On the Entanglement of Science and Europe at CERN: The Temporal Dynamics of a Coproductive Relationship

Kamiel Mobach and Ulrike Felt

Department of Science and Technology Studies, University of Vienna, Vienna, Austria

ABSTRACT
The European Organization for Nuclear Research (CERN) is one of the oldest, largest, and most emblematic European research infrastructures. Its history, as expressed through narratives of its own organizational identity, does not only reflect the development of its technoscientific activities but also strongly references a multiplicity of performances of Europe. By analysing these narratives of organizational identity over nearly seven decades, it is possible to observe an ongoing coproductive relationship between technoscientific and sociopolitical orders—more specifically between particle physics and Europe. Furthermore, there has been a considerable shift in the justificatory and explanatory relationship between these orders. In its first three decades, CERN was envisioned as an organization in which European unity could be accomplished through science. A broad vision of science as a common European language contributed to an imaginary of postwar Europe (re-)united through its cultural/scientific roots. Roughly since 1990, however, CERN has been presenting itself as a ‘laboratory for the world’, thereby constructing a new imaginary of Europeanness as an organizational and cultural resource to support global particle physics. Thus, there has been a narrative shift from European collaboration being promoted through science, to science on a world scale being promoted by a specific idea of Europeanness. Studying the temporal dynamics of coproductive relationships like these sensitizes us to shifts of balance between sociopolitical and technoscientific orders: it reveals which orders are narrated as drivers and which as driven as well as how this opens up or closes down justificatory narratives and ways of acting.

KEYWORDS
CERN; Europe; globalization; coproduction; temporality; organizational identity narratives

Introduction
Currently, more than ever, the question of how science and politics relate, or should relate, has become an issue of debate in policy circles and beyond. This issue follows two lines of reasoning. On the one hand, multinational
technoscientific research infrastructures are perceived as becoming increasingly essential, as cutting-edge research requires cost-intensive instrumentation that would push any single nation to its limits. On the other hand, much of what happens around large-scale multinational research infrastructures gets framed as a form of science diplomacy, thereby highlighting values such as building bridges between communities or nations. One can argue that both perspectives point us to the issue of how deeply knowledge orders and sociopolitical orders are entangled. Traces of such ‘coproducive’ relationships can be found in discourse around (the histories of) research infrastructures, in their organizational practices and in (narrative) performances of their identities (Jasanoff, 2004).

To date, some research infrastructures have reached a considerable lifespan and thus allow us to look at these coproducive developments over time, thereby going beyond investigating any specific moment or performance of the entanglement of research infrastructures and sociopolitical environments. Taking as our case study the European Organization for Nuclear Research (CERN), which is one of the oldest, largest, and most emblematic European research infrastructures, we want to invite the reader to follow the complex and multifaceted enactments of Europe and science in CERN’s ‘organizational identity narratives’ (Czarniawska, 2007). In doing so, we do not start from clear-cut understandings of Europe and science but rather look at how such understandings are enacted in specific settings and at specific moments in time.

Europe, as we will show, has appeared under many different denominations, conceptualizations, and representations, relating to unity, cohesion, collaboration, and geography (Figure 1), which have often been in reference to so-called European values. Narratives about a shared European history or a shared European spirit have repeatedly been constitutive of such imaginations. We will argue that by covering over 60 years of CERN’s lifetime, we can witness a shift in the ongoing coproducutive relationship between science and society—more specifically between CERN’s activities in particle physics and enactments of Europe in CERN’s organizational identity narratives. Therefore, this paper, beyond making a contribution to understanding CERN’s history, will also show that this coproducutive relationship is subject to temporal dynamics. Before diving into the analysis, we want to share a vignette that describes a moment that enacted the entanglement of specific narrative versions of Europe and science at CERN.

On 21 September 1984, heads of states, ministers, scientists, and administrators gathered in a large hall filled with scientific equipment to celebrate CERN’s thirtieth anniversary. The speakers addressed the gathered crowd with words about CERN’s scientific successes. One of these was the 1983 discovery of the W and Z bosons, which would lead to a Nobel Prize only a year later. However, more words were spent on CERN being a success of European collaboration in science. CERN was praised as ‘manifest evidence of European unity’, as a ‘cathedral’ or ‘temple of science’, and as contributing to ‘the spiritual and material development of man within the framework of deep European solidarity’ (30th Anniversary Speeches, 1984, authors’ translation).

In this moment of celebration, a re-envisioning took place as well. ‘Even in a European lab’, one of the anniversary speeches argued, ‘one cannot think of science in anything other than a global context’. Continuing to reflect on the future, the speaker stressed that ‘now CERN, as it has always been, is much more than simply a European lab’ (30th Anniversary Speeches, 1984, p. 6).
This short excursion into the utterances concerning the role of CERN at this celebratory moment hints towards the wider role that scientific organizations such as CERN play(ed) in the (re)making of Europe. It was a moment to look at the past as well as to envision the future: While always having been a ‘European lab’, CERN was simultaneously envisioned as much more ‘than simply a European lab’. Furthermore, the vignette points to the shifting entanglements between political and scientific spheres at CERN. Gradually, that relationship seems to have shifted from a phase of (re)making Europe through science to a phase in which Europe—both from a political and scientific perspective—appeared to be stabilized and CERN was ready to become a key player in shaping global science while still embracing and performing a specific idea and ideal of Europeanness.

To substantiate this hypothesis, we will investigate the following question: How has the coproducive relationship between enactments of science and Europe in CERN’s organizational identity narratives changed over time? We will discuss this question through the analysis of CERN’s annual reports, reports of administrative committees, vision papers and outreach material, as well as seven interviews conducted during a stay at CERN. We will, as a first step, underline the importance of dominant narratives and visions in such

Figure 1. Connections between CERN and national research institutes around 1975. Source: CERN.
official documents and offer a reflection on our understanding of documents and their analysis. The subsequent analysis will be structured in two phases, starting with a phase of making Europe through science, followed by a phase of using Europeanness as a resource for global science. In conclusion, we will reflect on the multiple identities of CERN and Europe that have been performed in and through their situated mutual entanglements and on the role of institutional identity discourse and visions. Finally, we will argue for the need to be attentive to temporal dynamics of coproduction due to shifts in explanatory and justificatory relationships.

