17.02.2015): http://www.theguardian.com/education/2015/feb/17/arts-and-culture-systematically-removed-from-uk-education-system (accessed 29.03.2016); the 2015 report by the Warwick commission on the future of cultural value by Jonothan Neelands, Eleonora Belfiore, Catriona Firth, Natalie Hart, Liese Perrin, Susan Brock, Dominic Holdaway and Jane Woddis, *Enriching Britain: Culture, Creativity and Growth* (Coventry: University of Warwick, 2015); Alex Preston, "The War Against Humanities at Britain's Universities", *The Observer* (29.03.2015): http://www.theguardian.com/education/2015/mar/29/war-against-humanities-at-britains-universities (accessed 29.03.2016).

[40] Eduardo Kac, *GFP Bunny,* 2000. Rabbit and jellyfish DNA.

[41] For example, in the Wellcome Trust's review of its SciArt programme, the goal was not to create art, but to "stimulate interest and excitement in biomedical science among adults, foster interdisciplinary and collaborative creative practice in the arts and science, create a critical mass of artists looking at biomedical science and build a capacity in this field." *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart programme*, 3.

[42] Helge Kragh, *Quantum Generations: A History of Physics in the Twentieth Century* (Princeton: Princeton University Press, 2002), xii.

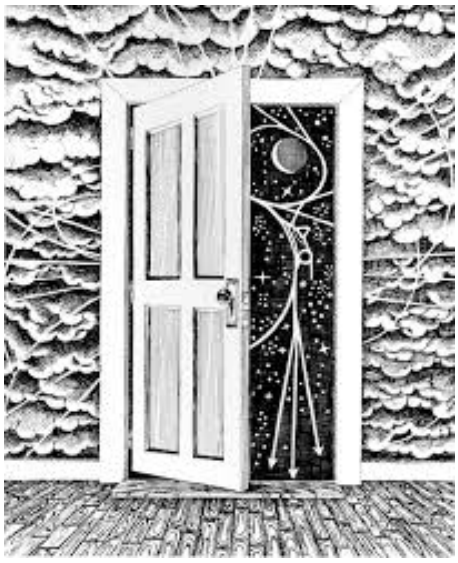

Fig. 11: *One of Angela Gonzales' many artworks made at Fermilab.*

Fermilab is still America's premier particle physics laboratory, founded in 1967 and a close colleague of CERN. The narrative of the organisation was originally built on the discovery of the American Frontier.[43] Fermilab's eccentric founder Robert Wilson passionately supported the idea of a scientific laboratory that integrated the arts, wild buffalo, and creativity with new technology and research.[44] He designed buildings and artworks on-site, and was known for making the space beautiful.[45] Wilson influenced much of the architecture, arguing for an aesthetic space in stark contrast to the "all science all the time" funding policy at CERN ten years previously.[46] Mathematical formulae and shapes were included in the buildings, as well as DNA double helix spirals and other canonical science images. Wilson's many abstract sculptures dotted the site.[47] In later years, Fermilab hosted a number of creative visitors, with artist Angela Gonzales staying on as a resident artist from 1967 to 1997. Her images of Fermilab are found on-site, but also as illustrations to Hoddeson's book, in annual scientific reviews and as commemorative gifts. Her science-fiction images of Fermilab's buildings are hallucinogenic visions of the site, inspired by cartoons and scientific images **(Fig. 11)**.[48] The laboratory's engagement with the arts also manifests itself in the Fermilab Art Gallery, where visiting artists exhibit their work to the resident scientists. A varied programme of speakers and amateur artists from the science community ensures that Fermilab is still a thriving

[43] Lillian Hoddeson, Adrienne W. Kolb and Catherine Westfall, *Fermilab: Physics, the Frontier, and Megascience* (Chicago: University of Chicago Press, 2008).
[44] Hoddeson, *Fermilab,* 1-9.
[45] Al Silverman, "The Magiciant: Robert Rathbun Wilson 1914-2000", *CERN Courier* (March 2000), 13-16.
[46] Hermann et al, *History of CERN*, *Volume II,* 17*;* Røstvik interview with Roger Anthoine, CERN, 25.03.2013.
[47] Fermilab, "Robert R. Wilson's Sculpture and Architecture", The Fermilab History and Archives Project (undated).
[48] Mike Perricone, "High Energy Artist Says Good-Bye", *FermiNews*, no. 16 (14.08.1998).

SciArt centre.[49] Thus, the staff that worked at Fermilab before moving on to CERN (as in the rest of the high-energy physics world, there was much overlap) were exposed to a culture that engaged with the arts. From founder Wilson's creative driving force to Gonzales science-fiction visions of their workspace, from visiting artists to the sculptures dotted around the site, Fermilab staff were part of an interdisciplinary and creative environment. While artists visited CERN in this period too, the organisation itself did not engage as closely with them as Wilson and Fermilab did. Whereas the latter built relationships with artists and used art in its official narrative as a creative, frontier site, CERN focused only on science and scientists.

Many CERN careers and projects started at Los Alamos. The National Laboratory undertook classified work towards the design of nuclear weapons in the Manhattan Project. The work was steeped in secrecy and was undertaken in the barren landscape of New Mexico. The physicists there helped to develop crucial knowledge in their field, and Los Alamos still has a varied research programme. Between 1942 and 1946 the Manhattan Project created a blueprint of what large-scale, complex and expensive transnational physics could look like.[50] The complex nature of Los Alamos' research, and the realisation of its consequences, led to much soul searching. As its legacy darkened, some high-profile Manhattan Project scientists relocated to Europe, arguing for peaceful physics in the Pugwash Conferences on Science and World Affairs and other places, campaigning against nuclear arms.[51] CERN's own focus on peace

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[49] Fermilab Cultural Events and Fermilab Art Gallery: http://www.fnal.gov/culture/NewArts/index.shtml (11.11.2014, accessed 26.06.2015).

[50] The history of Los Alamos and the Manhattan Project has been explored in countless books. The following are by no means a complete list, but provide detailed analysis and background for understanding the complex site and project. Lillian Hoddeson, Paul W. Henriksen, Roger A. Meade, Catherine L. Westfall, *A Critical Assembly: A Technical History of Los Alamos During the Oppenheimer Years 1943-1945* (Cambridge: Cambridge University Press, 1993); TaraShea Nesbit, *The Wives of Los Alamos* (London: Bloomsbury Publishing, 2014); Richard Rhodes, *Making of the Atomic Bomb* (New York: Simon & Schuster, 1986); Jon Hunner, *Inventing Los Alamos: The Growth of an Atomic Community* (Oklahoma: University of Oklahoma Press, 2014); Jeffrey Hughes, *The Manhattan Project: Big Science and the Atom Bomb* (London: Icon, 2003); Ferenc Morton Szasz, *British Scientists and the Manhattan Project: The Los Alamos Years* (New York: Springer, 1992).

[51] The Pugwash conferences were founded in 1957 to seek peaceful solutions to global security threats in the context of the Cold War. The meetings started following the publication of the Russell-Einstein Manifesto of 1955, a paper highlighting the threat posed by nuclear weapons, signed by eleven intellectuals and scientists. Many of the individuals involved had also been involved in developing the nuclear bomb, directly or indirectly. The Pugwash Conference and its founder Joseph Rotblat won the Nobel Peace Prize in 1995 "for their efforts to diminish the part played by nuclear

originates in this difficult time, and has recently been celebrated in the anniversary programme named "sixty years of science for peace".[52] Some chose to stay at Los Alamos and work on other projects, trying to change the culture of secrecy that had once dominated the site. Part of the solution was The Los Alamos Arts Council, formed in 1967 "to address the needs of the Los Alamos arts community".[53] Housed in one of the former Manhattan Project buildings, it became "a home for the artistic side of the scientific community." The first steps were organised by the American Association of University Women, and the first Los Alamos Arts Festival was run in August 1967. In 1977 the Fuller Lodge Art Center opened as a gallery, and it still hosts exhibitions. A donor scheme is in place, with membership costing from fifteen dollars (student) to 250 dollars (President's Circle). In its forty-seven-year history the project's Board of Directors has always included women.[54] As was the case with CERN, the permanent Los Alamos community was close-knit, and faced controversy and media scrutiny. But where CERN has organised its art programme only recently, Los Alamos created a strong programme of amateur and semi-professional artists. The soft powers of art can be seen as a strategy to heal the community, but it did not shelter them from criticism. While CERN's context is different (transparent and peaceful), there is a similar wish to create a holistic laboratory that engages with a broader culture. However, in contrast with Los Alamos internal community focus, CERN seeks a broader audience for its art projects, which are geared more towards the external world than the on-site society, as I shall explore.

Finally, Brookhaven National Laboratory in New York, another early civilian physics institution, also championed aesthetics and culture from its founding in 1947. Situated on a former US military camp, the staff and officers of the laboratory had to

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arms in international politics and, in the longer run, to eliminate such arms." (The Nobel Foundation, "The Nobel Prize 1995", The Nobel Foundations blog (undated): http://www.nobelprize.org/nobel_prizes/lists/year/?year=1995 (accessed 27.03.2016).

[52] CERN sixty-year anniversary webpage: http://cern60.web.cern.ch/en (accessed 11.03.2016).

[53] Los Alamos, "Los Alamos Arts Council and Fuller Lodge: Over 40 Years of History", The Los Alamos Arts Council website, pdf (undated): https://www.losalamosnm.us/gov/bcc/cdac/Documents/Los%20Alamos%20Creative%20District%20Plan.pdf (accessed 11.03.2016).

[54] Los Alamos, "Los Alamos Arts Council and Fuller Lodge: Over 40 Years of History, The Los Alamos Arts Council website, pdf. For a history of women at Los Alamos see Nesbit, *The Wives of Los Alamos*.

start explaining that their work on the atom was strictly peaceful.[55] CERN shares Brookhaven's goal of understanding the basic principles of the universe through the Standard Model of physics, as well as a growing focus on sustainable energy sources. As a similar experimental community, Brookhaven struggled with identity, funding and politics, having to justify itself on all fronts.[56] As in the case of CERN, much of Brookhaven's history has focused on the importance of machines such as the Relativistic Heavy Ion Collider (RHIC), the world's most powerful particle accelerator until the LHC was switched on in 2008. Brookhaven's founder, physicist and Nobel Prize winner Isidor Isaac Rabi, was passionate about Brookhaven's qualities, which he saw as having the capacity to inspire. He saw links between the arts and physics, stating that both could be a way of life.[57] One strategy for dealing with controversy at Brookhaven, including a twelve-year leak of hazardous tritium in the local environment, was to build on the artistic and creative qualities of their work. Instead of linking Brookhaven with abstract mathematics, Rabi and others stated that it was closer to the abstract nature of art: "It has the qualities of art, of literature, of poetry, for the physicist who's immersed in it (…) It can be so moving as to leave one almost speechless (…) Oh, no, it's very far from cold."[58] Networks between Brookhaven scientists and the nearby New York art scene were initiated. In one instance a reactor was used for pioneering work in art and archaeology. Another time the Metropolitan Museum of Art in New York sent its Rembrandt paintings to the laboratory to investigate their authenticity.[59] George Cox, a Brookhaven technical illustrator, cemented the link between the laboratory and peace when he designed the official Atoms for Peace stamp in 1955 to coincide with the international conference on atomic energy in Geneva the same year. By separating

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[55] Spencer R. Weart, *Nuclear Fear: A History of Images* (MA; Cambridge: Harvard University Press, 2009), 178.
[56] Robert Crease, *Making Physics. Biography of Brookhaven National Laboratory, 1946–1972* (Chicago; London: University of Chicago Press, 1999), 199; 223; 265; 349; 350.
[57] Crease, *Making Physics. Biography of Brookhaven National Laboratory,* 1–8; note 373 for excerpts from interview "Reminiscences of I.I. Rabi" (11.01.1983) and Rigden and Rabi's video interview (29.09.1982).
[58] Rabi quoted in Crease, *Making Physics*, 8. Many scientists and science writers argue this, for example John Banville, "Beauty, Charm, and Strangeness: Science as Metaphor", *Science* 281, no. 5373 (1998), 40-41.
[59] Crease, *Making Physics,* 189.

Brookhaven from controversial topics and drawing on the abstract connections between physics and art, the laboratory is still seen as a peaceful entity today.

The forms of engagement with the arts by these other laboratories anticipate some of CERN's strategies for harvesting cultural capital in later years. The charismatic leadership of Fermilab, complex history of Los Alamos and the abstract marketing of physics at Brookhaven generated creative, cross-disciplinary relationships. These laboratories often had an applied focus, in addition to being supported by the financial security of twentieth-century United States. For years, the United States was the global leader of physics, whereas today this power resides in Europe, with Japan quickly overtaking.[60]

These examples show that the field of high-energy physics has a history of cultural engagement. CERN shares some of this history in terms of the visits that artists have made to the organisation over the years. But for most of its history CERN has not interacted as closely with the arts as Fermilab, Los Alamos and Brookhaven. It has not fostered the same organic, casual growth of art projects as the other laboratories, nor culturally capitalised on the artists who visited the site. The American context is of course different, especially in terms of funding, but CERN nevertheless emerges as a less culturally engaged space in comparison with these three examples. Instead, CERN focused on PR in its contact with non-scientists.

2.4 Selling science at CERN

While Brookhaven, Fermilab and Los Alamos were engaging with artists and the arts, CERN's main communication with the outside world was through the Public Information Office. This section discusses the organisation's historical use of PR (the history of the PR office is discussed in chapter one). This is important to understand as the arts programme at CERN has been used as PR. In the 1960s, the budding PR office was concerned with the public visibility of CERN, because each CERN member state had (and still has) a representative who deals with and is paid to inform non-scientists.

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[60] Exemplified by the Japanese domination over the discussions about the International Linear Collider (ILC) machine in 2014/2015. Hitoshi Murayama, "Japanese Government Makes a Move", *Newsline: The Newsletter of the Linear Collider Community* (23.01.2014): http://newsline.linearcollider.org/2014/01/23/japanese-government-makes-a-move/ (accessed 29.03.2016).

Looking ahead to the 1970s, the question of transparency became important for the PR office: "In the seventies CERN will probably have to make an increased effort to defend its position in view of the anticipated budget squeezes on physics research in the Member States."[61] Thus, it was decided that CERN would focus its PR strategy on press notices, the *CERN Courier,* scientific publications, direct enquiries from the press, visits, commissioned articles, "placed articles" and individual initiatives.[62] This structure is still evident at CERN today, as well as a strong online presence and individual initiatives such as Arts@CERN. It was in the 1960s and '70s that these strategies were tried and tested. In 1962, a photography competition with the theme "How visitors see CERN" was organised by the Public Relations Office.[63] The response was "rather disappointing", but E. Fischer's image of the "white administration building against the summer's clear blue sky", and Marinus van Gulik's series of black-and-white photographs of his young son touring the laboratory, both won.[64] In the following year CERN welcomed 8,391 international visitors.[65] Reaching out to UK media in particular, the PR office invited journalists from twenty-three publications in 1976, including the *Times Higher Education Supplement* and *Nature.*[66] But the press office was also quick to point out mistakes in the media coverage. A 1978 letter informed Radio Moscow that they were wrong in claiming that "the interests of Chinese physicists undergoing training in the European Nuclear Research Centre in Geneva are not limited to the civilian sphere", pointing out that CERN is a peaceful endeavour.[67] By the end of the '70s, the Communications Group warned that future relationships with the press needed to become more sophisticated than they had been:

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[61] This was particularly relevant as regards to Sweden, as Swedish reporters often mistranslated CERN material. This national example became a warning for other CERN-press relations in other countries, especially the "five odd" language countries (Denmark, Greece, Norway, Italy and Holland)." Lab II-DI/SE/LP/nm, "Memorandum: Public Information Questions of CERN with Sweden" (03.04.1973).
[62] DIR/ADM/20(1), "Joint Meeting of Board of Directors/Division Leaders: Public Information Policy" (07.06.1973).
[63] "How a Visitor sees CERN" *CERN Courier* 2, no. 12 (Dec 1962), 3–12.
[64] *CERN Courier* (Dec 1962) 3–11.
[65] PIO/MJOS/hw, Roger Anthoine, "Memorandum: Seminar for PIO Guides" (25.01.1964), CERN archives, Geneva.
[66] DG/PV/PRESSE/RA/mp, "Positive Answer to the Invitation to the United Kingdom Press on 15 and 16 November 1976" (11.11.976), CERN archives, Geneva.
[67] DG/EX/PV/PRESSE/RA/mp, "Re: CERN and China: A Correction" (20.06.1978), CERN archives, Geneva.

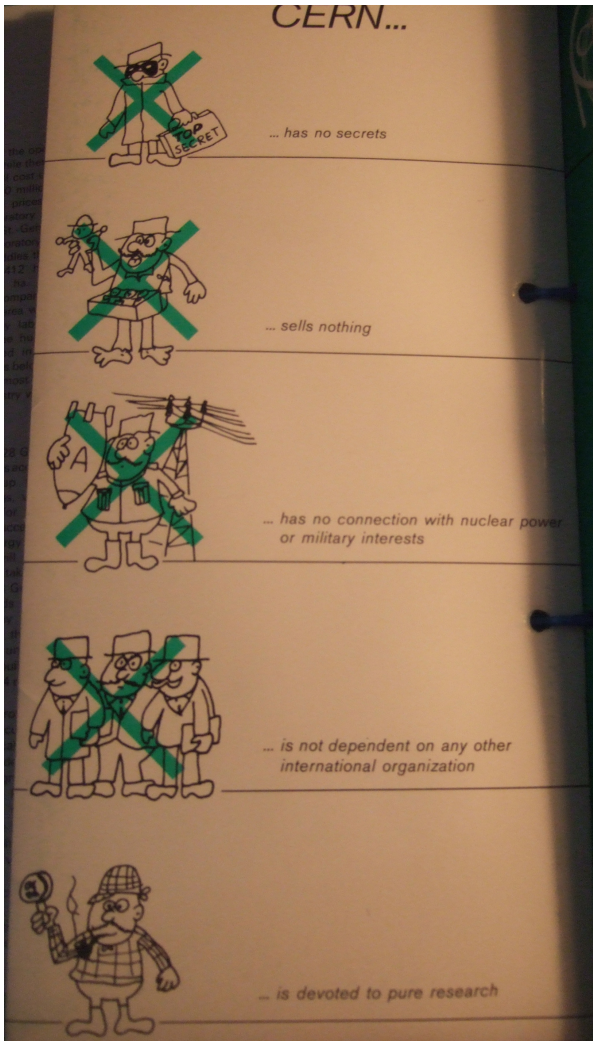

Fig. 12: *A CERN leaflet explains what CERN does not do.*

Despite the recession in science spending and a certain general disillusionment with high-energy physics, CERN has retained the general support of the press and (…) has won the respect and trust of the correspondents with whom it has been able to maintain direct personal contact. It must however be recognised that pressures on the Organisation will increase significantly and it will be difficult to counter competition (even opposition) unless a more positive and sophisticated attitude is, in future, adopted towards public relations.[68]

Thus, the PR office was given more funding, resulting in increased interest from the media, such as this extract from a letter from the BBC in 1985:

> As you know the question concerning the benefits of Energy Physics Research, are currently in discussion around Europe and particularly in the UK. We feel that it is important that the issues behind this debate are brought to the public's attention. To achieve this we propose to make a programme aimed at a European audience which addresses these issues. Such a programme requires a debating forum and it seems to us that the most appropriate place for this debate is at CERN.[69]

Leaflets about "How to Visit CERN" from the 1970s and '80s suggested that anyone could visit as long as they booked in advance.[70] Later, a weekly Saturday slot was offered to visitors due to high demand. By 1988, a permanent exhibition named

[68] DI/PIO/ES/yr, Edwin N Shaw/PIO to Prof W Jentschke/DI, "Memorandum: Communications in CERN" (26.11.1970), CERN archives, Geneva.
[69] Letter from BBC to CERN (03.04.1985), CERN archives, Geneva.
[70] Leaflet: "How to Visit CERN", *CERN Communications Group,* 1965 and 1969. In Public Information Office archive: PIO B1124 CERN-ARCH-PIO-02004, CERN archives, Geneva.

MICROCOSM was installed to accommodate and educate the thousands of annual visitors as a "new tool of public relations". Financial support came from the City and Canton of Geneva and the Union Bank of Switzerland.[71] Despite a slow process of "resistance and inertia", the permanent visitor centre was opened in 1993. Carlo Rubbia, then Director General, described it as a "cultural gesture" to encourage laypeople, especially the young, excited about CERN's work. The exhibition planning was led by a team of "outsiders [who were] essential, not only for their expertise, but also by the unprejudiced look they had." Rubbia goes on to describe their useful "foreign eye" as representatives of the lay public in creating a "conceptual, technical, stylistic" contribution.[72] The visitor centre marks the beginning of a more professional engagement with the public, focused on education and dispelling myths about scientists and science.[73] In a leaflet summing up CERN's core values, a cartoon man explains that CERN "…has no secrets", "…sells nothing", "has no connection with nuclear powers or military interests", "…is not dependent on any other international organisation" and "… is devoted to pure research" (**Fig. 12**).[74] Information leaflets such as this were not only a way of conveying information to visitors, but also worked to distance CERN from the context of nuclear rearmament in Western Europe at the time. CERN's modern Communications Group still focuses on these core values in disseminating information today.

In the 1990s it became clear that the Superconducting Super Collider (SSC) programme in Texas would be cancelled.[75] This would have been a big competitor for CERN, and although its ultimate failure led to Europe retaining power in the field, it was

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[71] "Gifts for the Implementations of the MICROCOSM project", Finance Committee Meeting 13.12.1988. CERN/1721 (CERN/FC/3197) (21.11.1988), CERN archives, Geneva.
[72] "Allucution du Professeur C. Rubbia, Directeur General du CERN, lors de l'Inauguration de MICROCOSM" (08.09.1993) (CERN/ARCH/DG/CR /2/3/1429), CERN archives, Geneva.
[73] Martin W. Bauer and Massimiano Bucchi, *Journalism, Science and Society: Science Communication Between News and Public Relations* (New York: Routledge, 2008), 44.
[74] CERN core values leaflet, undated but assumed to be from the mid-1980s. No catalogue number. CERN archives, Geneva.
[75] John G. Cramer, "The Decline and Fall of the SSC", *Analogue Science Fiction and Fact Magazine* (May 1997); Dan Kevles, "Good-bye to the SSC: On the Life and Death of the Superconducting Super Collider", *Engineering & Science* 58 no. 2 (1995), 16-25; Michael Riordan, Lillian Hoddeson and Adrienne W. Kolb, *Tunnel Visions: The Rise and Fall of the Superconducting Super Collider* (Chicago: University of Chicago Press, 2015).

also a lesson in political negotiations of science funding for high-energy physics.[76] The (inter)national debate over the decision to fund and then cancel the SSC in the United States extended well beyond the physics community. This clarified the relationships between politicians, funders and non-applied physicists to the lay audience. Fearing a similar worst-case scenario, CERN is moving in the opposite direction compared to what the SSC scientists and administration did over twenty years ago.[77] Instead of playing all their cards on the importance of science and direct spin-offs, CERN is increasingly reaching out to their idea of the layperson, and proliferating their name and knowledge in a wide stream of networks, from the Collide@CERN residency competition to participation at Davos.[78]

In the early 2000s, CERN faced more challenges after several technical problems created critical coverage in the press. In 2005, a CERN technician, José Pereira Lages, was killed in the LHC when a piece of equipment fell on him.[79] In 2007 a magnet provided by Fermilab malfunctioned, and in 2008, during testing of the LHC, a faulty electrical connection damaged the magnet again.[80] This, and two vacuum leaks in 2009, led to delays in the starting of the LHC.[81] The switching on of the LHC was supposed to be a moment of success for CERN, but these incidents led to many critical pieces in mainstream media.[82] This led the organisation to publicly review its own safety

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[76] Chiara Palmerini, "Science Reporting as negotiation" in Bauer and Bucchi, *Journalism, Science and Society,* 113-123.

[77] The political and public discussions in the United States leading up to the decision to cancel the SSC project are often held up as an example of why they got it wrong (by CERN) and right (by opposers). Lillian Hoddeson and Adrienne W. Kolb, "The Superconducting Super Collider's Frontier Outpost, 1983–1988", *Fermilab,* 271–310; Michael Riordan, "The Demise of the Superconducting Super Collider", *Physics in Perspective* 2, no. 4, 411–25 (subscription required); Sidney D. Drell, "The Superconducting Super Collider Project: A Summary", *High Energy Physics Advisory Panel's Subpanel on Vision for the Future of High Energy Physics* (May 2004); "The final debate in the House of Representatives regarding the Super Collider Debate from 24 June 1993", *C-Span Recordings:* http://www.c-span.org/video/?43633-1/super-conducting-super-collider-debate (accessed 19.03.2014).

[78] Barbara L. Whitten, "What Physics is Fundamental Physics?" *NWSA Journal* 8, no. 2 (1996), 1–16; note 15.

[79] Robert Aymar, "Message from the Director General", *CERN Bulletin* 44-45 (31.10.2005).

[80] "Fermilab Update on Inner Triplet Magnets at LHC: Magnet Repairs Underway at CERN", press release from CERN Press Office (1.06.2007); Paul Rincon, "Collider Halted Until Next Year", BBC News (23.09.2008): http://news.bbc.co.uk/1/hi/in_depth/7632408.stm (accessed 30.03.2016).

[81] "News on the LHC", CERN press office (16.07.2009)

[82] See for example "Bursting Magnets may Delay CERN Collider Project", *Reuters* (5.04.2007): http://www.reuters.com/article/us-science-cern-idUSL054919720070405 (accessed 30.03.2016); "Fermilab 'Dumbfounded' by Fiasco that Broke Magnet", *Photonics.com* (4.04.2007):

measures, and focus on a stronger relationship with the general public.[83] In an effort to communicate more effectively, workshops for all CERN staff were organised. One of the blurbs for a training session read:

> This session will cover how to work effectively with the media including print, radio and TV. You'll get an insight into how journalists and news rooms operate and what they would like from you. You'll learn to recognise both soft balls and traps – and develop the techniques for dealing with them. The challenges of explaining and positioning CERN to any media outlet whether local, national or international will be dealt with too. This interactive presentation, given by Jessica Pryce-Jones, Managing Director of the consultancy iOpener Ltd and Nisha Pillai, news anchor for BBC World, will be illustrated with various case studies.[84]

This kind of media training (again involving BBC staff) is not exclusive to high-energy physics, but has become increasingly relevant to a large number of CERN staff who are expected to answer questions about the Higgs boson, CERN's funding and new machines. Several of the training events have featured consultants and media personalities, solidifying the relationship between CERN and the press.

Today, the modern press office (the Communications Group) at CERN engages in many projects. James Gillies, head of the group, explained: "We don't care too much about them getting the science right. But we care about them getting the scientists right."[85] Thus, the focus is not solely on enlightening the public or educating the non-scientist. CERN needs to preserve a positive public image, as its main board consists of

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http://www.photonics.com/Article.aspx?AID=29203 (accessed 30.03.2016); Dennis Overbye, "After Repairs, Summer Start-Up Planned for Collider", *New York Times* (5.12.2008), etc.

[83] J. P. Blaizot, J. Iliopoulos, J. Madsen, G. G. Ross, P. Sonderegger, H. J. Specht, "Study of Potentially Dangerous Events During Heavy-Ion Collisions at the LHC: Report of the LHC Safety Study Group", CERN 1 (1.01.2003); J. Ellis, J. G. Giudice, M.L. Mangano, T. Tkachev, U. Wiedemann (LHC Safety Assessment Group), "Review of the Safety of LHC Collisions", *Journal of Physics G* 34, no. 11 (5.09.2008); "The Safety of the LHC", CERN press office (undated) rounds up further reports and reviews about safety at CERN from CERN and others: http://public.web.cern.ch/public/en/LHC/Safety-en.html (accessed 30.03.2016).

[84] CERN, "Special Seminar: How to Deal with the Media: Maximising Opportunity and Minimising Threat", CERN indico website (undated): http://indico.cern.ch/event/22904/ (accessed 27.03.2016).

[85] Røstvik interview with James Gillies, CERN, 25.03.2013.

scientists and politicians from each member country.[86] Certain types of communication have become one of CERN's strengths, in line with the many recommendations from governments and funding bodies to engage in public outreach. In the UK this can in part be traced back to the 1985 *Bodmer Report,* which found the science community lacking in its communication skills towards the public, and the Committee on the Public Understanding of Science (Copus) was founded in the same year by the British Association for the Advancement of Science, the Royal Institution and the Royal Society.[87] The last grants from the Copus grant scheme were given in the early 2000s and aided in developing a communication strategy between scientists and the public. Today these efforts bear fruit in countless science and humanities collaborations, increasingly with an inclusion of the arts. Deciding whether or not to reach out to the lay audience in the pre-Higgs events of the twentieth and twenty-first centuries, "there was quite a discussion on how we should engage the media", one which was "not uncontroversial", according to popular physics writer and CERN physicist Jon Butterworth.[88] Some "argued for a *Blue Peter* approach", where discoveries would be presented, rather than the process of scientific research. Others disagreed, but in the end CERN's ethics of transparency won, relying on the Internet to communicate its work quickly.[89] Such media discussions, sometimes involving dissenter Otto Rössler, inspired the organisation to meet controversy "head-on, fast and with one voice", in order to

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[86] CERN's main board consists of scientists and politicians from each of the twenty member countries. Member countries can fund anything within CERN's budgets, whereas countries with observer status can fund machines.

[87] W. J. D. Bodmer, *Public Understanding of Science* (J. D. Bernal Lecture, Birkbeck College London, 1985)*;* C. Cohen, *Sci-Art. An Evaluation* (London: Wellcome Trust, 1998); House of Commons: Committee of Public Accounts, *Big Science: Public Investment in Large Scientific Facilities* (2006/2007); House of Lords, "Setting Priorities for Publicly Funded Research", Volume 1: Report. London: House of Lords (01.04.2010); Royal Society, *The Public Understanding of Science, Report of a Royal Society ad hoc Group*, endorsed by the Council of the Royal Society. London: Royal Society (1985). See also Bodmer's reflection on Committee on the Public Understanding of Science (COPUS) from 2010: "Public Understanding of Science: The BA, the Royal Society and Copus", *The Royal Society Notes and Records* (14.07.2010) published online: http://rsnr.royalsocietypublishing.org/content/early/2010/06/16/rsnr.2010.0035.article-info (accessed 2 Nov 2015).

[88] Jon Butterworth, "Smashing Physics" talk, Blackwell's, Precinct Centre, Manchester (01.11.2014).

[89] *Blue Peter* is a children's TV programme produced and aired by the BBC. Central to the show are the craft and do-it-yourself (DIY) activities and projects presented by the hosts. Butterworth is referring to the programme's tendency to very clearly state each stage of production of a game, toy or project.

make the public feel as if they were "part of a rational group versus madness."[90] Letting you in on its secrets, CERN exposes itself instead of risking being exposed. It relies on the participatory model of science communication, rather than the deficit model, which assumes that the public is sceptical to science due to lack of information.[91] But despite this successful model of rationality "versus madness", the organisation still has to justify its cost. Recently the US Congress, a major funder of the machines at CERN, started preparing a bill that called for every grant to meet certain conditions, including being of "the finest quality, groundbreaking, and answer[ing] questions or solve[ing] problems that are of utmost importance to society at large."[92] This was one of the debates that led to the cancellation of NASA's artist in residency programme, as it was seen as wasteful.[93] This will possibly result in smaller non-applied science budgets in the future. At CERN, a parallel movement has been taking place, evident in the growing focus on spin-offs for the medical sciences in particular. In short, CERN still has to justify itself on many fronts. The sudden decision to start a structured art programme at CERN supports the organisation's PR agenda as it continues to legitimise itself to the media, funders and the public.

In the end, who funds and makes possible SciArt at CERN, and what are they asking in return? The Collide@CERN residency is funded by the city of Geneva, as well as Ars Electronica and private donors. The money that catalysed the programme came from the British Clore Foundation through Briton Ariane Koek. In many ways this reflects British funding of CERN, and British funding of SciArt in general. Since the 1950s the UK has been active in debates about CERN, at times arguing for European financial support, and at others for a freeze of the budget.[94] The UK has nevertheless

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[90] Jon Butterworth, "Smashing Physics" talk, Blackwell's, Precinct Centre, Manchester (01.11.2014).
[91] Bernadette Bensaude-Vincent, "A Historical Perspective on Science and Its "Others", *Isis* 100, no. 2 (2009), 359-368; David Dickson, "The Case for a 'Deficit Model' of Science Communication", *SciDev.net* (27.06.2005): http://www.scidev.net/global/communication/editorials/the-case-for-a-deficit-model-of-science-communic.html (accessed 3.04.2016).
[92] John Timmer, "Congress Tries to Reset Science Grants, Wants Every One to be "Groundbreaking", *Ars Technica* (29.04.2013).
[93] Keith Cowing, "NASA's First and Last Artist in Residence Laurie Anderson", NASAWatch, 21.06.2005. http://nasawatch.com/archives/2005/06/nasas-first-and-last-artist-in-residence.html (accessed 16.03.2016).
[94] For a discussion of this varied, but currently strong relationship, see John Krige, "Scientists as Policymakers: British Physicists' 'Advice' to their Government on Membership of CERN (1951/52)", in T. Frängsmyr (ed.), *Solomon's House Revisited: The Organization and Institutionalization of Science.*

played a major role at CERN, in particular in the LHC project. Fifteen university groups were involved in its construction and "key roles (…) held by UK personnel."[95] The university groups are involved in the design and construction of parts of the detectors, some of which were built in Britain before being sent to CERN.[96] Overall, there are 222 UK nationals employed regularly by CERN with more than 560 UK scientists working regularly on-site. Additionally, hundreds of graduate and summer school students make their way through the site annually.

