

Excellence and Frontier Research as Travelling Concepts in Science Policymaking

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Abstract Excellence and frontier research have made inroads into European research policymaking and structure political agendas, funding programs and evaluation practices. The two concepts travelled a long way from the United States and have derived from contexts outside of science (and policy). Following their conceptual journey, we ask how excellence and frontier research have percolated into European science and higher education policies and how they have turned into lubricants of competition that buttress an ongoing reform process in Europe.

Keywords Science policy · Discourse analysis · Conceptual history · Excellence · Frontier research · European Research Council · Metaphors

Language Concepts as Pacemakers of Science Policy Reforms

Many scholars of research and higher education policy agree—and sometimes join those commonly accepted expressions of lament—that higher education and science have been exposed to far-reaching reforms inspired by New Public Management (NPM), especially in Europe since the 1980s. Flanked by formalized management control mechanisms (Bleiklie 2005; Ferlie et al. 2008; Whitley 2011), these reforms ironically called for greater self-steering responsibilities of scientific institutions

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(Dunleavy and Hood 1994). Moreover, financial cutbacks were accompanied by calls for greater output, better quality and larger impact of research and teaching (de Boer et al. 2007) as well as by an increasing pressure to produce more economically (and socially) useful results (e.g., Slaughter and Rhoades 2004; Gavroglu 2012).

However, whether a so-called “neoliberalist war” (Giroux 2014) with its “fetish of competition” (Naidoo 2016) has really changed the nature of the science system, remains inconclusive in the social studies of science. Here, questions about the freedom, utility and accountability of science are still openly debated, partly because scholars are convinced that language concepts structure expectations about how society and science interact. The best examples are given by the *social contract for science* (Guston 2000) and the *linear model of innovation* (Godin 2006), narratives that are still working despite the mode-2ism and post-normalism of the 1990s (for critical summary, see Weingart 1997; also Rip 2010). And this is due to the polymorphic linguistic properties of those concepts they pivot on (Flink and Kaldewey 2018), in particular ‘basic research’ (Pielke 2012; Schauz 2014) and ‘applied research’ (Bud 1993; Kline 1995), which allow for bounding and tailoring (Calvert 2006) as well as for contestation and consensus (Jacob 2005: 198).

In this article we follow suit with studying science policy concepts as regards their structuring effects on the relationship between science and politics by highlighting the importance of two somewhat less obvious concepts that have arguably empowered recent science policy reforms. We canvass ‘excellence’ and ‘frontier research’ as prominent auxiliaries in science policy. While ‘frontier research’ was a paramount concept for the institutionalization of the European Research Council (ERC) in 2007, ‘excellence’ has arguably become a major conceptual driving force of a reform process and settled in with nearly every fiber of science and higher education policy, especially in the European context.¹ The question we follow is why ‘excellence’ and ‘frontier research’ were attached with such importance. In what context did they become meaningful, how did they percolate into science policy, and how did they proliferate from the United States to Europe justifying competition-oriented policy reforms? By following these questions, we can illustrate how change in science policy co-evolved with a change in the use of language. In this respect, we argue that it is vital to understand the metaphorical properties and the socio-historical processes that have charged both concepts with specific and comparable meaning: Cherished by the public in the United States—the frontier concept as of the late 19th century and excellence as of the late 1950s—both concepts initially conveyed the positive image of individual self-mobilization. But then it is vital to understand how these concepts—whilst travelling contexts—made inroads into science policy and finally crossed the Atlantic to function as “euphemizers” of competition in Europe.

The article is structured as follows. First, we will outline the need for combining discourse and cognitive metaphorical analyses under the heading of “travelling concepts.” We will then portray the individual conceptual journeys of ‘frontier

¹ To name but a few, this includes the EU-funded Networks of Excellence (2002–2006), Germany’s Excellence Initiative (2006–2017) and its consecutive Excellence Strategy as of 2017/18, the European Research Council (as of 2007), France’s Initiatives d’excellence (as of 2010), and the UK’s Research Excellence Framework (as of 2014), as a replacement of the Research Assessment Exercise.

research' and 'excellence' and conclude with methodological suggestions on how to further study concepts in science and adjacent policy fields.