**Storytelling, Visions and Identities: How to Know an Organization?**

Even if we investigated CERN mainly as an enterprise that brings a highly sophisticated technological infrastructure into being, Larkin reminds us that such infrastructures always ‘emerge out of and store within them forms of desire and fantasy’ (2013, p. 329). This invites us not only to focus on the organizational, technological and scientific activities of CERN but also to examine its narrative practices. In that sense, we follow Czarniawska’s understanding of ‘organisational narratives as the main mode of knowing and communication in organisations’—as well as beyond the organization, we would add (1998, p. 16). We thus embrace a narrative mode of understanding CERN, which enables us to engage with the argumentative repertoires and modes of justification that CERN produces while also keeping trace of its infrastructural, socio-political and scientific life (Boltanski and Thévenot, 2006). Looking into ‘organisational identity narratives,’ we analyze not only ‘official historical documents but also all kinds of collective storytelling that attempt to create a quasi-subject, the Organisation’ (Czarniawska, 2007, p. 392).

We follow narrativity as a locus for observing ‘coproduction’, which is ‘short-hand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it’ (Jasanoff, 2004, p. 2). More specifically, we will write about the coproduction of sociopolitical and technoscientific narrative orders (i.e. the positioning of CERN in and through political agreements and visions for society, and its positioning as enabling particle physics together with the necessary large-scale technologies). Furthermore, this paper contributes to the long-standing issue of ‘the direction of the influence of knowledge on power’ (Jasanoff, 2004, p. 36). By following narrative practices over time, we show that this direction of influence is far from static and that understanding this dynamic allows us to better situate the development of CERN and its place in the sociopolitical and technoscientific realms.

Our specific focus on coproduction also invites us to investigate promises and future-making practices that are spelled out in the form of narratives. These not only reflect the ‘prevailing institutional structures, express values
and reinforce collective aspirations’ but also ‘tacitly define the horizons of possible and acceptable action’ (Felt et al., 2007, p. 73). They always address values that guide both the life of the infrastructure and the organization that builds and runs it and that allow us to ‘distinguish relevant issues from non-issues, and central actors from non-actors’ (Felt et al., 2007, p. 73). Of specific interest will be those narratives that are stabilized and rehearsed regularly over time, as they allow us a glimpse into how sense-making happens and how it develops over time. We call them ‘narrative infrastructures’ as they form a temporarily stable network of narratives through which shared meanings and values of CERN as a European infrastructure and organization can be articulated, circulated and exchanged (Felt, 2017).

Focusing on narrative infrastructures at CERN moves our analytic gaze beyond single moments of envisioning or narrating as well as beyond single actors’ utterances. The word *infrastructure* in this concept suggests that certain narratives and visions are ‘embedded’, ‘installed’ or ‘standard’ in institutional settings and that changing or steering these happens in ‘modular increments’ (Star, 1999).

Accordingly, our investigation is reminiscent of and inspired by the concept of the *imaginary*. Especially Jasanoﬀ and Kim’s concept of ‘sociotechnical imaginaries’ is helpful because it builds on the idiom of coproduction and is attentive to narratives while simultaneously being ‘associated with action and performance or with materialization through technology’ (Jasanoﬀ and Kim, 2015, p. 20). Attending to the narratives that perform and sustain such sociotechnical imaginaries will, therefore, mean looking ‘back at past cultural achievements and ahead to attainable futures’ (Jasanoﬀ and Kim, 2015, p. 22). Thus, a CERN without its leadership, the scientiﬁc community or policy makers—i.e. the ‘imagined community’ willing to invest in it with their shared visions—would remain a fragile construct (Anderson, 1983).

**Methodological Considerations: Investigating 65 Years of CERN**

Most of our ﬁndings are based on the analysis of documents from CERN’s online archives (http://cdsweb.cern.ch/). These include annual reports, reports to administrative committees, vision papers and outreach material. These documents give us insight into the range of activities carried out at CERN and what signiﬁcance was given to them. Next to serving as records, documents are also used to regulate and coordinate and, therefore, can be seen as active participants in organizational processes (Shankar et al., 2017). Through this coordinating role, documents do not just document but more generally ‘enact, or take part in enacting, realities – that is, how words and things go together’ (Asdal, 2015, p. 87).

The bulk of our document corpus consists of 65 annual reports (1955–2019). An annual report is a document that showcases an ofﬁcial overview of the
activities of an organization. Because of its aim of providing an overview, an annual report gives narrative coherence to an organization, no matter how diverse its activities. Moreover, because of their recurring, calendric character, annual reports relate to each other in a temporal modality, thereby also providing narrative coherence over time. These attempts to provide coherence reveal which narrative strategies are available to CERN. It is an analysis of these narrative strategies that we seek, as well as an analysis of how they shift over time together with, and in response to, scientific and sociopolitical developments.

Historical narratives found in annual reports often do not withstand historiographical scrutiny and might rather be examples of ‘commemorative practices’ that ‘read, reorganize and reinterpret past intellectual achievements without avoiding [...] “anachronism”’ (Pestre, 1999, p. 204). Nevertheless, we think it is worthwhile to interpret their imposed coherence as a form of narrative steering (Bos et al., 2014; Felt, 2017).

Before entering the details of our analysis, we want to outline not only the moments in CERN’s nearly seven-decade long history that we analyzed but also the basic three registers of organizational identity narratives that we identified. While the moments point to discursive temporal shifts, the registers point to the basic narrative strategies that institutional story tellers could tap into and use to create a temporally situated blend.