CERN has also been beneficial for UK businesses.[97] The UK information technology manufacturer Viglen won a contract competition to supply servers and processors that will be used in the computer centre. The English technology manufacturer E2V supplies high-voltage thyratrons (gas-filled devices) used in the accelerator complex. Elite Electronics from Northern Ireland provides electronic units for the magnets at the core of the LHC accelerator. Scottish MSC Ltd. supplied electronic boards. The UK Institute of Physics has an ongoing publishing deal with the organisation. The Birmingham company C. Brandauer & Co. Ltd. supplies pressure relief springs. English Cryogenic Ltd. has a contract for the magnetometer systems. Visual Impact UK makes large parts of CERN's video systems.[98] CERN's need for machine parts and new technology means financial opportunities for many European countries, but these examples emphasise how beneficial CERN is to a number of UK industries.[99] The British exhibition about CERN and the LHC, named *Collider*, also led to contracts for UK firms. London-based company Shelton Fleming designed and constructed the exhibition for the Science Museum in London, and it was largely funded

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Nobel Symposium 75 (MA; Canton, Science History Publications, 1990), 270–91; John Krige, "Why did Britain Join CERN?" in D. Gooding, S. Schaffer and T. Pinch (eds.), *The Uses of Experiment: Studies of Experimentation in the Natural Sciences* (Cambridge: Cambridge University Press, 1989), 385–406.

[95] Science and Technology Facilities Council UK, "CERN – Questions and Answers", STFC website: *stfc.ac.uk* (undated): http://www.stfc.ac.uk/about-us/what-we-do/why-is-the-uk-involved-in-cern/ (accessed 27.03.2016).

[96] The university groups in the UK are at Birmingham, Bristol, Brunel, Cambridge, Edinburgh, Glasgow, Imperial College, Oxford, Lancaster, Liverpool, Manchester, Queen Mary, Royal Holloway, Sheffield and University College London.

[97] Science and Technology Facilities Council UK, "CERN – Questions and Answers", STFC website.

[98] Science and Technology Facilities Council UK, "CERN – Questions and Answers", STFC website.

[99] CERN contracts are procured through tendering, and privileges the CERN member countries. "Doing Business with CERN", CERN Procurement and Industrial Services Group (undated): http://procurement.web.cern.ch/doing-business-with-cern (accessed 30.03.2016).

by UK sources, including a private cancer research company dedicated to using beam-technology as therapy.[100] CERN is important to Britain's industry and technology sectors. In Scotland's referendum debate in 2014, Scottish scientists warned about what might happen in terms of dangers posed to science if Scotland was to leave the UK.[101] According to the UK Department of Business, Science and Innovation, the unknown costs of CERN's future is worth every penny, naming it as "one of the highest priorities for the UK's particle physics programme for the next decade and beyond."[102] The country's unwavering support of CERN is symptomatic of an educational and financial strategy based on innovation, entrepreneurs and the STEM field.[103] The UK government will continue to pay its membership fee to CERN and champion the organisation. This is the fiscal backdrop against which Arts@CERN, also initially catalysed by British funding, is set. While CERN "sells nothing", it certainly is part of a network of thriving economies.[104]

2.5 Conclusion

As explored in this chapter, SciArt is a defined art genre with a brief and institutional history. It often includes small circles of institutions and people that make decisions without directly involving artists or scientists. The genre's success is connected to those who coined it, funded it and set out its policies. Several of these "third culture" actors stand behind the Arts@CERN programme, for example cultural specialists, PR professionals and CERN itself. SciArt is a convenient investment strategy where local

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[100] The Science & Technology Facilities Council (funder and custodian of UK particle physics, and manager of the UK's national membership of CERN), Winton Capital Management (does scientific research into financial markets), the Embassy of Switzerland in the UK (host country to CERN), Advanced Oncotheraphy (a proton therapy/beam technology company that focuses on offering cancer patients particle treatments), National Instruments (American company that produces automated test equipment and virtual instrumentation software), The Ogden Trust (encourages and promotes the teaching of physics), and the Collider exhibition's patrons and supporters (anonymous).

[101] Department of Business, Innovation and Skills and Scotland Office, "Leading UK Scientists Believe No Vote in Scottish Referendum Will Protect Funding" (28.05.2014).

[102] Department of Business…, "Leading UK Scientists…"

[103] For analysis of the British culture of science and science communication works see Sharon M. Friedman, Sharon Dunwoody and Carol L. Rogers, *Scientists and Journalists: Reporting Science as News* (New York: Free Press, 1986); Stuart Allan, *Media, Risk and Science* (Buckingham: Open University Press, 2002).

[104] CERN core values leaflet, undated but assumed to be from the mid-1980s. CERN archives, Geneva.

and global, state-owned or private funders can get two intriguing and intellectually rich subjects covered by investing in one. In this context the artist's access to science can result in "contract art", meaning art that is created with the chief aim of satisfiying a client's wishes. There are not many examples of artists who try to critique or shake up the organisation they work with as a part of a SciArt project. The example of Anderson and NASA shows that artists might need to tone down any political or other critique. The artists also have to come to grips with working in "an extreme culture of objectivity".[105] In turn, this culture often capitalises on the personality and creativity of the artists. The artist, and what they stereotypically represent, can become an extended metaphor for how CERN wishes to be seen. With artists involved, CERN itself becomes SciArt. However, as with many SciArt projects, the artists are often so involved in the science that they themselves become makeshift scientists in the process, as we shall see in the case of Collide@CERN. Their non-scientist status is then traded for scientific insight. They remain outside of the production of scientific knowledge and therefore excluded from the creation of CERN's main narrative, which remains open only to scientists. Out of hundreds of requests, Arts@CERN organises on average twelve curated visits per year for artists. Having welcomed politicians, celebrities and journalists since the late 1950s, CERN is a space for translation and interpretation. It is well versed in the inclusion and/or exploitation of non-scientists to suit its own needs in a time where its budgets are being questioned (again). While many SciArt practitioners aim to combine science and art in equal measure, the collaborations that ensue are more often than not unbalanced, as the review of the Wellcome initiative found.[106] In the larger context, the booming global art market and science budgets have their own power structures. These are contexts that directly affect the individual artist and scientist working at CERN, but which they cannot change due to the institutional nature of these structures. SciArt, created by institutions rather than individuals, continues to first and foremost serve those institutions. Many of these structures are also at play in the case of Arts@CERN. This chapter has explored the institutional nature and history of SciArt, the use of art in other high-energy physics laboratories, and CERN's use of SciArt as

[105] Traweek, *Beamtimes and Lifetimes,* 162.
[106] Bamford and Glinkowski, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme*, executive summary, 7–10.

cultural capital and as a transparency-strategy. In the next chapter we turn towards the history of art at CERN, and explore the relationships between artists, scientists and institutional structures there.

CHAPTER THREE

Pasts. A History of Art at CERN

3.1 Introduction

This chapter examines the history of art that has been inspired by CERN before the Arts@CERN programme started. Through art historical analysis and drawing on the contexts introduced in previous chapters, this overview focuses on the artist's role at CERN. I take as a point of departure a definition of art in its broadest sense. It includes, for example, archaeology, architecture, gardens, sculpture, machines and stained-glass windows. Rather than conforming to notions of "high" and "popular" art, artists who have been inspired by CERN draw on many genres. Thus, this chapter examines a range of cultural products and does not make value judgements as regards to genre.[1] I also examine artworks that are not officially commented on by the organisation, and that are inspired by the more controversial topics surrounding CERN. I approach it this way in order to contrast and compare the reception of both types of art, and to discuss how the CERN art canon came into being. These works and artists usually come from outside of CERN, while some, in particular the band Les Horribles Cernettes, functioned from within the organisation. This chapter informs the discussion of Arts@CERN by presenting the art history of the organisation before the modern cultural policy came into being. These examples provide insight into the eclectic worlds of CERN art.

[1] Since the success of Pop Art and other art forms that played with notions of reproduction, some art historians have dismissed the traditional art historical canon focused on "high" art as opposed to "low", or "popular", art. Artists such as Andy Warhol, Jeff Koons, Robert Rauschenberg and Martha Rosler used everyday motifs, materials and/or contexts to create art that was often easy to reproduce, or reproduced by the artist themselves. Hailed by critics in due time, these artists are today (with the exception of Rosler) part of the circles of elite art in terms of sales and exhibitions. Nevertheless, these artists were at the front of a revolution in terms of canonical art history at the time they were most active. Theorists such as Walter Benjamin wrote, before and after the Pop Art revolution, about the consequences of reproduction and popular culture for the "high" arts. Today, many critics consider television, video games, graffiti, fashion, food and cinema to be art, and as technology improves and becomes more accessible to everyone (not just artists), notions of "high", "low" and "popular" art have in a sense collapsed completely. Nevertheless, most art historical literature, courses and degrees still focus on "high" art from the past, often relying heavily on the Western canon.

3.2 Meyrin

The founding member countries of CERN decided to build their organisation in the small village Meyrin outside of Geneva in Switzerland in the early '50s.[2] The country had been neutral in the Second World War, allowing for a European collaboration without old feuds.[3] Meyrin was an agricultural village until CERN moved in, bringing with it jobs and opportunity (**Fig. 13**).

Fig. 13: *Geneva officials and CERN staff survey Meyrin as construction of CERN begins.*

CERN's location at the edge of the Alps mirrors other sites of nuclear power plants, industry and research facilities in some of the world's most remote and beautiful places.[4] Several of the laboratory's workers live in Meyrin, or commute from Geneva. In 2008

[2] For a discussion of these debates see Hermann et al., *History of CERN*, *Volume I,* 238.
[3] For a discussion of scientists use of the concept of neutrality to promote their work see Rebecka Lettevall, Geert Somsen and Sven Widmalm, *Neutrality in Twentieth-Century Europe: Intersections of Science, Culture and Politics After the First World War* (London; New York: Routledge: 2012).
[4] See Peter Hales, *Atomic Spaces* (Illinois: University of Illinois Press, 1997), for a discussion of the Manhattan Project's distinct aesthetic in rural, remote and beautiful landscapes. Hales' analysis is also valid for the sites of aerospace research centres such as NASA, the natural beauty surrounding many of the UK's power plants and the vast landscapes around the world's nuclear power plants.

there were 144 births to Swiss citizens and 109 births to non-Swiss citizens.[5] The central airport, serving to the UN, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and CERN meetings, is also located near Meyrin. Non-governmental organisations and physicists have completely transformed the area.

Before the scattered buildings and farms on the outskirts of Switzerland could become host to scientists, engineers and supporting CERN staff, the area had to be examined as plans were made to build the laboratory on rich archaeological ground.[6] The first excavation was not well documented, and during the building of the LHC in the 1990s, it was found that the archaeological site was larger than suspected.[7] A team of archaeologists from the Rhone-Alps Regional Archaeology Service, together with the LHC authorities, carried out surveys to assess the archaeological sectors for potential interest. They identified five sectors for potential excavation. Sector A matched the foundations and surroundings of a Roman Empire farm. A discovery of coins from London and pottery from Champagne was also made, supporting the theory of an early agrarian economy with numerous trade connections. From this excavation two Roman columns were allocated to CERN. The organisation describes this as "2000-year-old technology transfer", placed in the central library to be "enjoyed by all."[8] The presence of the ancient Roman columns in the library invites visitors and staff to think about the history of the site. A photograph from 2001 shows a woman using one of the columns as a desk for her laptop, an

Fig. 14 *Woman leans on Roman column with laptop in CERN library.*

[5] Canton of Geneva Statistical Office, Population Statistics until December 2013 (in French), Republique et Canton de Geneve website (undated).
[6] History of Meyrin, CERN Library ref. 9(494), DUM, CERN archives, Geneva; CERN, Photographs of artefacts found at CERN Meyrin site, CERN archives document server (1998), LHC-PHO-1998-122 to LHC-PHO-1998-136, CERN archives, Geneva.
[7] "La Richesse Inouie du Patrimoine Gessien", *Dauphiné libere´* and PRESSCUT-98-065 (06.07.1998).
[8] Laurent Guiraud, photographs of woman and Roman columns in CERN Library, CERN archives document server, CERN-GE-0103011-01 and CERN-GE-0103011-02 (08.03.2001), CERN archives, Geneva.

example of CERN's use of cultural artefacts (**Fig. 14**). The image was used by the CERN Communication Group. It is difficult to understand what message they were trying to give. But in the recurring theme of CERN writing its own history, the Roman remains are fitted into a narrative of technology. Ever since Meyrin was chosen as a site, the organisation has embraced the beauty, history and stories of the site as part of its official narrative. This is also reflected in the architecture.

3.3 "All powerful architect"[9]

Following a quick competition in 1953, Swiss architect Dr Rudolf Steiger won the contract to become CERN's official architect.[10] By 1954 he had prepared the first site map of the organisation, which featured several green spaces and trees in order to fit into the rural landscape (**Fig. 15**).[11]

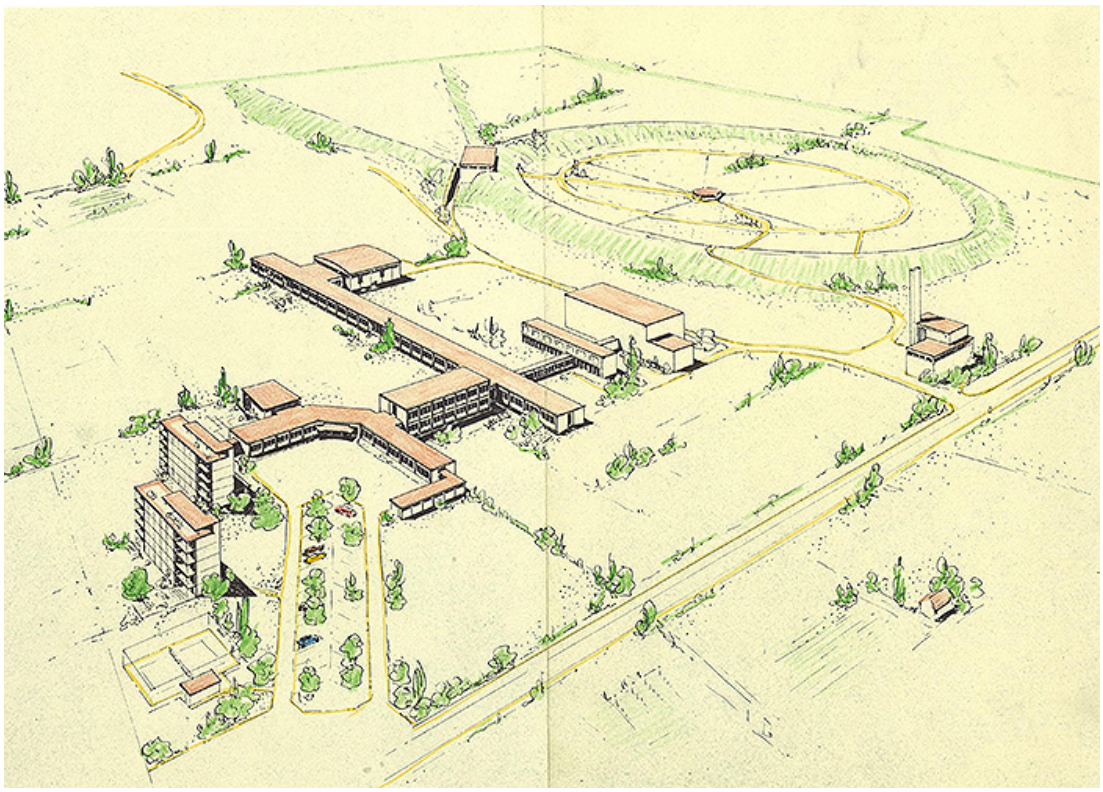

Fig. 15 *Steiger's vision for CERN from 1953.*

[9] "Some people referred to Steiger as the 'All Powerful Architect'", Hermann et al., *History of CERN Volume III,* 653.
[10] The CERN history team covers this in Hermann et al., *History of CERN, Volume II*, 17.
[11] Steiger, first preliminary map of CERN's site and buildings, CERN-L-REP 4, Jan 1953, CERN archives, Geneva.

Steiger soon had to abandon some of his aesthetic plans in favour of a more frugal focus that was in line with CERN's budget. He had to work under time pressures, which led to failures of communication. As a well-known Swiss architect, Steiger was used to having more freedom. Two years after starting work on CERN, he set out his ideas and fears in *TIME* magazine: "When mankind got electricity and steam factories sprang up, and residential sections were thrown around them without planning. That's what we must avoid in the atomic age. The architect should be Number One."[12] Nevertheless, the budget set aside for the architect at CERN was minimal. In contrast with other physics-architects, Steiger could not spend time and money on building a campus-like Modernist masterpiece.[13] A process of squabbles with CERN staff ensued, including discussions about funding and the timescale for completion. Steiger felt constrained by having to work within CERN's policies of European purchasing procedures. These were created to give all the member states equal opportunity to bid for the construction, materials and machine building, and are still in place today. No one showed an interest in the architect's issues. Steiger and his firm were left to make major decisions of scale and aesthetics on their own.[14] The founder of the *CERN Courier* and the first director of the press office, Roger Anthoine, remembers the architect as "regretting that CERN did not put more means into making it pleasant", and recalls the many discussions that ensued because Steiger was alone in the decision-making process.[15] Steiger was the first in a long line of non-scientists who would find working with the international, ambitious group of scientists challenging. The push and pull was part of the new organisation's frugal focus on pure science, rather than objects and aesthetics (with the exception of the machines). From the beginning the budget was "all science all the time."[16] This resulted in a basic structure of wooden barracks and simple housing, without any of the landscaping or trees that Steiger had drawn up. Today, with the LHC upgrade plans and the Higgs discovery making headlines, CERN's buildings are rarely criticised. To the contrary, journalists who write about CERN often make a point of comparing the sparse

[12] Rudolf Steiger quoted in "Art: Atomic Architect", *TIME* (05.09.1955) available online (paywall): http://content.time.com/time/magazine/article/0,9171,893079,00.html (accessed 22.03.2016).
[13] Stuart W. Leslie, "Aerospaces: Southern California Architecture in a Cold War World", *History and Technology* 10.1080 (2013): 331–68
[14] Hermann et al., *History of CERN, Volume II*, 17.
[15] Røstvik interview with Roger Anthoine, 25.03.2013.
[16] Hermann et al, *History of CERN*, *Volume II,* 17*;* Røstvik interview with Roger Anthoine, 25.03.2013.

corridors, offices and the noisy canteen with the sleek super-machines below. *Guardian* journalist Suzanne Moore wrote: "As I sit down in the canteen – every expense spared, except for an Antony Gormley sculptural scribble hanging outside – it is obvious these people have their minds on something higher than decor."[17] Her view of CERN, through the staff that guided her (Head of the Communications Group, James Gillies, is referenced in the piece), was one of frugality. The tension between CERN's boring and exhilarating spaces is also an ongoing fixation for many of the artists inspired by CERN. This is the legacy of Steiger. His sparse constructions now inspire staff and visitors to focus on the science, whilst new building projects are aiming to make CERN more like a university campus.[18]

A large-scale overhaul of the original architecture was undertaken in the '90s, leaving few of Steiger's structures intact.[19] Anthoine petitioned the Director General Heuer to save one of the old barracks "where a lot of important conversations took place."[20] His wish was to save one small wooden building in order to remember CERN's frugal beginnings, including the role of the original architect. But in early 2013 the structure was demolished. There were vague plans to put up a small plaque on the site instead. With the erection of new machines and buildings, arguments with Steiger are now part of a past that few people remember. The form of CERN's outward appearance, including machines and buildings, follows the same trajectory as the arts at the organisation in general: from humble, often chaotic origins, to a successful, business-like structure. It also mirrors Anthoine's experiences: "When I started in the PR office, I was trained as a journalist and I could stick my nose in everywhere at CERN. It was the reward of the job". As a journalist, scientist and pilot, Anthoine arrived at the organisation "curious and mischievous."[21] He guided figures such as Che Guevara and Margaret Thatcher, as well as artists and film crews around the new grounds. The

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[17] Suzanne Moore, "After the Higgs Hype, CERN Still Has as Much Purpose and Passion as Ever", *The Guardian* (08.11.2013).
[18] Sean Kitchen, "New Public Entrance for CERN, Geneva Switzerland", *Architects Journal* online (11.07.2011): http://www.architectsjournal.co.uk/business/competitions/new-public-entrance-for-cern-geneva-switzerland/8617201.fullarticle (accessed 22.03.2016).
[19] Buildings 40 and 42 are the newest buildings at CERN, with the former housing a glass copula and spacious open floors with offices for CMS and ATLAS staff. More are planned.
[20] Røstvik interview with Roger Anthoine, CERN, 25.03.2013.
[21] Røstvik interview with Roger Anthoine, CERN, 25.03.2013.

current Head of PR, Gillies, now refers many non-scientist visitors to his staff and increasingly the arts programme and Ariane Koek (**Fig. 16**).

Fig. 16 *Che Guevara meets Roger Anthoine at CERN in 1964.*

When the first buildings were finished, Anthoine set about naming the streets of CERN: "To one of those streets over there", he said, pointing from the main building, "I gave the name Albert Picot because he deserved that."[22] Picot was the local politician responsible for finally deciding on CERN's location, amidst international debate about the future of high-energy physics and the local communist party's protest.[23] Route A. Picot remains the only non-scientist name on any of the CERN roads. No roads are named after women. Traweek has argued that scientists can "become immortal" through having equations, buildings, streets or other objects named after them.[24] Similarly, the acronyms of international physics projects are easy to remember, making the possibility of their use by scientists and laypeople effortless. With names such as Route

[22] Røstvik interview with Roger Anthoine, CERN, 25.03.2013.
[23] "Albert Picot", *CERN Courier* 6, no. 10 (1964).
[24] Traweek, "Bodies of Evidence: Law and Order, Sexy Machines, and the Erotics of Fieldwork among Physicists", in Susan Foster (ed.), *Choreographing History* (Bloomington: Indiana University Press, 1995), 219.

Schrödinger, Route Zeeman, Route Democrite and Route W.F. Weisskopf, CERN staff are constantly reminded of their own and their employer's future potential for greatness.

Until the 1970s, all visitors were greeted in an "amateurish fashion".[25] Anthoine cleared up confusions about what CERN did, especially concerning security or military questions. Visitors made their own way to Meyrin and would often stay for long periods. The infamous artist James Lee Byars' visit is one example. In 1972 he visited CERN to explore the laboratory. Self-styled as "The World's Most Famous Unknown Artist", Byars' life was an eccentric performance. His staged self-portraits at CERN became part of this rendition.[26] Byars wrote about his time at CERN in his characteristic style based on abbreviations of language**.** He visited the laboratory for two weeks and was subsequently put on the cover of the *CERN Courier* in September 1972 as a "summer visitor."[27] Byars became friends with the physicist John Bell, and immersed himself in the intellectual environment on-site. Dressed in "gold sunglasses, gold tennis shoes, and a Panama hat" he made no effort to disguise his eclectic style.[28] He described his time at CERN as "perfect". But Byars also recalled that it could have been made "more perfect" if he was given a grant or an invitation to undertake art projects on-site. He called for "opportunities" for artists, and "additional investment on their part as to what type of relationship it could be." Byars remembers that all his quirks and statements were met with "uh huh", and he longed for more to do.[29] While Byars did voice these concerns, he also stated that he was: "asking a

Fig. 17: *James Lee Byars visits CERN in 1972.*

[25] Røstvik interview with Roger Anthoine, CERN, 25.03.2013.
[26] CERN archives Photolab/document server, Images of Byars visiting CERN, 344-8-1972 (1972).
[27] The cover of *CERN Courier* 12, no. 9 (Sept 1972).
[28] Magali Arriola and Peter Eleey (eds.), *James Lee Byars: ½ an Autobiography (Volume 1 Sourcebook)* (Köhn: Koenig Books, 2014), 108. Many thanks to Alex Brown for scanning and sending CERN-related material from this book from the CERN library in Geneva, as it was difficult to get it elsewhere.
[29] Arriola and Eleey (eds.), *James Lee Byars,* 108.

very great amount because, already, they have the whole world on their back, without having to consider these luxurious elements of metaphysics." As an artist who dedicated his life, work and language to metaphysics, Byars was inspired by his time at CERN.[30] He was welcome to wander around and snap self-portraits (**Fig. 17**). Today this would have been seen as an excellent PR opportunity. Indeed, the images were discovered in 2014 by the Scientific Information Service at CERN, and promptly shared online and on CERN's social media platforms.[31] Byars is an exception as an artist who made direct contact with scientific CERN staff in the early days, by getting on the cover of the *Courier* and spending time in Meyrin. His sophisticated handling of his own PR made this possible, whereas other artists without this focus or skill remain anonymous or unknown visitors. In the same decade, some artists wrote to the organisation for advice, and were met with clear instructions. Preparing to write about CERN in a novel, the author Johansen was promptly nudged in the right direction:

> Your proposition for a novel centred around CERN similar to the exciting little booklet you sent me is certainly a new approach to presenting the work of the organisation. I can see certain problems arising because of the need to do so much more explaining but you may be able to find a way out of this difficulty. We must, however, avoid any suggestion that our research is in any way associated with defence or of course attack![32]

There are many such examples of explaining CERN to writers and other non-scientists. Others still are not documented, wandering through CERN on their own and taking their impressions of the organisation back home to their studios.

As in the case of Byars, the organisation soon became a destination for physicists and non-physicists. The early CERN PR officials could only show their visitors the wooden barracks, some machines and some future plans. Today there are many buildings to visit, some famous in their own right, especially the Globe of Science and Innovation (**Fig. 18**): the Globe is a "landmark for CERN" and its role is to "serve as source of pride for the scientific community" by sharing the organisation's work with

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[30] Arriola and Eleey (eds.), *James Lee Byars,* 108.
[31] "James Lee Byars", CERN Document server (undated, but likely uploaded 2014/2015): http://cds.cern.ch/record/1968608 (accessed 22.03.2016).
[32] Letter to Mr. Johansen from W. Jentschke, Director General of CERN (28.02.1973).

Fig.18: *The Globe of Science and Innovation*

the local and international community.[33] It is "about the size of the Sistine Chapel in Rome (twenty-seven metres in height and forty metres in diameter)" and is a "symbol of sustainable development". Furthermore, the PR office writes: "the Globe sends a clear message on science, particle physics, technologies and applications in everyday life."[34] Thus, it is an important part of the organisation's public engagement strategy.

The outer shell of the building started its life as a Swiss Pavilion at the World Exhibition in Hanover in 2000.[35] The Swiss government called for the Globe to be used in another setting after the exhibition, and CERN was chosen. The building was rebuilt on the present site in 2004. It was first used for the official celebrations that marked the fiftieth anniversary of the organisation, and has been open for limited access to the public since September 2005. It was designed by Swiss architect Peter Zumthor to "symbolise sustainable development."[36] It was planned to be a forum for discussion and

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[33] CERN Web Communications, "The Globe of Science and Innovation: A Landmark for CERN" (2005) http://public-archive.web.cern.ch/public-archive/en/Spotlight/SpotlightGlobe-en.html (accessed 26.06.2015).

[34] CERN Web Communications, "The Globe of…"

[35] Marinella Ferrara and Murat Bengisu, *Materials that Change Color: Smart Materials, Intelligent Design* (Heidelberg; New York: Springer, 2014), 113.

[36] CERN, "The Globe of…" The word "sustainable" is repeated several times in the available information about the building, but is not underpinned by documentation. Furthermore, CERN claims that the Globe is one of the highest timber structures in the world. But at twenty-seven

exchange between science and society, as CERN states:

> A key element of CERN's communications strategy, this building is geared towards all the different members of the public who visit CERN (...) By creating such a place for exchange, CERN has attracted the interest of numerous museums and scientific centres in Europe. In this field, the Organisation is becoming a significant source of resources available to all.[37]

There is no information about how CERN has attracted the interest of museums, but we may count the *Collider* exhibition in London and Manchester as an example. The Globe also became the setting for the contemporary Arts@CERN artists' lectures. Like the artists involved with CERN, the building is a non-scientific entity brought in from the outside world to make contact with lay society. The Globe shows the importance of culture and aesthetics in CERN's PR strategy. CERN has embraced the building, and for the last ten years the visitor badges show a photograph of the Globe rather than any of the scientific images produced by the laboratory. Posters of the building are also for sale in the gift shop as the embodiment of new high-energy physics aesthetics. Trading wooden barracks for wooden 'starchitecture', twenty-first-century CERN continues to build its own image. The site itself has become part of the organisation's PR strategy. This is another example of the ways in which the institutional nature of CERN promotes certain artistic expressions, especially when it can be used as public engagement.

3.4 The gardens of CERN

On the edge of the Swiss Alps, CERN is located in a striking visual landscape. The organisation is nestled between a tramline and a field, while smaller hubs and underground structures stretch across the border to France. The rural setting makes for picturesque photographs. Below ground, the accelerators define and investigate matter. Overground, the site is being modernised and shaped to mirror this work. CERN's position in the countryside has also endowed it with the possibility of outdoor landscaping and gardens, as originally envisioned and abandoned by Steiger due to

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meters several of the Scandinavian stave churches, built over a thousand years ago, are on average the same height – or higher.

[37] CERN, "The Globe of…"

financial constraints. The organisation takes the effects of its environmental impact seriously, bringing in artists to beautify the spaces. Two of the larger ongoing landscaping projects at CERN are led by former engineer and professor of landscape gardening Laurent Essig. The Slate Garden, developed in 2010, is located between the glass walls of the main CERN cafeteria and the lecture halls at the heart of the site.[38] It is constructed from several-meter-long black stone slates, which overlap and interlace in a symmetrical fashion. Reminding the onlooker of the large machines underground, the garden is also a historical commentary paying tribute to the traditional use of the slate and blackboard in physics. Some CERN physicists still prefer using the blackboard, and take pleasure in the history and aesthetic of this particular method of note-taking.

Essig's second landscaping project on-site is located by the main visitor centre. Metre-long square boxes have been paired up in the extended parking area, enveloping long thin twigs sprouting towards the sky. In summer they blossom. In winter fairy lights are hung on barren branches. The project, InGRID, is ongoing and developed from the artist's earlier spontaneous interest in CERN (**Fig. 19**).[39] InGRID symbolises "the sharing of data, knowledge, expertise and innovation" and is the first stage of the undefined concept of Campus CERN 2030.[40] The goal of the larger project is to make the aboveground CERN environment feel more like a university campus than a parking space, bringing the organisation's image in line with other high-energy physics laboratories around the world.

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[38] Alexandre Pelletier and Anaïs Schaeffer, "The Slate Garden", *CERN Bulletin* no. 49–50 (05.12.2011).
[39] Laëtitia Pedroso, "Rendez-vous with InGRID", *CERN Bulletin* no. 15–16 (11.04.2013)
[40] "A competition will soon be launched to select the architect, urban planner or landscape designer to undertake the first phase of redevelopment of the parking area by the flagpoles, between Entrances A and B. This will be the first stage in a wider development project aimed at sprucing up the CERN site and enhancing its image. Work to create a pleasant and harmonious area at the CERN entrance will start in 2013 while preparatory work for other developments inside the CERN site has already begun." Pedroso, "CERN in 2030".

Fig. 19 *The start of the InGRID project at CERN.*

The campus concept will help CERN catch up with the international aesthetic ideal for a large-scale science facility: the open-access campus solution of the Modernist laboratories of 1940s and ‘50s America. After years of shoestring architectural budgets, CERN is now starting to plan its future as a university-like and publicly engaged entity. Fundamentally, CERN has to include both open and closed areas in its aesthetic makeup. Similar to a university campus, there will be open spaces, landscape architecture, halls for public lectures, cafés and facilities for visitors. This will balance out the hidden off limits areas where only a select few can go due to safety or security concerns. The landscape architects Charles and Lily Jencks and architecture collective Groupe H will be developing the site in a project that has not yet collected sufficient funding to start (**Fig. 20**).

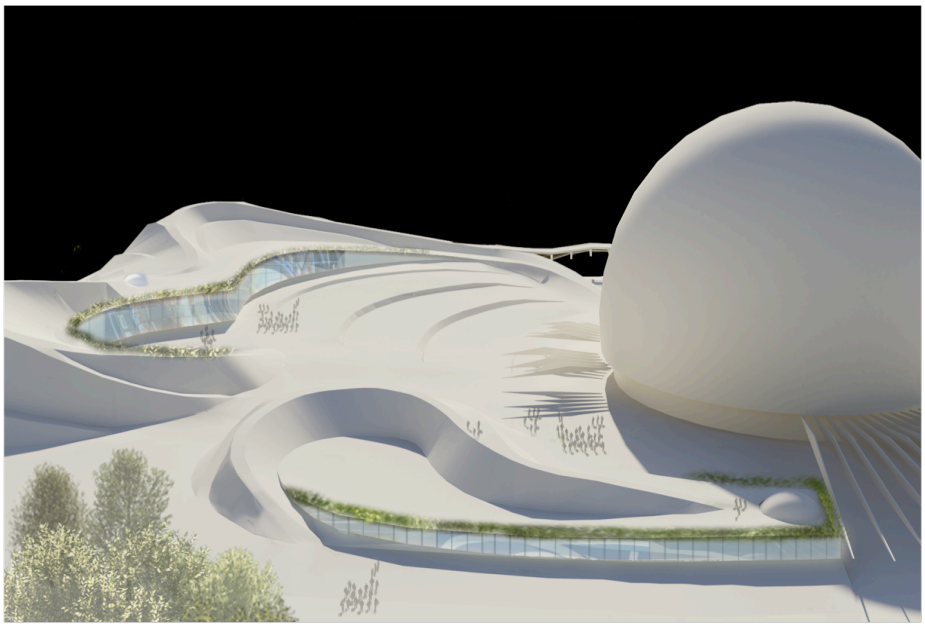

Fig. 20 *The planned project for the area around the Globe, on active pause since 2010.*

This will include walkways, a new gift shop and a café, and will cater more for visitors than staff. In addition, there will also be "a separate VIP entrance", signalling an increased focus on celebrities on-site.[41] These new features will be tied together by a "physics-inspired cosmic garden [with] shaped mounds, ponds and a natural amphitheatre for public events."[42] Introducing an artificial river into the site will completely change the landscape of CERN, and will take years to finish. These carvings and alterations of CERN's site signal an interest in increasing visitor numbers, providing a nice tourist attraction and hosting more dignitaries. While the Slate Garden was built mainly for those within CERN, the planned changes to the outside areas are made for the visitors. The gardens and landscapes beautify and modernise the site, but it is also another part of the overall CERN PR strategy.