Travelling Concepts as Bridge-Builders in Science (Policy) Studies

There seems to be a permanent issue between the social studies of science and the history of science as regards the most adequate methodology to treat their common empirical interest, and their debate is reflected in the many *turns* that the field of study has undergone (Jasanoff 2000; Daston 2009). Once again, taking to language concepts seems to be *en vogue*², as a new *conceptual turn* aiming to overcome disciplinary quarrels and methodological boundaries can be observed. It contends that central (language) concepts in science and policy matter, insofar as they reflect “a condensation of historical meaning and experience” (Bud 2013: 416). Concepts are studied as regards their historical-contextual meaning of what provides a bridge between conceptual history of science (especially genealogy), the sociology of science and science policy studies. More than tokens of cheap talk or strategic “boundaring” and “tailoring” (Calvert 2006), concepts are held to provide actors with identities (Somers 1994) that co-develop with them throughout a narrative process, no matter how strategic they act.

We take to the idea of *travelling concepts* (Bal 2002; Neumann and Nünning 2012; Hyvärinen 2013) for two reasons: First, as they are held to travel “between disciplines, between individual scholars, between historical periods, and between geographically dispersed academic communities [whose] operational value differ” (Bal 2002: 24), we can employ them in order to avoid the afore-mentioned quarrels on methods. Second, travelling concepts can be regarded as objects of empirical study themselves. In this respect, we trace, where, when, why and to whom ‘excellence’ and ‘frontier research’ have become meaningful and then reconstruct whether their travels between contexts have made actors assume the same or different meanings. For a term “does not indicate the same concept or the same content in different times and different contexts” (Hyvärinen 2013: 17), but if it does, it will indicate a structuring effect of language and—with it—of underlying social institutions that are co-shaped by language expressions. In this respect, the travelling aspect of concepts adds flexibility to our genealogy (Foucault 1984: 81), whilst sensitizing for context-specific conversions and recodings, construction mechanisms and logics of order (Bevir 2008).

In light of a persistent proliferation of discourse, we identified key texts that discussed ‘excellence’ and the ‘frontier,’ including scientific literature, published policy documents, management literature and central self-descriptions of organi-

² This is reflected *inter alia* in the very recent foundation of the research network “Conceptual Approaches to Science, Technology and Innovation” (www.casti.org). There seems to be a revival of conceptual history within the history of science (e.g., Godin 2006, 2017; Shapin 2012; Kaldewey 2013; Schauz 2014; for a compelling state of the art review, see Schauz 2015).

zations. This was done by (i) exploring scientific and non-scientific text corpora³ from 1890 until mid-2000 to determine the broadness, depth and temporal extent of the discourse, (ii) identifying key texts for the individual discursive thread, often by resorting to academic discussions (especially history, sociology, political science, science studies), and (iii) interpreting the meanings of the concepts as part of their narrative frames and their individual social context respectively. Our approach matches with how metaphorical analyses are employed in science studies, as we agree with Maasen and Weingart (2000: 3, 17–20) that concepts bridge intra-scientific with political discourses and unfold specific meaning, which can even format policies in those contexts that differ geographically from their original application.

From the Literal to the Metaphorical Frontier

The ‘frontier’ is a prominent concept in the United States and it describes a central element of the American way of life, i.e., the riskful venturing into the unknown to find prosperous grounds. While US-American applications of the term date back to the early 17th century, the frontier is most commonly associated with an era known as the Wild West: the scouting and exploiting of territories lying west of the Mississippi River in the 19th century (Lamar 2000). In order to understand its metaphorical transformation, one needs to acknowledge that the literal frontier has never meant a manifest border⁴ or demarcation line. Rather, it portrays a contact zone in an incessant state of transition between the hitherto explored and the unknown land lying ahead, with the latter being pushed back in a process of “exploration and exploitation” (Ceccarelli 2013: title). Moreover, the frontier was both, reality for those who *de facto* tapped into the unknown—the frontiersmen—, and utopia for those who did not dare doing so but glorified those frontiersmen in their hard and bold ventures.

The utopian idea of the frontier is crucial for this conceptual genealogy, because when most borders of the Americas were reached, it turned into a myth. Whereas the negative sides of the frontier process were quickly forgotten or glorified via thrilling stories, e.g., the agony of the Donner-Reed Party (Stuckey 2011), the frontier spirit was built up in public to become one of America’s most prominent self-images: as a “tale of conquest, but also one of survival, persistence, and the merging of peoples and cultures that gave birth and continuing life to America” (Hine and Faragher 2000: 10). For over a century, frontier narrations were reverberated via folklore (Hofstadter and Lipset 1968; Rushing 1986), and their mythical power is borne by a popular though controversial idea: that the frontier process has forged a “special American character [...] marked by fierce individualism, pragmatism, and egalitarianism” (Cronon 1987: 157).