**Identifying Seven Key Moments**

Through a ‘focused coding’ of CERN’s annual reports (Charmaz, 2006, p. 57–60), we identified seven moments in the history of CERN at which narrations and visions of Europeanness were strongly expressed (Table 1). We see these moments as narrative snapshots that allow us to develop a comparative examination of (dis)continuities in CERN’s narrative infrastructure and reconstruct the temporal dynamics of the coproductive relationship. We chose these seven moments because they either reconfigured CERN’s narrative resources and discursive possibilities or consolidated previously articulated narratives into a more stable form. The exploration was deepened by analyzing publicly available policy and strategy documents, video material, and transcripts of speeches and presentations.

Furthermore, we conducted seven ‘problem-centred interviews’ with (former) members of CERN’s management and with researchers at CERN to sharpen our analysis (Witzl and Reiter, 2012). Informed consent was established before the start of each interview. The interviews covered a variety of themes but revolved around the questions of what is regarded as European about CERN and what this Europeanness means/mean in practice. Quotes from these interviews show how phrases that we observed in documents return in conversation at CERN. Here, the mere fact that phrases and ideas recur is more important than that a specific person expresses them.
Three Registers of Organizational Identity Narratives

By analyzing the explicit and implicit (dis)continuities in CERN’s narrative infrastructure, we found recurring phrases relating to Europeanness such as ‘European cultural unity’, the ‘spirit of Europe’, the ‘Europe of tomorrow’, ‘European experience’, the ‘European strategy’, the ‘European organizational model’ and the ‘European heart’. We can group these Europeanist utterances into three registers (Boltanski and Thévenot, 2006). The first is an affective register of spirit, heart, and unity. The second, by linking past experience to visions of tomorrow, relates to what Arjun Appadurai calls ‘trajectorism’ (2013, p. 223–5). This trajectorial register constructs imaginations of a cumulative progression from past (European) achievements to future visions, which are seen as a logical, almost natural consequence of that past. The third is a utilitarian register that refers to organizational and strategic competences, as well as to the wider usefulness of both the sociopolitical and technoscientific innovations produced at CERN.

As we will see in the following analysis, all three registers have an important role to play in the identity work that CERN performs to create coherence for the institution over time. Therefore, the three registers should not be seen as disjoint narrative modes but rather as three ingredients that come together in CERN’s narration of its success stories. First, the affective register is essential for defining and framing CERN’s missions and for providing a sense of importance to those missions. Arguments from the affective register create a sense of

Table 1. Seven Moments in CERN’s History That Gave Rise to, Reworked or Stabilized CERN’s Narrative Resources.

| Moment | Timeframe | Description |
|--------|-----------|-------------|
| 1 The CERN Convention and its Prehistory | 1949–1954 | The convention was, and has remained, a strong affective reference point through its description of European collaboration in pure science free from military applications. |
| 2 Budget Reductions | 1975–1981 | CERN’s directorate was faced with budget cuts; there was a shift in argumentation for efficient and rational expenditures and growing utilitarian arguments as narrative strategies. |
| 3 30th Anniversary | 1984 | After a major scientific breakthrough (W and Z bosons), CERN’s visions were finally backed up by success; the past, present and future of the organization got turned into a single narrative of breakthroughs. |
| 4 ‘Dramatic Changes in Europe’ | 1989–1993 | CERN highlighted that the values it stood for brought Western Europe together after the Second World War and would thus also help integrate Eastern Europe. |
| 5 ‘A Laboratory for the World’ | 1998 | Expanding collaborations led to the emergence of a globalization narrative; this was portrayed as a logical continuation of the (European) values that CERN had stood for. |
| 6 The European Strategy for Particle Physics | 2006–2010 | CERN envisioned a strengthening of its central position in global particle physics through a consolidation of European capabilities; a working group investigated organizational expansion beyond Europe. |
| 7 60th Anniversary | 2014 | CERN celebrated being a success of European scientific collaboration; this narrative led to a claim that CERN’s European organizational model allowed it to include global partners and that this model could be exported to other regions. |
belonging for CERN in Europe by portraying it as a product of and vehicle for the values that are ascribed to Europe. Second, the trajectorial register provides arguments to claim that there exists a continuous historical development between the past and future of Europe, as well as of CERN. This allows CERN to argue for certain futures based on stories about the past. Third, there is the utilitarian register that functions as a support for the other two. When any doubt arises about the worth of values and the possibility of realizing future visions, CERN can use this register to argue that it has the organizational and technical capabilities to carry out its plans. Examples of past technical and organizational achievements can function as back-up for claims about capability in the future. In this way, trajectorial arguments again support the utilitarian register.

Analysis: The Coproduction of Science and Europeanness at CERN

Making Europe Through Science

European Spirit and the Establishment of CERN

He was a French diplomat and you could truly, still at his age, see his sparkling eyes when he talked about CERN. […] He, and I quote him, said ‘The best work I ever did as diplomat was the foundation of CERN.’ I think that characterizes at least in the spiritual sense the CERN model, the CERN spirit (interview 7, former member of directorate).

The foundation of CERN has an almost mythical character in CERN’s organizational identity narratives. In the above quote, we see a reference to a ‘CERN spirit’ that can, allegedly, be traced back to postwar diplomats. Whereas a consistent ‘CERN spirit’ is a retrospective construct, phrases that contain the word spirit do have a historical reality. After the Second World War, visions of a peaceful Europe depended on imaginations of a common European culture and spirit that was shared not only by all Europeans but also by all Western civilization. As Hermann et al. describe, intellectual circles that were proponents of such ideas had a distinct effect on the establishment of CERN (1987). Here, we first want to focus on an initiative made by the Centre Européen de la Culture (CEC) at its 1949 conference in Lausanne (Movement Européen, 1949). At this conference, the suggestion was made to Europeanize nuclear research as a concrete step to culturally reunite Europe. The CEC saw science as a cultural phenomenon that, like art and literature, could transcend nationalism due to its universalist nature. Moreover, they envisioned that Europeanizing nuclear research would reduce the technical and military advantage that single nations could gain over others.