[41] "Cosmic Rings of CERN, Geneva, Switzerland, in development 2008+ (with Jencks2 and GroupH)", Charles Jencks website (undated: http://www.charlesjencks.com/#!projects-cern (accessed 27.02.2016).
[42] Katarina Anthony, "A New Look for the Globe Gardens", *CERN Bulletin,* no. 44–45/2014 (01.11.2010).

3.5 Sculptures and personalities

Fig. 21 *André Bucher, Matière, 1985.*

Beyond the Globe and the new landscaping project, there are several sculptures dotted around the site. The first artwork visitors will encounter is Swiss sculptor André Bucher's large bronze and lava sculpture *Matière* from 1985 (**Fig. 21**).[43] The late artist had a passion for science and often visited CERN. Placed in front of the visitor centre, it is a square metal form. Its intestines have been carved out in the form of a spiral. At the centre, fragments of lava from Mount Etna are frozen in time. Standing on a grey plinth and stretching above visitors' heads, it is a large abstract sculpture on a green square of CERN. *Matière* was donated by the Société de Banque Suisse, which has close links with CERN, providing cash machines and services on-site in later years. In this spot, where visitors first see CERN, the sculpture provides an aesthetic welcome to the laboratory as one walks from the tram or car park. Bucher's work is heavy in its materials but light in shape. It is matter and antimatter, space and absence. At first glance the surface does not reveal much about the world of physics. However, in its swirling cut-out, Bucher had created a man-made absence of matter within the sculpture. Art at CERN, while not necessarily intended as symbolic gestures, can provide a meditative space beyond science. A bit worn down and endowed with the scribble of seagulls, *Matière* has seen better times, but remains a rare piece of non-

[43] André Bucher, *Matière,* 1985. Bronze, with fragment of lava from Mount Etna in the centre. In front of the CERN visitor centre, Geneva.

technological, traditional, object-centred and abstract art on-site.

Other sculptures have a more pedagogic aim. CERN's busts exhibit the likeness of Wolfgang Pauli, Cornelis Jan Bakker, Niels Bohr and Marie Curie in a traditional lifelike style (**Fig. 22–23**).

Fig. 22–23 *The bust of Marie Curie is donated and unveiled.*

Pauli and Bakker were unveiled in 1960. Bakker was commissioned after he was killed in an airplane crash during his time as Director General. Bohr's bust was given its place in 1963, whereas the Marie Curie was donated in 1974. She is placed slightly off-centre in the foyer of the CERN visitor building. Curie is the first work of art portraying a person that the visitor will see, although slightly dishevelled and placed in a corner. The likeness is visible, despite the shiny nose, perhaps a sign of visitors touching it for good luck. Curie, an internationally recognised name, is a symbol of success to communicate to visitors, while she did not have any real life links to CERN. She is also the sole example of a female scientist represented in any of the CERN art on-site. On my last visit our enthusiastic guide explained the artwork: "Countries like to give CERN presents because they get something back, like jobs etc."[44] The Curie bust, for example,

[44] Guided tour of ATLAS in English at CERN, 10.30am (23.03.2013).

was donated by J. Felicki, the Polish Deputy Minister of Energy and Nuclear Power.[45] The traditional busts dotted around CERN are reminders of the big personalities of science, in a similar vein to the CERN streets that were named after scientists. Today, the busts are joined by a new series of portraits of all of the Director Generals outside the cafeteria. Visitors come to learn about the scientists from the laboratory, taking part in what Traweek called the personality cult in high-energy physics.[46] The artworks thus become part of the overall PR strategy of the organisation, showing how the institutional nature of CERN exploits some aspects of the arts.

The next sculpture visitors come across is the late Serge Moro's eclectic floor piece *Cosmic Song* from 1987, which covers the floor of the foyer in the visitor centre (**Fig. 24**).[47] The slab of metal, with its light and abstract shapes, dominates the room and is impossible to ignore.

Fig. 24 *Serge Moro, Cosmic Song, 1987.*

[45] "A Bust of Marie Sklodowska Curie" *CERN Courier,* 19 (1979), 164. Photo: CERN-PHOTO-7903375. CERN archives, Geneva.
[46] Traweek, *Beamtimes and Lifetimes,* 101; 111; 140.
[47] Serge Moro, *Cosmic Song*, 1987. Bronze, light tubes, electric system, iron and coloured plexiglass. CERN visitor centre, Geneva.

Fig. 25 *Antony Gormley, Feeling Material XXXIV, 2008.*

The work is also a cosmic ray detector, made in collaboration with a CERN workshop in 1987. It lights up in bright colours with the "constant rain of cosmic particles from outer space", although it is not explained what this means.[48] Before his death, the artist joked about "how his sculptures when they will be found in thousands of years will be a quiz for scientist and archaeologist who will wonder to which civilization they belonged." (*sic.*)[49] His time in Geneva had been isolated, and despite spending a lot of time at CERN, he had to initiate the project. His "mad useless" monumental sculptures (the words are used to describe the pieces "tenderly and in retrospective admiration" by his daughter) and his deep love of science have become a permanent fixture of the visitor centre.[50] *Cosmic Song* cannot easily be removed as it was glued, hammered and welded to the floor. Its pink, purple and yellow lights change constantly. The small plaque explaining what the piece symbolises is tucked away on a pillar by the gift shop nearby. It is not known what will happen to the sculpture when the new visitor centre opens, but it remains an example of the eclectic art historical past of CERN, which used to be driven by artists like Moro.

If visitors continue into CERN (depending on security clearance), towards the cafeteria, they will see Antony Gormley's sculpture *Feeling Material XXXIV* from 2008 (**Fig. 25**).[51] It is an example of art inspired by an artist's visit to the laboratory prior to Arts@CERN. Ariane Koek rediscovered the piece in a cardboard box in the archives.[52] Today it hangs above the main staircase at the heart of CERN, leading into the cafeteria and office buildings.[53] Sarah Gillett, the British Ambassador to the Swiss Confederation

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[48] "Cosmic Song, Serge Moro (France) 1987", Arts@CERN website (undated): http://arts.cern/works/cosmic-song (accessed 31.03.2016).
[49] Email from Moro's daughter, Maya Kishi-Moro, to Røstvik, 13.11.2015.
[50] Email from Moro's daughter, Maya Kishi-Moro, to Røstvik, 13.11.2015.
[51] Suzanne Moore, "After the Higgs Hype…"
[52] Røstvik interview with Ariane Koek, 02.03.2013.
[53] Antony Gormley, *Feeling Material XXXIV*, 2008. 5mm square section mild steel bar, 155 x 244 x 153 cm. Overhanging staircase in CERN's central building, Geneva.

(now Ambassador to Norway), unveiled the piece. The rehanging was part of the redecoration of the main building, including painting the walls, new floor coverings and new portraits of CERN's former Director Generals. Myriam Veyrat, the director of the project, said at the time:

> We're working with firms specialised in building renovation. The building materials, furniture and paintwork have all been carefully selected to create a warm and friendly atmosphere. A work of art donated to CERN by sculptor Antony Gormley will take pride of place, suspended over the main stairwell.[54]

This "warm and friendly atmosphere" has created a space for CERN staff and visitors to meet, talk and eat, including diplomats such as Gillett. The small shops, post office and bank near the cafeteria circle the main staff entrance. From this space a large staircase, crowned by Gormley's sculpture above, leads up to the portraits of the former CERN Director Generals. From here, one gets a bird's eye view of the Slate Gardens. It is a social space filled with cultural objects, where the rediscovery of *Feeling Material XXXIV* in part catalysed the redecoration of the area. It is often included in pieces about CERN, described as "a knot of tangled hair" by Butterworth, and "hanging scribbles" by Moore.[55] Gormley is one of a few artists who worked at CERN before the modern art programme started, and had an official relationship to Arts@CERN.

Fig. 26 *Gayle Hermick, Wandering the Immeasurable, 2013.*

[54] "Renovating the CERN Main Building", *CERN Bulletin* no.25–26/2010 (21.06.2010).
[55] Jon Butterworth, "CERN has a Gormley", *The Guardian* (20.09.2011): https://www.theguardian.com/science/life-and-physics/2011/sep/20/1 (accessed 31.03.2016); Moore, "After the Higgs Hype".

Other CERN sculptures fall outside the scope of the Arts@CERN canon. *Wandering the Immeasurable* commemorates the sixtieth anniversary of the organisation (**Fig. 26**). Canadian sculptor Gayle Hermick visited CERN in 2005 and, feeling inspired by "experimentation based on centuries of scientific exploration", envisioned the project.[56] It is a seven-metre-tall and ten-metre-wide coiled stainless steel object. Hermick engraved 396 events in physics history and the names of their discoverers on it. The sculpture was funded by Fondation Meyrinoise du Casino, which supports local culture, whereas Swiss metalwork firm SENN-AG was awarded the construction contract. The idea was to "retrace the history of science", and for the sculpture to act as a bridge between science and society.[57] It was placed near the Globe, in the area all visitors can access. As a part of the CERN Campus idea it is part of the rebranding of the area that visitors first encounter on-site. *Wandering the Immeasurable* is located between the Globe, the visitor centre, the tramline and the Swiss Alps. Mirroring the public engagement aims of the Globe, the sculpture is pedantic, with an aim to teach viewers about the successes in the field of high-energy physics. Bernard Pellequer, who is in charge of the Globe's programme of engagement, stated that "this work allows visitors to understand a part of the history of science, from its beginnings to today. This educational role is also one of CERN's fundamental aims."[58] Most of the sculptures at CERN have pedagogical aims, which are clearly set out in descriptive plaques close to the artworks. They are examples of how the organisation utilises non-scientific artefacts to tell its story. As symbols, they allude to a wider context of awe and beauty. As logos, they communicate the brand's values of scientific excellence and international cooperation. This is also clear in the use of machine aesthetics on the site.[59]

In the courtyard behind the visitor centre and main office buildings, CERN's old bubble chambers are exhibited. (**Fig. 27**). Carlo Rubbia claimed that:

> Detectors are really the way to express yourself. To say somehow what you have in your guts. In the case of painters, it is painting. In the case of

[56] Anaïs Schaeffer, "Wandering the Immeasurable", *CERN Bulletin*, no. 31–32/2013 (29.07.2013).
[57] Schaeffer, "Wandering…"
[58] Schaeffer, "Wandering…"
[59] R.L. Rutsky, *High Techne: Art and Technology from the Machine Aesthetic to the Posthuman* (Minneapolis; London: University of Minnesota Press, 1999).

sculptors, it is sculpture. In the case of experimental physics, it's detectors. The detector is the image of the guy who designed it.[60]

Fig. 27 *Bubble chambers in one of the CERN courtyards, Gargamelle to far right.*

Bubble chambers, including CERN's Gargamelle, were particle detectors of major importance during the founding years of high-energy physics in Europe.[61] Authors describing the scientific uses of bubble chambers also point out their visual impact: "Even today, bubble chamber photographs provide the aesthetically most appealing visualisation of sub nuclear collisions."[62] Whilst the particles perform their "geometric dances" under the influence of the magnetic field, the machine creates the visual imagery.[63] The imagery produced by bubble chambers and other CERN machines, are utilised for scientific and aesthetic purposes by the organisation. They show visitors glimpses of the past that would otherwise have been lost in the rapidly changing technological environment of the organisation. Bubble chamber photographs have been used in many art exhibitions, but the exhibiting of the machines themselves can only be found at CERN and similar high-energy physics laboratories with a history of using

[60] Carlo Rubbia quoted in Galison, *Image and Logic: A Material Culture of Microphysics* (Chicago: University of Chicago Press, 1997), xviii.
[61] Hermann et al., *History of CERN Volume III*, 39-65.
[62] Rudolf K. Bock and Angela Vasilescu, *The Particle Detector BriefBook*, first published 1998 (Berlin; Heidelberg: Springer: 2013), 9.
[63] Kemp, *Seen/Unseen. Art, Science and Intuition from Leonardo to the Hubble Telescope*, 311.

them.[64] These techno-sculptures have both pedantic and aesthetic uses for CERN and some science writers, whereas others argue that what appears as complex images is only "half-art" and "cannot be adequately interpreted, even using the language of the most radical anti representational art criticism."[65] Whether high art, basic science or both, the bubble chambers and other machine art at CERN serve the purpose of letting visitors have access to both the history of the laboratory and the parts of the sites that they cannot access due to security restrictions. Another piece took this even further.

In Josef Kristofoletti's large mural of ATLAS made around 2010, the detector below ground is brought to the surface (**Fig. 28**).

Fig. 28 *ATLAS wall mural, Josef Kristofoletti.*

[64] James Elkins, *Six Stories from the End of Representation: Images in painting, Photography, Astronomy, Microscopy, Particle Physics and Quantum Mechanics 1980-2000* (CA: Stanford: Stanford University Press, 2008), 177; Melvin L. Alexenberg, *The Future of Art in a Postdigital Age: From Hellenistic to Hebraic Consciousness* (Bristol; Chicago: Intellect, 2011), 169; Arthur I. Miller, *Insight of Genius: Imagery and Creativity in Science and Art* (New York: Springer, 1996), 406.
[65] Elkins, *Six Stories from the End of Representation*, 177.

Painted onto one of the large walls of the ATLAS experiment, it is situated above a parking space and faces the Globe in the publicly accessible area of CERN. The mural is conveniently positioned on the route of the ATLAS visitor tours and serves as an illustration for the action below ground. Kristofoletti's artwork, colourful and massive, fetishizes the machine and has often been depicted in mainstream media. The bright colours can be seen as visitors drive into the parking lot or arrive by tram from Geneva. In articles such as a 2013 *The Guardian* piece on CERN's work post-Higgs, the artwork serves as the illustration while the artist's name is not included.[66] Kristofoletti, however, is pleased with the attention.[67] The American artist visited CERN after being inspired by the large machines. He painted the mural and ever since it has been a memento of his visit, as well as a place visitors see as part of their official CERN tours around the site. As an oddity, the mural was welcomed into the creative culture of ATLAS at the turn of the century.

A less known work of art that also engages directly with the built environment and machines at CERN is Gianni Motti's performance piece *Walking for Art's Sake*, and the accompanying series of photographs *Looking for the Anti-Motti* (**Fig. 29**).[68]

Fig. 29 *Walking for Art's Sake; Looking for the Anti-Motti, Gianni Motti.*

[66] Moore, "After the Higgs Hype…" For a brief discussion of authorship in art residencies see Pujol Ernesto, "The Artist as Educator: Challenges in Museum-Based Residencies", *Art Journal* 60, no. 3 (Autumn 2001), 6.
[67] He shared the article on Twitter with the comment "wohoo!"
[68] Gianni Motti, *Walking for Art's Sake,* CERN, 2005. Some excerpts from the six-hour performance appear on YouTube, uploaded 24.08.2008: https://www.youtube.com/watch?v=gUkYfcPAodM (accessed 26.06.2015).

Motti visited in 2005, when he started a project where he "compared himself to a proton."[69] Descending into the circular tunnel that would soon house the LHC, Motti walked the twenty-seven kilometres "at the average, unaccelerated pace of five kilometres per hour." In a video excerpt from the performance, the artist is seen from behind walking briskly through the tunnel wearing a blue safety helmet. The walk took him about six hours, in comparison to the particles that loop the ring 11,000 times per second. His walk was documented by a video camera. One art critic wrote that the performance was one in which "strange uneasiness takes hold, the very uneasiness (…) that Einstein called relativity."[70] Motti, whose career took off when he staged his own funeral in 1989, is never shy of flirting with authority. He claims to have caused the 1986 Challenger explosion and the 1992 Los Angeles earthquake, pretended to be a delegate for Indonesia at the UN, and staged an empty retrospective where security guards whispered his career highlights to confused visitors.[71] His CERN performance, however, has not been presented as a political message, in line with the rest of his work. *Walking for Art's Sake* is mentioned on the Arts@CERN website as an example of CERN art and SciArt, but does not analyse the artist's intent or, indeed, his lack of engagement with scientists.[72] In the context of his career we can conclude two things about his performance in the LHC tunnel. First, this is an examination of person versus particle, comparing the two in the act of comparing speed. Second, this is a declaration of the power of art. Motti was marking the territory of art for future artists. Not everyone will come across his work, which is the nature of live performance, but those who do may reflect on the occupation made in 2005. While Motti's performance at CERN is not included in his large retrospectives, it is important in the field of SciArt. Instead of simply illustrating the machines on-site, Motti occupied CERN and, while this was a

[69] "Looking for the Anti-Motti", *ArtsyNet* (undated): https://artsy.net/artwork/gianni-motti-higgs-looking-for-the-anti-motti-cern-geneve-1 (accessed 26.06.2015).
[70] "Looking for the Anti-Motti", *ArtsyNet.*
[71] Tirdad Zolghadr, "Gianni Motti", *Frieze* 82 (Apr 2004): http://www.frieze.com/article/gianni-motti (accessed 10.04.2016).
[72] "Walking for Arts Sake", Arts@CERN website (undated): http://arts.cern/works/walking-arts-sake (accessed 4.04.2016).

fleeting settlement, he also recorded his conquering in the photographs capturing the performance.[73]

This small selection of art that engages with CERN's machines is an example of the attraction, and at times fetishization, of the LHC and other large machines in Meyrin. As a tourist attraction, CERN's old machines are exhibited to historicise this hyper-modern setting. Some visitors are disappointed because they cannot go below ground to see the machines due to security restrictions. These art works therefore give visitors some insight into what is restricted, and thus fulfils CERN's ethics of transparency. The tour guides, and indeed large parts of the CERN community (including Arts@CERN) make much of the size and purpose of the massive instruments underground. Likewise, many visitors want to understand the machines of the site. With the help of art, they can. This is another example of CERN's use of art and artists.

3.6 Dispersing CERN's image

Not all CERN culture is tangible. CERN is steadily becoming a popular cultural phenomenon, to such a degree that the Communications Group cannot comment on all references.[74] CERN defines this link to the art world as "…the laboratory capture[ing] artistic imagination."[75] There are countless examples, but the five discussed below give some insight into the varied ways in which CERN is creating and sharing its culture outside of Meyrin. A stamp, a stained-glass window, a computer game, a documentary and an opera are explored to show the many, and often eccentric, ways in which CERN's culture is proliferated and dispersed.

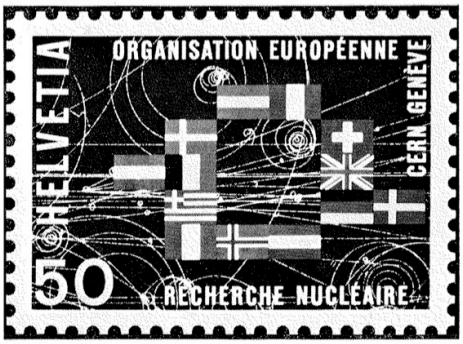

Fig. 30: *CERN stamp from 1966.*

In 1965 the Swiss Postal Authorities issued a stamp in honour of CERN. Scientists and engineers had the opportunity to meet with artists

[73] Motti's piece would not have been possible due to security structures after the LHC switched on in 2008.
[74] Email from James Gillies to Røstvik, 6.11.2014.
[75] "Collide@CERN Pro Helvetia Open Call", Arts@CERN website (undated): http://arts.cern/collidecern-pro-helvetia (accessed 8.04.2016).

in its development. Leading up to the finished product, five Swiss artists, alongside CERN staff from the Site and Building Division, worked on the design. The artists visited the laboratory were told the story of CERN and guided around the site. The artists' ideas for the stamp were evaluated in May 1965 by a committee including Roger Anthoine, representatives of the Federal Commission of Fine Arts, the Commission of Applied Arts and the Union of Philatelic (stamp) Societies. The Zürich-based artist H. Kümpel's design won. It was a constellation of flags of the then thirteen member states of CERN, superimposed on a bubble chamber photograph (**Fig. 30**). The stamp shows the swirling bubble chamber images, and the flags form a symbolic and aesthetic combination. The collaboration between artists and CERN staff in 1965 is an early example of the interest in interdisciplinary projects at the organisation. Several other stamps and coins celebrating CERN have been produced since, recently in 2004 with the Swiss Commemorative Stamp for the organisation's fifty-year anniversary.[76] As the stamps leave Switzerland and make their way through the world, the CERN brand goes global.

Across the Atlantic, in another artistic interpretation of CERN, Jonathan Feldschuh explored the LHC through the construction of large stained-glass windows (**Fig. 31**).

Fig. 31 *Jonathan Feldschuh, LHC series.*

[76] "The New Swiss Commemorative Stamp Dedicated to CERN Available at the Organisation's Meyrin Post Office on Tuesday, 9 March!" (09.03.2004), CERN-GE-0403008, CERN archives, Geneva.

The American artist has a physics degree from Harvard, and has been engaged with scientific themes for the last ten years. Initially drawn to scientific work at CERN through Harvard's links via Carlo Rubbia (affectionately named the "Swiss-Air Professor" for his frequent shuttling back and forth to Geneva), Feldschuh had a change of heart and pursued art instead. His first solo exhibition, *Large Hadron Collider*, was all about CERN, a place where he had hoped to work in his days as a physicist. Marrying the traditional stylistic language of the church windows with the new technology of the collider, Feldschuh's pieces explore science through a religious iconography. Drawing on a tradition going back to the first gothic church in Saint Denis, Feldschuh evokes "holy light" through the colours of the glass, as it is viewed from the inside of a dark room.[77] Feldschuh painted on mylar (polyester film), before mounting the images on street-facing windows. He did this for the changing effect that the night- and daylight had on the piece. Soft pink, purple and orange washes glide over the angles of the machine. It is shown in detail, rather than as a whole. Each window reveals a stage in the construction of the larger structure. The accompanying press release described *Large Hadron Collider* as "providing viewers with a literal window into the invisible: a celestial event on a human scale."[78] Allowing us to peer through the window into the LHC, a representation of a part of CERN was suddenly in the New York and Saint Louis galleries that exhibited the work from 2012 to 2015. Stretching CERN's brand into the American art scene, Feldschuh ensured another successful reading of the organisation. At the same time he was also one of the unsuccessful applicants to the first international Collide@CERN residency competition. He continues to be inspired by CERN:

> For me CERN is inspiring in several ways. At a scientific level, it is pushing our understanding on the most basic of physical questions, in the field I originally studied. On a societal level, I think CERN is incredibly inspiring because it is a successful example of collaboration in the pursuit

[77] Erwin Panofsky and Gerda Panofsky-Soergel (eds.), *Abbot Suger on the Abbey Church of St. Denis and its Art Treasures*, first published 1948. (Princeton: Princeton University Press, 1979).
[78] "For Immediate Release" (Jonathan Feldschuh, *Large Hadron Collider* press release), Mixed Greens gallery (undated): http://www.cpnas.org/press/announcements/feldschuh_release.pdf (accessed 10.04.2016).

> of pure knowledge, across borders and institutions, without motive of profit or military advantage. If we can work together on a problem of this complexity and scale and difficulty, maybe there is hope for our solving some of the other great problems (global warming, environmental pollution, hunger, etc.) that we face as a species.[79]

Feldschuh's work has been included in some Arts@CERN material, but he has not been enveloped into the full programme as a CERN artist. Working on the boundaries of CERN as a physicist and artist, he is one of many artists who have a scientific and artistic interest in the organisation.

CERN has inspired many artistic expressions, including in graphic design and video gaming. Graphic designer André-Pierre Olivier designed an online game named *ParticleQuest* as part of the first CERN hacker festival in 2012.[80] According to the game's narrative, the LHC has had a meltdown and particles have escaped from CERN, as well as acquiring language. The main aim of the game was to educate, and each particle has been given "charming sprites'" by Olivier, telling the player about their qualities as they encounter them.[81] One physicist described the designs as "beautiful [because] they reflect the actual behaviours of the particles represented – it's really amazing."[82] The game only existed for a short time. CERN, however, lives on online through the organisation's own *Particle Clicker* game where the parameters for success are "data, reputation and funding."[83] In the similar *LHC Game* players are guided by a diverse group of staff through CERN, learning how to run a laboratory.[84] In *CERNland* children play their way through particle physics by the help of Betty, Bob and Baby-Einstein.[85] These online games are often linked to CERN's own live streaming of events and data. As part of the policy of transparency, a creative online presence is yet another

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[79] Røstvik Skype interview with Feldschuh, 24.01.2013

[80] A hacker is someone who exploits or seeks weaknesses in already existing computer networks or computer games. Andrew Purcell, "Go on a Particle Quest at the First CERN Hackfest", *International Science Grid This Week (ISGTW)* (15.08.2012): https://sciencenode.org/spotlight/go-particle-quest-first-cern-hackfest.php (accessed 10.04.2016).

[81] In computer graphics, a sprite is a two-dimensional image or animation that is integrated into a larger scene.

[82] Andrew Purcell, "Go on a Particle Quest".

[83] *Particle Clicker* website: http://particle-clicker.web.cern.ch/particle-clicker/ (accessed 26.06.2015).

[84] *LHC Game* website: https://cern50.web.cern.ch/cern50/multimedia/LHCGame/StartGame.html (accessed 26.06.2015).

[85] *CERNland* website: http://www.cernland.net (accessed 26.06.2015).

way for CERN to reach its growing and diverse audience. From the post office to a New York gallery, from hackers to children, CERN is a topic that inspires the creative public. This enthusiasm has extended the scope of traditional public outreach, and has become visualised.[86]

In the 2013 documentary *Particle Fever* the Higgs boson narrative is told with computer graphics and interviews. Directed by theoretical physicist Mark Levinson, it is another example of a scientist using art to express his love for the field. However, the documentary introduces competing theories to the Higgs and emphasises that long-term implications of the Higgs boson discovery are undefined. It treats the science less like a succession of breakthroughs and more as a complex series of intellectual discussions. Using the aesthetics of the blackboard, interviewees draw on the screen, and particle collisions are shown as explosions of colour. *Particle Fever* has been broadcast across the West and received enthusiastic reviews.[87] In 2014, it was available on several national TV networks, including the BBC and Norwegian Norsk Rikskringkasting (NRK).

Fig. 32 *Symmetry poster from Ruben van Leer's production.*

Parallel to the production of *Particle Fever*, another group crowd-funded the opera film *Symmetry*.[88] The director, Ruben van Leer, soprano Claron McFadden, dancers and a large crew have visited CERN several times in order to draw on its visual aesthetic and narrative of grand discovery (**Fig. 32**). Partially set on-site, the script tells the story of a male CERN researcher who is: "thrown off balance while working on the theory of everything and

ı Popular Science Books" in Bauer and Bucchi, *Journalism, Science*

Film that Brings the Higgs Boson to Life", *The Guardian* (13.04.2013): https://www.theguardian.com/science/2014/apr/13/particle-fever-film-higgs-boson-director-mark-levinson (accessed 4.03.2016); A. O. Scott, "To Scientists in Pursuit, a Bit of Matter Is No Small Matter", *The New York Times* (5.03.2014), C5; David Gritten, "Particle Fever, Sheffield Doc/Fest, review", *The Telegraph* (16.06.2013): http://www.telegraph.co.uk/culture/film/10123379/Particle-Fever-Sheffield-DocFest-review.html (accessed 4.04.2016); Todd McCarthy, "Particle Fever: Film Review", *The Hollywood Reporter* (10.09.2013): http://www.hollywoodreporter.com/review/particle-fever-film-review-646439 (accessed 4.04.2016).

[88] *Symmetry* movie blog and website: http://www.symmetrymovie.com (accessed 26.06.2015).

the smallest particle." Through Claron's singing he will: "rediscover love, in an endless landscape [as she] takes him back to the moment before the big bang, when time didn't exist; a love with no end."[89] The film uses the trope of a male scientist uncovering "feminine" nature as the main narrative in its story.[90] *Symmetry* is a supernatural story, yet capitalises on the intellectual rigour of CERN through props such as the blue CERN safety helmets, worn by the characters. The ambitious project used YouTube, trailer teasers and blog posts to publicly chart the journey from inspiration to product. The public appetite for popular science broadcasting has helped CERN become a mainstream organisation. These interpretations of CERN, from stamps to video games to opera, spread the brand of CERN into new territories at no financial cost.

3.7 *Signatures of the Invisible*

Finally, within the context of art and artists who celebrate and respond to CERN, Arts@CERN has a predecessor in the exhibition *Signatures of the Invisible.* It was initiated in 1999 by film director Ken McMullen, along with the London Institute, and former CERN press spokesperson Neil Calder. McMullen has worked with science organisations throughout his career, for instance when filming conversations with physicists at Stanford Linear Accelerator Centre and Fermilab. *Signatures of the Invisible* became an international event, with shows in London, Beijing, Rome, Geneva, Lisbon and New York. It included particle accelerator ready-mades, three-dimensional

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[89] *Symmetry* movie blog and website: http://www.symmetrymovie.com (accessed 26.06.2015).

[90] The literary trope of men discovering nature as a female human has been explored in Mary Wollstonecraft Shelley's discussion of Frankenstein" pursuing nature into her hiding places", and de Beauvoir's comments in *The Second Sex:* "Man seeks in woman the Other of Nature and as his fellow being. But we know how ambivalent feelings in Nature inspires in man." Mary Wollstonecraft Shelley, *Frankenstein; or, The Modern Prometheus,* first published 1818 (Hertfordshire: Broadview literary texts, 1999). Simone de Beauvoir, *The Second Sex*, first published 1949 (London: Vintage, 2011). The trope was also used in Louis-Ernest Barrias' sculpture, *Nature Unveiling Herself Before Science* from 1899. The trope and the sculpture have been analysed by Carol P. MacCormack, "Nature, Culture and Gender: A Critique", 1-25; Maurice Bloch and Jean H. Bloch, "Women and the Dialectics of Nature in Eighteenth-Century French Thought", 25-42; Ludmilla Jordanova, "Natural Facts: A Historical Perspective on Science and Sexuality", 42-70 in Carol P. MacCormack and Marilyn Strathern, *Nature, Culture and Gender* (Cambridge: Cambridge University Press, 1980), 54; Harding, *The Science Question in Feminism*, 118; Janet Price and Margrit Shildrick, *Feminist Theory and the Body: A Reader* (New York: Routledge, 1999), 164; Ludmilla Jordanova, *Sexual Visions: Images of Gender in Science and Medicine Between* (Wisconsin: University of Wisconsin Press, 1989), 93; Galison and Daston, *Objectivity*, 244; Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (New York: HarperOne, 1990), 189-190; Elaine Showalter, *Sexual Anarchy: Gender and Culture at the Fin de Siècle* (London: Virago Press, 1992), 145.

spaces for visitors to explore, and photographs of CERN. The broad spectrum of art on display in the exhibition explored high-energy physics and notions of invisibility. Varying in age and experience, the artists were brought together by McMullen and Calder in order to create an exhibition that explored many facets of physics. Roger Ackling burned driftwood with a magnifying glass, Jérôme Basserode explored time using large metal spinning tops, John Berger showed videotaped conversation with CERN physicists, Sylvie Blocher created multimedia installations, Mel Chin drew with contaminated soil, Richard Deacon created sculptures, Patrick Hughes' paintings of optical illusion tricked their viewers, Gustav Metzger's auto-destructive art challenged notions of finite existence, Ken McMullen's films explored the philosophy of physics, Tim O'Riley's photographs of CERN made people see the empty spaces of the site, Paola Pivi experimented with energy fields in interactive works, Bartolomeu dos Santos used etched stone and ceramic tiles to express physics, and Leo Villareal's light art enveloped the whole experience. The artists visited CERN, met with physicists and saw the site for themselves before creating these works. In this way the semi-organised structure of *Signatures of the Invisible* is similar to the structure of Arts@CERN. The artists produced artworks from their interaction with CERN, in contrast to the focus on process rather than outcome expected from Collide@CERN artists. *Signatures of the Invisible,* by whetting the public international appetite for SciArt and physics, opened the door for the current arts programme. However, its artist-led focus did not continue. The artists from the former project are noticeably absent from Arts@CERN press, and Koek has not drawn extensively on the blueprint in her talks and writings. Nevertheless, some structures have continued through to the contemporary artists-in-residency programme. With two out of thirteen artists being female, *Signatures of the Invisible* shares its gendered makeup with Arts@CERN, SciArt, CERN, and STEM. While the exhibition delved into some difficult topics, such as the loneliness captured in the photographs, most of the artists presented already established CERN narratives of success and discovery. Thus throughout the organisation's history, it has been up to a few groups, usually outside of institutional SciArt, science or art structures, to critically examine CERN.

3.8 Controversial topics

This section examines the culture that explores the more controversial facets of CERN. It is in particular within crime literature and films that CERN has been explored in this way, although photographers, musicians and documentary filmmakers have also responded to the organisation. The following are some examples chosen to give a broad insight into the topics of controversy that artists working in media have engaged with. By controversy I do not necessarily mean negative interpretations, but rather works and people who question the science, goals or history of CERN, some of whom have raised awkward questions about lack of openness, lack of diversity in the personnel, and so forth. My aim is not to provide a complete overview, but rather a sampling of the sorts of critique and disquiet about CERN that has surfaced in art. There are some themes that echo with the contemporary Arts@CERN programme, in particular the doubts experienced by the artists when engaging with the organisation. These examples are all relatively recent, as it is difficult to detect any art that engages critically with CERN before the 1990s. The examples do not harm CERN. On the contrary they continue to proliferate CERN's brand name to different audiences. As was the case with the more celebratory artworks discussed above, these works are alternative readings of CERN. At their best, they give insight into the meaning of CERN and, in a few instances, its particular problems.