³ Including the archives of *Nature*, *Science*, *Jstor*, *Web of Science* core collection and existing discussions of excellence and the frontier and adjacent variations of these terms in scientific and non-scientific literature, including speeches, policy documents etc., which we refer to over the next pages.

⁴ As greatly mistaken for a border by Gibbons et al. (1994): 1, 20, 40, 43, 93, 160.

The transformation of the frontier into a metaphorical concept and its overlying idea of an American exceptionalism did not appear from nowhere but was enthusiastically declaimed by historian Frederick Jackson Turner, who first presented his treatise to the American Historical Association in Chicago in 1893 and then modified it via presentations to academic and public audiences and via numerous writings until 1921.⁵ Turner's thesis was fiercely contested by his academic colleagues, as the historian cherished some vague truisms⁶ about the evolution of those allegedly exceptional American frontier character traits that individuals would have received from experiencing adversary conditions of life at the frontier: that they would have assumed "a new physical and spiritual appearance" (Coleman 1966: 36). Inasmuch as Turner's observation and—in fact—call for an exclusive American frontier spirit could not convince his fellow historians, it caused a hype in popular American culture, because Turner presented his thesis at the American Historical Association's convention, which was held in public at the *World's Fair: Columbian Exposition* in Chicago, 1893, to celebrate the achievements of the young American nation. Another reason is that Turner's heroic characterizations of the American frontiersmen were greatly received by the common people, not least because Turner had no interest in moral judgments but simply admired practical assertiveness (ibid.): "To the frontier the American intellect owes its striking characteristics. That coarseness and strength combined with acuteness and inquisitiveness; that practical, inventive turn of mind, quick to find expedients; that masterful grasp of material things, lacking in the artistic but powerful to effect great ends; that restless, nervous energy; that dominant individualism, working for good and for evil [...]" (Turner 1921: 37).

Leah Ceccarelli (2013: 35) concludes that since Turner, American identity "came to be seen through the screen of the frontier myth," and his cherished notion of risky pragmatism inspired notions of the *American Dream* (Adams 1931: 304). At the same time, Turner's frontier concept radicalized a liberal-egalitarian notion of negative freedom: While the individual would thrive through self-mobilization in the face of adverse conditions, governmental oversight was held inimical to society. In particular, federal state institutions were outright depreciated as hampering the individual in his course of self-realization—and this would ultimately inhibit US society as a whole from forming a collective identity (Turner 1921: 271–272).

⁵ Turner integrated his original treatise on 'The Significance of the Frontier in American History' from 1893 as the first chapter of his lifework, a monograph entitled 'The Frontier in American History' (1921).

⁶ The historian zealously borrowed from the biological vocabulary of Jean-Baptiste Lamarck (1744–1829), in particular evolutionary ideas of plant biology, and applied them to describe societal developments in the US. Turner's new American frontiersmen were called "germs" that need to burgeon on barren soil, as the only way to ensure the prospering of a robust social organism: US society (Coleman 1966: 24–26).

Turnerism in US Science Policy

With its popularization, the frontier metaphor also percolated into science⁷ and science policymaking, and this relates to two aspects. First, in order to make the frontier live on, Turner needed to contrive new frontiersmen, and these were “university men” that the historian imagined as *experimental* scientists rather than as (European) bookworms. With this distinction, Turner distinguished bold American scientists from European *scholars*, who—for him—constituted a pejorative category of an academic: hamstrung by tradition and dull of contemplation. Second, with “[t]he test tube and the microscope” substituting the old pioneer’s axe and rifle “in this new ideal of conquest” (Turner 1921: 284), scientists-as-frontiersmen were to be separated “from the safety and familiarity of civilization to seek the unlimited opportunities that exist beyond the horizon of the known and established” (Ceccarelli 2013: 8). In this respect, Turner filled a metaphorical breach by arguing that the frontier spirit would endure (through science) and nurtured the idea of a social contract for science in a radical way: frontier scientists are the *avant-garde* and must be unfettered from society, if they want to explore and exploit the unknown for the latter’s sake. And this was to inspire politicians and science policymakers in the US.