For the CEC, this project would be one of re-uniting Europe, based on their assumption that all European cultures shared the same origin but had
diversified over time. They saw Europeanness as consisting of a distinctly European culture, morality and spiritual life based on Christianity and humanism. European unity was, therefore, not a matter of constructing an identity but of ‘letting it manifest itself’ through openness and freedom of exchange. At the same time, they paradoxically saw the specificities of European culture as universally applicable to the whole of humanity (cf. Chakrabarty, 2008):

Europe has always been open to the whole world. Rightly or wrongly, out of idealism or ignorance, by virtue of its faith or imperialist views, it has always conceived of its civilization as a set of universal values (Mouvement Européen, 1949, p. 12–3, authors’ translation).

Also in the Council of Europe, CERN was mentioned as an initiative that would contribute to Europe regaining a leading position in the world through its spiritual and cultural unity (Schuman, 1953). In a roundtable discussion chaired by the CEC’s director Denis the Rougemont, the participants expressed the following:

Europe’s mission cannot end with the decline of its political supremacy in the world. Today that mission is spiritual in nature. It is for Europe to give meaning to contemporary life and thus to acquire a leading moral position (Council of Europe, 1953).

British historian Arnold Toynbee, a participant in this roundtable, stated that Europe could not be unified by delineating itself from the rest of the world, because Europe ‘in some sense united the globe […] by casting a network of European technology, commerce and culture around the whole face of the planet’ (1953). We read this as an attempt to come to terms with the paradox between a postulated European origin of technologies that had been circulating in European intercontinental empires and the undeniable non-European influences that these technologies must have built on by virtue of their wide circulation and adaptation. This paradoxical universalist justificatory role of science retained its relevance in the imagined future of postwar Europe. It was seen as the driving force for the progress of civilization and as universally applicable but of European origin.

**Drafting the CERN Convention**

If Europe is defined by universalism, where can its boundaries be drawn? On a political level, this paradox is illustrated by the amendments to the CERN convention made by British diplomats. These amendments concerned article III.2, which would define how states that were not part of the original negotiations could become a member of CERN. Article III.2 was one of the most heavily contested when writing the convention (Hermann et al., 1987, p. 250–2 and p. 331–4). An early draft simply stated that ‘other European states’ could join the—mostly Western European—members if they also ratified the convention (European Council for Nuclear Research, 1952a). The British, however,
opposed Eastern European membership and wanted to keep membership open to the Commonwealth and to the United States.

To achieve this, the British delegation first proposed inviting new member states only if a two-thirds majority of Council desired to do so (European Council for Nuclear Research, 1952c). This approach would increase the chance of excluding Eastern European states. Later, they proposed deleting the word ‘European’ from the article altogether (European Council for Nuclear Research, 1953). By not defining in advance who could and who could not join CERN, a principle of openness towards both Eastern Europe as well as the United States and the Commonwealth could be maintained. The British reluctance to define the European character of CERN can be seen in the context of their relation to the Commonwealth. Although British delegations had often stressed the values of European spiritual and cultural unity—as in the famous 1946 Zürich speech by Winston Churchill—they envisioned the unification of Europe as being parallel to and modelled after the British Commonwealth rather than being part of it themselves (Harris, 2010, p. 47).

This political controversy over CERN membership did, however, not greatly affect the convention’s article II.1, which describes the purposes of the organization. The focus of this article was to describe the nature of CERN’s scientific activities. On the one hand, this discussion drew from an idealistic vision of science as pure and impartial; on the other hand, it also drew from a wish to not share secret military knowledge through an obligation to free and open scientific exchange (European Council for Nuclear Research, 1952b). The convention’s article II.1 defines the purposes of CERN as follows:

The Organization shall provide for collaboration among European States in nuclear research of a pure scientific and fundamental character, and in research essentially related thereto. The Organization shall have no concern with work for military requirements and the results of its experimental and theoretical work shall be published or otherwise made generally available (Convention, 1953).

Through its idealistic characterizations of science, article II.1 of the convention quickly became a strong visionary reference point for CERN. The first annual report, as well as those from 1960 until 1984, contain the article in full. It remains a strong reference point even today, as the following interview quote implies:

The people who wrote this, they were very clever and had a clear mind to be precise but not too precise; to leave the door open for possible future developments (interview 3, former member of directorate).

The article’s allusion to ‘pure’ science fits the idea of a reinvigoration of European culture well. It is a reference to a concept that was more widely used in late-nineteenth-century Europe and its colonies. The use of the adjoined
phrase ‘fundamental character’, however, fits the postwar science policy context better and resonates with Vannevar Bush’s publication, *Science, the Endless Frontier*, thereby pointing at the influence of the US on the vision of a Europe unified through basic science (Krige, 2006). The simultaneous use of the two terms suggests a discursive link between new (fundamental) and old (pure) conceptions of science, as well as a semantic shift in the concepts themselves (Clarke, 2010; Pielke, 2012; Schauz, 2014).

The existence of a discursive link between the concept of pure science and European culture is further illustrated by a speech given by C. F. Powell on the occasion of CERN’s tenth anniversary (1964). Powell argued that the progress of civilization depended on pure science from the past, which justified continued spending to secure future progress and that science was an indispensable element of European morale and culture.

**The European High-Energy Pyramid**

Next to imaginative and diplomatic resources affecting what the category *Europe* meant at CERN, systematic collaboration between high-energy-physics institutes in Europe gave this category substance (Figure 2). Up to this day, this multinationalism is important for CERN’s Europeanness:

Pretty much every European country is involved in experiments at CERN. There are some experiments that have a national flavor to them and it is, I think, more an accident of history that the expertise was in that country (interview 6, senior researcher).