Crime writers Dan Brown, Robert Harris and Russell T. Davies have written about safety issues in their books *Angels and Demons* (2000) and *The Fear Index* (2011), and radio series *Torchwood* (2008).[91] *Angels and Demons* was also turned into a Hollywood blockbuster starring the famous actor Tom Hanks. The story follows sexy Harvard symbologist Robert Langdon in his efforts to stop the secret society of the Illuminati from destroying Vatican City with antimatter stolen from CERN (**Fig. 33**).[92]

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[91] Dan Brown, *Angels and Demons* (New York: Pocket Books, 2000); Robert Harris, *The Fear Index* (London: Hutchinson & Co., 2011); Russell T. Davies and Joseph Lidster, "Lost Souls", episode of radio series *Torchwood,* first broadcast on BBC Radio 4, 10.09.2008.

[92] In particle physics, antimatter is a material made up of antiparticles. These have the same mass as ordinary matter particles, but with the opposite charge. It is one of several topics CERN is investigating today.

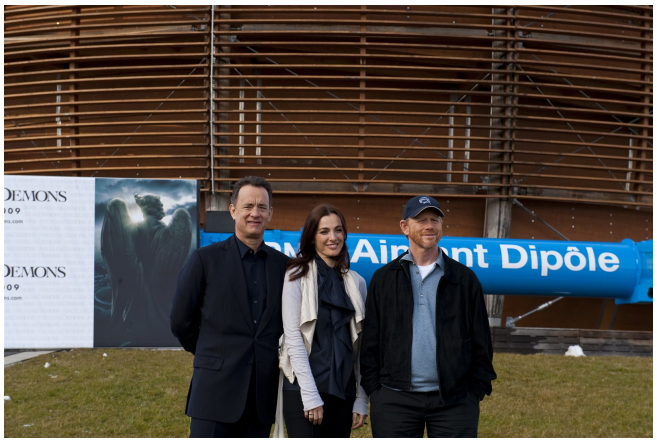

Fig. 33 *Tom Hanks (left) visits CERN promoting Angels and Demons.*

On the way, Langdon goes to Meyrin and meets sexy CERN scientist Vittoria, before they set out to stop the end of the world together.[93] In Harris' *The Fear Index,* also scheduled for the big screen, former CERN scientist and multi-billionaire Dr Alex Hoffman has developed a new form of artificial intelligence that tracks human emotions, making it possible for his machine to predict movements in the stock market. Hoffman's funds are based in Geneva, where he retired from working at CERN after making his fortune. In the *Torchwood* episode "Lost Souls", set at CERN, people disappear from the site due to side effects from the LHC activation and a creature that feeds on neutrons from live bodies.[94] These interpretations of CERN all focus on the dangers of black holes, terrorism and blackmail within a semi-fictional world of physics. This has openly been embraced as a PR opportunity for CERN. As Head of Communications James Gillies wrote in relation to the BBC Radio 4 programme:

> As one of the leading centres of scientific research, what does CERN do when it finds itself turning up in works of fiction like Torchwood or Angels and Demons? It has three choices: it can rail at the inaccuracy of the science in the fiction; it can bury its institutional head in a bucket of sand. Or, it can seize the opportunity to get physics on the public agenda –

[93] On sexy science see Luca Carra, "The Sex Appeal of Scientific News" in Bauer and Bucchi, *Journalism, Science and Society,* 101-109; Frederick Thomas Attenborough, "Complicating the Sexualization Thesis: The Media, Gender and 'Sci-Candy'", *Discourse & Society* 22, no. 6 (2011), 659-676.

[94] *Torchwood* is a spin-off of the enduring and much-loved British science fiction TV series *Doctor Who* (BBC), presenting a twist on real science.

> and this is what CERN has chosen to do.[95] Whether avoided, well treated, or even wrong, science in fiction gives laboratories like CERN a great opportunity to bring the excitement of research at the frontier of knowledge to a broader audience than any amount of laboratory PR can do. The success of Angels and Demons drove up traffic to the CERN website by a factor of 10 overnight, and it has kept on climbing. Dan Brown is not the only factor – there are some amazing things going on at CERN – but it certainly helped.[96]

However, CERN did not trust Dan Brown, Robert Harris, Russell T. Davies or their audiences' interpretations completely. When the film *Angels and Demons* was released, CERN set up a website explaining that the film included incorrect science.[97] The website is a mixture of frequently asked questions, videos explaining what CERN does, and images of the various covers of Brown's book. Functioning as a factual check and balance, the website provides scientific information that the book misrepresents in a playful tone. CERN was also involved in the production of the *Torchwood* episode. Representatives of the organisation read the script to check for scientific inaccuracies. The episode, after being checked by CERN, became part of the celebration of the switch-on of the LHC in 2008.[98] Robert Harris also visited CERN to seek inspiration for the plot in *The Fear Index.* He is featured in the Arts@CERN gallery of past projects online.[99] The fact that *Angels and Demons, The Fear Index* and *Torchwood* are fiction does not make CERN shy away from making sure the interpretations do not give the public the wrong associations, even though the organisation itself has been active in its script-writing. CERN does "not care about the science", according to Gillies, "as long as they get the scientists right."[100] Roger Anthoine remembered how much time he had to spend reassuring the public that CERN was not a nuclear bomb-making machine or a military plot in the early years. Today, creative licence can be as uncomfortable for

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[95] "BBC Big Bang Day website", BBC (undated): http://www.bbc.co.uk/radio4/bigbang/sciencefiction.shtml?select=page1 (accessed 26.06.2015).
[96] "CERN in Science-Fiction", BBC website (undated): http://www.bbc.co.uk/radio4/bigbang/sciencefiction.shtml?select=page2#article (accessed 26.06.2015).
[97] CERN, "Angels and Demons: the Science Behind the Story", CERN accelerating science website (2011): http://angelsanddemons.web.cern.ch/
[98] Mark Wright, "Torchwood – Lost Souls", *The Stage TV* (10.11.2008).
[99] "The Fear Index", Arts@CERN website (undated): http://arts.web.cern.ch/works/fear-index (accessed 12.03.2016).
[100] Røstvik interview with James Gillies, 25.03.2013.

CERN to dealing with as the military question used to be. Writers such as Brown, Harris and Davies either invoke the old difficult safety concerns, or dream up new (and potentially worse) alternatives. The organisation's reaction and involvement in *Angels and Demons, Torchwood* and *The Fear Index* is symptomatic of its general attitude towards the arts.[101]

3.9 Emptiness and religion

Artists' images of CERN usually focus on the organisation's buildings, people or the nature surrounding Meyrin. But in British photographer Tim O'Riley's work, CERN is a destination for a philosophical enquiry (**Fig. 34–37**).

Fig. 34-37 *Tim O'Riley, Twenty-Seven Kilometres series.*

O'Riley was part of the *Signatures of the Invisible* exhibition, but went on to publish his photographs separately later.[102] Describing his meeting with CERN, O'Riley writes:

[101] See for example, "Antimatter and Other Mysteries in the ATLAS experiment", ATLAS PDF (undated): http://ippog.web.cern.ch/resources/2011/antimatter-and-other-mysteries-atlas-experiment (accessed 10.04.2016).
[102] Tim O'Riley, *Twenty-Seven Kilometres* (London: Revolver, 2014).

> I was struck by the signs of human presence in the anonymity and impenetrability of the place. Wandering about the warren-like spaces that house the sophisticated machines used for the experiments, I would sometimes come across a piece of furniture abandoned in a forgotten corner (…) But it always seemed empty, as if everyone had mysteriously vanished. Confronted with the apparent impenetrability of the whole enterprise that constitutes particle physics, these small fragments or signs of human presence began to take on a special quality. Traces of things no longer present, they reminded me of the images of the trajectories of countless minuscule particles as they collided in one or other of the experiments.[103]

Seeking this human presence, O'Riley visited CERN in the 1990s. At the time, before the LHC was switched on, he was relatively free to walk around on his own. He finished his last shoot when maximum security put an end to his walks there. Drawing on human fascination with post-nuclear landscapes, the photographs are concerned with human absence rather than the presence of man-made machines. Clothing, bicycles and trash are also man-made, but few people celebrate the reality of small-scale and seemingly useless objects in a place such as CERN. O'Riley is not affiliated with the Arts@CERN programme, even though his work directly engages with the site. In 2014 he published the photographs in a small book, but CERN has not endorsed this, as it has other external cultural projects. O'Riley is another example of an artist who was inspired, but not officially supported, by CERN.

Fig. 38 *Representatives from the Indian government donate the Shiva sculpture to CERN.*

CERN's sculpture of the Hindu deity Shiva can also be viewed as posing controversial philosophical questions (**Fig. 38**). In 2004, the two-metre-high statue of the dancing god was unveiled and presented to CERN by the Indian

[103] O'Riley's website: http://www.timoriley.net (accessed 26.06.2015).

government. While it is a typical example of donated art that solidified a relationship with a donor country (India is not a member country, but funds specific projects and machines), the sculpture has proven awkward for CERN for several reasons. The laboratory would likely not have chosen this particular display of aesthetics and it is an example of what can happen in the gesture of donated art. In a sense the Indian government, a partner but not a member of CERN, had more power in the transition of the object because they funded it. In the *quid pro quo* relationship between donors and the expectations of CERN's research output, a pragmatic business network is at play. We are reminded here of the young CERN visitor guide who explained the reason behind the on-site sculptures as national governments seeking benefits within the organisation.[104] This type of financial and international connection accounts for many of the donated artworks at CERN, but the Shiva sculpture asserts the donor's ideological stance clearer than others. Shiva, or Nataraja, is a Hindu god of cosmic dance who undertakes a divine performance to destroy the universe, making preparations for the god Brahma to start the process of creation. Historically concerned with avoiding accusations of destructions, this is a peculiar symbol for CERN to house on-site. In order to avoid a culturally sensitive debate about religion and symbols, CERN had to accept the piece. Instead of focusing on the religious message, the organisation explained the link to the universe on a plaque nearby:

> Hundreds of years ago, Indian artists created visual images of dancing Shivas in a beautiful series of bronzes. In our time, physicists have used the most advanced technology to portray the patterns of the cosmic dance. The metaphor of the cosmic dance thus unifies ancient mythology, religious art and modern physics.[105]

There is indeed this symbolic link, but also the more known narrative of the god's destructive powers. Furthermore, Shiva has an even more problematic connection to physics through J. Robert Oppenheimer's infamous quote: "Now I have become death.

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[104] Guided tour of ATLAS in English at CERN, 10.30am (23.03.2013).
[105] "Shiva's Cosmic Dance at CERN", Fritjof Capra website (20.06.2004): http://www.fritjofcapra.net/shivas-cosmic-dance-at-cern/

The destroyer of worlds."[106] Likening himself to Shiva, Oppenheimer commented on the moral dilemma scientists working on nuclear weaponry faced. CERN's history intersects with the many scientists who regretted their discoveries after Hiroshima and Nagasaki. The Shiva sculpture might engage those on-site in interesting moral conversations about this. It is another work of art that does not receive much attention from the Arts@CERN programme, but has the potential to instigate the cultural debate and exchange that CERN celebrates elsewhere. This provides insight into how CERN utilises the arts and artists. Artworks that can provide positive, clear stories about the organisation and its work are promoted by CERN. Artworks that bring up complicated or difficult topics are often silenced.

3.10 Three films

Recently, film and documentary has been used to critically explore CERN. One such example is the short science-fiction film *Rift*, inspired by CERN's work (**Fig. 39**).[107] Produced in 2009, the short film engages with the debate prior to the switching on of the LHC in 2008. The narrative follows one CERN staff member through one day, spanning breakfast with his family, the announcement of the switch-on of the LHC and the dystopian consequences of this.

Fig. 39 *Still shot from Andy Huang's film Rift.*

Echoing fears that Rössler and others have expressed through legal disputes and on *lifeboat.com,* it has been described as a "surreal interpretation of Pandora's box."[108] The scientist's failed experiment results in a formation of a black hole that alters the space and time of his

[106] Oppenheimer quote: "Now I have become death. The destroyer of worlds." Quoted in the programme: "For the Safety of Mankind – Dilemma of Scientists", *Horizon*, BBC (29 Dec 1969).
[107] Andrew Huang (director) and Zack Keller (co-writer), produced by Moo Studios and New Deal Studios, *Rift*, 2009. 9.52 min. YouTube: https://www.youtube.com/watch?v=msnZShgdBrY / (uploaded 29.09.2009) (accessed 26.06.2015).
[108] *Collider* exhibition pamphlet, MOSI Manchester, 14.

own life. This creates a nightmarish circular conclusion where the protagonist is forced to relive the same day over and over. Director Andrew Huang, writer Zack Keller and producers Benjamin Wilkins and Keith Collea are not mentioned in the Arts@CERN literature, nor is the short film. It was screened at the late-night events at the *Collider* exhibition once it opened at the Science Museum in Manchester (but not in London, where senior CERN staff played larger roles and celebrities such as Brian Cox and Stephen Hawking took part instead). The original aspect of *Rift* is that it performs its message in an accessible form, available on YouTube for free, and adopting the tropes of Hollywood in order to reach a vast audience. The main character is a white middle-aged male scientist. He is not prepared for the disaster. This is not the scientist as hipster, boffin or hero – this is the scientist firmly placed back in the traditional category of nerd turned mad experimenter.[109] The film uses tropes, but remains an alternative narrative compared with other art inspired by CERN.

In the documentary *CERN People – Unrequited Love,* CERN staff members are portrayed as wrestling with their field and lives after the discovery of the Higgs boson.[110] The documentary focuses in particular on the research groups that failed to see the Higgs-like results in their data. Following young scientists in the year of the discovery, we hear their worries about the increasing expectations of their work. "I'm just so tired of looking for the Higgs", exclaims one young man.[111] Another young man from one of the CERN groups that did not see Higgs-like results in 2012 felt "hated by everybody" because of it. The film is a reminder that the laboratory is made up of people, not particles. While it was made as a somewhat odd alternative insight into the "real" CERN, it expands on the stereotype of the nerd. "I was just tired of the Earth. I was fascinated by antimatter. I wanted an anti-Earth", explains one scientist about his

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[109] Bucchi, *Routledge Handbook of Public Communication of Science and Technology*, 101.
[110] The *CERN People* episodes available via the Intelligent Channel on YouTube (uploaded 16.09.2014): https://www.youtube.com/playlist?list=PLQTF-1oWnPbbXTkPYQG8Ak6OPntnkhqGK (accessed 26.06.2015). The series was produced by Liz Mermin and Crow Hill Films, and sponsored by the Science and Technologies Facilities Council and the Irish Film Board.
[111] *CERN People,* episode "TAU TROUBLE", YouTube (29.06.2014): https://www.youtube.com/watch?v=KeOkrc1H-QA&index=8&list=PLQTF-1oWnPbbXTkPYQG8Ak6OpntnkhqGK (accessed 5.04.2016).

early love for the field.[112] Six months later, the same scientist is stressed and worried. While not engaged in an outright critique of CERN, the documentary sheds some light on the pressures on young scientists at the organisation. The documentary was produced by the Intelligent Channel, a YouTube partner presenting high-quality videos on "intelligent matters".[113] It was funded by the Science and Technologies Facilities Council and the Irish Film Board, and is only available in English (with no subtitles). Furthermore, it was directed by London-based director Liz Mermin. Thus, *CERN People* is yet another British project that examines CERN, but one that does so critically. Made with the cooperation of mostly young CERN physicists, the documentary series has not been promoted by the organisation.

Bram Conjaerts' documentary *The Circle* (2009) provides insight into what CERN's neighbours think about the organisation. It remains the only artwork that has included this group.[114] Conjaerts, working on the project for four years, became interested in CERN through his father who was "passionate about science".[115] But he wanted to focus more on the human and philosophical side of the field. When he visited CERN he did not turn towards the machines or the scientists. Exploring the site before the switch-on of the LHC, Conjaerts was one of the last artists who could explore some parts of the tunnel. He quickly wished to go aboveground again. Tracing the twenty-seven-kilometre ring outside, Conjaerts interviewed locals who lived on the circular route of the LHC aboveground. A range of people, from a priest to a farmer, young couples and retired CERN staff, provide the narrative. The only work of its kind, the documentary leaves out the scientists, who are only present through sparse audio and not on screen in person. This was done in order to focus on the neighbours. The locals provide commentary, opinions and information, ranging from proud enthusiasm to fear. Perhaps no one knows CERN better than these people who deal with visitors, press,

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[112] *CERN People,* episode "TAU TROUBLE", YouTube (29.06.2014): https://www.youtube.com/watch?v=KeOkrc1H-QA&index=8&list=PLQTF-1oWnPbbXTkPYQG8Ak6OpntnkhqGK (accessed 5.04.2016).
[113] The Intelligent channel on YouTube: https://www.youtube.com/user/IntelligentChannel/featured (accessed 5.04.2016).
[114] Author and director Bram Conjaerts, *The Circle,* 2013. Produced by A Team Productions in Belgium. 48min. Trailer available online: http://www.andanafilms.com/catalogueFiche.php?idFiche=1176&rub=VOD (accessed 12.03.2016).
[115] Røstvik Skype interview with Bram Conjaerts, 18.07.2014.

sound, radiation, bureaucracy and indeed visiting artists. Conjaerts also interviewed Otto Rössler ("The scientists laughed") to explore CERN from all points of view.[116] After this, he felt the need to "earn the trust of the PR office" in order to get access to the scientists. When he tried to contact them directly for a commentary, he found that CERN and the PR staff were "annoyed".[117] Especially difficult was the subject of radiation in relation to the neighbours, and in the end the matter was left out of the film. Furthermore, the Communications Group "did not like questions about black holes", and once he had talked to Rössler he decided not to inform the PR group about this conversation. After the documentary was finished, Conjaerts had further encounters with the organisation. Conjaerts recalls: "I sent the film to all the scientists involved and they were excited. Some said it was the best CERN film they had seen".[118] But he heard nothing from the larger CERN system, and felt that his project was being silenced. Conjaerts nevertheless believes CERN will always attract artists, but he is split in his view of the organisation, as is his film.[119] The film has not been enveloped into the Arts@CERN programme nor officially commented on by the Communications Group. Silencing is a strategy that has worked when dealing with controversy before. It benefits CERN and its staff, but not the artists who are cut off from engaging with CERN's audience. CERN has been involved in many films, but as this shows, it will only promote those that present a story about the organisation that is in line with CERN's own PR narrative.

3.11 Will Self

The three films *Rift, CERN People* and *The Circle* have not reached a large, mainstream audience. Their interpretations of CERN have not been endorsed by the organisation and have thus not been shared via the organisation's large public platform online. If CERN, through Arts@CERN, functions as a curator of art, these pieces have not made the final edit. But not all creative interpretations need Arts@CERN to reach the public. The British writer and intellectual Will Self touched on many of the same themes as the films

[116] Røstvik Skype interview with Bram Conjaerts, 18.07.2014.
[117] Røstvik Skype interview with Bram Conjaerts, 18.07.2014.
[118] *The Circle* won the category of best mid-length documentary in the documentary award event Hot Docs in Toronto, Canada, in 2013.
[119] Røstvik Skype interview with Conjaerts, 18.07.2014.

in his radio series from 2015. His analysis was broadcast by BBC radio, which ensured a much larger audience (a podcast was also made available), at least in English-speaking countries.[120] The BBC, which has celebrated the organisation, facilitated Self's public and humorous attack on the organisation. In a format of five fifteen-minute episodes, Self visited CERN in one of his many long broadcasted walks in the style of a modern flâneur. Throughout his visit to CERN he remained unimpressed by the organisation, in particular its use of PR people and inability to communicate "what they are actually doing."[121] Self explored the stereotype of the peaceful international laboratory and other tropes. He was disappointed by not "feeling the wonder" of CERN and concluded by stating "the emperor has no new clothes."[122] Self was in the guise of his characteristic public persona: grumpy, provocative, and willing to poke fun at sacred cows.[123] The enthusiastic scientists he spoke with could not convince him to love their work, and Self seemed unwilling to be persuaded. In this sense he mirrors the high-handedness of Cox, Butterworth and others in meeting with dissenters of CERN's work, such as Rössler. The short radio episodes are some of the most critical analyses of CERN in mainstream media.

Self's visit exemplifies the many ways in which CERN PR works. First, Self was invited by CERN staff member Akran Khan, a professor of particle physics who is passionate about public engagement. Self was also followed around on-site by "CERN PR flack Stef."[124] Thus he is as controlled and guided as the Arts@CERN artists, even though he comments on this dynamic. Second, CERN's relationship to British media remains strong. The BBC's relationship with CERN has spanned fifty years and reveals a fascination with intellectual elites.[125] One short series of sarcastic critique does not balance out the many celebrations of CERN made by the BBC since the '60s. Third,

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120 "Self Orbits CERN", BBC Radio 4 produced by Laurence Grissell (first aired 5.01.2015 – 9.01.2016). The podcasts are available via the BBC website: http://www.bbc.co.uk/programmes/b04xxvtb (accessed 12.03.2016).
121 "Self Orbits CERN", episode 1 (first aired 5.01.2015).
122 "Self Orbits CERN", episode 5 (first aired 9.01.2015).
123 For a discussion of Self's public persona see M. Hunter Hayes, *Understanding Will Self* (Columbia: University of South Carolina Press, 2007).
124 "Self Orbits CERN", episode 1 (first aired 5.01.2015).
125 For background on British broadcasters and science see Sharon M. Friedman, Sharon Dunwoody and Carol L. Rogers, *Scientists and Journalists: Reporting Science as News* (New York: Free Press, 1986); Stuart Allan, *Media, Risk and Science* (Buckingham: Open University Press, 2002).

there is perhaps no such thing as bad PR. The popularity of Self's grumpy analyses ensures that new audiences become aware of CERN. Like Brian Cox, the BBC's main physics presenter, Self will also attract an audience that is interested in science. But unlike Cox, he is not a scientist and his eclectic pasts and status (he often appears as the antagonist in cultural productions, has a public history of mental health issues, and is an outspoken public intellectual figure) as a public intellectual directs itself to a different group. In the end, this was another free publicity stunt for CERN.

While encouraging of cultural engagement, CERN still cautions artists against concentrating on the potential dangers of the organisation's experiments. Some genres, such as science fiction, are tolerated, probably because the genre is so clearly not trying to account for reality. But the general attitude to external controversy has been a mixture of educating artists (Collide@CERN, *Signatures of the Invisible*), correcting facts (*Angels and Demons*), embracing interpretations as PR (Will Self, *The Fear Index*) or silencing (*Rift, The Circle*). Silence is also a tool of communication.[126] The silence surrounding some of these controversial artworks stands in contrast to the warm welcome extended to artists who win the Collide@CERN residency, or who show CERN in a positive light. This is a natural strategy for an organisation, but it is not an ideal situation for the freedom of art. Self's radio programmes sit somewhere in between, as they were initiated by the organisation through Khan, yet not endorsed by CERN (although Khan did put out a series of tweets about his and CERN's involvement). This might hint at a more diverse and open organisational policy for the future, or it might mean that CERN considers the radio programmes as another example of media inspired by CERN that they do not have time to comment on.

3.12 Les Horribles Cernettes

One of the few artistic interpretations of CERN driven by women came from a group of non-scientists within the organisation. The female-fronted parody pop group Les Horribles Cernettes (the horrible Cernettes; a direct pun on the LHC) was founded in 1990. It consisted of Cernoises: Michele de Gennaro, Colette Marx-Nielsen and Anne MacNabb (joined occasionally by other members) (**Fig. 40**).

[126] Felicity Mellor, "The Power of Silence", *Physics World* 27 (2014), 28-30.

Fig. 40 *Les Horribles Cernettes - this blurry image was used by Tim Berners-Lee as the first image on the World Wide Web*

Some were non-scientific CERN staff, others were wives or partners of male staff. As Cernoises they were both inside and outside of CERN, and their perspective on this boundary position is explored in their lyrics. The band's first brainstorming resulted in the "National Anthem of the High Energy Kingdom".[127] "Collider" is a story about a man who is "married" to his machine. It suggests both sexual self-involvement, but also a rather unhealthy fixation with objects. The band became CERN's own feminist house organ. Titles such as "Daddy's Lab", "My Sweetheart is a Nobel Prize", "Microwave Love" and "Mr Higgs" play with the traditional pop themes of love and heartache, but set in the world of high-energy physics. Les Horribles Cernettes maintain their position as the only female-led art project that has come out of CERN. Alluding to sex, gender performativity and romance within the "extreme culture of objectivity", the group performed with enthusiasm and determination:

> You say you love me but you never beep me
> You always promise but you never date me
> I try to fax but it's busy, always
> I try the network but you crash the gateways
> You never spend your nights with me
> You don't go out with other girls either
> You only love your collider [128]

As was the case with other third-wave feminist art of the 1990s, the use of pop culture, irony and imitation of traditional femininity was utilised by Les Horribles Cernettes in

[127] Les Horribles Cernettes website: http://musiclub.web.cern.ch/MusiClub/bands/cernettes/ (accessed 26.06.2015).
[128] "Collider", Les Horribles Cernettes, 1994.

order to reach their audience. While not the most political of feminist activism, third-wave feminism's playfulness broke glass ceilings in the entertainment business, as well as emerging through Girl Power as a sex-positive solution to stereotypes of the more politically inclined second-wave feminists.[129] Les Horribles Cernettes utilised all the strategies of the third wave, and emerged as one of the most critically engaged artworks to come out of CERN. The fact that the group is still celebrated by the high-energy physics community shows physicists' ironic take on their own environment. However, Les Horribles Cernettes is another cultural project that has not made it into the Arts@CERN canon. It only resurfaces in the public eye when one of the band's photographs is discussed in the context of being one of the first images on the Internet.[130] This is not the type of "exceptional art" that the CERN art programme is dedicated to promoting, as we shall see in the following chapters.

3.13 Conclusion

The artists who engaged with CERN throughout its history, from the first architect to Les Horribles Cernettes, revealed the non-scientific aspects of the organisation's culture. Their work ensures that CERN will not be forgotten, and that more than the Communications Group's version of events will survive. Even the controversial artworks that explore CERN, such as Will Self's radio programme and the short film *The Rift,* do not severely damage the organisation's reputation. They create a rich tapestry of viewpoints that invite many characters to engage with the organisation and its work. Controversy in art is nothing new.[131] Telling us more than CERN's PR team does, art can collapse the structures of the official organisational narrative and explores the deep and varied Many-World interpretations of CERN.[132]

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[129] Shelley Budgeon, *Third Wave Feminism and the Politics of Gender in Late Modernity* (London: Palgrave Macmillan, 2011).
[130] See for example Andrew Smith, *Totally Wired: On the Trail of the Great Dotcom Swindle* (London; New York: Simon & Schuster, 2012), chapter 5. Gennaro has disclaimed the story writing that the media were "totally distorting our words for the sake of cheap sensationalism", quoted in Andreas Sofroniou, *Surfing the Internet, Then, Now, Later* (Self-published on lulu.com, 2014), 48.
[131] See for example John Albert Walker, *Art and Outrage: Provocation, Controversy, and the Visual Arts* (Michigan: Pluto Press, 1999); Richard Howells, Andreea Deciu Ritivoi and Judith Schachter (eds.), *Outrage: Art, Controversy, and Society* (Basingstoke; New York: Palgrave Macmillan, 2012).
[132] The Many-World interpretation of quantum physics is a controversial theory that states the reality of many parallel realities, histories and futures.

As the examples of this chapter have unveiled, there is already a living tradition of cultural engagement within and outside of CERN. But the majority of these examples remain within the field of high-energy physics or niche areas of SciArt, and only a small minority confirm to the tropes of "high" art. This is why so few of these examples have made it into the official CERN canon. From pedagogic computer games to playful feminist song writing, these artistic expressions reflect a workspace's history. This is not the same as the culture of physics, or the art of science or science as art. Rather, it is a particular outcome of the strengths and weaknesses of over sixty years of communication with a non-scientist audience. The shift from the eclectic and unofficial nature of these early cultural projects, to the more rigid, professional and commercial setting seen today will be explored in the next chapter. The modern cultural policy seeks to change certain parts of the organisation's existing culture, and to culturally capitalise on others. With the advent of the Arts@CERN programme, the need for a sudden labelling of CERN's culture signals a shift in focus for the organisation and for the artists who work within it.

CHAPTER FOUR

Control. CERN's Cultural Policy for Engaging with the Arts

> HAVE YOU SEEN AN A3 WHITE ARTIST'S FOLDER CONTAINING AN ORIGINAL STORYBOARD? (…) Contents include an original storyboard, which is laid out like a cartoon series, depicting the adventures of a dynamic girl wearing a breathing apparatus on the hunt for the Higgs at CERN. Please contact Ariane Koek with any information you might have regarding this portfolio – whether you have seen it and/or most of all, found it or know where it is. The storyboard is original creative work and means a great deal to the artist.
>
> Ariane Koek, *CERN Bulletin,* no 15-16 (8.04.2013)[1]

4.1 Introduction

This chapter explores the creation of CERN's first cultural policy. For context, I first explore two other artist residency schemes from the twentieth century, Experiments in Art and Technology (E.A.T.) and Centre for Advanced Visual Studies (CAVS). I then provide a close reading of CERN's cultural policy, which has changed the ways in which the organisation interacts with artists. Today, there are art experts working with CERN and a clear entry point for all artists. There are also several international and national art competitions in place at CERN, and the laboratory has more control in determining which artists gain access to its site than ever before. All of these changes have allowed CERN to start cashing in on its own cultural capital. The previous chapter's discussion of the organisation's art history shows that although several artists had been inspired by CERN, the laboratory itself did not gain helpful PR from these visits. The modern cultural policy is designed to maximise all the energy and resources that CERN spends on artists. This chapter discusses the context in which this new system was constructed, CERN's motivation for making these changes, and explores the new policy's consequences for artists seeking to visit the organisation today.

4.2 Arts@CERN

Ariane Koek's arrival at CERN signalled a change in the ways in which the organisation

[1] Ariane Koek, *CERN Bulletin,* no 15-16 (8.04.2013): https://cds.cern.ch/record/1540274?ln=en (accessed 22.03.2016).

engaged with the arts. In 2009 the cultural specialist came to CERN funded by a British Clore Fellowship. The fellowships set out to support outstanding cultural leaders, mainly from the UK. Since 2002, over two hundred fellowships have been awarded to individuals from across the cultural sector.[2] The sum depends on the project and is usually awarded for one set period of time.[3] It has not been possible to find out if Clore is still financially involved in the CERN art project. Koek writes that she was given the opportunity to start an art programme anywhere with her Clore funding, and she soon considered CERN. She conducted a four-month-long feasibility study of CERN as a potential space for future art projects. I asked for insight to read this study, but it was not possible.[4] Some Arts@CERN funders were made official in late 2012. They include the city and canton of Geneva, the SciArt pioneer Prix Ars Electronica and the insurance company UNIQA.[5] The city of Geneva funds the international and local programmes, whereas Prix Ars Electronica funds the international strand, and the insurance company covers all the artists on-site. In addition, the project is supported by the Exclusive Friends of Collide@CERN, who are private anonymous patrons. The project remains entirely supported by these external funds. This is important, as CERN can only spend money on scientific pursuits. At some point Koek made contact with CERN, through the Communications Group and Director General Heuer, presenting the idea to them with an almost immediate effect. Awarded the fellowship in 2009, Koek's idea was a reality by

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[2] Clore Fellowships Information website: http://www.cloreleadership.org/page.php?id=48 (accessed 26.06.2015).

[3] The foundation is supervised and managed by English philanthropist Vivien Duffield, sole heir to property and retail financier Sir Charles Clore. He (1904–1979) was a British financier, retail and property magnate and philanthropist of Lithuanian Jewish background. He owned, through Sears Holdings, the British Shoe Corporation and Lewis's department stores (which included Selfridges), as well as investing heavily in property. His philanthropic trust, the Clore Foundation, is a major donor to arts and Jewish community projects in Britain and abroad. Upon Sir Charles's death, Inland Revenue sued, claiming he was British domiciled (he had claimed Monaco domicile), in order to collect inheritance taxes. The court upheld the Inland Revenue position. The Clore fellowships are also supported by a number of smaller charities, Arts Council England and the Wellcome Trust, the original champion of SciArt in the UK. The Clore wings at the National Gallery and Tate Britain are examples of the Clore foundation's presence in the elite British art world today.

[4] "Not available as I am sure you correctly surmise that is private work. Sorry." Koek in email to Røstvik, 19.02.2015.

[5] Collide@CERN's sponsors where not made public until late 2012: "We are entirely supported by external funds – from donations from our private donors known as Exclusive Friends of Collide@CERN, the City and Canton of Geneva, Prix Ars Electronica, and UNIQA who sponsor all the artists' insurances." From Collide@CERN press pack available exclusively online (undated): http://arts.web.cern.ch/sites/arts.web.cern.ch/files/Collide%40CERN%20Press%20Pack.pdf (accessed 26.06.2015).

2011. Five years later the residency is still running based on Koek's original feasibility study.

In one of the monthly Arts@CERN newsletters from early 2015, Koek announced that she would move on to a role in the CERN Cultural Board. Koek's new role meant working as: "a strategic cultural expert, as well as producer/curator – delivering, developing, creating and consulting on exciting new international creative and innovation projects in arts/science/technology and other fields too, including ecology."[6] In the same newsletter, Koek announced that she had also been able to secure future funding for the project. This included six years of funding from the city and canton of Geneva and from Ars Electronica. The funding would cover the Collide@CERN residency programmes, four years of funding for the newer Accelerate@CERN artist research programme (collaborating with individual countries), three years of funding for administrative student Julian Calo to continue the practicalities of the programme, and three years of funding for the new curator. In March Koek announced that Monica Bello would take over her role. Similar to Koek, Bello is an independent curator and art critic. Previously, Bello had been director of the art and science organisation VIDA in Madrid (which awards the SciArt prize Art and Artificial Life International Award), the head of education at LABoral Centro de Arte in Spain, and the founder of curatorial platforms such as Biorama in Huddersfield.[7] These changes have been implemented quickly. Koek has proved successful in her aims of expanding the programme into a global, independent and financially secure endeavour. The art programme has altered CERN's position in the art world, and changed the ways in which artists interact with the organisation.