Whenever public spending on science, especially new programs containing high degrees of uncertainty, needed extra rhetorical justification, US Presidents and science policymakers resorted to the frontier metaphor, laid out by Frederick Jackson Turner. The first prominent example was provided by Herbert Hoover in 1922—at that time serving as Secretary of Commerce—with his book *American Individualism*, alluding to one of the frontier’s central leitmotifs of tapping into boundless opportunities: “The great continent of science is as yet explored only on its borders, and it is only the pioneer who will penetrate the frontier in the quest for new worlds to conquer” (Hoover 1922: 64). As US President, Hoover often resorted to the frontier metaphor—so did further Presidents (Ceccarelli 2013): When John F. Kennedy campaigned as a presidential candidate, he vouched for the space program to be enlarged by promising “[b]eyond that frontier are uncharted areas of science” (Kennedy 1960). In 1979, Jimmy Carter requested an expansion of federal R&D investment, saying “[w]e are pushing back the frontiers in basic research for energy, defense and other critical national needs” (Carter 1979).

The most influential document in US science policy referring to Turner’s frontier thesis though is Vannevar Bush’s report of 1945, *Science – The Endless Frontier*: “Although these frontiers have more or less disappeared, the frontier of science

⁷ A full text search in the American journal *Science* reveals that the term ‘frontier’ (or frontiers) appears since 1887. Until 1903, 302 publications refer to the literal, i.e., the geographical frontiers, be it in the US, in Siberia or elsewhere. In the same year, few references started making use of the frontier metaphorically, e.g., when scientists called for overcoming disciplinary and national boundaries in the fields of physiography (Hobbs 1903: 539) and meteorology (Shaw 1903: 491). Others employed the term to discuss differences in university qualities, e.g., by pressing for financial endowments for “frontier colleges” (Chamberlin et al. 1903: 581). One year later, the frontier was used to argue that intellectual and industrial undertakings should not be regarded as a trade-off, as “progress in any department of human activity is followed by gains at other points along the frontier of the domain of the known” (Russell 1904: 843). Still, these examples remain exceptions.

remains. It is in keeping with the American tradition—one which has made the United States great—that new frontiers shall be made accessible for development by all American citizens” (Bush 1945: 11; also 12, 74). With WWII coming to an end, inter alia revealing the US’ technological supremacy due to heavy investments into war-related research, the Bush report fell in “a highly political context which was generated by a growing debate over a major policy issue—the issue of how the federal government should advance science for the general welfare in peacetime” (Kevles 1977: 5).

Despite numerous other issues being addressed by the Bush report under the heading of the frontier, the most important aspect for our purpose is that its frontier metaphor shuffles together two political rationales: first, a geostrategic demand in that the US need to claim new lands of discovery, whilst competing with other states globally and, second, that in order to do so, the “independence of scientist-frontiersmen from the government [...] that funds those explorations” needs to be protected (Ceccarelli 2013: 45). The travelling of the frontier into the metaphorical spectrum of science policy has not only backed academic science to do basic research, but proliferated an image of an egoistic self-organization in science, based on fierce competition that will cater to the best of society (ibid.). In fact, different from what is associated with the linear model of innovation and its sequential steps of action, though nowadays widely contested (e.g., Rosenberg 1991: 335; Fagerberg 2005: 8–10), the very risk-taking attitude expressed in frontier terms is regarded *immediately* fruitful for the whole of a society.

Today, numerous scientific institutes and research programs in the US pay reference to the meaning of Turner’s frontier. One of the best examples of the sustained impact of the frontier metaphor is provided by the Koch Institute for Integrative Cancer Research (MIT, Boston) describing its Frontier Research Program: “Creative exploration at the leading edge of cancer research has often led to important, transformative new discoveries [...] Yet early-stage ideas all too often do not qualify for funding [...] The Koch Institute is deeply committed to supporting boldly conceived, highly innovative, and highly collaborative research.”⁸ Also, the US Department of Energy’s Frontier Research Centers argue in this vein: “History has demonstrated that radically new technologies arise from disruptive advances at the science frontiers.”⁹ Thus, what these and most other applications of the frontier metaphor have in common is their positive framing of risk and boldness. By this meaning, the metaphor could be translated from the US to Japan as part of a transnational learning process, as will be discussed below.

The Intercontinental Travel of the Frontier

As a metaphorical concept in science policymaking, the frontier did not rest in the US. Japan, for example, employed the concept, given that the US’ occupation authority also influenced the country’s science policy landscape and its programmatic orientation in the course of the democratic restructuring process after WWII

⁸ <https://ki.mit.edu/approach/frontier> (last accessed 05.01.2017).