Recently, Roberto Lalli examined how efforts for coordination between universities and physics institutes in Western Europe were framed as contributing to European cultural unification in the 1960s (2021, p. 107–111). Lalli describes how two physicists at CERN, Gilberto Bernardini and Wolfgang Gentner, were active in promoting a scheme that would connect institutes to each other, partly through their relation to CERN. This scheme, the *European high-energy pyramid*, would see a coordination of research efforts and a flow of researchers among Western Europe based on the strength of the equipment at the various institutes. CERN was to be found at the top of this pyramid. To promote this scheme to the CERN Council, which consists of representatives of member-state governments, Bernardini and Gentner wrote the following:

The institution of centres of education at this level, producing of the order of a few hundred Ph.D. per year, will favour the trends of a European scientific culture unbounded by those more humanistic than scientific traditions which were, and still are, one of the most serious obstacles to the development of Europe as a nation (Bernardini and Gentner, 1965).

The scientific culture of physics, in this quote, is portrayed as being able to overcome the limitations of the humanities, namely, the fact that they describe the differences between European cultures. This is an appropriation of arguments
put forward by institutions such as the CEC and the Council of Europe in an original way. It posits physics as a ‘common European language’ that could culturally unify Europe (Lalli, 2021, p. 111–112). Lalli’s observations of the efforts of people such as Bernardini and Gentner are corroborated by CERN’s annual reports. In the annual report of 1965, for example, director-general Victor Weisskopf discussed the coordination of European physics as follows: ‘You cannot distinguish between the work in high-energy physics at CERN and in Europe. The work in Europe depends on CERN and the work of CERN depends on Europe’ (Annual Report, 1965, p. 12).

Science as Embedding and Embedded in European Culture
During and after the founding of CERN, visions of science were used to construct visions of a unified Europe. We see this construction as an ongoing coproducutive relationship between visions and narratives of science and of Europeanness, together with their material entanglements. In this relationship, the technoscientific, in the form of ideas about the nature of science, was the
justification for a felt sociopolitical necessity of European unity and the explanation for how this unity could be achieved under the banner of CERN. Broad visions of science as European culture explained the existence of CERN and were used to argue for its continuation into the future; for example, when director-general Willibald Jentschke wrote that ‘whether Europe is to continue to participate in the culture of this century—the advance of scientific knowledge—will depend upon plans laid in the next few years’, referring to the budgets to be determined by the CERN Council (Annual Report, 1975, p. 31).

Intermezzo: The ‘Very Big Accelerator’ and Expansion of CERN’s resources – Between Collaboration and Competition

CERN was not the only arena where universalistic visions of science were used to argue for certain social orders. Another important example of such a relationship is the idea of a ‘world accelerator for peace’, which was openly discussed for the first time at the 1959 meeting of the ‘International Union for Pure and Applied Physics’ in Kiev in the midst of the Cold War. This project was seen as a unique opportunity to overcome increasing international political tensions (Kolb and Hoddeson, 1993, p. 104). Building such a unique accelerator ‘and operating a World Laboratory’ was described as an endeavour of ‘not only […] exploring nature, but […] also exploring some of the ingredients of peace’ (Kolb and Hoddeson, 1993, p. 105). Here, we can witness narratives of international harmony and a shared culture in the physical sciences that was seen as powerful enough to work despite prevailing tensions.

A more concrete vision of a ‘very big accelerator’ (VBA) was put forward in 1975 at a seminar under the leadership of the organizing committee chairman Victor Weisskopf, formerly the director-general of CERN (Riordan et al., 2015, p. 7). The VBA was conceived of as either a 10–20 TeV fixed-target proton accelerator or a ±100 GeV electron-positron collider. Both options were expected to be too large to be built and financed by any single region—i.e. it would be an infrastructure of such size that a ‘world-wide CERN would be necessary and desirable’ (Kolb and Hoddeson, 1993, p. 108). Weisskopf later commented that the VBA would be a ‘symbol of human values’ and ‘international collaboration beyond ideological frontiers’ (Kolb and Hoddeson, 1993, p. 109).

The political specifications of the VBA, however, turned out to be harder to agree upon. While the planning of a VBA was ongoing, CERN approved the construction of its Large Electron-Positron Collider (LEP) in 1981, with specifications that were similar to those of the collider variant of the VBA (CERN Council, 1981). Two years later, a recommendation was made in the US for the building of the Superconducting Super Collider (SSC), which was a proton-antiproton collider that would also reach energies that the VBA proposal had reserved for worldwide collaboration and thereby attracted European
and Japanese suspicion of co-opting the VBA for nationalistic purposes (Kolb and Hoddeson, 1993, p. 121). Parallel to this criticism, however, CERN’s Scientific Policy Committee stated the following in 1979: ‘While competition cannot be our main motivation, certainly it must be allowed to play a role, and we see an excellent opportunity for Europe to be first in this domain of human activity’ (1979, p. 4). Thus, a situation emerged in which both Europe and the USA were working on accelerators on the scale of the envisioned VBA.

The increase in accelerator energies was accompanied by an increase in the number of physicists collaborating on experiments embedded in these accelerators. Whereas scientific experiments in the 1970s typically required the collaboration of up to a dozen scientists producing and studying pictures from bubble chambers from a specific angle, the two experiments that discovered the W and Z bosons in 1983 were carried out by almost 150 scientists in total (Krige, 1996, p. 256). This increase in team size was accompanied by a shift towards the use of electronic detectors, which replaced the use of bubble chambers. Another large difference from earlier experiments, apart from scale, was the fact that these scientists came from roughly a dozen different institutes. Today, publications can have an order of magnitude more authors, as was the case for the papers announcing the discovery of the Higgs boson in 2012 (ATLAS Collaboration, 2012; CMS Collaboration, 2012).