One of Koek's goals is to make art at CERN world class. Her hope, and that of the Director General Heuer, was to instill professionalism in management of the arts to match CERN's scientific reputation. Collaborative floor pieces, pop music groups and film festivals might be interesting, but they did not represent what CERN as a brand

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[6] Ariane Koek, "Happy New Year! New Changes at Arts@CERN in 2015 and Beyond", Collide@CERN Newsletter, Jan 2015.

[7] For a discussion of VIDA see Nell Tenhaaf, Paula Gaetano, France Cadet, Federico Muelas, Scott Draves, Michelle Teran, Jeff Mann, Haruk Nishijima, María Verstappen, Erwin Driessens, Marc Böhlen and J.T. Rinker, "Art Embodies A-Life: The VIDA Competition", *Leonardo* 41, no. 1 (2008), 6-24.

sought to represent, namely the exclusive concept of "exceptionalism." The timing of this initiative became significant as CERN located the Higgs boson and overnight became a focus for the world's media. Embarrassment at the amateurishness of its prior cultural projects may have been a catalyst that changed the rhetoric of the arts at CERN from 2011.[8] While Koek was undertaking her feasibility study and the first call for artists was announced, the Higgs boson was yet to be discovered. As the celebrations on and after the announcement on 4 July 2012 propelled CERN onto front pages throughout the world, the organisation's culture was also being highlighted. PR became important in this period. In other words, although Koek certainly is "a dynamo", it was the institutional levels of CERN that decided to start the art programme.[9]

Prior to Koek, no one at CERN had seriously considered organising the visiting artists in any specific way. Before Koek, (some) visiting artists and projects were primarily discussed in the *CERN Courier,* which is mainly read by people who work with high-energy physics. The closest the organisation had been to igniting a similar project, was through one of CERN's founding fathers, Isidor Isaac Rabi, according to undocumented rumours.[10] In the early days, fears of spending money on non-scientific endeavours overshadowed any wishes to engage seriously with the arts. Koek, externally supported by Clore, came as a gift to the organisation. Until then, CERN staff had concentrated their attention on building the laboratory, while artists were left to wander

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[8] On rhetoric in science, see Alan G. Gross, *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science* (Albany; New York: SUNY Press, 1997); Michael J. Zerbe, *Composition and the Rhetoric of Science: Engaging the Dominant Discourse* (Carbondale: SIU Press, 2007); Henry Krips, J. E. McGuire, Trevor Melia, *Science, Reason, and Rhetoric* (Pittsburgh: University of Pittsburgh Press, 1995); Jeanne Fahnestock, *Rhetorical Figures in Science* (Oxford: Oxford University Press, 2002), Gerald James Holton, *Science and Anti-Science* (Harvard: Harvard University Press, 1993), chapter three; John Schuster and Richard R. Yeo (eds.), *The Politics and Rhetoric of Scientific Method: Historical Studies* (Dordrecht: Reidel, 1986); Andrew E. Benjamin, G. N. Cantor and J.R.R. Christie (eds.), *The Figural and Literal: Problems of Language in the History of Science and Philosophy 1630-1800* (Manchester: Manchester University Press, 1987); L. J. Prelli, *A Rhetoric of Science: Inventing Scientific Discourse* (Columbia: University of South Carolina Press, 1989); Jan. V. Golinski, "Language, Discourse, and Science", in R.C. Olby, G.N. Cantor, J.R.R. Christie, *Companion to the History of Science*, 110-23; Marcello Pera and William R. Shea, *Persuading Science: The Art of Scientific Rhetoric* (MA; Canton: Science History Publications, 1991).

[9] In his discussion of Collide@CERN in *Colliding Worlds* Miller describes Koek as "a dynamo" (145).

[10] Several CERN staff members mentioned this when we spoke, but they did not know any details and there is no evidence for this in the literature or archive material available. It may be likely that Rabi, the initiator of CERN, envisaged a creative element to the new organisation, but there is no evidence to back this up. Whether he wished to use cultural engagement as a cover for the questions of military interaction, or if it was part of the fashion of the time to engage in such interdisciplinary can, of course, only be speculated upon.

the corridors of the organisation alone. Today, the situation has been reversed. All artists at CERN are now accompanied by staff, and traced by one or several recording devices as they arrive and work on-site. Annual artist visits are also reduced to twelve. These are examples of the control and branding strategies that come into play within the culture of Arts@CERN at CERN. I begin looking at these topics by examining two historical projects that provide historical context for the type of SciArt residency that started at CERN in 2011.

4.3 E.A.T. and CAVS

Before turning towards CERN's cultural policy for the arts, Experiments in Art and Technology (E.A.T.) and Centre for Advanced Visual Studies (CAVS) demonstrate two different ways of organising collaborations between scientists and artists. There are traces of both projects in Arts@CERN and Collide@CERN, and understanding these historical examples helps explore the context of the art at CERN today.

E.A.T. was founded in 1966 by engineers Billy Klüver and Fred Waldhauer, and artists Robert Whitman and Robert Rauschenberg. As a non-profit group that remained active until the 1980s, E.A.T.'s aims were to mobilise the arts, industry and science in projects that involved professionals from each field. The collaboration was created by pairing artists with engineers, similar to Collide@CERN's "speed dating" of artists and scientists.[11] E.A.T., like Arts@CERN, was invested in being an international project. One of its biggest projects involved artists from the group designing the Pepsi Pavilion at Expo '70 in Osaka, Japan. Emerging technologies such as computer-generated images were a focus, as well as synthetic materials and sound. By the mid-1970s, E.A.T. had chapters in the United States, Canada and Japan. These countries are not CERN member states (although they fund individual machines and projects), but the structure mirrored Arts@CERN's contemporary collaboration with non-CERN countries through the Accelerate@CERN strand. E.A.T. has been an inspiration for Arts@CERN and Koek, and the project's manifesto foreshadow some aspects of the CERN programme. It emphasises a "civilised collaboration between groups unrealistically developing in

[11] "It's almost going to be like speed dating. We need to find matches that really inspire each other." Koek quoted in Ian Randall, "CERN to launch artists in residence programme", ALICE website (11.09.2001): http://alicematters.web.cern.ch/?q=arts-at-cern-programme (accessed 6.04.2016).

isolation"[12], and seeks to:

> Maintain a constructive climate for the recognition of the new technology and the arts by a civilised collaboration between groups unrealistically developing in isolation. Eliminate the separation of the individual from technological change and expand and enrich technology to give the individual variety, pleasure and avenues for exploration and involvement in contemporary life. Encourage industrial initiative in generating original forethought, instead of a compromise in aftermath, and precipitate a mutual agreement in order to avoid the waste of a cultural revolution.[13]

Here we can see some links to CERN's cultural policy, especially the focus on "a civilised collaboration." Furthermore, E.A.T. avoided politics, and introduced a degree of elitism and a focus on "high" art into its projects. Both Arts@CERN and E.A.T. developed into non-profit, tax-exempt programmes with a charity-like structure. The project has not survived, although its legacy lives on at CERN.[14]

The second example, CAVS, was started at Massachusetts Institute of Technology (MIT) in 1967 by György Kepes, a Hungarian-born painter, educator and art theorist. He was supported by MIT-researcher, Los Alamos pioneer and later CERN Director General Victor Weisskopf, a vocal supporter of peaceful physics who helped make CERN the global influencer it is today.[15] Kepes had taught at the influential art school Bauhaus in Chicago, and wanted to encourage artistic collaboration in the sciences and in engineering.[16] In one of the many obituaries written after his death in 2001, the MIT news concluded: "Geörgy Kepes was the greatest pioneer in the marriage

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[12] E.A.T website: http://www.fondation-langlois.org/html/e/page.php?NumPage=237 (accessed 26.06.2015).
[13] "E.A.T Manifesto/Statement of Purpose", 1967, in "Collections of Documents Published by E.A.T", *La fondation Daniel Langlois Pour l'Art, la Science et la Technologie*, The Getty Research Institute, Los Angeles, US.
[14] E.A.T.'s history and legacy is discussed in Billy Klüver, J. Martin and Barbara Rose (eds.), *Pavilion: Experiments in Art and Technology* (New York: Late Edition, 2003); The E.A.T. archives, see "Inventory of the Experiments in Art and Technology Records, 1966-1993", *The Getty,* Los Angeles, Getty Research institute (undated): http://www.oac.cdlib.org/findaid/ark:/13030/tf4j49n6rt/ (accessed 13.03.2016).
[15] For insight into Weisskopf's time at CERN see his autobiography *The Privilege of Being a Physicist* (London: W.H. Freeman & Company, 1989) or Anthony Tucker, "Victor Weisskopf, Obituary", *The Guardian* (26.04.2002).
[16] CAVS website: http://cavs.mit.edu (accessed 26.06.2015).

of art and technology in America, if not the world."[17] He wrote influential books on SciArt collaborations before the term existed, including *Language of Vision* and *The New Landscape in Art and Science*.[18] These writings echo in the Arts@CERN programme, as the artists are told to focus on collaboration rather than on producing outcomes. Judith Wechsler, drawing on Kepes and Weisskopf's MIT course on the "Aesthetics in Science and Technology", outlined the approach of the centre:

> We studied "works of science" as one might works of art, examining the relation of form and content, the personal and social context in which the work was created, and the intention and application of the work. Developments in science were studied with regards to prevailing styles, schemata, and paradigms, referring to the theories of Gombrich and Kuhn. Many students developed increasing awareness of the fit between their personal sensibilities and their chosen field.[19]

While MIT and CERN are similar as organisations, the freedom given to the artists is different. The MIT courses focused on collaboration through historical critique, exploring science as social. Whereas CERN set up speed dates between scientists and artists, CAVS was concerned with challenging those relationships, asking for example why scientists use terms such as "beauty" in their work through close readings of their tastes, backgrounds and interests. Where Arts@CERN is aesthetic, CAVS is analytical, and where Arts@CERN and E.A.T. remained science-focused, CAVS sought to explore how "both art and science evoke the previously ineffable in making ideas and concepts clear, cogent, and manipulable."[20] The CAVS centre is still active, with ties to the *Leonardo Journal of Arts, Sciences and Technology.*[21]

Both E.A.T. and CAVS have inspired Arts@CERN, but it is in E.A.T.'s manifesto we find CERN's careful, structured and hierarchical (or "civilised") approach to creativity. In contrast, the CAVS technique of examining the social structure of

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[17] "György Kepes, founder of CAVS, dies at 95", *MIT news* (16.01.2002): http://news.mit.edu/2002/kepes (accessed 27.03.2016).
[18] György Kepes, *Language of Vision,* first published 1944. (Online publishing: Literary Licencing, 2012); Kepes, *The New Landscape in Art and Science* (New York: P. Theobald, 1956).
[19] Judith Wechsler (ed.), *On Aesthetics in Science* (Cambridge, Mass.: MIT Press, 1978), preface.
[20] Wechsler, *On Aesthetics in Science,* 1.
[21] *Leonardo Journal of Arts, Sciences and Technology* website: http://www.leonardo.info/leoinfo.html (accessed 6.04.2016).

science has not been taken up by CERN. CERN's cultural policy, through Koek's familiarity with SciArt, is linked to these projects but aims higher. It also aims in a more controlled way in order to reach its high goals. Turning towards the second topic of this chapter that examines CERN's cultural policy, we can see how the ideas behind E.A.T. also live on in Meyrin.

4.4 CERN's cultural policy

The policy framework that structures the Arts@CERN programme today was written by Ariane Koek and implemented by the organisation on behalf of all CERN staff. For artists, this means that they can get a direct sense of how CERN understands the arts. The policy is available online only, in Portable Document Format (PDF) format and only in English.[22] The four-page document included a colourful image of a particle collision as a front page and backdrop, and the Arts@CERN logo.[23] The language of the policy is enthusiastic and, at times, euphoric, with frequent use of capitalised letters in bold and/or italics. Whether CERN's intentions are to tick the cultural engagement box or be viewed as a more crucial part of their interaction with the arts, a policy is nevertheless a guide for decision-making. In sociology, policies are part of the social construction of what is considered normal.[24] The policy is thus an idealised norm, and should therefore be read carefully. The tone that CERN wishes to frame arts in, is made clear in the policy's introduction:

> This is CERN's first cultural policy for engaging with the arts. It was conceived as the foundation for Collide@CERN – the International Artists Residency programme. It became quickly apparent that if there is to be an International Arts Residency scheme, CERN crucially needed a Cultural Policy for Engaging with the Arts to provide the essential policy framework and foundations for the Collide@CERN arts residency initiative, as well as for all other high-quality arts engagement and

[22] This and all future reference to the policy are based on the version available through the Arts@CERN website until early 2015. By summer 2015 the document had been changed with an "Arts@CERN Press Pack", which is accessible here: http://arts.web.cern.ch/sites/arts.web.cern.ch/files/Arts%40CERN%20Press%20Pack%20-%202015.pdf (accessed 26.06.2015). The Arts@CERN cultural policy is attached as Appendix I.
[23] Ariane Koek, "CERN: Where Art and Science Collide."
[24] Dave Elder-Vass, *The Reality if Social Construction* (Cambridge: Cambridge University Press, 2012), 202.

activities.

There is no explanation as to why it became apparent that CERN needed this, but as I have explored in earlier chapters, issues of PR, timing and media are relevant. The document goes straight on to introduce the name of the policy: *Great Arts for Great Science.* The focus on greatness and exceptionalism runs through the policy, as it does in the lectures and events surrounding the collaborations. As a celebration of SciArt, the policy also sets out CERN's take on the "Two Cultures" debate:

> Both arts and science are ways of exploring the world we live in and our place in the universe. Science demonstrates its effectiveness through tests, equations and proof thus creating new knowledge and certainty, the arts demonstrates its impact through the senses, transporting people to see the world and relate to each other with a sense of wonder through the power of the imagination.[25]

This language focuses on the esoteric reasons for the collaboration, in contrast to the focus on greatness in the remaining section of the document. It reflects Ariane Koek's personal writing in her blog *The Beauty Quark*, where she writes about poetry, art and science.[26] But the overall tone of the policy is not poetic. In a paragraph subtitled "Why Great Arts for Great Science?", CERN defines its focus on the arts and elite endeavours in general:

> Called Great Arts for Great Science, CERN`s cultural policy creates for the first time the essential foundation and framework at CERN for expertise and knowledge of the arts to match CERN`s world renown for expertise and knowledge in science.
>
> Great Science deserves Great Art – with the same high standards of selection and quality control that are made to employ talented world-class scientists, engineers and technologists at CERN, being matched by CERN selecting equally talented, world-class, innovative artists. The policy will enable this with a key recommendation, building in the necessary expertise

[25] CERN cultural policy summary, see Appendix I.
[26] Ariane Koek's personal/professional blog, The Beauty Quark: http://wwwbeautyquark-beautyquark.blogspot.ch (accessed 26.06.2015).

> by setting up for the first time an independent Cultural Advisory Board for engaging with the Arts (CABA).
>
> By adopting Great Arts for Great Science, CERN can clearly demonstrate to the global cultural community that it is a cultural force – by engaging its great science with great arts.[27]

CERN wants to be seen as leading in the art world, as well as in the sphere of high-energy physics and international scientific diplomacy. But the collaboration is still new and not well known outside the SciArt field. In the encyclopaedia of SciArt by the late professor of conceptual art Stephen Wilson, CERN and Arts@CERN are not mentioned (despite the programme being advertised globally in mainstream and SciArt media at the time of publication).[28] Similarly, in the LHC-themed *Collider* exhibition, Arts@CERN was not mentioned in the opening discussion dedicated to science and art.[29] The Collide@CERN residency competition received some attention in mainstream media as we have seen, but most of the coverage coincided with the Higgs boson discovery in 2012. The policy thus defines a new frontier for CERN to conquer. As a policy document it ties CERN artists to the goals of the organisation, and has direct consequences for future visiting artists on the site. In other words, the cultural policy has changed the context for artists at CERN.

4.5 Excellence in Geneva

The belief in the possibility of a definitive art canon is key to CERN's building of a new hierarchy of culture. CERN's insistence on engaging only with excellent art can be seen as a rejection of subjective tastes, and a further example of the culture of objectivity within high-energy physics.[30] It also signals an interest in making the collaboration international, as compared to the earlier local connections between artists and scientists

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[27] CERN cultural policy summary, see Appendix I.
[28] Stephen Wilson, *Art + Science Now: How Scientific Research and Technological Innovation are Becoming Key to 21st-century Aesthetics* (London: Thames & Hudson, 2010).
[29] Nima Arkani-Hamed and Ian McEwan, "What Is the Common Ground Between Art and Science? And how is Beethoven like Darwin?" *The Guardian,* blog from Science Museum London event connected to opening of *Collider* (17.11.13): https://www.theguardian.com/science/2013/nov/17/art-science-ian-mcewan-nima-arkani-hamed (accessed 27.03.2016).
[30] Traweek, *Beamtimes and Lifetimes,* 162.

in Meyrin and Geneva. Koek sets out a new path for non-scientific creativity at CERN, and homes in on "greatness" as a major goal:

> "GREAT" is defined as…
> Established Talent – World-class and recognised excellence, exceptionalism and ability.
> Emerging Talent – New talent that demonstrates exceptionalism, innovation, imagination and the ability to break the mould in their art forms to create the truly original and inspirational.
>
> Whilst in science, greatness is measured according to the absolutes of scientific proof and results, in the arts it is judged and assessed according to a combination of the experience and knowledge of the history of the different art forms demonstrated by experts – who include practitioners, curators, directors, producers, and critics. These are the kinds of people qualified to make valued critical judgments and choices about artists and their quality, their exceptionalism and their ability – thus ensuring Great Art for Great Science.[31]

Here, CERN's earlier casual and unorganised attitude to visiting artists is abandoned. James Lee Byars, Serge Moro, Les Horribles Cernettes and the other earlier CERN artists do not fit into this clear definition of art. CERN's focus is firmly planted in the future and expectations are high. Artists will have to be excellent, and will be judged by scientists and experts from the art world. This is a clear commitment to a hierarchical structuring of the arts from CERN.

This structure will seek out artists from around the world, instead of drawing on local people close to the laboratory. While individuals from Meyrin are involved in the Collide@CERN Geneva residency, the scheme has no goals of reaching out and back to the city's artistic heritage. The medieval city centre hosts several art museums, displaying famous names such as Ferdinand Hodler and Felix Vallotton alongside new artists. The city's position through world wars resulted in harbouring artists and intellectuals through times of turmoil. The notion that it will be Arts@CERN and CERN that will establish exceptional art in this city is ambitious. The scheme's lack of political engagement is also a world away from this revolutionary area. Fighting through Catholic, Calvinistic and Revolutionary disputes, artists such as Hodler and Vallotton

[31] CERN cultural policy summary, see Appendix I.

used symbolism to engage their audiences in difficult topics. In their private lives they were outspoken in their condemnation of war and abuses of power, as many artists still are in the city today.[32] Anarchist and communist groups have had their place in the seemingly glossy exterior of the business-oriented area, as have a vast population of legal and illegal immigrants who do not benefit from CERN's supranational inclusive culture.[33] The countercultures of Geneva and the areas surrounding it have been important, often changing the world.[34] This was the area where Mary Wollstonecraft Shelley started writing *Frankenstein*: one of the most famous books about scientists ever written.[35] As a revolutionary writer she expressed contemporary fears about science and the pursuit of knowledge. It is not the stunted and lonely creature who is the monster, but the scientist Dr Victor Frankenstein: born, socialised and educated in and around Geneva. Showing the dangers implicit in science unrestrained by moral conscience, Shelley's book can be read as a call for social responsibility in science. Arts@CERN's 'exceptional' art, inspired by CERN, stands in contrast to the area's artistic heritage. Although Arts@CERN invites some local artists to collaborate with the organisation, it keeps most of the politically and scientifically engaged local artists out of the network.

4.6 Expert knowledge

The CERN cultural policy sets out four clear strategies for success. These are presented as essential "to ensuring that the aims, values and missions of Great Arts for Great Science are implemented in the Cultural Policy."[36] The first strategy highlights the focus on expertise:

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[32] Hans A. Lüthy, *Ferdinand Hodler: Views & Visions* (Geneva: Swiss Institute for Art Research, 1994), 14; Arnold D. Harvey, *A Muse of Fire: Literature, Art and War* (London: The Hambledon Press, 1998), 111.

[33] Dominique Marie Gross, "Immigration Policy and Foreign Population in Switzerland", Volume 3853 of Policy Research Working Papers (World Bank Development Research Group: World Bank Publication, 2006).

[34] Richard Gombin, *The Radical Tradition: A Study in Modern Revolutionary Thought,* first published 1978 (New York: Routledge, 2009); 70; Steve Giles and Maike Oergel, *Counter Cultures in Germany and Central Europe: From Sturm und Drang to Baader-Meinhof* (Oxford: P.Lang, 2003); Nicolas Bouvier, Godon A. Craig and Lionel Gossman, *Geneva, Zurich, Basel: History, Culture, and National Identity*, first published 1994 (Princeton: Princeton University Press, 2014).

[35] Mary Wollstonecraft Shelley, *Frankenstein; or, The Modern Prometheus,* first published 1818 (Hertfordshire: Broadview literary texts, 1999).

[36] CERN cultural policy summary, see Appendix I.

> To create expert knowledge in the arts, in addition to that provided by an arts professional, by setting up the honorary Cultural Advisory Board for engaging with the Arts (CABA) that will include arts professionals at the highest level.[37]

Relying on experts to make decisions is not unusual in the art world, and it is also a normal process for scientists. Collins and Evans have argued that the science establishment has had an unhealthy monopoly on scientific and technological judgement. In what they describe as a culture where "greed for scientific authority" is a motivation, "science's spokespersons have claimed to be the custodians of universal truth akin to those offered by morality and religion."[38] In the same vein, the art world relies heavily on experts to judge the elusive and subjective taste characteristics of art. Curators, museum directors, auction houses, private investors and cultural specialists such as Ariane Koek define what is "good" art.[39] The Arts@CERN programme relies on the dualisms of winners and losers, and "good" and "bad" art. Haraway has warned that dualisms create unbreachable cuts in identity and meaning.[40] CERN is a place of dualisms, privileging "pure", or "blue-sky" research, as opposed to applied work. In the same vein they are investing in certain types of art. The metaphorical image of a blue sky is also important in the public's thinking about art, as explored in Russian artists Komar and Melamid's project that asked what ideal art looked like to different nationalities. Across the world abstract art was least wanted, while the winning ingredient for a popular painting was a bright blue sky.[41] "Good" art, for CERN, shares many of the characterisations of physics: mysterious, prize-winning, and pure. In this epistemological approach to "good" and "bad" art (and science), CERN defines what it wants. Both high-energy physics and the art world share a reliance on experts to judge

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[37] CERN cultural policy summary, see Appendix I.
[38] Harry Collins and Robert Evans, *Rethinking Expertise* (Chicago: University of Chicago Press, 2007), 8.
[39] Leonard Diepeveen and Timothy Van Laar discuss how hierarchies affect cultural value in the art world in *Artworld Prestige: Arguing Cultural Value* (New York: Oxford University Press, 2013).
[40] Haraway, *Simians, Cyborgs, and Women: The Reinventure of Nature*, 151.
[41] In 1994 artists Komar and Melamid published the findings from their *Most Wanted Paintings* project, a part of a series conceptualising people's choices. Vitaly Komar, JoAnn Wypijewski and Alexander Melamid, *Painting by Numbers: Komar and Melamid's Scientific Guide to Art* (California: University of California Press, 1997) explains the statistical underpinnings of the polling process and provides the results of each country's preferences.

elusive, strange or subjective data. Thus, the introduction of the cultural board at CERN provided yet another hierarchical and familiar structure within the organisation.

The Cultural Advisory Board for engaging with the Arts (CABA) is made up of the director of Kunsthalle Zürich Beatrix Ruf, the director of Lyon Opera House Serge Dorny, the director of Institut de Recherche et Coordination Acoustique/Musique (IRCAM) in Paris Frank Madlener, the director of Art for Geneva Christoph Bollman, and CERN scientist Dr Michael Doser. These are important individuals in the world of contemporary art and science. Curator Beatrix Ruf was named one of *Art Review*'s "Power 100" in 2013.[42] Serge Dorny was director of Dresden's celebrated opera house Semperoper until he was fired in a highly publicised scandal where he allegedly had an argument with the composer Christian Thielemann about proposing too many changes.[43] Frank Madlener runs the IRCAM which was originally connected to the Pompidou Centre through the Ministry of Culture in France. Christoph Bollman organises exhibitions for the programme Art for Geneva. Particle physicist Michael Doser has proved his interest in public engagement through several TEDx talks, where he replied to questions from the audience about the *Angels and Demons* film. He was also involved with Ars Electronica in 2011. The members of the board meet three times per year to evaluate artists' applications to work with CERN. In the meetings they also allocate the funding for Collide@CERN and the country-specific Accelerate@CERN projects. In addition, on a more flexible timescale, artists such as Pipilotti Rist and Antony Gormley take on a supporting mentoring role for the project.[44] The use of words such as "mentors" and "advisors" are blurred in the policy, creating a somewhat confusing impression of a large group of Arts@CERN supporters. Nevertheless, the board's main role is to decide which artist wins the annual residency competition. The authority vested in these individuals means that the CABA functions as a curator of CERN art, making decisions based on what the organisation wants from the project. CABA filters

[42] "Beatrix Ruf/Power 100", *Art Review* online (last updated 2016): http://artreview.com/power_100/beatrix_ruf/ (accessed 13.03.2016).
[43] Intermezzo, "Why Dorny had to go", Intermezzo Opera blog (25.02.2014): http://intermezzo.typepad.com/intermezzo/2014/02/why-dorny-had-to-go.html (accessed 27.03.2016).
[44] I tried to contact Rist through her gallery several times, but did not succeed. The gallery did not know of Rist's work or visits at CERN. I have not been able to find other evidence of her visit than these sparse Arts@CERN references.

the many artists who wish to work with CERN, and those who make it through the process of scrutiny are accepted as "good" enough for the organisation. Instead of dealing with a wild and vast array of artists' interpretations of CERN, the influence of the CABA now ensures some control over which artists are officially part of the CERN brand.

From the 1990s onwards, the authority and scope of the curator's role has increased.[45] As CERN emerges as a curator of art through Arts@CERN, it slots itself into this trend. Well known curators such as Hans Ulrich Obrist have made careers out of managing artists, running galleries, structuring art fairs and editing the contemporary canon. As part of the institutionalisation and management of the art world, critics draw attention to the financial and career gains that result in this "third culture". Furthermore, it helps propel certain artists and institutions to the top, whilst neglecting others. Koek, Collide@CERN and the CABA, functioning as curators, help to control, market and sell CERN's image through expert knowledge. By focusing solely on artists they take some responsibility off the shoulders of the Communications Group. It is a convenient agreement between the board and the brand, created by CERN's trust of experts. It shares this trust with the elite art world. This, however, might be changing. Recently artists and funders alike have called for a more transparent process of decision-making within art competitions. In 2008 a British review of the arts commissioned by the Department for Culture, Media and Sports strongly recommended that every publicly funded organisation's art project boards should include at least two artists or practitioners.[46] Furthermore, boards were found to have a duty to behave as "guardians of artists' freedom of expression", supporting them if they received "hostile reaction to their work."[47] Whether reviews such as this signal an end to the era of the super-curator or not, CERN is currently operating with a cultural board with no artists. On the other hand, CERN's art experts are in tune with other parts of this review, which recommended that organisations should focus on assessments and peer review based on

[45] For a discussion of the role of the curator in the contemporary art world see Steven Rand and Heather Kouris (eds.) *Cautionary Tales: Critical Curating* (New York: Apexart, 2007); Judith Rugg, *Issues in Curating Contemporary Art and Performance* (Bristol; Chicago: Intellect, 2009).
[46] Sir Brian McMaster, "Supporting Excellence in the Arts: From Measurement to Judgement" (Jan 2008), Department for Culture, Media and Sport.
[47] McMaster, "Supporting Excellence…" Executive summary, 6–8.

"objective judgements about excellence."[48] In this sense, Arts@CERN is operating like a modern arts institution, focused on innovation. Creating a cultural board with specific targets to aim for is part of many modern big institutions' plans for development, although the lack of practitioners within the cultural board signals a strong belief in the trustworthiness of experts.

4.7 Creating an entry point

In the second strategy of the cultural policy Arts@CERN is given its mandate of importance through concentrating the many possible entryways into CERN. This could make it more difficult for artists to visit. As the entry points diminish, this becomes another crucial way for CERN to control its image. The policy states that the second strategy will:

> **…** create clear entry points for artists to visit CERN in which CERN adopts a system for dealing with unsolicited cultural proposals and artists enquiries, including visits, with a single point of contact, an arts professional, who has cultural expertise and knowledge to evaluate the requests. The arts professional works with the Cultural Advisory Board for Engaging with the Arts when major partnership proposals are made. The most obvious and clear entry point for artists will be the Collide@CERN Arts Residency Programme.[49]

The clearest departure from past artistic interactions at CERN is in the focus on a single point of contact. This takes care of unsolicited proposals. The reason is both practical and grounded in a question of image. As explored, the interaction with previous artists has not given CERN solely positive press. The CABA will allow CERN to streamline their contact with artists, deciding who is best for the organisation at any given time. Curated visits, competitions and the cultural board will ensure that no further mistakes are made, whether that is so-called unexceptional art or criticism. When the Arts@CERN policy defines some art as great, they are confirming their belief in "bad" art. This subscribes to a rather old-fashioned view, where the wish is to bring forth great

[48] McMaster, "Supporting Excellence…" Executive summary, 6–8.
[49] CERN cultural policy summary, see Appendix I.

masters via grand patrons, who are saluted by art critics, and then presented to the public. The selection process becomes a way of controlling arts at CERN:

> To instigate Collide@CERN the arts residency scheme to encourage dialogue and exchange between arts and science at the same level by selecting imaginative and extraordinary artists for their excellence to work alongside CERN scientists.[50]

The focus on excellence and selection is in contrast to the previous projects of a more spontaneous, messy origin, such as Dan Brown's book *Angels and Demons* and Jonathan Feldschuh's stained-glass windows (such projects will thus probably continue to crop up as the Board has no power to stop external projects). What will happen to all the artists who are inspired by CERN, but not found to be exceptional? Will they be free to engage with the organisation as Moro, Kristofoletti, Motti and Les Horribles Cernettes before them? At best, the homing in on the best candidates for the job will ensure that artists who are chosen are more prepared for their CERN experience. With over four hundred applications in the first round of the international Collide@CERN competition, there is clear interest in this opportunity within the global artistic community. At worst, the selection process can also deny some artists' access to CERN, and create a culture of competition. Thus, the policy's insistence on excellence ensures that the organisation will accommodate artists whom CERN defines as excellent. By rewriting the canon of art at CERN, the organisation emerges as an author in charge of its own cultural narrative.

4.8 Cultural potential

In the policy's final strategy for ensuring the success of Arts@CERN, the potential for cultural capital within the organisation is set forth:

> To provide for the first time professional cultural expertise and advice to already existing home-grown arts activities at CERN to enable them to

[50] CERN cultural policy summary, see Appendix I.

fulfil their cultural potential.[51]

Here the existing art projects, such as the CERN Film Festival (focused on science fiction), are enveloped into the Arts@CERN brand. In order for these activities to expand, outside experts (non-CERN staff and non-scientists) will be brought in to explain the potential for growth. This means that CERN can create a catalogue of artistic activities, examining each project in order to find potential. By both utilising existing schemes and highlighting those that are labelled as excellent, CERN is curating its own culture. Arts@CERN scrutinises artists and art, focusing resources and maximising potential. The cultural capital of the organisation, neglected for so long, will now be exploited.

Pierre Bourdieu's ideas of cultural capital as power encapsulate how Arts@CERN and CERN seek to develop the organisation by focusing on its cultural assets.[52] Bourdieu asserted that: "Scientific authority is thus a particular kind of capital, which can be accumulated, transmitted, and even reconverted to other kinds of capital under certain conditions."[53] The combination of scientific and cultural capital at CERN is reconverted into other powers, such as institutional and/or intellectual authority. But the timing of Arts@CERN and the cultural policy were useful to CERN in terms of funding. From Koek's Clore Fellowship to private donors, the discovery of the Higgs boson has captured plenty of attention from people looking to invest. In 2014, CERN set up CERN & Society as a charity-like structure to bring in funds, wishing "to share the excitement and enthusiasm of discovery with as wide a public as possible."[54] In order to develop a programme of "education and outreach, technology transfer and innovation, and creative and cultural initiatives at CERN", the charity welcomes "voluntary external support", and is putting in place an online donation system.[55] In an interview with *Nature,* Director General Heuer said that donors will be able to benefit from tax-deduction and perhaps have buildings named after them, although not particles as "that

[51] CERN cultural policy summary, see Appendix I.
[52] Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, 8; 75-81.
[53] Pierre Bourdieu, "The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason." Quoted in Mario Biagiolo (ed.), *The Science Studies Reader* (London: Routledge, 1999), 34.
[54] CERN & Society website: https://giving.web.cern.ch (accessed 26.06.2015).
[55] CERN & Society website.

is science. We don't touch that."[56] However, if a donor wished money to go towards research rather than culture (historically this has been the member states' responsibility to fund), Heuer said CERN would consider it. Similar to the anonymous donors behind Arts@CERN, the structure of the organisation's new charity status will make complete transparency difficult. Capitalising on the timing of the Higgs discovery and its popularity, as well as Koek's expertise, CERN's non-scientific activities have been streamlined, expertly managed and mined for potential since 2011, signalling a new era of fundraising at CERN. This shows how the non-scientific activities at CERN are more than eccentric projects. They are also part of the financial and cultural makeup of the organisation.

4.9 The competition

This section examines what CERN gains from the art residency, whereas the next chapter questions what the artists acquire from the exchange. After a seven-week open call for the first Collide@CERN residency, announced at the Ars Electronica Festival in September 2011, CERN received entries from over forty countries. Ars Electronica Director Gerfried Stocker commented: "The large international participation as well as the artistic quality and inspirational power of many of the submissions are encouraging indicators that this residency programme is perfectly meeting the growing interest and excitement about sciences".[57] CERN Director General Heuer agreed. In this sense the Collide@CERN residency has been a success, creating media interest and cultural capital. More artists than ever before have been made aware of the laboratory, and all of this happened at no cost to CERN.