⁹ <https://science.energy.gov/bes/efrc/> (last accessed 05.01.2017).

(Cummings 1990: 431–433). These interactions seem far more intense (Gerstenfeld 1982) than is commonly assumed in light of the countries' intensified economic rivalry (Nelson 1971) and Japan's historical orientation towards the Prussian science and education system of the 19th century (Odagiri and Goto 1993). Yet, it is not reported until the early 1980s that Japanese science policymakers turned the frontier into something programmatic (Abe et al. 1982: 171). Here, 'frontier research' and 'frontier science' became central leitmotifs to gear non-university research institutes toward high-risk basic research in the natural sciences. In 1986, the Institute for Physical and Chemical Research (RIKEN) launched the Frontier Research Program to conduct multi-disciplinary basic research in "areas never before accessed" and "for bringing together world-class scientists."¹⁰

There is great similarity to the US in how Japanese science policymaking implemented funding programs under the heading of frontier research, which comes close to what is held 'strategic research' or 'strategic science' (Irvine and Martin 1984: 4; Rip 2002: 125). With respect to the travelling nature of the frontier, its transnational spread is best reflected in Japan's launching of the Human Science Frontier Program (HSFP), a funding institution dedicated to biomedical research. Proposed by Prime Minister Yasuhiro Nakasone at the 13th G7 Economic Summit in 1987 as a transnational organization, the HSFP was from the beginning supported by the US, Canada, the EU and five European states and it developed strong linkages with the life science communities (Nathan 1999).

The last metaphorical travel destination of the frontier is Brussels. Here, 'frontier research' served the institutionalization process of the ERC. Discussions about installing a pan-European research funding council dedicated to basic research, similar to the US National Science Foundation, are as old as the European Communities, but never gained momentum (Flink 2016: 94).¹¹ After the European crisis of the 1970s, the revitalization of the European integration process was, for most parts, geared toward realizing the internal market project (e.g., Peterson and Sharp 1997). In this respect, the EEC and later EU research policy were set up primarily to boost the competitiveness of European enterprises¹², or put the other way round: funding science for its own sake was out of question. This orientation was buttressed legally, given that the Commission was allowed to finance R&D only, if it served the so-called *added value* of the common market project.¹³ Thus, the Framework Programmes (FPs) mainly followed demands from industry to help advance their high-tech products and services, which "marginaliz[ed] alternative perspectives" in EU science policymaking (Banchoff 2002: 13). Still, with the FPs attracting an increasing share of publicly financed researchers and institutions, the

¹⁰ About one third of researchers have come from abroad, the average age of all participating researchers is 35 years (<http://www.riken.jp/lab-www/tera/OLD/english/frontier.html>; last accessed 10.01.2017).

¹¹ The European Science Foundation was founded in 1974, but ever since it lacked institutional and financial backing, to say the least (Darmon 1997).

¹² The integration of new member states actors into collaborative research projects and the Marie Curie mobility schemes were also linked to this rationale, as they were designed to enhance the quality of R&D-entities from the new and often weak member states.

¹³ Needless to say, the principle of subsidiarity required that supranational actions were not to be taken, if they already existed on lower levels governments (regional, national) or could arguably be taken by these.

Commission had to face increasing criticism with respect to the design and purpose of the FPs, which were excoriated to be too bureaucratic and burdensome, unscientific in terms of review processes and, in general, politically preconditioned. In the mid-1990s, requests to finance politically unconditioned, i.e., scientifically defined basic research, and thus the idea of creating a pan-European research council were out in the open again (*Nature* 1994, 1995). The European Molecular Biology Organization took the lead of an ever widening discourse coalition, later entitled the Initiative for Science in Europe, that pressed for an ERC (Flink 2016: 106–113). The Commission could not neglect the public pressure anymore by the time that conferences under EU presidencies—2001 in Sweden and 2003 in Denmark—were discussing the ERC and that Research Commissioner Philippe Busquin openly supported it.