Multi-national collaborations were not unique to CERN. Fermilab, located in the US, set up guidelines for the participation of groups from outside the US in its experiments in 1979; these guidelines were quickly adopted by other laboratories throughout the world (Kolb and Hoddeson, 1993, p. 116). For CERN’s LEP, multi-institutional collaboration on experiments diffused the material and personnel costs to other institutions. Of the 320 million Swiss francs needed to build the LEP’s four detectors, 50 million were paid by CERN, 160 were paid by member-state institutes and 110 were paid by non-member-state institutes (LEP Experiments Committee, 1984, p. 11). The latter were located in regions as diverse as Japan, Russia, the United States, China, India and Israel. Furthermore, these developments also created the situation that the accelerator infrastructure and its experiments became disjoint in that the latter were not European in terms of membership and funding. As the following interview quote suggests, this meant that two different levels of participation and influence emerged at CERN:

CERN fulfils two purposes. One is really the infrastructure, and the second is participation in the experiments. And there is a clear separation in influence which you can have (interview 7, former member of directorate).

**Using Europeanness as a Resource for Global Science**

Things really started to change with the LHC, particularly when the SSC was cancelled in the States. Suddenly, we had this huge influx of American scientists here, so the transatlantic flow became very uneven (interview 1, leading staff member).
After more than 20 kilometres of the SSC’s tunnel had already been bored, the project was cancelled in 1993 (see Riordan et al., 2015). Because of the end of the Cold War, attitudes towards big scientific and technological projects changed in the USA. It became less important to display national might. In addition, the SSC was set up as a project that turned out to be too large to manage, and strong nationalistic rhetoric around the SSC might have scared off overseas investment (Appell, 2013).

At this time, CERN was busy preparing the construction of its Large Hadron Collider (LHC). As CERN’s director-general Carlo Rubbia observed, the cancellation of the SSC meant that many American scientists would be looking to participate in new experiments at CERN (Annual Report, 1993, p. 5). This followed an earlier observation that the number of physicists from the US working at CERN had exceeded the number of European physicists working at US laboratories (Annual Report, 1991, p. 6). Already since 1981, the number of US physicists working at CERN had been growing more than twice as fast as before (Schopper, 2009, p. 111).

The cancellation of the SSC increased CERN’s acquisition of non-member-state resources for the LHC compared to LEP. In addition to contributing to designing, financing and building the LHC’s detectors, non-member states – notably the US – also contributed to the accelerator itself. This required new forms of coordination between the CERN Council and non-member states that went beyond participation in experimental collaborations. In this large coordinating role, CERN reversed a trend in which US laboratories had always been one step ahead of CERN in organizational terms (Krige and Pestre, 1992). This coincided with an increasing narrative emphasis on CERN’s organizational capabilities.

The Globalization of CERN

Whereas overseas investments in the SSC could not easily be found, the construction of the LHC was expected to be partly financed by Japan, Canada, Israel, India, and the United States. In this context, the LHC was described as ‘a global collaboration’, and CERN’s signature vision of European international collaboration was complemented with a vision of ‘inter-regional scientific collaboration’, which indicated collaboration between Europe and other regions of the world (Annual Report, 1995, p. 13). These developments in the 1990s resulted in an envisioning of CERN as ‘a laboratory for the world’ under the mandate of director-general Christopher Llewellyn Smith (Annual Report, 1998, p. 8):

Five years ago, CERN was already global in terms of the origins of its users […]. But in the past they have not contributed to CERN’s infrastructure. The globalization of CERN provides an important model for interregional collaboration in other fields of science. I think we can be proud that, having pioneered European collaboration, CERN is now pioneering global scientific collaboration (Annual Report, 1998, p. 6).
The quote reflects the institutional separation between detectors—planned and operated by ‘users’—and the accelerator, which is referred to as the ‘infrastructure’. At first glance, this quote makes it seem like CERN reduced its emphasis on Europeanness when building the LHC. However, the rebranding of CERN as a global laboratory did not leave Europeanness behind; rather, it restructured it as an argumentative resource. Already when preparing for VBA negotiations, the European delegation had stressed that CERN’s member states had ample experience with international collaboration and that this experience would be beneficial to a VBA (European Committee for Future Accelerators, 1976). CERN’s discursive connection between European collaboration and global collaboration was an invitation for non-European partners to contribute. In this effort, it helped that Europeanness had already been constructed as a universalist worldview that envisioned the progress of civilization through science—still seen as European in origin. Using these argumentative resources, CERN could claim the visions of worldwide collaboration that had carried the VBA project as its own (Figure 3). CERN did, thus, not become a global institute placed in Europe but continued to cultivate its Europeanness:

It is the world’s center, but it is European. It is not just in Europe, it is European (interview 6, senior researcher).

**Europeanness as Model for a Global Community**

I don’t want to have CERN changing to the American way of governing.

Interviewer: What would you describe as the American way?

Oh, ‘We determine what goes on.’ And that’s not the case in the CERN model. We, together, determine what’s going on (interview 7, former member of directorate).

The quote above performs a specifically European way of governing that can inform and shape the way worldwide scientific collaboration can be governed (at CERN). The contrast to an American way of governing indicates that CERN’s Europeanness was not simply replaced by a global identity when building the LHC. This is demonstrated more explicitly by a strategy document called *The European Strategy for Particle Physics* (ESPP), which was published in 2006. In this document, particle physics is seen as a ‘cornerstone of European scientific strategy’ (ESPP Preparatory Group, 2006, p. 4). From the seventeen points making up the strategy, two stand out with regards to the relation to the European character of CERN; the first is the statement that ‘Europe should maintain and strengthen its central position in particle physics’ (ESPP Preparatory Group, 2006, p. 36), while the second is as follows:
Council, drawing on the European experience in the successful construction and operation of large-scale facilities, will prepare a framework for Europe to engage with the other regions of the world with the goal of optimizing the particle physics output through the best shared use of resources while maintaining European capabilities (ESPP Preparatory Group, 2006, p. 37).