The many unsuccessful applicants to the residency competition are reminders of the vast interest in SciArt amongst contemporary artists. Having received hundreds of proposals, CERN quickly decided that selected runners-up should get the opportunity to visit the organisation by being given honorary mentions and short, curated visits on-site. The Collide@CERN honorary mentions have been given to new-media artist Nataša Teofilović from Serbia, composer Arnoud Noordegraaf from the Netherlands and writer

[56] Elizabeth Gibney, "Charity Begins at CERN", *Nature* 511, no. 7509 (15.07.2014).
[57] Stocker introducing von Bismarck's first Collide@CERN lecture, 21.03.2012.

Adrian Hornsby from Britain, coder Eno Henze from Germany, and industrial designer Ale de la Puente from Mexico. There is not a lot of information about their visits to CERN, other than some photographs on the Arts@CERN social media accounts. Their visits were curated by Ariane Koek, in a similar fashion to the winners of the Collide@CERN residencies. So far, no art has been produced as a result of these visits. But these artists are a minority. Most of the hundreds of Collide@CERN applicants were turned down, and not given the opportunity to visit CERN. Koek declined sharing the list of applicants with me, but two artists who previously worked with CERN were willing to share their views on the competition.

Josef Kristofoletti's wall mural has become a part of the ATLAS project at CERN, but he was unsuccessful in his application to the competition. Jonathan Feldschuh, who had worked on CERN through the creation of his stained-glass windows, was also turned down. In speaking to both artists about their previous experience of CERN, the organisation emerged as a promiscuous muse. Kristofoletti, echoing the feelings of several winning Collide@CERN artists pre-Arts@CERN, would have to wait for weeks as the CERN bureaucracy decided on the timescale, look and texture of his work. His visit had been chaotic, and nothing had been planned prior to the start of the project. Similarly, Feldschuh respected CERN, but was baffled when he read that the organisation has started an international art competition. He thought it seemed like they were making art into a race.[58] Both artists' interest in high-energy physics and CERN is still strong, but they question the use and goal of the competition. Unsuccessful Collide@CERN applicants do not win the fame, funding and networks that the residency could have provided them with. Furthermore, CERN's public focus on exceptional art implies that artists who do not win the residency are not exceptional. While the budget allows only for a few projects annually, we know that many artists visited prior to the start of Arts@CERN. These artists made a wide array of work without an official structure or any funding. Arts@CERN provides a structure for funding, but it also creates a hierarchy in which, for the first time, there are not only official CERN artists but also rejected artists barred from entering the organisation (it is not clear whether artists can still come as visitors). As is the case in many competitions, this has not led to

[58] Røstvik interview with Feldschuh 24.11.2014.

dislike in the art community but a strong interest in becoming a CERN artist. The organisation has carved out its own elite position in the SciArt world based on what it wants from the collaboration.

4.10 Conclusion

The cultural policy at CERN marks a change in the way the organisation views artists. CERN's approach to the creative sector has become more streamlined. Some of the early spontaneity is lost, in favour of using a ranking system for artists and art. Feldschuh and Kristofoletti's ambiguous feelings towards Arts@CERN express worries about the new structure. On one hand, winning artists have more chances to engage with the laboratory, meet scientists and immerse themselves in CERN than ever before. The funding opportunity also ensures some financial stability. Earlier artists would have had to buy their own plane ticket to Geneva, for example. Furthermore, without the pressure to produce artworks, Collide@CERN becomes a breathing space for artists, a fact all of the winners have acknowledged as unusual and welcome. On the other hand, the streamlining has led to a more controlled atmosphere. Although artists are not expected to make art as part of the residency, this does not mean that they are not expected to work. The creation of runners-up and losers is part of a hierarchical structure that sits uncomfortably with Arts@CERN's own clear aims to encourage all exceptional artists to engage with the organisation. Asserting its authority, today CERN accompanies the artists every step of the way, from competitions to visits. It is the organisation that speaks through the CERN cultural policy and exerts control over the process. As much as Ariane Koek has structured the everyday management of Arts@CERN, it is CERN itself that polices it. As a cultural policy for and by CERN, the programme was designed to display the laboratory in a favourable light. The modern art programme is one of the many vessels used to sell the organisation's message of creativity and European cooperation. Arts@CERN has become one of many exercises in improving visibility in the foggy landscape of science in a time of financial crisis in Europe.[59] As we turn our attention to the Arts@CERN flagship project, the Collide@CERN residencies, the

[59] For a discussion of CERN's efforts to "improve visibility" in science and politics see Krige, "The Public Image of CERN", 153.

cultural policy's language becomes reality for the artists of CERN.

CHAPTER FIVE

Artists. The Collide@CERN Residency

> Life should be as it is here. With no financial worries.
>
> Jan Peters, Collide@CERN lecture, 27.02.2014.

> I felt that I was being fed a corporate line. A well-rehearsed script. I don't doubt many of the things they say have a great deal of validity. But I wanted to expose this.
>
> Will Self, "Self Orbits CERN", BBC Radio, 2015.

5.1 Introduction

What is life like for an artist who has CERN for a studio today? The previous chapter asked why and how CERN seeks to collaborate with artists, and what the organisation hopes to gain as a result. This chapter, using the case studies of all the Collide@CERN winners, discusses what the artists and CERN get out of the residencies, analysing the processes and outcomes of the competitions. The chapter explores why there is an art residency at the laboratory today and how being an artist at CERN influences the creative process. Written against a backdrop of the previous chapters' analysis of the laboratory at large, this final discussion brings the historical overview up to date, focusing on the recent CERN artists.

One of Collide@CERN's general aims is to break down hierarchies between scientists and artists, and bringing about "collisions" of equal minds.[1] This big goal has not always been reached. The artworks that are produced as a consequence of Collide@CERN often echo similar sentiments. Usually they are about the LHC, sounds or particle speed. There is little social, political or cultural commentary about the laboratory from these artists. Having explored the varied history of CERN art in previous chapters, the collaborations described in this chapter instead result in SciArt that reinforces CERN's own branding. To this end I have identified five themes that are relevant to the seven winning artists and their experiences during Collide@CERN: the type of artists involved in Collide@CERN (demography, stage of career and art medium), the artists' experience of CERN, the outcomes of the residencies (lectures,

[1] "Collide@CERN", Arts@CERN website (undated): http://arts.cern/collide (accessed 8.04.2016).

interventions, art and networks), the changes in the artists' confidence, and the benefits to the artists. These focal points show how artists are at times used to sell science by rendering science a culture, at a time when culture can be used as a commodity. But the thematic overview also shows how some artists try to defy this and step outside the boundaries of contracted SciArt.

First, we look at a breakdown of the structures of the various Arts@CERN schemes. Between 2011 and 2015 there have been seven winners of the Collide@CERN competition: three in the international strand and four in the local (the last local award went to two people working together). In addition, several artists have visited CERN as part of the wider Arts@CERN programme, including runners-up to the residency. Artists are also involved in CERN through the new programme Accelerate@CERN that will operate as a sister strand to the competitions.[2] This scheme is a country-specific one-month research award for artists who have not worked in a science laboratory before and is awarded to two different countries annually. Accelerate@CERN winners receive 5,000 Swiss francs and funders also cover administration costs of projects at CERN. The jury, as in the case of Collide@CERN, consists of the funders of the programme, cultural specialists and representatives from CERN. So far Greece (funded by the Onassis Cultural Centre), Switzerland (funded by Pro Helvetica Swiss Arts Council), Austria (funded by the Federal Chancellery) and Taiwan (funded by the Ministry of Culture) have participated.[3] It is not within the scope of this chapter to discuss Accelerate@CERN (which has just begun), but one should note how this signals a solidifying of the CERN art project and possible expansion into non-European countries. Thus, since Ariane Koek came to CERN, a steady stream of artists and funders have interacted with the organisation, creating media, events and artworks.

According to Koek, one artist described the influence of his time at CERN as "BC and AC: Before Collide@CERN and after Collide@CERN"[4]. The quotation also

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[2] Accelerate@CERN website: http://arts.web.cern.ch/acceleratecern (accessed 14.03.2016).
[3] CERN press office, "CERN Announces 3 New Awards and Reaches Asia", CERN press office website (28.10.2014): http://press.cern/press-releases/2014/10/artscern-announces-3-new-awards-and-reaches-asia (accessed 27.03.2016).
[4] "CERN marked a watershed in my practice – I think in terms of BC (Before CERN) and AC (After CERN)", First Collide@CERN artist Julius von Bismarck, quoted in Ariane Koek's (@BeautyQuark) tweet (03.11.2013): https://twitter.com/BeautyQuark/status/397036473716711424 (accessed 26.06.2015).

describes the changes in the organisation's interaction with the arts. Arts@CERN, with the help of Koek and funders of the scheme, has taken control of art that interprets CERN's work. By inviting artists to CERN, instead of waiting to be visited, the organisation can offer structure and external funding whilst gaining insight and control. Emerging as an arts patron, CERN now controls its artistic output. While Koek has plaid a key role in this, she is also easily eclipsed by the organisation's own interests. "What we are doing is not advertisement", she explains.[5] The analysis below explores these intersections of interests and agendas.

5.2 Successful artists at CERN

The first of the five themes that I identified as tying the CERN artists together focuses on the type of artist that wins the residency. In terms of demography, Arts@CERN has not changed the face of CERN or its arts. Of the named visiting artists at CERN I have counted seventy-six, including Arts@CERN artists and collectives.[6] Out of these seventy-seven artists, eighteen were female (including collaborations or dance groups that included women). There has been one visiting artist who is black (Will.i.am's selfie). The visiting artists' media varied. Most artists worked with music (nine), film (nine), installation work (eight), photography (nine) and dance (five). Most of the artists came from the UK (seventeen), the United States (twelve), Germany (eight), and Switzerland (eight) (several of the artists work with many media, so this count reflects those that clearly work with at least one of these forms). Most of the titled artworks (not all artists produced art after their CERN visit) included scientific words or direct references to CERN or the LHC. There were a handful of internationally recognised names on the list, the most prominent being David Lynch, Antony Gormley and Anselm Kiefer (apart from Gormley, there is not any information about these visits). These seventy-one visiting artists confirm many of the trends that also tie the winners of Collide@CERN together, from their levels of international fame to their gender, from their knowledge of science to their nationality. The number of Collide@CERN winners

[5] Koek interviewed by Florian Fisch, "Science, technology and art should be engaging together", *ScienceComm'16* website (23.06.2014): http://www.sciencecomm.ch/en/blog/science-technology-and-art-should-be-engaging-together (accessed 14.03.2016).
[6] For an overview see Appendix II: Overview of CERN Artists. Names, titles and details taken from the Arts@CERN website, CERN website, CERN archives and individual artists' websites.

now counts seven male artists and seven male CERN staff members (in their roles as scientific inspiration partner).[7] The study of SciArt is still relatively new, and there have been no studies of the role of gender in the field. However, we can speculate that Collide@CERN's strong focus on media art, technology and science attracts artists who already engage with these themes. We have seen that it is usually male artists who have visited and worked with CERN prior to the new art programme.[8] Numbers from Ars Electronica show that the majority of successful SciArtists are indeed male and white (see below), indicating that the new art genre already has a diversity problem. The focus on historically and stereotypically male fields of interest (technology, science, machines, etc.) can go some way in explaining this situation. But SciArt, as we explored in the second chapter, also has institutional barriers that might face women once they break through stereotypes and societal barriers. For example, does the CERN art board chose to award the prize to male artists, or are they mostly receiving submissions from men? Since this information is not available it is difficult to understand the factors that contribute to the dominance of male artists in the scheme. Nevertheless, Arts@CERN has been organised and run by women (Koek, then Monica Bello), but it has focused on male artists and scientists. Koek's MA thesis was informed by gender theory and she is likely to be aware of this imbalance.[9] In 2014 she commented on her blog: "I am unusual in that I am not a physicist – or a man – amongst 10,000 people. But I am an arts person."[10] When I asked her about her personal and professional observations about questions of diversity at CERN she wrote: "I wouldn't have anything to add than what you already know I am sure! It is interesting that Italy is exceptional in the number of women in high-energy physics: you may want to look at that ☺ Maybe you should look into that? Would be interesting to analyse this."[11] This was not responding to the

[7] There have been female runners-up, who receive some CERN media coverage and a guided tour, but no funding or opportunities to work with/at CERN. The female runners-up were German installation artist Agnes Meyer-Brandis (2014) and industrial designer and artist Ale de la Puente (2013). The media artist Natasa Teofilovic (Serbia) got an honorary mention in 2012.
[8] See Appendix II for a breakdown of gender, women are highlighted in bold.
[9] Ariane Koek graduated with a Masters distinction for a project about Modernism and Romanticism from the University of Southampton in 1987. Her thesis title was: "Narcissism and the Figuration of Women: Writing and Gender in Percy and Mary Shelley, Derrida and Freud."
[10] Ariane Koek, "Turning Inside Out – Classical Music and Particle Physics", The Beauty Quark blog post (28.01.2013).
[11] Koek in email to Røstvik, 22.06.2015.

question I asked, but it does nonetheless show that Koek was aware and interested in the gender question relating to CERN scientists. There is no evidence for any discussions of diversity, minorities or quota-like options in the Arts@CERN material. To explain this we have to understand that CERN as a whole subscribes to a post-feminist ideal free from quotas, allowing the "best" person to emerge through positive action rather than positive discrimination.[12] As we explored, the imbalance between male and female CERN staff members is a PR problem for the organisation, but CERN still subscribes to the same hiring and promoting strategy that was part of shaping the situation.[13] The ideology of positive action has not worked as Arts@CERN and CERN may be concerned about gender questions, yet continue to hire and promote mostly white men.

The Collide@CERN winners are also the type of artists attracted to pioneering SciArt initiator and CERN collaborator Ars Electronica. Their winners are also predominantly male, white and with art school or university degrees. Their choice of medium is connected to the fields of technology, science, web design, special effects, sound, and computer graphics design. Since 1987 Ars Electronica has awarded the Golden Nica to 116 winners in up to eleven categories.[14] Ten of these awards have been given to women (including large projects with several people). Ironically, Golden Nica winners are awarded a golden, semi-naked and headless statue of Nike (Greek goddess of victory). Her decapitated body is, year after year, the most consistent representation of women at Ars Electronica and in the elite circles of SciArt (**Fig. 41**). The lack of female artists at CERN, Ars Electronica and SciArt, is representative of the wider art market and world. Female artists' auction results have never equalled those of men. In a list showing the hundred most expensive art works sold at auction in 2014, there was not

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[12] "At CERN, the policy is to have positive action and not positive discrimination, with the aim to enable all to contribute to their full potential without singling out any individual or group for special treatment." Diversity at CERN, "FAQs", CERN Diversity website (undated): http://diversity.web.cern.ch/about/about-cern-diversity-office (accessed 8.04.2016). For a discussion of late-capitalist individualism see Frederick Jameson, *Postmodernism, or, The Cultural Logic of Late Capitalism (Post-Contemporary Interventions)* (NC; Durham: Duke University Press, 1992). For a discussion of post-feminism see Budgeon, *Third-Wave Feminism.*

[13] Britta Thege, Silvester Popescu-Willigmann, Roswhitha Pioch and Sabah Badri-Höer (eds.), *Paths to Career and Success for Women in Science: Findings from International Research* (Wiesbaden: Springer, 2014).

[14] Ars Electronica archive of past winners of the Golden Nica: http://archive.aec.at/prix/ (accessed 24.11.2015).

a single work by a female artist.[15] In the art world, as in science, there are fewer women in the top echelons. While not all white men with an art school education make the same type of art, these demographic observations may go some way towards explaining why so much SciArt engages with the same questions. The systemic low representation of female and non-white SciArtists in Ars Electronica, at CERN and elsewhere, has many consequences for the people who work in the field, but what does it mean for Arts@CERN? The eighteen female artists worked on the same themes as the male artists. They were directly inspired by CERN's scientific work, used scientific words in their titles, and used the same media as the men. Furthermore, they came from similar stages in their careers, the same countries and the same educational background as the male artists. There is nothing strikingly different about the female CERN artists, except how few there were. Numbers from Ars Electronica suggest women receive about 10% of prizes and fellowships, but make up only 25% of applicants.[16] The same structure has long been evident in science, with fewer women in the field resulting in fewer women at the top. While SciArt grew out of art institutions, this suggests a replication of attitudes to women in science within its own growing culture. SciArt, however, does not have to be a passive recipient to this culture by way of osmosis. To the contrary, examples, such as Laurie Anderson at NASA, show how this relatively new field of art can have a direct impact on the perceived image of the scientific institution. Just as artists are recruited to bring something new to CERN, different voices can be valuable to the image of the organisation. Koek and other arts professionals are likely aware of this, but have to tread carefully at the start not to shake things up too much. As with many art and science

Fig. 41: *Ars Electronica's award, the Golden Nica.*

[15] Artprice report, "The Art Market in 2014."
[16] A roughly estimated percentage based on numbers from the Ars Electronica website: http://www.aec.at/prix/de/ (accessed 27.02.2016)

fields, SciArt 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. As some of the respondents to the Wellcome Trust's evaluation of SciArt made clear, the combination of art and science "would be good" in part because it "might make science less male."[17] 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.[18] As we saw when we explored the role of Cernoises at CERN, gender remains a public issue for the organisation. Arts@CERN, as a new project without historical baggage, nevertheless seems to have replicated CERN's demographic makeup.

5.2.a Stage of artists' career

The seven winners of the Collide@CERN competitions are all mid-career artists. They are not famous, but have obtained some media and public attention. They have successful international collaborations behind them and are interested in science. But there are some differences between the local and international competitions. In the local strand, four winners have been announced since 2013: Gilles Jobin (2012: dance and performance), Jan Peters (2013: film) and Rudy Decelière and Vincent Hänni (2014: music). The local artists solidify links between Geneva and CERN. The days of the protesting communist group on-site are over, and today Geneva is proud of its science heritage, throwing firework-lit parties in the city as the organisation turned fifty and sixty years old. On these occasions the President of the Geneva State Council issued a public message of congratulations stating it was "natural that Geneva should be deeply

[17] Glinkowski and Bamford, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme,* 99.
[18] 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).

attached to CERN."[19] The laboratory was also involved in Geneva's centenary marking of the First World War, present through one of the older colliders being driven through the streets of the city.[20] While CERN did not exist at the time of any of the world wars, it remains such a strong part of the area's legacy that any celebration now includes the organisation. Furthermore, CERN has become a tourist attraction. The relationship between CERN and Geneva plays out in the Collide@CERN Geneva strand, and shows how an international organisation balances the local interests with the global. Noticeably the focus is on Geneva (a forty-minute tram ride away), rather than on Meyrin or any of the villages nearby (walking distance). But the local strand of Collide@CERN is not unique. Many institutions, organisations and scientific laboratories start artist in residency schemes in order to strengthen the local bond, as explored in chapter two. In contrast, the international strand winners were all digital or new-media artists, as specified in the call for interest. The winners were Julius von Bismarck (2012: performance, installation and photography), Bill Fontana (2013: sound art) and Ryoji Ikeda (2014: techno-electronic screen art). The local winners are all Swiss, the latter German, American and Japanese respectively.

While none of these artists is as famous as Antony Gormley, they are recognised within their own specialities. In the SciArt world, through their collaboration with CERN, they are well known. Jobin (born 1964), Peters (born 1966), Decelière (born 1979) and Hänni (born 1972) are less known than the international winners, but are all experienced in terms of residencies and collaborations, having worked with institutions, theatres and organisations before. They all share interests in concepts such as time, sound and physics. The international winners share many of these qualities and experiences. Fontana (born 1947) and Ikeda (born 1966) have made careers out of working in collaboration with governments and international organisations. Von Bismarck (born 1983) presents an exception as the youngest winner, with a short career made up of the work he made at art school and solo exhibitions in traditional galleries. As the first winner, he also tested the limits for Collide@CERN. After presenting his

[19] President of the Geneva State Council Robert Cramer, "Message on the 50th Anniversary of CERN", *CERN Bulletin* (19.10.2004).
[20] Marie Bugnon, "Giant Magnet Parades through Downtown Geneva", CERN website (03.06.2014): http://home.cern/about/updates/2014/06/giant-magnet-parades-through-downtown-geneva (accessed 8.04.2016).

work and thoughts at CERN, by far the most controversial art to be catalysed by the programme, the residency changed gears and the subsequent winners have since been older and more experienced. Jobin, Peters, Decelière, Hänni, Fontana and Ikeda, with their knowledge of how large-scale institutional collaborations work, were more used to the format than von Bismarck.

While CERN certainly wants artists to perform some sort of coherent public engagement message through their work with the organisation, there is neither time nor resources to provide a comprehensive education in high-energy physics. The science-partner structure, organised to help the artists understand the site and some physics, is not a mentoring scheme. If they require guidance or emotional support, Koek takes on this role, with many of the artists publicly emphasising her invaluable help during the process. Thus, largely made up of experienced and professional artists with an understanding of the pragmatic relationship needed to make a large-scale institutional collaboration work, Collide@CERN has now become a space where mid-career artists can take their next steps.

5.2.b Art medium

The artists of Collide@CERN are all interested in physics. Their choice of medium is technically sophisticated, often inspired by engineering or physics. Ranging from interventions with scientists to films about high-energy physics, all the artworks that were produced as a result of Collide@CERN were filtered through media that lend themselves to the context of CERN as a high-tech science institution. Technologically literate artists utilised modern media to communicate their ideas about CERN. Jobin's dancers emulated the movement of particles, illustrating CERN's work. Jan Peter's interest in Einstein's theory of relativity sent him hunting for historical material from the CERN archives, and he used the clips he found there to discuss matters of time as it related to the organisation. Decelière and Hänni wanted to explore how the analogue turned into the digital at CERN, a project that is still evolving and based on CERN's own technological research. Julius von Bismarck became enthralled with ideas of control in particles, creating an artificial swinging motion for a hanging lamp with the help of CERN engineers. Bill Fontana listened to the LHC for days, recording the

sounds it made with CERN physicists. Ikeda explored data in quantum dimensions, drawing directly on CERN data. These men have some understanding of and interest in high-energy physics. Through their collaborations with scientists and engineers at CERN they become even more literate.

While Collide@CERN claims to focus on the process rather than the outcome, the specification for artists' chosen medium sets some limitations to applicants. The international residency is for digital arts, and the local strand has also engaged in multi-media, high-tech art such as film, sound and data art. The connection to digital art is made through Ars Electronica, which co-organises and funds the international strand. The director of the digital art emporium, Stocker, has introduced all of the artists' lectures at CERN. Furthermore, some of the winning artists were already in collaboration with Ars Electronica before applying to Collide@CERN. Von Bismarck won the Golden Nica award in 2008, and Ikeda in 2001. As the largest European festival dedicated to the intersections of art, technology and science, the Ars Electronica festival in Linz has likely interested many of the Arts@CERN artists at some point. Through Ars Electronica, CERN has reached out to a seasoned partner, which can provide a shortlist of artists and art projects already found appropriate. While countless artists have interacted with Ars Electronica over the years, the similar content of many of the artworks may be one of the reasons why the festival has not succeeded in penetrating the public consciousness. For example, the many dance projects at CERN all utilise the dancers' bodies as particles, and many artists interested in sound and light explore this through recording the noises that come from the LHC. Respect and curiosity for both scientists and science ties all the Collide@CERN artists together, and this is expressed through their talks at CERN and the art inspired by their experiences there. In the still small and exclusive world of SciArt, Ars Electronica and its awards are comparable to the Oscars. It mirrors particle physics' focus on media, celebrity and branding, and its insistence on competition and hierarchy as methodologies of finding both "excellent" artists and elusive particles.

The chosen media of the Collide@CERN artists, usually dance, performance, sound art, film or installation, all lend themselves to a specific message. These live events and objects cannot be fixed to CERN as a sculpture or painting could. The

original dances, performances, interventions and sounds produced by the artists are now gone. They remain memories of matter and events, like the particle collisions recorded at CERN, a point often made in the lectures.[21] These temporary spurs of creative energy at CERN are quick, fluid interventions that are observed live by relatively few people. The media attention about these events and objects live on for a wider audience to enjoy, alongside recorded clips of interviews and events authored by CERN through Arts@CERN. Thus the technologically savvy SciArt that the Collide@CERN artists create serves not only their interest in science and engineering, but also the quick pace of CERN PR and knowledge dissemination in the twenty-first century. The artists and art of Collide@CERN work in a temporary medium that is later disseminated through language and social media. The audience who is not present for the original event has to rely on these interpretations. The Collide@CERN artists' choice of media results in a few original performances, followed by permanent ownership by CERN.

5.3 The artists' experience of CERN

The second theme that ties the Collide@CERN projects together is the artists' experiences of CERN. Throughout their residencies the winning Collide@CERN artists receive an education from CERN. Koek attaches each artist to a scientific member of staff, an "inspiration science partner."[22] This individual is arrived at through "speed dating" in order to make sure that the fit between the two is optimal.[23] Koek and CERN choose the people that take part in this dating process, selecting the scientist who would be best suited for the collaboration. The individuals come from all over CERN. Specialist in scientific visualisation Joao Pequenao worked with Gilles Jobin. The film creator Jan Peters worked with ATLAS engineer and CERN film festival organiser Neal

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[21] For discussions about performance art see Erika Fischer-Lichte (translated by Saskya Iris Jain), *The Transformative Power of Performance: A New Aesthetics* (London; New York: Routledge, 2008); Jen Harvie, *Fair Play: Art, Performance and Neoloberalism* (Hampshire: Palgrave Macmillan, 2013); Amelia Jones and Adrian Heathfield, *Perform, Repeat, Record: Live Art in History* (Bristol; Chicago: University of Chicago Press, 2012).

[22] Cian O'Luanaigh, "Collide@CERN: Call for scientists as "inspiration partners", CERN website on the 'CERN people' section (27.11.2012): http://home.cern/announcements/2012/11/collidecern-call-scientists-inspiration-partners (accessed 23.03.2016).

[23] "It's almost going to be like speed dating. We need to find matches that really inspire each other." Koek quoted in Ian Randall, "CERN to launch artists in residence programme", ALICE website (11.09.2001): http://alicematters.web.cern.ch/?q=arts-at-cern-programme (accessed 6.04.2016).

Hartman. Decelière and Hänni were paired with theoretical cosmologist Diego Blas and experimentalist Robert Kieffer. Von Bismarck's partner James Wells is a theoretical physicist. Fontana worked with cosmologist Subodh Patil, and Ryoji Ikeda is currently paired with the young physicist and music enthusiast Tom Melia. These male scientists share an expressed interest in culture and public engagement, as stated in their Collide@CERN lectures.[24] Koek is the first point of contact between the artists and CERN. She organises events and meetings, and answers questions. The relationship between the partners is cemented on a mutual feeling of crossing disciplinary boundaries. In the highly competitive field of physics, the possibility of standing out is also important. The scientific partners' main responsibility is being a reliable entry point for the artist to explore theory and method at CERN. The conversations, according to both sides, were interesting and abstract. To be able to set aside some (paid) time to discuss art/science with an artist/scientist was talked of as a luxury, and a welcome break from making art/science. These discussions were at the core of what Collide@CERN was about, according to Koek. The "collision" of two cultures is made possible by the openness of the science institution. At the same time these collisions hinge on the assumed reality of the "Two Cultures", despite Koek naming the concept a "false distinction".[25]

The inspiration partners also functioned as brokers between the internal CERN staff and the artist. In *Colliding Worlds*, Miller is sceptical of this structure, suggesting that "it might have been better if the artist could have come and gone over a period of time, conversed with physicists, imbibed the atmosphere, then return to his studio to produce sketches and prototypes."[26] Will Self, despite being at CERN in a different capacity, describing his walk through CERN, also reflected on the slightly intimidating aspect of being followed by a figure from the organisation, comparing the experience to "something out of Kafka."[27] CERN, after all, has a corporate structure and can come

[24] The science partners are selected from a list of applicants. It is not clear how many people apply for the role or who chooses them, but Koek and the CABA are involved.
[25] Ariane Koek, "Viewpoint: Collide – A Cultural Revolution", *CERN Courier* (7.06.2010): http://cerncourier.com/cws/article/cern/42725 (accessed 23.03.2016).
[26] Miller uses "him" to describe the CERN artists. Miller, *Colliding Worlds,* 151.
[27] Self, "Self Orbits CERN: Episode 1, A Naked Lunch."

across as institutional.[28] The science partners' participations in the Collide@CERN lectures were all accompanied by PowerPoint presentations. By representing the role of the scientists on behalf of many of the CERN staff in the audience, some admitted to having had misconceptions about artists before. Wells, for example, turned to von Bismarck in one lecture stating that it was nice to see "Julius, someone clearly at the top of his field in art, and his approach to work. He worked hard!"[29] The surprise expressed about how artists work and think was repeated in many of the lectures. While the science partners also gained knowledge and some recognition (it is unclear if they were paid) from the residency, they were also interested in what creativity would mean for their field and the possibility of artists inspiring younger scientists, especially doctoral candidates, to think more daringly. At twenty-eight, Wells reminded the lecture audience, von Bismarck was "creative", whereas many of his students were "set in their ways."[30]

The artists' experience of CERN was thus filtered through Koek, their inspiration partners and the organisation itself. This is not to say that the artists' agency was corrupted, but it does give insight into the events and artworks that followed. The administration of the artists' visits required attention and thought from both CERN and Koek. It was no longer sufficient to let the artists roam around alone, freely interpreting anything they came across within the organisation. The inspiration partners were one step in a long line of control posts. If anything was found to be uncomfortable or damaging for CERN, it could be weeded out by Koek or the inspiration partner. Furthermore, the fact that the artists were already relatively science literate when awarded the residency shows how structures of control came into play even before the artists visited CERN for the first time. In many instances the artists and CERN wanted the same things, namely to celebrate CERN's work. The artist and scientist, by their mutual respect for each other, thus police their attitudes towards their respective fields at and beyond CERN.

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[28] "CERN's structure" from the CERN website 'About us' section: http://public-archive.web.cern.ch/public-archive/en/About/Structure-en.html (accessed 16.03.2016).
[29] Ariane Koek, "The Art of Science", *Laboratory News* (08.12.2012).
[30] Wells, in von Bismarck's final Collide@CERN lecture, 25.09.2012.

5.4 Outcome of residency

As the third of the five themes about the Collide@CERN artists, this section explores the various outcomes of the residency in subsections that relate to lectures, interventions, and artworks and networks respectively. This is done in order to examine the contemporary art programme at CERN, and how it relates to PR and the institutional nature of SciArt. Koek has made it clear that Arts@CERN is about "dropping a discipline into the unknown", and that it is "not instrumentalising the science by using the artist to illustrate that."[31] Thus there is not always tangible art produced as a result of the collaboration. Despite this, CERN claims to inspire the artists for years to come. In addition to the artists' presence, lectures and interactions with staff become their work whilst on-site. Yet there are expectations of the artists. In Jobin's final lecture, Director General Heuer introduced the programme and the artist: "You have been here for three months, so I expect something!"[32] Koek also stressed: "This is just the beginning. The real work will happen in one to two years. Watch this space."[33] Similarly Jan Peter's residency was predicted to "result in some fascinating creative collisions" in his post-CERN period.[34] Heuer said that CERN was "eager to see how this […] investigates the past and present of our laboratory with their eyes and ears."[35] Six months into von Bismarck's residency Heuer stated: "Julius's worldview is changed forever."[36] In the CERN and Arts@CERN PR relating to von Bismarck, this was explained:

> "I have thirty years' worth of ideas thanks to my residency. And it has totally changed the way I look at the world and approach my work." Those are the words of Julius von Bismarck's the first winner of the Prix Ars Electronica Collide@CERN residency which has been a declared a definite success.[37]

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[31] Koek, in von Bismarck's final Collide@CERN lecture, 25.09.2012.
[32] Heuer, introducing Jobin's final Collide@CERN lecture, 6.11.2012.
[33] Jobin's final Collide@CERN Geneva lecture, 6.11.2012.
[34] "Jan Peters", Arts@CERN website (undated): http://arts.cern/jan-peters (accessed 27.03.2016).
[35] "Third Collide@CERN Geneva Prize in Music and Sound Awarded to Two Artists", Arts@CERN website (29.04.2014): http://arts.cern/news/2014/third-collidecern-geneva-prize-music-and-sound-awarded-two-artists (accessed 27.03.2016).
[36] Heuer introducing von Bismarck's final Collide@CERN lecture, 25.09.2012.
[37] "Daring to do – the final event by Julius von Bismarck, CERN's first artist in residence, on 25.09.2012", Arts@CERN website (03.10.2012): http://arts.cern/news/2012/daring-do-final-

Koek explained it thus:

> Now, a year later, he has rediscovered his playfulness by regaining his distance from the all-intoxicating wonder of particle physics, and is starting to create great work again.[38]

Prior to Bill Fontana's residency, Director General Heuer again engaged with the arts, announcing: "The physics of sound has a long tradition of inspiring artists. So it will be fascinating to see how the physics and technology of the Large Hadron Collider and CERN will inspire one of the world's pioneers of sound art."[39] Koek commented: "He really thought this was the ultimate challenge for him, he was very humble."[40] When Ikeda was announced as a winner, the Director General wrote: "It is fantastic that an artist of his calibre sees CERN's processing and analysis of data as a source of inspiration."[41] In the wake of Ikeda's commissioned piece commemorating the start of World War I in London, Arts@CERN quickly informed its social media followers of Ikeda's success, asking: "What will come out of his Collide@CERN residency in a year's time or more? You can only imagine!"[42] Thus, confidence in the artists and the potential brilliance of their work emerges in CERN's rhetoric. The expectations are high for the residency artists, also in the time after their residency ends and the funding terminates. Whatever the artists may or may not produce as part of the project, Collide@CERN thus ensures positive outcomes for the laboratory. The local strand is

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event-julius-von-bismarck-cerns-first-artist-residence-25th-september-2012 (accessed 27.03.2016).