The applied language in the following institutionalization process of the ERC presented a surprising shift. During the phases of discourse formation, agenda-setting and problem formulation (1994–2004) all actors resorted to customary concepts, i.e., they discussed the necessity of funding “basic research” or “fundamental research.” Even the Commission, hitherto circumventing these discussions, disseminated a communication on basic research (Commission 2004) arguing for its supranational financing.¹⁴

Yet, in her legal proposal of FP7, the Commission proposed to establish the ERC as part of the Specific Programme “Ideas” by substituting all references to basic or fundamental research for the term ‘frontier research,’ which should be “carried out by individual teams competing at the European level, in all scientific and technological fields, including engineering, socioeconomic sciences and the humanities” (Commission 2005: 3, 64). Two months before the start of the legal co-decision procedure, this conceptual shift was flanked by an expert report (Harris 2005), entitled *Frontier Research: The European Challenge*, which the Commission had ordered. This report portrayed a gloomy picture¹⁵ for European science, and so it urged national science policymakers to take necessary action and support the funding of a critical mass of basic research.

Until now, the ERC has fully adopted the Commission’s strategy to circumvent basic research and has mainly imported the metaphorical meaning of the US’ frontier concept, i.e., it rejects a distinction between basic and applied research whilst emphasizing the need for funding small pioneering teams of investigators in their course of high-risk-high-gain research. Moreover, by employing frontier research, the Commission seemed to justify the possibility of funding *individual* research undertakings on the EU-level, which had by and large been a political no-go in light of the ideals of European integration; and so far these were translated into collaborative research projects. Again, there is a strong parallel between the EU’s

¹⁴ The Commission does not only argue that distinctions between basic and applied research have become blurred, but dramatizes the old technology gap between Europe, the US and Japan in that it would have exacerbated to a science-technological gap, so that the EU must heavily invest into all kinds of research activities including basic research.

¹⁵ The title obviously presents a blend of Vannevar Bush’s (1945) *Science: The Endless Frontier* and Servan-Schreiber’s (1968) *The American Challenge* calling for an utmost urgency for Europe to tackle the technology gap against the US.

usage of frontier research and what basic research epitomized in the US of the post-WWII era, where “[n]ew (federal) support for basic research initially focused on individual researchers” (Schauz 2014: 307). Still, the ‘frontier research’ metaphor idealizes a slightly different type of a scientist: unlike ‘basic research,’ it does not necessarily imply “moral superiority of academic research over benefit-oriented industrial research” (ibid.), especially not in the context of the ERC, which follows the objective “[...] to reinforce excellence, dynamism and creativity in European research and improve the attractiveness of Europe for the best researchers from both European and third countries, as well as for industrial research investment” (Council of the EU 2006: 17).

Altogether, the discourse leading to the ERC employed frontier and excellence in the metaphorical sense of the US, ironically to fight the latter geopolitically. But excellence does not even seem enough for the ERC as Europe’s response to the US, which reflects in the policy descriptions that ‘teams of the highest levels of excellence’ should be financed (Council of the EU 2004: 27; Harris 2005: cover text).

Excellence: Equal Rights and Duties of Self-Mobilization

Until the 1950s, excellence as a distinct concept was commonly used as a form of salutatory address in the diplomatic protocol (for representatives of the state and the church) and as an acclaim of the outstanding quality of items, activities and often artistic performance.¹⁶ Then, in the US of the late 1950s, the term started being publicly charged with distinct conceptual meaning. There was a rising concern that while the US had widely benefited from the economic boom times of the postwar era, a state of normalcy begun creeping into its society. Different from simple complaints about people becoming idle, this concern rather pertained to a conformist, propriety-oriented and puritan attitude, not allowing for deviations from what the normalized ‘organization man’ (Whyte 1956) was expected to be doing. In such normalized society, ruled by the middle-class’ mass consumption and cushioned snugly by social security, so it was held, there was neither space for individual self-realization nor for elites to develop, unless the latter would have comprehended themselves as righteous representatives of the masses.

Excellence became *the* catchcry in the US: that mediocrity should be overcome. Specifically, it was used as a wake-up call for the US-American society in the wake of the Soviet Union’s launch of the satellite Sputnik in 1957. While US citizens had “firmly believed that to live ‘correctly’ also meant to live ‘successfully’, ‘Sputnik’ and ‘Lunik’ startled them out of this certainty” (von Hentig 1960: 1). More than an atomic threat, Sputnik meant a total technological deprivation of the US by the Soviet Union. Accordingly, the importance of knowledge was accepted in general, and the very pressure stemming from the technological footrace during the Cold

¹⁶ That does not mean ‘excellence’ was not used as a term in scientific writings. From 1845-1958 only *Nature* mentions ‘excellence’ in 5,206 articles, whilst almost exclusively with regard to the quality of technical devices or research activities and hardly with respect to persons or that heavily laden meaning we will uncover.