In the ESPP, ‘European experience’ is seen as underlying CERN’s capacity for globalization. It is not the case that a global identity replaces Europeanness or that being European is not enough anymore for CERN. Rather, the ‘globalization of CERN’ is seen as a logical continuation of being a success of European scientific collaboration. This trajectorial argument is implicitly drawn out into the past even more by calling particle physics ‘the direct descendant of ancient Greek philosophical tradition’ (ESPP Preparatory Group, 2006, p. 4). Referring to these mythical origins is a way to see the envisioned global future of particle physics as a consequence of European cultural/scientific history.

**CERN’s European Heart**

It remains to be asked what the ‘globalization of CERN’ meant in organizational practice. At the time that the ESPP was published, all of CERN’s member states were European. Globalization was limited to contributions to the organization’s detectors and accelerator infrastructure from outside of Europe. However, the ESPP also stated that CERN would ‘establish how the non-Member States should be involved in defining the strategy’, thereby referring to future updates of the ESPP (ESPP Preparatory Group, 2006, p. 37).
To investigate this, the CERN Council appointed a *Working Group on the Scientific and Geographical Enlargement of CERN* in 2008. This working group delivered three documents to the CERN Council in 2010 that try to combine the envisioned global future of CERN, meaning a future that is not only European, with the visions and regulations laid down in the past. The first document states that ‘the endeavour of science brings nations together towards a common goal’ and that ‘CERN’s openness [to global partners] is in line with the mandate laid down in the CERN Convention’ (Council Working Group, 2010a, p. 1). Mirroring both the argument about ‘European experience’ in the ESPP and the argument about CERN being characterized by an open scientific spirit, the document states as follows:

CERN’s rich experience and facilities and its open working environment for the international scientific community would place Europe in a good position to offer to initiate and host a future global accelerator project (Council Working Group, 2010a, p. 3).

The last of the three documents suggests that the potential hosting of a future global accelerator asks for organizational change. It proposes opening the category of member state to non-European countries and streamlining associate-member and observer status. The working group did not find any legal reasons to limit membership to European countries and expressed that such a limitation could not be justified considering the globalization of particle physics. These considerations led to an ‘emerging consensus on the principle of global opening of the Organization, concerning both full and Associate Membership’ in 2009 (Council Working Group, 2010b, p. 4–5). As of today, CERN’s only non-European member state is Israel and its only non-European associate member states are India and Pakistan. As already stated in the working group’s plan, CERN’s organizational expansion would be limited. ‘The European foundation of the Organization’ would have to be ‘reflected in the Membership’, which, in practice, would mean that the majority of member states had to be European, with *European* being defined as being a member of the Council of Europe (Council Working Group, 2010b, p. 5–6).

Next to controlling the geographical spread of member states, it seems like CERN aimed to control its European core through value structures:

When we proposed the extension of CERN beyond Europe, we said, ‘Ok, CERN is a global lab, but with a European heart.’ This means retaining the European spirit and the European way to do things (interview 7, former member of directorate).

To become a member state, there would be criteria concerning scientific and industrial capabilities and a state’s commitment to the funding of basic science. These would be judged by the CERN Council. In addition, there would be a political requirement that would have to be judged by CERN’s
member states individually: ‘A stable political system within the applicant State guaranteeing democracy, the rule of law and human rights’ (Council Working Group, 2010b, p. 7).

A Layered Organization

Although there are now further member states or associated member states on the path to becoming member states, I do not think it has actually changed the identity of CERN as a European research center (interview 6, senior researcher).

CERN is still seen as a European centre despite large non-European participation. From the previous discussions about the expansion of membership, we see that the globalization of CERN was envisioned to be based on a European value structure—on a European heart and spirit. This value structure was to be secured by keeping the core organizational structure of CERN European. Its experiments and detectors might include physicists from all over the industrialized world, but the main decisions considering its accelerator and other infrastructure would stay in European hands. CERN’s envisioned global science should therefore be seen as an extension of its Europeanness. This analysis is illustrated by the following quote from a speech held at CERN’s 60th anniversary:

The success of the LHC is the proof of the effectiveness of the European organizational model for particle physics. Europe should preserve this model in order to keep its leading role (Ceremony of the 60th Anniversary of CERN, 2014).

Keeping ‘its leading role’ is an indirect reference to CERN’s scientific successes since the discovery of the W and Z boson in 1983. From that moment onwards, CERN’s carefully crafted vision of Europe united through science was felt to be vindicated by a world-class discovery. The flow of researchers, equipment, money and expertise to CERN in the following decades helped construct a new vision of the globe united through science. This imagination relied on a vision of science, like postwar Europeanness had before.

However, there is more to the story than a simple continuation of the story of science as a unifying force. CERN’s statements about global scientific collaboration were not mainly based on affective visions of science (e.g. objective, universal, common European language), such as the imaginations of a (re)united Europe. Instead, they were based on affective visions of Europeanness as a universalist culture, a collaborative spirit of scientific rationality, and a heart made of openness and diversity. To phrase this in terms of the observed ongoing coproductive relationship between CERN’s narrative enactments of science and Europe, we have found that in CERN’s more recent history, sociopolitical narratives about Europeanness were used to show the possibility of, and to justify, technoscientific visions of globalization—at CERN.
This analysis allows us to understand what phrases like ‘more than simply a European lab’, ‘the globalization of CERN’ or ‘a laboratory for the world’ mean. They refer to broad scientific collaborations that are open to anyone willing and able to contribute and based on a substrate of European values and governance. In this second phase, universalistic values alone were no longer enough to produce shared visions but had to be supported by arguments about technical and organizational capability. These values and arguments are reminiscent of those of the previous phase. We understand this similarity as a narrative infrastructure that defines the tropes that can be used by CERN to position itself while remaining recognizable as the same organization.