[38] Koek, "CERN – Where Art and Science Collide", Davyd Whaley blog (19.10.2011): http://davydwhaley.blogspot.co.uk/2011/10/art-and-science.html (accessed 22.03.2016).

[39] Heuer introducing Fontana's first Collide@CERN lecture, 04.07.2014.

[40] Koek quoted in Kharunya Paramaguru, "What Particle Physics Sounds Like: Meet Bill Fontana, Artist in Residence at CERN", *TIME* (28.11.2012): http://newsfeed.time.com/2012/11/28/what-particle-physics-sounds-like-meet-bill-fontana-artist-in-residence-at-cern/ (accessed 1.03.2016).

[41] "Japanese Artist, Ryoji Ikeda, Wins the Third Prix Ars Electronica Collide@CERN", Arts@CERN website (28.01.2014): http://press.cern/press-releases/2014/01/japanese-artist-ryoji-ikeda-wins-third-prix-ars-electronica-collide-cern (accessed 27.03.2016).

[42] Collide@CERN Facebook message (05.08.2014): https://www.facebook.com/Collidecern/posts/713932392017975 (accessed 27.03.2016, available without a Facebook account).

seen to improve the links between the site at Meyrin and the city of Geneva, whereas the international strand has increased awareness of CERN in the art world at large.

5.4.a Lectures

Each of the winning artists have so far given one lecture at the start and one at the end of their residency. These are presented in the Globe of Science and Innovation, a space dedicated to public engagement. The lectures introduce the science community at CERN to the artist and vice versa, although most of the artists already had a chance to explore the site in preliminary visits. Lectures were usually introduced by Director General Heuer, Ariane Koek, Stocker from Ars Electronica and the artist's science inspiration partner. Heuer's position as Director General continues to be important in securing a CERN audience and giving legitimacy to the event. In his opening addresses he accentuated how excited he and CERN were to host artists of excellent international reputation. Following him, Stocker introduces Ars Electronica and Koek introduces the artist. The lectures conclude with a moderated discussion and wine. The events were all streamed live, and later made available online.

In March 2012 Julius von Bismarck described CERN as important and inspiring.[43] He introduced his interest in the unexplained concept of: "hidden world things" and announced that he was interested in working on visibility at CERN. Von Bismarck answered my question about the reception of the project: "Many artists and scientists think SciArt is bullshit. But they should respect that not everyone is aware of it." His defence of science enthused the audience, largely made up of scientists. "What happens", he demanded, "if we call the scientist an artist, and the artist a scientist?"[44] Six months later Heuer stated: "Julius's worldview is changed forever."[45] Before Koek introduced von Bismarck in his final lecture she reminded the audience that "…it's all about the ideas generated, not the product but the generation of ideas…"[46] This is at the core of the collaboration's goals, and specifically relevant in the case of von Bismarck, as no new art was produced (his piece, *Versuch unter Kreisen*, was made during his time

[43] Von Bismarck's first Collide@CERN lecture, 21.03.2012.
[44] Von Bismarck's final Collide@CERN lecture, 25.09.2012.
[45] Heuer introducing von Bismarck's first Collide@CERN lecture, 04.07.2013.
[46] Koek introducing von Bismarck's first Collide@CERN lecture, 04.07.2013.

in art school). Doubt presented itself in the latter part of his final lecture: "How can an artist make relevant work about science without understanding science", he asked, ending by saying he felt able to do more "relevant work" and thanking Koek.[47]

Similarly, Jobin's lectures also revolved around what CERN could bring to his practice and knowledge as an artist. "Quantum physics revolutionises our concept of time and space. I had a lot of catching up to do at CERN"[48], Jobin explained. Presenting his earlier work as a choreographer, he focused on the history of dance and the local context.[49] In Fontana's first lecture and the Arts@CERN media coverage leading up to the event, the artist's work was described as a philosophy of sound. "All sound is music", he said, and his source of inspiration is "thus everything, as there is no such thing as noise."[50] Jan Peters gave his opening lecture about film and expressed his thrill at being at CERN. He stated that being there was "a dream (…) come true." His near-euphoric lecture presented his previous works, with various clips illustrating his interests as well as the practical aspects of being a visitor at CERN.[51] Delighted by his CERN experience, he received warm applause. In contrast, Ikeda signals a slight change in the international residency, as he does not want to be photographed, and is present only via his voice in the lectures. Like the other artists, he spent his first lecture praising CERN and giving an overview of his previous work. Recently Decelière and Hänni were the first artists who gave a lecture in French, despite it being CERN's second official language and the language of the local communities. As with the previous winners they presented an overview of their hopes for their time at CERN. Ikeda, Decelière and Hänni's final lectures, presenting their time and work at CERN, have not yet happened.

In general, the opening lectures are overviews of the artists' previous work. All of the artists have had some previous interest in and experience of science, highlighting this in their presentations. The atmosphere is friendly and the questions are welcoming.

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[47] Von Bismarck's final Collide@CERN lecture, 25.09.2012.
[48] "*Quantum* in Paris", Arts@CERN website (04.11.2013): http://arts.cern/news/2013/quantum-paris (accessed 27.03.2016).
[49] Jobin's final Collide@CERN lecture, 06.11.2012.
[50] Fontana's first Collide@CERN lecture, 04.07.2013.
[51] In particular the everyday activity of measuring radioactivity at CERN. Peter's detector went from 0 to 0.008 during a month at CERN. CERN states that only if the dosimeter reaches 500 or over are humans at risk: "Collide@CERN Geneva 2013: Jan Peters", Arts@CERN Vimeo (2014): http://vimeo.com/79898503 (accessed 26.06.2015)

In the final lectures, the artists' ideas for their future work based on their time at CERN are shared. With the exception of von Bismarck, all the artists fell in love with CERN and happily admitted this in their lectures.

5.4.b Interventions

The Collide@CERN winners were expected to make interventions at the organisation. Jobin's interventions included choreography where dancers performed in the CERN library. The interventions were not performances, but rather interactions with staff and the site. The dancers emulated particles, colliding, flipping over and between each other. In the early performances on-site, Jobin acted as a magnet that controlled the direction of their movements and rendered them chaotic when he moved around. The dancers, in brightly coloured clothing, underlined the different characteristics of each entity. They suggested a self-contained individuality that the magnet, however powerful, could not control. Likewise, the dancers were choreographed but also free to stop the dance or improvise. Dancers hung off of machines, twisted through library shelving and folded over furniture, resulting in high-resolution images that were disseminated online (**Fig. 42**).

Fig. 42 *Gilles Jobin and dancers intervene in the CERN library.*

In the first of von Bismarck's three interventions he locked thirty physicists underground and asked them what they saw in the complete darkness. Subdued inside CERN's historical archives he wanted to start a discussion about how both the arts and the sciences are preoccupied with the concept of invisibility. Recognising his own shyness in many of the scientists, using darkness was one of the few ways that the artist felt comfortable to talk to what he called the "smarter people" at CERN.[52] We should however keep in mind that von Bismarck often uses irony as part of his artistic oeuvre, so that his commentary might have been part of the intervention too. The following intervention that Bismarck provided was a ninety-minute art course to some of the staff. Confident in his knowledge outside of science, von Bismarck set about introducing the physicists and engineers at CERN to the art world. In subsequent public lectures he spent little time discussing this intervention, although this event was the only one in which a Collide@CERN artist taught scientists about art, rather than the other way around. A fascinating conversation might have taken place, but with no tangible material to analyse, these ninety-minute art courses become the most obscure part of von Bismarck's residency. The last of von Bismarck's interventions began when the artist rigged up a tree in the CERN cafeteria, using it as a listening post inspired by "Heisenberg's memoirs of talks in science-eating halls."[53] The recording was made over eight hours in the week before the announcement of the Higgs boson discovery was made on the 4 July 2012. Blessed either with luck or information, the artist ordered the sounds of these days to be locked away in the archives. The recordings rest there, embedded in the thirty-year confidentiality clause and at the artist's own wishes.

Fontana, the second international residency winner, worked more directly with scientists at CERN. He listened to the proton source of the particles that make the twenty-seven-kilometre journey around the LHC ring. Physicist Detlev Küchler, who had worked on the source for twenty years, was "visibly moved" by their interaction,

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[52] Von Bismarck's final Collide@CERN lecture, 25.09.2012. This echoes Arthur I. Miller's interviews about Collide@CERN at CERN: "A number of physicists at CERN complained that there was little transparency in the programme, in that almost nothing was discussed or explained to the group as a whole. Many of the physicists who interacted with von Bismarck got little out of it. As a result few chose to participate (…) Another comment was that Collide@CERN was too structured, and there was too much control over the artist." Miller, *Colliding Worlds,* 151.

[53] Von Bismarck's final Collide@CERN lecture, 25.09.2012. It is not clear how this connects to Heisenberg, but may have drawn on earlier work that von Bismarck did whilst at art school.

according to Arts@CERN media.[54] Giving control over to the artist, Küchler could for the first time listen to what he had assumed was a silent machine. The CERN power generator and storage, the Antimatter Hall and the cooling towers outside ATLAS also became sound sources throughout Fontana's interventions. His recording of the LHC looping back on itself soon became available online, alongside a video blog tracing his experiences at CERN week by week (filmed by his son).[55] His sound art thus touched some individual scientists' lives, whilst also reaching a public audience.

Jan Peters, the first Geneva-based Collide@CERN winner, found his inspiration in the CERN archives. He played 16mm (referring to the width of the film) archival material outside the cafeteria during his residency.[56] As was the case with Fontana, the memories and celebration of the past moved CERN staff, young and old. Camped outside the cafeteria for a day, looping archive material, Peters started many conversations. In Peters' final lecture, Koek introduced him as having: "… gone further than any other artist. He's been inside the ATLAS pixel detector, adopted by the scientists, working there, where no member of the public is allowed to go."[57] Whilst working below ground, Peters collected material for a future film about the nature of time and his experience at CERN. The film is still a work in progress, whereas his presence amongst these rarely visited spaces of CERN became his intervention. The artist's gaze and filming became part of the scientists' day. As friendships were made, Peters became one of the ATLAS team for a brief period of time, and his future products could indeed reflect this. But his passionate interest in science, new CERN friends and knowledge of high-energy physics could also risk blunting the tools of the documentary genre as the artists became an outspoken fan of the organisation.

International winner Ikeda and local winners Decelière and Hänni's projects are ongoing at CERN, but will likely also find new ways to engage scientists and use the site. By connecting artists to the actual lives of scientists, a view of science as social and cultural emerges. From shy scientists submerged in darkness to moved engineers

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[54] Heuer introducing Fontana's first Collide@CERN lecture, 04.07.2013.
[55] All the videos are available at Ars Electonica's online Collide@CERN blog, published by Ariane Koek: http://www.aec.at/aeblog/en/category/prix/collidecern/ (accessed 14.03.2016).
[56] Peters playing the old 16mm: "Collide@CERN Jan Peters Old CERN Films Intervention", Arts@CERN Vimeo (2014): http://vimeo.com/81924279 (accessed 26.06.2015).
[57] Jan Peter's final Collide@CERN lecture, 27.02.2014.

listening to their machines for the first time, the artists have started engaging with CERN staff. While these interventions are not available to witness in real time and are cloaked in the enthusiastic Arts@CERN rhetoric, there is still a playfulness in these events that suggests a connection between the individuals and their respective fields beyond the institutional goals of CERN and SciArt.

5.4.c Art and networks

When the Collide@CERN artists use CERN as a studio and muse, they are encouraged to focus on learning, rather than production. Collide@CERN is not invested in making art. It is a system where the process, not the outcome, is key. This is why it is the figure of the artist, and not the role of art, that Ariane Koek and the programme emphasises:

> … it is stressed that the residency at CERN is all about research and discovering new ideas. CERN is a research centre after all. No outcomes are expected, although of course if they happen that is great. It is every tribute to CERN that the laboratory has embraced this idea – it is unusual for a science laboratory to have the foresight to give value to the creative research process rather than the outcome.[58]

While the process takes priority for the Collide@CERN artists, the art also has a role to play. Artists are in part judged on their experiences of making art as the cultural board picks the residency winners. Furthermore, much is made of the artworks that are produced while the artist is at CERN. Finally, the artists' post-CERN art production is included in the Arts@CERN canon. The following section discusses such artworks as one of the outcomes of the residency, analysing how this has benefitted CERN and the individual artists.

After his Collide@CERN experience, choreographer Jobin made *Quantum*, a contemporary dance piece based on some of his work at the laboratory. It was first performed directly above the Compact Muon Solenoid (CMS) particle detector at CERN in front of a life-size image of the machine.

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[58] Ariane Koek, "The Art of Science", *Laboratory News* (18.12.2013): http://www.labnews.co.uk/features/the-art-of-science-18-12-2012/ (accessed 27.03.2016).

(**Fig. 43–44**).

Fig. 43–44 *Gilles Jobin, Quantum performance at CERN.*

SciArtist and composer Carla Scaletti's pre-existing soundtrack accompanied the event and was, similar to Fontana's work, inspired by the sounds of the LHC.[59] The dancers' movements were inspired by the principles of particle physics, drawing on Jobin's work at the organisation. Jobin intended the performance as: "an ode to particle physics".[60] The performance was a one-off and is not publicly available to view. There are snippets of the movements and many photographs available online, but not an entire screening of the dance. It is not possible to comment on the piece without having seen it, but the photographs indicate an energetic choreography involving five young dancers. The dancers move their entire bodies, but there is special emphasis on their hands. At times they draw together, dancing in synchronicity. Other times they dance apart, moving in individual patterns. Following the CERN performance, *Quantum* had its external premier at Thèâtre de la Citè Internationale in Paris in November 2013. By then it had

[59] Thèâtre de la Citè Internationale, "SUSY Symmetry par Carla Scaletti pour QUANTUM de Gilles Jobin et Julius von Bismarck", SoundCloud (undated): https://soundcloud.com/theatredelaciteinter/susy-symmetry-par-carla (accessed 26.06.2015). Scarletti is not affiliated with Arts@CERN or a winner of Collide@CERN.

[60] *Quantum* was described as "an ode to particle physics" by Gilles Jobin in a video by Luke Groskin and Alexa Lim (07.09.2014): http://www.sciencefriday.com/videos/quantum-an-ode-to-particle-physics-2/ (accessed 27.03.2016).

already been given an award by the fashion house Hermès' foundation. Their New Settings Award was based on the original CERN performance, meaning that someone from the organisation must have attended the dance. The award was announced on the CERN arts blog on the same day as the premiere. The Hermès foundation upholds the same values and structures as the Clore Fellowship, Ars Electronica and, indeed, Arts@CERN. Created by a small group of people, they award prizes to each other, legitimising and elevating each other's work. This creates a tightly woven network of informal and formal structures. For the artist, this is one of the most useful outcomes of the residency: access to a network with capital. While selling themselves as an alternative to the "Two Cultures" debate by bringing separate spheres together, these foundations are invested in boosting "third culture" careers (meaning those who facilitate creativity and competition through SciArt). Artists are directly affected by these networks, but they rarely start them. They have agency, but usually little control. *Quantum* is an example of this. The dance was supported by Ariane Koek, who was funded by the Clore fellowship, then financed by CERN and external partners, going on to win an award by the stock investments of a luxury fashion house. These stages create a structure of validation. In addition to validating the artist, the organisation is validated by the art. As the dancers, paid by this network of money, work around the world, CERN's name is also shared with their audiences. The organisation is gaining a reputation in this network. Jobin felt "science-abled" by CERN, indebted as to a muse.[61]

[61] Jobin to Jascha Hoffman, "Science-events: Dancing Particle Physics and Science-Inspired Fashion", *New York Times* (30.09.2014), D6.

Quantum is claimed by the organisation through its PR and branding, on behalf of all CERN staff. After the dance was performed, Koek and CERN staff tweeted, used Facebook, blogged and video-recorded to share the event. On behalf of CERN, the movements organised by Jobin will be seen as inspired, catalysed and put into motion by the organisation. Echoing von Bismarck's question regarding what might happen if the scientist becomes artist, and the artist a scientist, here CERN becomes creator and the artist a midwife. *Quantum* has been performed in several countries, and is always tied to the organisation in the accompanying press releases. For choreographer Jobin this is useful, but for CERN it is revolutionary. Before Arts@CERN no one would have expected CERN to have an audience, let alone win prizes, in the world of contemporary dance. After Jobin's residency the laboratory has done all of this.

As the second artist to arrive on-site, von Bismarck spent his time at CERN on his three interventions. But he also presented the installation *Versuch unter Kreisen* (*Experiment among Circles*). It consists of four swinging lamps, engineered to look as if they are moving as a pendulum under normal gravity (**Fig. 45**). This large installation was also part of his graduate work before coming to CERN. Von Bismarck constructed the lamps to move, thus creating a fictional representation of gravity assisted by engineers at CERN. The piece now exists as photographs and as the backdrop for Gilles Jobin's dance *Quantum*. Choosing to call his Collide@CERN piece a "versuch" (an experiment) could be interpreted as a site-specific choice, or it might be a sign of CERN's gravitational pull. As von Bismarck himself admitted or performed in his first lecture, he was nervous about appearing "stupid." But it is also possible that von Bismarck is playing the role of

Fig. 45 *Julius von Bismarck, Versuch unter Kreisen.*

the naive artist, something he has done in previous works and which has led to arrests and other controversial incidents.[62] *Versuch unter Kreisen* is a tangible outcome of his residency, but does not directly relate to his time at CERN, nor to the crisis in confidence he experienced there.

In contrast, the second international Collide@CERN winner Bill Fontana's carefully planned artwork was produced in its entirety at CERN. In his sound piece, *The Universe of Sound*, the LHC was his main inspiration. Fontana approached the LHC as an object, recording its mechanical sounds and creating a rhythmic soundtrack for CERN. The mechanical rhythm repeats and becomes increasingly intense. The piece was released on YouTube in autumn 2013, enabling commenters to share their opinions. One commenter wrote:

> Love science, love CERN, but this video is disappointing.
> We hear some strange sounds but do not get explanations of what they are. We are told an artist is performing some kind of experiment, but we do not get a full explanation or see any results. This is no way to promote science. If those of us who already love science and know something about it do not understand this, then the average layman will be left completely put-off by such meaningless confusing nonsense.[63]

Another YouTube user is less patient, stating: "What a surprise, a pretentious lame idea from the art world."[64] These kinds of anonymous reactions are of course easy to express on a medium such as YouTube, and with only 1,680 views the interest was not big. Nevertheless, the medium of YouTube fits Arts@CERN's interactive, social media-aware, interdisciplinary mode. Furthermore, as none of the Collide@CERN art was exhibited, it is one of the few ways to understand how the public reacted to the artworks. Fontana is still working with the sounds he collected from CERN, but the LHC recording remains his main output from his residency.

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[62] Von Bismarck was arrested on Liberty Island outside of Manhattan, New York, in 2012 for whipping the Statue of Liberty, as one of many stops on his "whipping tour" of important statues. His whip and materials were confiscated and he was quickly released.
[63] YouTube clip and comments, "Loud & Underground: Bill Fontana – Collide@CERN Artist", posted 05.08.2013. Comments from users Learner Learns, 10minTwo and Samson Tesla. https://www.youtube.com/watch?v=OegoEYj9z00&feature=player_embedded (accessed 26.06.2015).
[64] YouTube clip and comments, "Loud & Underground".

The third international Collide@CERN winner Ryoji Ikeda created the installation *Supersymmetry* based on his time at CERN.[65] In April 2015 the work premiered in a multi-storey car park in the UK, presenting a collection of sounds, video, light pulses and overlapping screens. Viewers walked through the space, bombarded with noise, light and streams of visualised data on the screens. The title, *Supersymmetry,* refers to an unproven part of the Standard Model, but there is no other obvious link to the topic or CERN's work in the piece.[66] *The Guardian* art critic Jonathan Jones wrote one of the few reviews of the piece, describing it as "noisy, nervous and annoying."[67] Jones argued that the piece was "not a work of art about physics. It is a work of art about how crazy everything is. That's a trivial misunderstanding of what goes on at CERN, surely." Michael Doser, CERN Cultural Board Member and CERN physicist, saw it another way: "The link to high-energy physics, CERN and his residency there is not only made explicit in the catalogue of the exhibition; for a particle physicist, it is immediately obvious in the work itself."[68] Not commenting on Jones' public critique, CERN remained quiet about Ikeda's contribution to the Collide@CERN canon.

Jan Peters is still working on editing his film about his experiences at CERN and it is too early to say what Ikeda, and Decelière and Hänni's post-CERN practices will be. However, Ikeda proposed "to look at data in quantum dimensions"[69], and Decelière and Hänni want "to explore in sound how the analogue developed into the digital world at CERN."[70] It would seem that these residencies would result in some future art as based on their "detailed and ambitious" research proposals, according to Arts@CERN.

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[65] Images and video of *Supersymmetry* is available via the artist's website (2014): http://www.ryojiikeda.com/project/supersymmetry/ (accessed 14.03.2016).
[66] "Supersymmetry", CERN website (undated): http://home.cern/about/physics/supersymmetry (accessed 23.03.2016).
[67] Jonathan Jones, "Should Art Respond to Science? On this Evidence, the Answer is Simple: No Way", *The Guardian* (23.04.2015), available online: http://www.theguardian.com/artanddesign/jonathanjonesblog/2015/apr/23/art-respond-science-cern-ryoji-ikeda-supersymmetry (accessed 14.03.2016).
[68] Julian Carlo, "Sypersymmetry", Arts@CERN website (12.05.2014): http://arts.cern/news/2014/supersymmetry (accessed 27.03.2016).
[69] Arts@CERN, "Japanese Artist Ryoji Ikeda Wins Third Prix Ars Electronica Collide@CERN", CERN Press office website, News/Press releases section (14.01.2014): http://press.cern/press-releases/2014/01/japanese-artist-ryoji-ikeda-wins-third-prix-ars-electronica-collide-cern (accessed 27.03.2016).
[70] Julian Carlo, "The Third Collide@CERN-Geneva Prize in Music and Sound Awarded to Two Artists", Arts@CERN website (29.04.2014): http://arts.cern/news/2014/third-collidecern-geneva-prize-music-and-sound-awarded-two-artists (accessed 27.03.2016).

However, in the existing Collide@CERN artworks there are similarities. Inspired by engineering and high-energy physics theory, *Quantum, Versuch unter Kreisen, The Universe of Sound* and *SuperSymmetry* all perform science through artistic forms. Jobin's dancers perform particle movements, von Bismarck's lamps create false gravity, Fontana's soundtrack is a sonic reading of the Large Hadron Collider, and Ikeda's sensory installation translates CERN data into light. All of these pieces could be used to illustrate science, in particular the type of content that CERN produces. The artworks present CERN to audiences traditionally beyond the reach of the organisation. Penetrating the worlds of contemporary dance, performance, sound art, social media and *The Guardian* art column, their projects introduce new audiences to CERN. Furthermore, they become commodities. Jobin, von Bismarck and Ikeda's pieces in particular have become commercial entities, performances for sale on stages around the world (it has not been possible to find out if CERN profits from this).

In addition to the opportunities the individual artists gained through collaborating with CERN, they experienced varying outcomes. In his post-CERN time, Julius von Bismarck focused on performance art. At the art fair Art Basel in 2015 von Bismarck performed the piece *Egocentric System.*[71] Consisting of a large rotating bowl, equipped with a desk, chair, pillows and duvet, the performance showed the artist living in the moving space throughout the entire fair. While Basel centres on the buying and selling of art works, von Bismarck stated that *Egocentric System* was "an experiment" and a performance. The artwork is both freely available to view online and for sale as photographs and video through von Bismarck's gallery (Marlborough Chelsea).[72] The piece was reviewed as one of the highlights of the show, and in many of the reviews von Bismarck's Ars Electronica Golden Nica award and time at CERN were mentioned.[73] His access to events and opportunities such as Ars Basel indicates that the institutional

[71] The piece is available to view free of cost on YouTube, as are other von Bismarck performances. VernissageTV YouTube channel: https://www.youtube.com/watch?v=XfrjxhMKD-8 (23.06.2015).
[72] Marlborough Chelsea is a New York gallery. Information about von Bismarck art prices was not available for other than serious buyers, but the artist's representation by a commercial gallery shows that he has some institutional and financial security today.
[73] Nate Freeman, "Round, and Round, and Round: Taking a Spin on Julius von Bismarck's Much-hyped Installation at Basel", *ARTNEWS* (17.06.2015): http://www.artnews.com/2015/06/17/round-and-round-and-round-taking-a-spin-on-julius-von-bismarcks-much-hyped-installation-at-basel/ (accessed 27.03.2016).

SciArt influence of Ars Electronica and CERN have helped to launch him onto a bigger, international platform. This access also results in art patrons, exhibitions and fame. In comparison, Bill Fontana and Ryoji Ikeda were already established SciArt names when they started their Collide@CERN residencies, and have gained further SciArt opportunities from their time there. Fontana has recently been recording the sound of sand for the Abu Dhabi Festival, and Ikeda is still performing *SuperSymmetry* around the world.[74] As sound and digital artists, both Fontana and Ikeda rely more on patrons than sales to make a living. Ikeda sells work for £13 on Amazon, and Fontana also uploads his work for free online. Other than this, it is difficult to gain a sense of what financial gains they may have made. Similarly, there were no available numbers on the prices of Collide@CERN Geneva winner Jan Peters' film work, nor the work of sound artists Rudy Decelière and Vincent Hänni before and after their time at CERN. In general, the exposure was larger for the Collide@CERN international prize-winners, compared to the local and less known names. In conclusion, the illustrative and PR potential of the artwork is useful for CERN, the financial commodification of high-energy physics is beneficial to some artists.[75]

5.5 Confidence

The Collide@CERN artists have all stated that their residencies had been a nice experience, although some expressed doubt about their own work whilst at CERN. This section discusses the case study of von Bismarck, who went on a public personal journey that started with worries about "being stupid."[76] By the time his residency ended, von Bismarck seemed like a changed man compared to his confident first lecture. "How can an artist make relevant work about science without understanding science?" he asked at the end, echoing the Collide@CERN Geneva winner Jobin who introduced himself by admitting a need for "catching up."[77] Before coming to CERN, or knowing much about physics, von Bismarck, Jobin and the other artists had indeed made relevant work about

[74] Jones, "Should Art Respond to Science." While the review was negative, the fact that Ikeda has now been reviewed in a mainstream and international paper by an infamous critic also shows how working at CERN can, if nothing else, lead to media attention.
[75] On the role of the artist as educator see Ernesto Pujol, "The Artist as Educator: Challenges in Museum-Based Residencies", *Art Journal* 60, no. 3 (2001), 4-6.
[76] Von Bismarck, final Collide@CERN lecture, 25.09.2012.
[77] Arts@CERN, "*Quantum* in Paris", Arts@CERN website (04.11.2013).

science, nature and engineering. Von Bismarck claims to be doing more "relevant work now" but it is not clear what this actually means.[78] This quotation is useful PR for CERN, indicating that CERN is a transformative space for artists. Koek has also written about von Bismarck's confidence: "I watched an established artist lose his confidence during a one-year residency and at the end he just created work which tried to prove he could communicate astro-particle physics."[79] In another publication she added:

> For nine months, I tracked a very confident young Swiss artist and astrophysicist working together on a residency. For four months, they were equally enthralled by each other. But then there was a turning point. The artist said to me: "The science is so amazing that I have to prove that I understand it and that I too have a brain." From that moment, I knew he was lost. The work he did at the end of the residency was at best a communications piece trying to explain what quantum fields were. Now, a year later, he has rediscovered his playfulness by regaining his distance from the all-intoxicating wonder of particle physics, and is starting to create great work again.[80]

The other Collide@CERN artists also thanked Koek and expressed some sense of feeling lost. However, these changes and problems were not talked about or explored in the CERN and Arts@CERN PR. Instead it gave this overview:

> "I have thirty years' worth of ideas thanks to my residency. And it has totally changed the way I look at the world and approach my work." Those are the words of Julius von Bismarck, the first winner of the Prix Ars Electronica Collide@CERN residency which has been a declared a definite success.
>
> Not least because both James Wells and Julius von Bismarck, the scientist and the artist have survived their collision during the first Collide@CERN residency according to CERN Director General, Rolf-Dieter Heuer.[81]

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[78] Von Bismarck, final Collide@CERN lecture, 25.09.2012.
[79] Koek, "The Art of Science." *Laboratory News.*
[80] Koek, "CERN – Where Art and Science Collide", Davyd Whaley blog (19.10.2011): http://davydwhaley.blogspot.co.uk/2011/10/art-and-science.html (accessed 22.03.2016).
[81] "Daring to do – the final event by Julius von Bismarck, CERN's first artist in residence, on 25.09.2012", Arts@CERN website (03.10.2012).

This also fails to mention that von Bismarck's third intervention was not only inspired by Heisenberg, but also by Otto Rössler, the controversial CERN dissenter and the original inspiration behind the artist's interest in high-energy physics. In line with his previous oeuvre, von Bismarck may have chosen to interact and mention Rössler in order to provoke a reaction from the institution, but he may also not have been aware of the scientist's divisive reputation. His mentioning of Rössler's own worries about CERN sent a rippling of uneasiness through the audience of his first lecture and has since not featured in any of the connected post-residency media. Based on CERN's official line on controversy there is reason to suspect that von Bismarck's inclusion of Rössler in his art is the reason why he had the most transformative and uncomfortable time as a Collide@CERN artist, whether this was his intention or not. The artists who followed were all politically and scientifically correct, and their events ran smoothly as a consequence. Attempting a nibble at the hand that fed him, von Bismarck underwent a clear change during his time at CERN, whether real or performed.

5.6 Benefit to artists

As each artist thanked CERN for the residency opportunity, they reflected on what they had gained from the interaction. They all gratefully acknowledged the chance to collaborate in an interesting space and with interesting people. Making contact with the arts professional Ariane Koek and their individual science inspiration partners was always important. While some confidence might have been lost along the way, the benefit of accepting the residency usually outweighed this. Gaining three months of work that was not tied to any outcome was seen as a rare opportunity. Likewise, there were financial benefits to winning the Collide@CERN residency. Each winning artist received 10,000 Euros in prize money (from anonymous donors), as well as cover for rent, subsistence and travel.[82] There is no available information about the artists' prices before and after their time at CERN, in part due to the varied media they work with, which are often not permanent (von Bismarck, Jobin, Fontana and Ikeda are connected to traditional galleries, but they would not give me this information unless I was a

[82] "Collide@CERN Ars Electronica Award 2015", Ars Electronica: http://www.aec.at/prix/en/collide/ (accessed 7.03.2016).

serious buyer). Nevertheless, their CERN experience has resulted in more commissioned work and activities for all of the artists.

While none of the artists spelled this out in their lectures, the access to new networks became another clear benefit. Von Bismarck and Jobin, after meeting each other through Arts@CERN, decided to work together on *Quantum,* thus touring the world, selling performances and winning prizes together. Julius von Bismarck's performance at Art Basel in 2015 gave him access to one of the most prestigious art fairs in the world. The same year Jobin won the Grand Prix de Suisse de Danse for his CERN-related work. Bill Fontana's residency was written about in *TIME* magazine, reaching a large audience and leading to his work in Abu Dhabi. Jan Peters won the Geneva-based 48-hour Film Project with footage shot at CERN with the help of CERN staff. Ryoji Ikeda, an already established artist, continued to cement his reputation in the world of electronics, technology and high-energy physics, and was reviewed in *The Guardian*. These are tangible benefits to each artist in terms of work and reputation.

Prior to the Arts@CERN structure, many artists who wished to visit CERN could do this. Compared to the Collide@CERN artists they did not receive monetary benefits, or insight into elite art or science networks. Nevertheless they did gain knowledge, friendships and inspiration. As CERN now controls which artists gain access to its site, work and staff, the benefits to the chosen artists are larger, but there are fewer artists who benefit from this. Thus, a hierarchy is established. By controlling which artists are invited to CERN, the organisation might cut itself off from some truly fascinating interventions. Nevertheless, for those who do win the various competitions, the benefits of being an artist at CERN have, on a whole, never been bigger.

5.7 Conclusion

In this chapter I have explored the Collide@CERN artists, asking who they are, what experiences they have had at the organisation, what the work they made there means, and what benefits they gained from the residency. I have found that their time at CERN is not without conflict, but that it is usually a positive experience. Some artists created art as a direct consequence of spending time at CERN, and all of the winners gained access to networks, prizes, recognition and some financial stability post-CERN. While

most of the artists struggled with an inferiority complex in their interactions with scientists, many created warm working relationships with their science partners despite this.[83] Selected from a pool of over 300 applicants, the artists were already filtered by CERN and found to be suitable matches for the organisation's goals. Furthermore they (and other CERN artists) usually mirrored the demographic makeup of CERN staff in terms of their nationalities, their gender and the career stage that they were in. In the artists' post-residency relationships with CERN they may also continue to benefit from the organisation's networks. Having access to CERN gives individual artists access to certain networks and benefits. But in the controlled cultural atmosphere of the cultural board and residency application system, artists who are not invited to work with the organisation have little chance of visiting the site. While they may share a passion for science, these artists can now be excluded from CERN. So what is it like for the artist who does have CERN as a studio today? Under contract, freedom may be compromised, but there are also new opportunities, networks and benefits to explore. Furthermore, in a time where some art residencies ask artists to pay a fee, Collide@CERN treats artists as professionals.[84] Gaining knowledge, friendships, funding and access to networks, Collide@CERN artists are as celebrated by the organisation as the organisation is celebrated by them.

[83] An inferiority complex is a lack of self-worth, stemming from the psychoanalytic branch of psychology and Alfred Adler, founder of Adlerian psychology, which argues that many symptoms originate in this feeling.
[84] Matthew Caines, "Artist-in-residence schemes: top tips", *The Guardian* (3.06.2013): http://www.theguardian.com/culture-professionals-network/culture-professionals-blog/2013/jul/03/artist-in-residence-schemes-top-tips (accessed 14.03.2016).