War spurred US-American elites on engaging into comprehensive policy reforms (Rockefeller 1958: 19; Bell 1996; Drucker 1993).

In light of the Cold War's friend-foe-logic, excellent *performance* was held essential for survival, whereas being and doing only but good was deemed not good enough anymore. And this credo was applied to the education system in particular. Excellence, however, combined different discursive threads, and certainly a prominent one revolved around meritocratic ideas of how to advance knowledge society as a whole. William Connell (1959: 386) wrote in the journal *The School Review*, "the excellence of a democratic society depends on the excellence of the general education among its citizens. Let us hope that our secondary schools will provide general education that will encourage the human excellence we desire." There are plenty of other treatises sensitizing experts and the public on this issue (e.g., Barzun 1960; Bertocci 1960; Hamilton 1964).

One of the most prominent figures in public policy at that time and a key promoter of the conceptual idea of excellence was John W. Gardner, then president of the Carnegie Corporation and its homonymous Foundation for the Advancement of Teaching. Gardner was responsible for a seminal report in 1958, which prepared the launch of the famous educational reform program, called *Great Society*.¹⁷ In his book (Gardner 1961: xii–xiv) *Excellence: Can we be equal and excellent too?*, he asked whether the American people would have

"lost their sense of purpose and the drive which would make it possible for them to achieve excellence [...] a problem that cuts across all the others. If a society holds conflicting views about excellence—or cannot rouse itself to the pursuit of excellence—the consequences will be felt in everything that it undertakes. The disease may not attack every organ, but the resulting debility will be felt in all parts of the system."

In numerous quotes, this early reference to excellence revolved but around the geostrategic positioning of the US, while the whole of society was addressed. Gardner (1961: 132) explained:

"A rocket can still explode on its launch base because the constructor was incompetent or the mechanic who installed the last valve was incompetent. The same applies to everything else in our society. We need excellent physicists and excellent mechanics. We need excellent ministers and excellent primary school teachers. Every fibre of our society depends on the ubiquitous and continuous pursuit of proficiency."

Moreover, the epistemic community around Gardner was convinced that the bureaucratic overburdening and a misunderstood democratic egalitarianism would hamper the people's will to perform better. When Gardner thus filed out President Lyndon B. Johnson's *Great Society* reform program, excellence was translated into a societal model almost entirely free of economically-oriented arguments but equipped with strategies of individual mobilization and optimization. The core of

¹⁷ That education reform program had been in the hands of Gardner himself, who became Secretary of Health, Education, and Welfare.

this understanding of excellence was a meritocratic conception of society: Differences were permissible as long as every individual changed his/her performance for the better (Graubard 1962; Peyre 1962; Young 1958). In addition, an increasingly meritocratic choice of leadership positions was regarded to have a socially balancing effect, “as, in key institutions, technical competence becomes the overriding consideration” (Bell 2008: 426). Hence, if managerialism defeated family dynasties, if the old social elites were mixed up ethnically and technical professions became more important in social decisions, it was not the (social) origin anymore that mattered but performance only. Some moderate egalitarianism of equal opportunities would thus allow for physical or intellectual differences to enable top performance. Those striving for excellence had to overcome barriers. This ideal corresponds to a pluralist, broad-based understanding of excellence along the lines of “everyone can do it,” a conception applied horizontally and based on the idea that there was a plurality of excellent abilities and talents (Gardner 1961: 132).

As regards science policy, excellence became not only a programmatic term in higher education (National Science Teachers Association 1961) and funding by the U.S. Government (U.S. Department of Health, Education and Welfare, Office of Education 1962). In reflection of the Sputnik shock and jumping on the bandwagon of President Johnson’s *Great Society* program, the National Science Foundation started its “Centers of Excellence Program” to increase the number of institutions of recognized excellence in research and education in the sciences (NSF 1965: 2). The funding of grants for basic research appears to be motivated by strategic national goals, which were decidedly anti-elitist: “Excellence in science is no longer a prerogative of a few privately endowed institutions, but has become a goal which more and more State institutions are achieving. In all such cases initiative at the State level has preceded and catalyzed the granting of Federal support” (NSF 1965: 17). This funding strategy corresponds with the egalitarian understanding of excellence of the 1960s. However, management discourse would soon give it a different twist towards social selection and stratification, as will be discussed in the following chapter.