**Conclusion**

In this paper, we traced the emergence, stabilization, and development of CERN as a technoscientific as well as a sociopolitical project in the aftermath of the Second World War up to the present. Our analysis has shown how the bringing to life of a technoscientific infrastructure has been performing *Europeanness* in multiple ways. In the context of CERN, narratives about Europeanness and about particle physics have stood in a coproducive relationship, which is visible through ‘the constant interplay of the cognitive, the material, the social and the normative’ (Jasanoff, 2004, p. 38). Visions of a future Europe have been coupled to strong narratives about science, and conversely, visions about future scientific projects have frequently tapped into narratives about Europeanness as a resource.

In the almost seven decades that CERN has existed, this coproduction of sociopolitical and technoscientific orders in institutional identity narratives has, however, taken on rather different forms. To understand these, attention to the temporality and changing relationality inherent in this coproductionist development is needed. By carefully observing continuously coproduced enactments of particle physics and Europe, we make analyzable the work that goes into the continuation and stabilization of the identity of organizations such as CERN. More concretely, we have shown how diverse situated performances created a multiplicity of Europes, as well as of sciences, which mutually shaped each other. In ever-evolving entanglements, Europeanness has taken the form of a heritage, of various political identities, of sociotechnical future visions, of organizational capacity and of a cultural spirit. Likewise, science has been performed as a cultural tradition, as European, as universal, as global, as something valuable for its own sake, and as something that is economically viable by driving innovation. We thus encountered many versions of how *culture* and *science* relate: Cultures of science, science in culture and culture in science.

Describing the entanglements of these performances at various moments in CERN’s history, and being attentive to narrative infrastructures, has illustrated that such entanglements cannot be understood as temporally stable. Instead,
any performance draws its strength from earlier expressions and adapts to changing environments and other prevailing discourses. Just as material infrastructures must be constantly maintained, upgraded, and reinvented to survive, narrative infrastructures also constantly have to renew themselves and the ways in which they perform these coproductive relationships, while building on and relating to earlier expressions.

In addition, narrative enactments of the coproduction of science and Europe have been presented in affective, utilitarian and trajectorial registers. It is interesting to remark that while affective narratives and trajectorial narratives have shown a strong presence in the accounts that we analyzed, the utilitarian register has often remained more in the background in regard to performing the entangled character of science and Europeanness. While it is an essential ingredient in CERN’s success story, which gains visibility especially in the second phase, this register is often described more as a catalyst. It allows visions to emerge, accountability to be performed, arguments to be made, and successes to be reported, while rarely being at the centre of the narrative or the driving element; however, it is still an important collateral achievement worth mentioning. Whereas the affective and trajectorial registers contain the most visible visionary resources and justifications for Europeanness becoming powerful, these are always backed up by utilitarian arguments, which also function to imagine and explain how Europeanness can remain powerful.

While we have shown that enactments of Europeanness and science in CERN’s organizational identity narratives have been reworked again and again, we also identified a distinct transition that inverted the explanatory and justificatory relationships between sociopolitical and technoscientific orders in these narratives. In the early phase of CERN’s history, science, as an expression of European culture and as driven by a shared set of universal values, was seen as one of the enablers of a postwar European future. In the later phase, we encountered the narrative of the European model, spirit or heart being an important driving force in global scientific developments. This first phase, which we called making Europe through science, and this second phase of using Europeanness as a resource for global science are connected through the narrative infrastructures that they both draw on. Narratives in both phases were built on visions of the universality of European values and of science. This points to an argumentative resource that goes back to the enlightenment tradition. However, the two phases are also distinct. In the first phase, technoscientific orders in the form of narratives of the universality of science were used to justify a shared European organization to support the stabilization of a fragile postwar Europe. Conversely, in the second phase, sociopolitical orders in the form of narratives about Europeanness were used to argue and justify that CERN could become the locus and driver of global technoscientific collaboration in particle physics.
The case of CERN teaches us that we need to be attentive to fluidities and shifts and to the specific situatedness of coproductive entanglements in space and time. European early postwar history is deeply inscribed in institutions like CERN and allows this specific kind of scientific enterprise to take shape and, thereby, to support the making of Europe. This same scientific enterprise and its success, in a later phase, allow to imagine, perform, and stabilize a specific role for CERN in the wider international context through a set of institutional narratives. With Europe assumed to be stabilized, and Europeanness seen as a key value to be represented, CERN could start repositioning itself as the location from which global science could be shaped. Going beyond the concrete history of CERN, we have thus learned that, when using a coproductive lens to understand historical developments, specific attention needs to be given to the shifting balances between technoscientific and sociopolitical orders. It is the temporal dynamics at work in any entanglement that allows us to better understand which orders are narrated as drivers and which as driven, as well as how this opens up or closes down certain justificatory narratives and ways of acting that are perceived to be possible and reasonable.

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Notes on contributors

Kamiel Mobach is a researcher in the project Making Europe Through and for its Research Infrastructures (METAFORIS) at the Department of Science and Technology Studies at the University of Vienna. He holds a master’s degree in History and Philosophy of Science from Utrecht University.

Ulrike Felt is professor of science and technology studies and head of the STS Department at the University of Vienna, Austria. Her research focuses on shifting research/technology cultures (e.g. digital transformations) and related institutional changes as well as questions of governance and public participation in contemporary technoscientific democracies.
Questions of time and future imaginaries as ordering forces as well as the role of values and (e)valuations are key in her work.

**ORCID**

Kamiel Mobach [http://orcid.org/0000-0001-8644-0098](http://orcid.org/0000-0001-8644-0098)

Ulrike Felt [http://orcid.org/0000-0001-7506-4234](http://orcid.org/0000-0001-7506-4234)

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