CONCLUSION

Boundary Breakers? Artists at CERN.

In this thesis I asked why CERN is investing its resources in a structured art programme now. The answers presented reveal the institutional structure of SciArt through the case study of CERN. CERN has always had an active PR office, and branding and image have become integral to how it operates as a globally recognised organisation. CERN's goal of legitimising its work as part of its survival strategy remains, and PR is crucial to sustaining this. CERN's PR strategy has changed over the decades, but has only very recently included the arts and artists. This thesis has, for the first time, questioned these SciArt structures as features of promotional culture in science. In this conclusion I discuss the key findings that have been revealed from this analysis. I reflect on my methodology, revisit the key findings of the individual chapters, explore how this project expands various literatures, and discuss key themes.

Reflections on methodology

This thesis utilised interviews, archival research, site visits, art historical approaches, and theories of gender and cultural capital as part of its methodological framework. I used an inductive approach to interpret this data. This approach proved to be successful because it allowed me to understand the patterns and relationships between the economic, institutional and cultural factors that have created an art project at CERN today. While the textual sources and interviews provided rich contextual evidence to support the claims made in this thesis, as in all research, there are limitations regarding the researcher's interpretations of the data. Nevertheless, using both primary and secondary data has provided a broad and unique understanding of arts at CERN, and of how scientific institutions such as CERN shape and control SciArt.

Reflections on chapters

The first chapter, 'Image', explored the historical use of PR and branding at CERN. I provided a scholarly investigation of CERN's PR office, drawing on archival material and interviews. I used the case study of the 'Higgs Boson Blues' to find out how

CERN's history of PR has informed its current Communication Group. I examined this through a close reading of the song's lyrics. I also interviewed the current head of the PR office, James Gillies, and found that CERN as a rule differentiates between art and popular culture (although the exceptions to this reveals insight into other public engagement goals), and that it choses what it has time to engage with. I also explored the controversial issues that surround the organisation, in particular questions of gender and diversity, conspiracy theories, and financial pressures. Understanding these difficult topics explain why CERN needs PR today. The thesis shows that the Communication Group's main task is to maintain CERN's identity. But in the new post-Internet media landscape, the nature of PR is changing. I argue that art and artists are part of this change in PR at CERN, and that while they have agency, they do not have control over these structures.

In the second chapter, 'Contracted', I explored SciArt and found that it lends itself to the goals of CERN's PR office. Through examining the field of SciArt, and exploring how other physics laboratories have used the arts in the past, I argued that the institutional nature of this new genre is perfectly suited to CERN's needs. I traced the start of SciArt back to the Wellcome Trust's initiative in the '90s, and showed how, ever since, the field has always been tied to institutions and hierarchical structures. This is the first critical examination of the field and history of SciArt, in contrast to most SciArt literature that celebrates or explains the field. I argue that SciArt, like any genre of art, should be carefully examined, and that this includes investigating the financial and institutional factors that created it.

The third chapter, 'Pasts', presented the history of CERN art. Drawing on archival research, interviews, visits to CERN and art historical analysis, I introduce the artworks at the organisation. This is the first time the organisation's visual culture has been explored. I show how CERN's art history is eclectic and varied, comparing works that celebrate the organisation with pieces that engage in controversial topics. Drawing on my work about the history of PR at CERN, I show how the organisation employs silencing strategies in cases of controversial art. This provides an important framework for understanding how contemporary artists are chosen for the new art residency, and how they might experience their time at CERN. The chapter also argues that CERN has

always inspired artists, and that it is only now that the organisation seeks to culturally capitalise on this creativity, and thus improve its image to prove its legitimacy and secure funding.

In the fourth chapter, 'Control', I explore why CERN is seeking to culturally capitalise on art and artists since 2011. I explore the origin of Arts@CERN, examining the people and financial support that created the project. For this, I analysed the economic and historical factors behind the origins of the scheme. I also used historical methods to explore E.A.T. and CAVS, comparing these two early science and art schemes with Arts@CERN. CERN is unique in significant ways, but comparing its art programme to E.A.T. and CAVS shows how CERN has chosen to shape Arts@CERN today. The chapter also presents a close textual analysis of CERN's new cultural policy, showing how the rhetoric of this text underlines the organisation's attitude to the arts and to artists.

In the final chapter, 'Artists', I focused on the artists' experiences at CERN today. I explored what type of artists succeed in the new Collide@CERN residency competition in terms of demography, stage of career and art medium. I looked at the experiences they had whilst at CERN, and the outcomes they produced (lectures, interventions, art and networks). I analysed the artists' statements about confidence and creativity whilst at CERN, showing how there was an inferiority complex at work in many cases. I argued that although the artists gained some funding, networks, opportunities and friendship from the exchange, it was CERN that gained most. Having explored how CERN's strong culture of PR has worked since the start of the organisation, and how the office did not culturally capitalise on the many artistic projects that took place before Arts@CERN, we can see why, in a time of intense reputational and financial pressures, the Communication Group sought to capitalise on this free opportunity. CERN has not had any expenses throughout Arts@CERN, as the money comes from external donors. In this context I argue that although Arts@CERN provides genuine creative 'collisions' between artists and scientists, it is also a genuine PR opportunity. The latter is what structures both the organisation's cultural policy and attitude towards the arts, and based on my research I believe that CERN's own interests will always be privileged over those of individual artists. This questions the common

notion that artists should be free to be creative, showing how both SciArt and Arts@CERN use the stereotypes surrounding artists for their own gains. These themes and my findings are discussed in detail below.

Reflections on literature

In this thesis I utilised several fields of scholarship, bringing them together in new ways from an art historical perspective. While interdisciplinary research can be challenging, it can also strengthen a project. Drawing on art history, science history, science communication studies, branding theory, sociology, anthropology, social science and gender studies, I have situated CERN in an interdisciplinary and complex reality (these literatures are discussed and referenced in the literature review part of the introduction). Most scholarship on CERN has focused on its scientific work and its machines. Utilising interdisciplinary literatures, I have shown how CERN is not only about science; it is also a cultural, economic and political space.

Each separate field of scholarship has provided rich context to this study of SciArt at CERN, and in turn this project has located some limitations in the individual scholarly fields, and sought to fill those gaps. Within art history, there are very few scholars who explore science. Most of those who do, engage with scientific theory or discoveries. In contrast, this thesis explores the visual culture of a scientific institution, drawing on art historical methodology. In the history of science, many scholars have explored the culture of science, but there has been little engagement with the visual culture of scientific organisations. This thesis explores the scientific history of CERN, but focuses on the history of PR and art at the organisation, rather than on scientific theories or machines. In science communication studies we have been shown evidence for the relationship between PR and science. This thesis expands this relationship to include artists, and shows how they are also part of the science communication network of contemporary science. Sociologists and anthropologists have long been interested in how scientists work. In this thesis I show how artists, as both non-scientists and professionals, experience a scientific organisation. I have explored how this clash of cultures functions as useful PR for CERN, and is at times complicated for the individuals involved. Gender studies and feminist science theory have explored the lack

of women in science, the forgotten women of the past, and the theoretical implications of inequality. In this thesis, I have shown that there is not only a lack of women at CERN, but also a lack of women in SciArt and Arts@CERN. I have argued that there needs to be a dedicated analysis of inequality in SciArt, and that the lack of diversity in Arts@CERN and Ars Electronica could start that conversation. I have also drawn on Bordieu's ideas about cultural capital, expanding this to explore scientific capital and artistic capital at CERN. Thus, the project draws on several vast literatures, addressing limitations in these fields, and filling some gaps. Likewise, this work should be of interest to art historians who work on science, science historians, science communication scholars, sociologists and anthropologists of science, economists who explore science or art, and scholars who work on theories relating to science and art.

Key findings

This study is unique in its focus on the institutional history of SciArt. Artists experience CERN as non-scientists and creative observers, led through a series of initiation processes in order to produce desired outcomes for the organisation. These outcomes (whether art works, interventions, debate or other forms of cultural capital) benefit the organisation more than it does the individual scientists or artists involved in the programme. In the mid-'90s, the pioneering SciArt programme initiated by the Wellcome Trust found that artists stood to gain more than scientists from collaboration.[1] In this thesis the focus has been redirected towards the institutional nature of the collaboration, the entity that is profiting most from SciArt. This is not to say that artists and scientists get nothing from the CERN art programme, but they are neither the catalysts nor main beneficiaries of its structure.

A key issue explored in this thesis concerns how artists, in the course of their interaction with CERN, function both as non-scientists and professionals who lend their expertise to 'sell' CERN's brand. Some artists have experiences of CERN that are similar to other non-scientist groups, not fully accessing the inner workings of the organisation, either because they do not wish to, or because they are not invited to. They

[1] Glinkowski and Bamford, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme.*

may work with topics of controversy, and thus remain outside the elite circles of SciArt (not attending Ars Electronica's festivals for example). They may also suffer from complex societal and institutional barriers. As we saw when we explored the role of Cernoises at CERN, gender and sexuality remains a public diversity issue for the organisation, as exemplified by the harassment of the CERN LGBT group as recently as 2016. Nevertheless, Arts@CERN has the same demographic makeup as CERN. Whether this is due to the low number of women working in SciArt, the selection process of Collide@CERN winners, CERN's lack of female staff, or all the above, the topic has not been examined in academia. It is beyond the scope of this thesis to speculate why female artists do not reach high positions in SciArt. The case of Arts@CERN and Ars Electronica can nevertheless go some way in showing how institutional structures play a role in excluding women and minorities. A separate study on the numbers of women applying for such opportunities would make for a fascinating insight. There are already rumblings in the art community about this disparity through the #KissmyArs Twitter campaign, where artists are expressing their concern about the lack of female and minority winners of the Golden Nica and other SciArt prizes.[2] Nevertheless, this case study of SciArt at CERN hints at a larger gendered imbalance in the field, and will hopefully be joined by other studies of women in SciArt. The low numbers of female artists at CERN and Ars Electronica have not been examined before, and the numbers reveal that there are structures of selection within the SciArt world that still privileges male white artists and scientists.

At the same time, other artists are welcomed into the organisation. These artists match the demographic makeup of CERN staff more closely, and are often involved in the elite circles of SciArt (including winning prizes such as Ars Electronica's Golden Nica). Through a series of validation processes these individuals are initiated into the organisation. CERN's new cultural board and cultural policy enables the organisation to choose which artists work on the site, and whom they work with. Arts@CERN also

[2] The ongoing Twitter campaign #KissMyArs focus is on the lack of female and black artists at Ars Electronica and in SciArt. Various artists have been involved in the debates under the hashtag: https://mobile.twitter.com/hashtag/kissmyars (most active in October - November 2015). Artist Heather Dewey Hagborg started the hashtag with a tweet (4.09.2015) reading: "Prix Ars Electronica is the world's most time-honored media arts competition" for men" accompanied by statistics (90% of prizewinners are male): https://mobile.twitter.com/hdeweyh/status/639838531142164480 (accessed 16.03.2016).

builds post-residency connections, thus creating a network of artists connected to CERN. However, as this thesis has argued, the artworks made by the artists prior to, and outside of, the official CERN art programme already benefitted the organisation. These artworks start discussions, beautify spaces, and project CERN's reputation into the art world. Giving an account of this organic and often messy process shows the many faces of CERN. From sculptures to dystopian fiction, from the neighbours' opinions to feminist pop, the organisation has inspired a large output of culture that it now seeks to capitalise on. But instead of engaging with these artworks, CERN is focused on SciArt. In the creation of the residency competition, the cultural board and the cultural policy in 2011, control over cultural activities at CERN is now vested in a small group of experts. It mirrors the concentration of power in scientific institutions, and indeed is parallel to CERN's own history as it emerges as an influential scientific diplomat (exemplified by its presence at Davos and in the UN).[3]

While SciArt collaborations serve institutional agendas, of course artists can also benefit from these arrangements. Residencies can offer some security for artists, as a source of income. Institutional reviews of SciArt usually focus on what the artist and scientist can get from the exchange.[4] This thesis showed that the benefits for individual artists or scientists are less observable than those gained by CERN. In the service of science, the artist becomes a smaller figure in a grander plan of survival and legitimacy for the individual host institution. In the case of CERN, the artist brings the elusive blue-sky qualities needed to make a case for mystery and awe, and functions as part of the organisation's long-term survival strategy by promoting a positive message. While the artists gain funding and networks from this interaction, it is CERN that has gained most from the collaboration, in particular new networks, funding and media attention. Studies of SciArt have until now focused on individuals rather than institutional structures. Taking Arts@CERN as a case study, this thesis has shown that it is important to ask how institutions benefit from SciArt and what social, economic and political structures form as a consequence. Future studies could ask similar questions of the Wellcome

[3] 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).
[4] Glinkowski and Bamford, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme.*

Trust, NASA and other high-profile scientific institutions that champion SciArt. In the meantime, artists, like those involved in the #KissMyArs campaign, are starting to highlight these topics.

A further significant finding of this thesis centres on the outcomes of the art programme at CERN today. The focus of Arts@CERN is on collaboration and discussion, rather than on making art. There is no expectation that the artist will produce an artwork by the end of their residency. Nevertheless, as this thesis shows, CERN often holds artists to account after their residencies finish. The job of the artist can sometimes be to deepen the mystery of their host institution. In the current art programme at CERN, the creative participants have in part been brought in to do this job. In some cases, the direction established by their time at CERN continues to be followed after the residency ends (Peters, Jobin, Ikeda, Fontana). Others are not directly inspired by CERN in their post-residency existence (von Bismark, visiting and shortlisted artist), yet regardless the organisation claims a positive outcome. The promise of future benefits outlasting the actual residency is similar to that of the CERN Knowledge Transfer Group, the office that works on disseminating knowledge about the organisation's future scientific spin-offs. Promising future outcomes, whether creative or scientific, is one way for the organisation to secure its future funding and existence.

To this end, artists are coopted to CERN's branding strategy. Post-Higgs era CERN continues its work in the public sphere, often with the help of science museums, journalists, celebrities and individuals such as Ariane Koek. The exhibition *Collider* at the Science Museum is one example, as are CERN's many public Twitter accounts, public speakers such as Brian Cox, and visiting celebrities such as Will.i.am. There was already SciArt activity at CERN prior to Ariane Koek's arrival there, but it was not coordinated or publicised in a way that would reach people beyond the high-energy physics community and, more importantly, funders. Today, CERN has made culture part of its PR through utilising SciArt as public engagement. As an organisation dependent on public funding and being seen as legitimate, PR is part of its survival strategy. It is not surprising that CERN wants its SciArt to function as PR, and place their artists under contract. However, since CERN was founded 1954 it has wrestled with critics and conspiracy theories that have endangered its reputation, and thereby its survival. CERN

cannot control all these external interpretations of itself. But, as we have seen, it can distribute its message through careful selection of artists. In the past, this was not done, and many artists produced conspiracy theories because the laboratory captured their imagination. Today, through the Arts@CERN structure, CERN can harness positive messages from handpicked artists, and exclude artists who do not comply with the organisation's narrative. Thus, CERN is using cultural capital to communicate its importance to the outside world. Whether this strategy is beneficial or not will depend on how the public and funders view CERN in the future. After discovering the anticipated Higgs boson, it is not clear what happens next for CERN. In a situation based on public opinion and changing factors, the art programme at CERN is not necessarily safe from being cut in the future. But for now, Koek has shown that artists can be used in the organisation's branding strategy through media coverage, and through the Collide@CERN initiated projects, that disseminate knowledge about CERN in the art world.

Of the SciArt inspired by CERN, or catalysed by Arts@CERN, most of it revolves around what the artist has learned from science, rather than the other way around. While the goal of Arts@CERN is to facilitate an equal exchange of outputs, this outcome is in line with the rest of the SciArt world. The 2009 review of the Wellcome Trust's SciArt initiative found that in most projects involving artists and scientists, the scientific capital had not increased in line with cultural, economic, aesthetic, social, personal, innovative or educational capital.[5] While the initiative was found to have had "high impact", it was thus unbalanced between the two main groups. At CERN, this was particularly evident when it comes to dance and choreography, where each of the choreographers involved has cast the dancer in the role of particle, and in photography, where most concentrate on the empty spaces and corridors of the site. Isabelle Stengers has argued that the content of the sciences is intrinsically linked to the ideologies of its images.[6] At CERN, some artists are a part of the trend within SciArt that embraces the mysticism of non-applied physics. This mysticism is connected to what Sharon Traweek has described as pride in not engaging with applied science within the high-energy

[5] Bamford and Glinkowski, *Insight and Exchange: An Evaluation of the Wellcome Trust's Sciart Programme*, executive summary, 7–10.
[6] Isabelle Stengers, *The Invention of Modern Science*, 86.7 (*sic.* Stengers uses unusual page numbers).

physics community.[7] While artists sometimes gain more from the exchange than scientists, the question of how independent an artist can be under such patronage remains. Furthermore, it is not the individual artist or scientist who has gained most, but CERN itself. Arts@CERN did not promise events or objects, but both were created. The main outcome for CERN was new networks through the establishment of the cultural board, the new funding strategy, external arts funding and contacts in the art world that it would not have achieved without the project. The art, while part of these larger outcomes, was not the main focus for Arts@CERN.

These findings reveal an institution that is both welcoming and excluding to laypeople. While some artists move from a layperson position to becoming an accepted colleague at CERN (Peters in particular), the hope of their boundary-breaking qualities as expressed in the CERN cultural policy does not always manifest itself. In the context of a broader commercialised art and science market, this poses the question of the effects of contracts like Collide@CERN upon the creative process of artists. The new art programme has changed the way in which artists respond to CERN. Now more streamlined, some of the spontaneous character of artists' visits has been lost. Arts@CERN has altered some hierarchies by placing the winning artist and scientists together. But it has created others, such as a selection process and the privileging of specific types of art over others.

As explored in this thesis, the artists may also find themselves contracted to a theme or ideology. Some freedom is lost in the exchange between the individual and the institution. On the other hand, the experiences of the artists pre- and post-Arts@CERN reveal how much the professions of art and science have in common. The individuals who have been part of the CERN art programme have all made long-lasting connections and friendships. Their discussions revolved around creativity, playfulness, adventure and beauty, not business or the long-term plans of their respective organisations. In this sense, Arts@CERN both succumbs to and defies the larger CERN ideology. By recruiting artists who are fascinated by CERN to provide interpretations its work, we have seen how the organisation benefits in terms of PR. Yet, the scientists and artists who became part of Arts@CERN are meeting people they would perhaps not have

[7] Traweek, "When Eliza Doolittle Studies 'enry 'iggins", 5.

encountered otherwise. This was part of Ariane Koek's original vision. In an email, she writes that her role as a non-scientist is "absolutely and completely crucial."[8] At the heart of its function, Arts@CERN remains a cultural project at the centre of a large scientific operation. It speaks of subjective taste and creativity in a culture of objectivity, but this paradoxical existence may also be one of its strengths. While the project's outcomes, as shown here, are not particularly diverse yet, the potential for the project to grow into a challenger of the status quo, exists. There are a number of different types of artists waiting for that opportunity: the hundreds of Collide@CERN applications is proof of this. As the programme expands, the scene is set for more artists gaining access in order to disrupt and examine CERN's culture.

Analysing the artists' work and experiences at CERN can, as this thesis has shown, reveal how and why the organisation seeks to 'sell science' to the public. But if the art programme is left to CERN to interpret, the outcome will be PR-based, including scientifically correct contract art. 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."[9] The potential of the art programme lies in resurrecting the broader public debate about high-energy physics and the value of "big science", rather than acting as free publicity for an arts patron. If the common notion implies that artists should exercise freedom of speech in their work, we cannot fail to comment on their role as contract artists producing politically and scientifically correct SciArt in large organisations. In a time when culture can be a commodity, art at CERN risks becoming an exercise in selling science. But when individual scientists and artists are free to explore the world together, at the edge of their known universes, boundaries can be broken. This thesis contributes to knowledge by showing how CERN utilises the arts as PR as part of its own image-making and branding strategy. This case study also lends itself to the broader study of SciArt. It reveals the genre's institutional nature, and shows

[8] Koek in email to Røstvik, 22.06.2015.
[9] 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 26.06.2015).

how the role of both artists and scientists in such collaborations come second to the institutional interests that drive SciArt projects.

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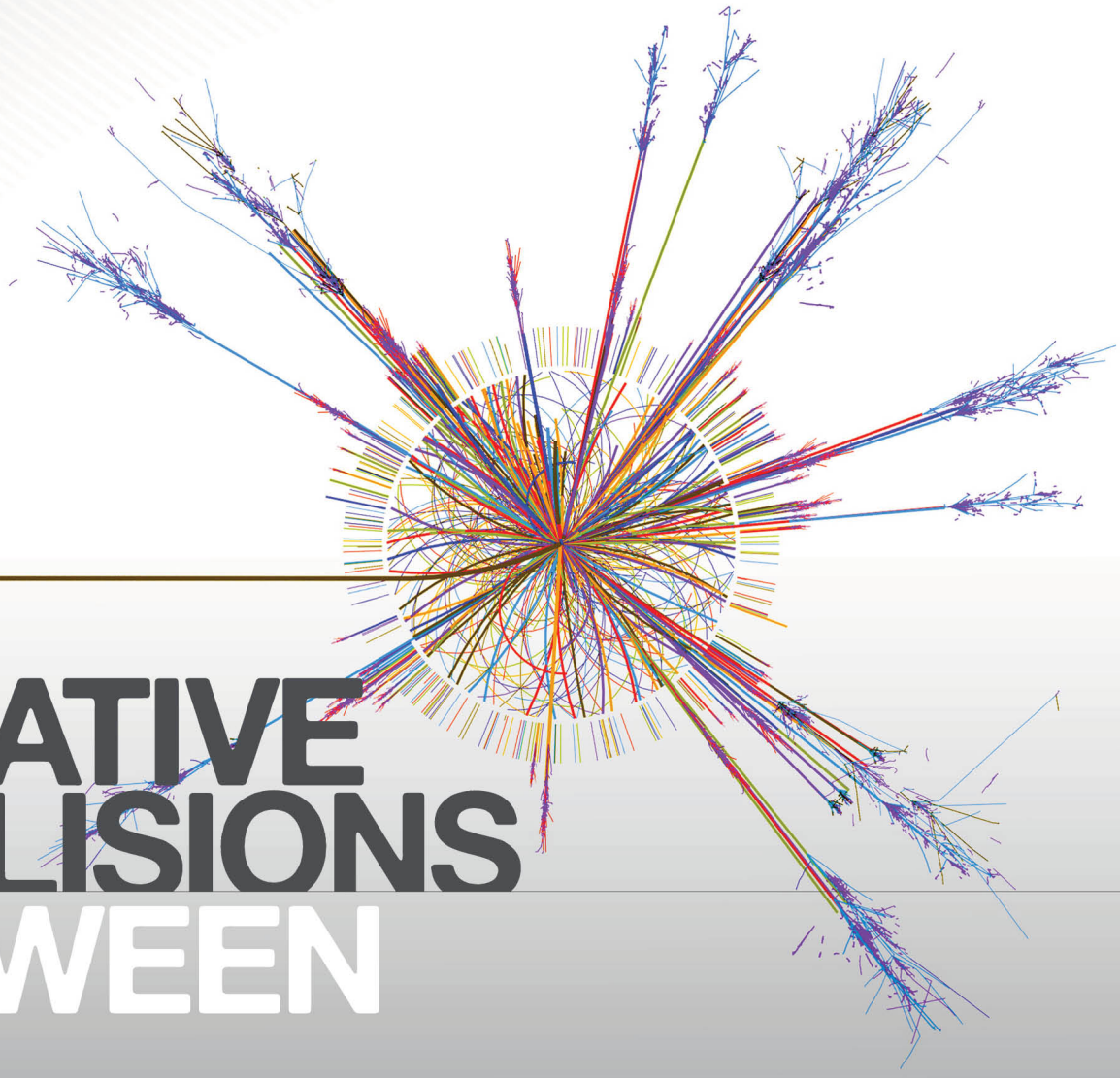
Appendices:



CREATIVE COLLISIONS BETWEEN THE ARTS AND SCIENCE

Collide@CERN

CERN

SUMMARY:

CERN'S Cultural Policy for Engaging with the Arts

INTRODUCTION
CULTURAL POLICY FOR ENGAGING WITH THE ARTS

This is CERN's first cultural policy for engaging with the arts. It was conceived as the foundation for **Collide@CERN** – the International Artists Residency programme. It became quickly apparent that if there is to be an International Arts Residency scheme, CERN crucially needed a Cultural Policy for Engaging with the Arts to provide the essential policy framework and foundations for the Collide@CERN arts residency initiative, as well as for all other high quality arts engagement and activities.

CERN's first cultural policy for engaging with the arts is called **Great Arts for Great Science**.

Both arts and science are ways of exploring the world we live in and our place in the universe. Science demonstrates its effectiveness through tests, equations and proof thus creating new knowledge and certainty, the arts demonstrates its impact through the senses, transporting people to see the world and relate to each other with a sense of wonder through the power of the imagination.

WHY GREAT ARTS FOR GREAT SCIENCE?

Called Great Arts for Great Science, CERN`s cultural policy creates for the first time the essential foundation and framework at CERN for expertise and knowledge of the arts to match CERN`s world renown for expertise and knowledge in science.

Great Science deserves Great Art – with the same high standards of selection and quality control that are made to employ talented world-class scientists, engineers and technologists at CERN, being matched by CERN selecting equally talented, world-class, innovative artists. The policy will enable this with a key recommendation, building in the necessary expertise by setting up for the first time an independent **Cultural Advisory Board for engaging with the Arts (CABA)**.

By adopting Great Arts for Great Science, CERN can clearly demonstrate to the global cultural community that it is a cultural force – by engaging its great science with great arts.

"GREAT"
IS DEFINED AS...

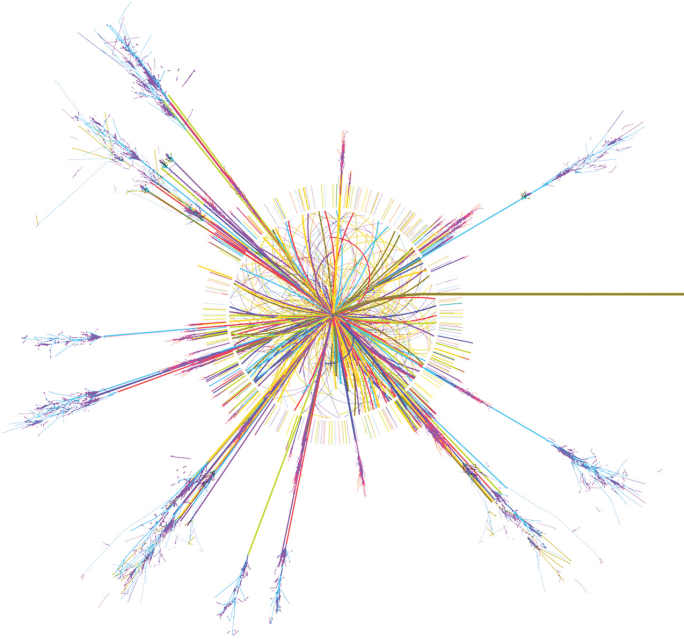
Established Talent – World-class and recognized excellence, exceptionalism and ability.

Emerging Talent – New talent that demonstrates exceptionalism, innovation, imagination and the ability to break the mould in their art forms to create the truly original and inspirational.

Whilst in science, greatness is measured according to the absolutes of scientific proof and results, in the arts it is judged and assessed according to a combination of the experience and knowledge of the history of the different art forms demonstrated by experts - who include practitioners, curators, directors, producers, and critics. These are the kinds of people qualified to make valued critical judgments and choices about artists and their quality, their exceptionalism and their ability – thus ensuring Great Art for Great Science.

PLEASE NOTE:

The term '**artists**' is used generically to encompass people who work in the fields of dance, literature, theatre, film and television, digital arts, visual arts, architecture, design and music – the entire range of artistic activity as it is defined in the outside world.



THE FOUR MAIN STRATEGIES
FOR GREAT ARTS FOR GREAT SCIENCE

The following four strategies are essential for ensuring that the aims, values, and missions of Great Arts for Great Science are implemented in the Cultural Policy:

STRATEGY ONE

To create expert knowledge in the arts, in addition to that provided by an arts professional, by setting up the honorary Cultural Advisory Board for engaging with the Arts (CABA) that will include arts professionals at the highest level.

STRATEGY TWO

To create clear entry points for artists to visit CERN in which CERN adopts a system for dealing with unsolicited cultural proposals and artists enquiries, including visits, with a single point of contact, an arts professional, who has cultural expertise and knowledge to evaluate the requests. The arts professional works with the Cultural Advisory Board for Engaging with the Arts when major partnership proposals are made. The most obvious and clear entry point for artists will be the Collide@CERN Arts Residency Programme.

STRATEGY THREE

To instigate Collide@CERN the arts residency scheme to encourage dialogue and exchange between arts and science at the same level by selecting imaginative and extraordinary artists for their excellence to work alongside CERN scientists.

STRATEGY FOUR

To provide for the first time professional cultural expertise and advice to already existing homegrown arts activities at CERN – CinéGlobe, for example – to enable them to fulfill their cultural potential.

– Ariane Koek
International Arts@CERN

APPENDIX II: OVERVIEW OF KNOWN CERN ARTISTS

	A	B	C	D
1	**APPENDIX II: OVERVIEW OF KNOWN CERN ARTISTS**			
2	(In no particular order. Women in bold)			
3				
4	**ARTIST**	**ART MEDIUM**	**YEAR**	**Nationality**
5				
6	**Jane Wilton**	Digital print and photgraphy	2012	UK
7	Gerhard Mayer	Ink drawing, murals	2012	GER
8	Eno Henze	Digital print, LED technology	2009 - 2012	GER
9	Anthony Gormley	Sculpture	2008	UK
10	**Niamh Shaw**	Performance	2012	IRELAND
11	Robert Harris	Author	2011	UK
12	David Lynch	Film	2011	US
13	Reit Larsen	Author	2008/2010	US
14	**Monica Sand**	Sculpture	2000/2003	SWEDEN
15	Gianni Motti	Performance	2005	SWISS
16	**Paola Pavi**	Interactive installations	2003	IT
17	Serge Moro	Interiour installation	1987	FR
18	Mimescope Theatre Company	Theatre	2001	SWISS
19	Patrick Hughes	Installation	2001	UK
20	Philip Glass and Frans Lanting	Multimedia concert	2008	US/NETH
21	Chris Drury	Landscape art	2007	UK
22	Bigert and Bergstrom	Film	2009	SWEDEN
23	Ecole-Atelier Rudra Bejart	Ballet	2000	SWEDEN
24	Jerome Basserole	Installation	2000	FR
25	Dance Xchange and **Liz Lerman**	multi	2007	US
26	Simon Norfolk	Photography	2008	UK
27	Roland Olbeter	Stageset	2009	GRE/SPAI
28	Gilles Jobin	Dance	2011	SWISS
29	Jan Peters	Film	2013	GER
30	Bill Fontana	Sound art	2012	US
31	Julius von Bismarck	Installation and performance	2011	GER
32	Deceliere & Hanni	Music and installation	2014	SWISS/FR
33	*Ryoji Ikeda*	Light sculpture	2014	JAP
34	**Iris van Herpen**	Fashion	2014	NETH
35	Mark Baldwin	Choreography	2014	US
36	Aleix Plademunt	Photography	2014	MEX
37	Christopher Keller	Photography and Film	2013	UK
38	**Ale de la Puente**	Multimedia, industrial design	2013	MEX
39	Wolfgang Tilman	Photograhy	2013	GER
40	Mark Bowden/Owen Sheers	Composing/Author	2013	UK
41	**Rosalind McLachlan**	Virtual art	2013	UK
42	Essa-Pekkka Salonen	Composer	2013	FIN
43	Alberto Di Fabio	Painter	2014	IT
44	**Christina Tingskog**	Choreography	2014	SWEDEN
45	Ruben von Leer	Opera	2000-2010	
46	**Nadezda Surorova**	Interactive design	2014	SWI
47	Mario von Rickenbach	Game designer	2014	GER
48	Nikos Papdopoulos	Visual art	2014	GREECE
49	**Carla Scarletti**	Composer	2011	US
50	**Pipilotti Rist**	Video and installation	unknown	FIN
51	A. Noorderaaf/Adrian Hornsby	Composer/Writer	2013	DUTCH/UK

APPENDIX II: OVERVIEW OF KNOWN CERN ARTISTS

	A	B	C	D
52	James Lee Byars	Performance, conceptual	1972	US
53	**Natasa Teoflic**	New Media art	2013	SERBIA
54	Laurent Essic	Landscape design	2010	SWISS
55	Charles and **Lily Jencks**	Landscape design	2010	UK
56	**Gayle Hermick**	Sculpture	2005	CAN
57	Jospeh Kristofoletti	Mural, street art, graffiti	2010	US
58	Jonathan Feldshuh	Windows, objects	2011	US
59	Andre-Pierre Olivier	Game designer	2012	FR
60	Mark Levinson	Documentary film	2013	US
61	Russel Davis	TV	2008	UK
62	**Liz Mermin**	Film	2012	UK
63	Bram Conjaerts	Film	2009	DUTCH
64	*Les Horribles Cernettes*	Music	1990s	INT
65	Keith Tyson	Tech-art	2009	UK
66	Roger Ackling	Wooden sculpture/driftwood	unknown	UK
67	Tim O'Riley	Photography	unknown	UK
68	**Sylvie Blocher**	Multimedia, performance	unknown	FR
69	Richard Deacon	Sculpture	unknown	UK
70	Ken McMullan	Film	unknown	UK
71	Bartlolomeus dos Santos	Printed image	unknown	PORT
72	Dan Brown	Author	2000	US
73	**Agnes Meyer-Brandis**	Installation	2014	GER
74	Otto Künzli	Jewellery	2014	SWISS
75	Andre Bucher	Sculpture	1972	SWISS
76	Will Self	Radio programme for BBC	2015	UK
77	Will.i.am	Music/social media (selfie)	2014	US