Excellence and the Making of Elites

Apart from its initial grounding in meritocratic values, excellence was closely linked to emerging theories of the *knowledge society*, which codified “a new social order based, in principle, on the priority of educated talent” (Bell 2008: 426). Thus, the reproduction of a society, it was held, would increasingly rest upon academic/scientific outputs, while social advancement was linked to qualification by education (Bell 1996; Drucker 1993; Steinbicker 2010). Moreover, the growing importance of scientific and technological advancement not only required that society should extend its knowledge foundations on a broad scale but also steered the focus towards selecting only few talents that would hopefully bring about scientific progress.

For Robert K. Merton, for instance, the need for and value of excellent scientists was beyond doubt, and charismatic scientists were required not only to “strive for

excellence, they have [also] the ability to awaken excellence in others” (Merton 1973: 452). In this respect, excellence was comprehended not an end by itself for those possessing it, but it should cater for everyone qua effects of mobilization. Building on the questions of the selection of excellent talent, Merton (re)formulated a concept of scientific recognition that is still of significance and has formed the meritocratic-thought-selective understanding of excellence in science and science policy ever since. And ideas, such as the promotion of reserve talents, the self-fertilizing of excellence by means of pre-existing excellence and that difference in performance was a prerequisite of vertically-thought excellence, spilled over to other social fields, broadening the focus from individuals to groups and social contexts (Jackson and Rushton 1987). Excellence, the argument was—and still is—would trigger a perpetual motion machine: Research institutions that are excellent themselves would breed excellent researchers that—again—would stimulate their environments to become excellent (Zuckerman 1977). Accordingly, a central question was: how can structures of excellence be triggered or organized to become self-energizing? In research policy, this thinking is reflected by the setting up of concrete instruments, such as ‘excellence clusters’ and ‘networks of excellence.’

A complementary thread of discourse, following the knowledge-society-rhetoric of “potential,” was translated into human capital theory (Becker 1993). Institutions were regarded as business and the individual as a self-entrepreneur “being for himself his own capital, being for himself his own producer, being for himself the source of [his] earnings” (Foucault 2008: 226). Thus, the social authority of coordination is not the state but the market. Striving for excellence is thus by no means obsolete, but its focus shifted to smaller units and was unmistakably adapted to be further shaped by the language of neo-liberalism, a style well represented in the worldwide bestseller *In Search of Excellence* by Peters and Waterman (1982). Its authors, at that time consultants at McKinsey & Company, recommended a paradigm shift to the mainstream of management in that the owner *and* each employee of a company should become entrepreneurial, i.e., self-organizational and highly committed. Peters and Waterman’s quasi-cultural turn in management literature has shaped modern understandings of business management and outranged the metaphorical impact of excellence to other social spheres, including public policy. Specialization in and concentration on core competencies, flexibility, simplicity and identification (or commitment) have become central catchphrases of the discourse revolving around excellence. The entrepreneur has become a central character for individuals and organizations, while the market is cherished as the only coordinating authority.

With the neoliberal turn, individuals, organizations and entire states have become subject to a “permanent economic tribunal” (Foucault 2008: 247), critically examining all government activities in terms of their economic consequences. Accordingly, governmental actions are expected to anticipate economic evaluations and subordinate their programs to economics. Investment in human capital is held central to this new growth policy (ibid.: 232) and the educational system would develop from a marginal condition of the economy to the ultimate foundation of growth.

In this conceptual transformation of excellence, the US National Commission on Excellence in Education (NCEE) was made responsible for changing education policy in the 1980s. In its report, *A Nation at Risk* (1983), the NCEE portrayed the US in a state of dystopia, whose former dominance in economic and technological innovation would have dwindled in the face of strong global competitors. Starting from the assumption that there was but a knowledge-based economy, it framed the state of the education system as the ultimate existential question of the nation:

“If only to keep and improve on the slim competitive edge we still retain in world markets, we must dedicate ourselves to the reform of our educational system for the benefit of all. Learning is the indispensable investment required for success in the ‘information age’ we are entering” (NCEE 1983: 10).

Responding to increasing complaints as of the late 1970s about an alleged waste of talents (Burroughs 1977), this report—informed by human capital theory—framed learning as an economic investment. Thus, if the early Cold War arguments about excellence had been justified by the geostrategic question of how to stay superior in military technology and survive an atomic world war, then now it was employed to argue that educated human capital was a scarce and fragile resource, and moreover decisive for seizing competitive advantages in globally interconnected knowledge-based societies. In this way, the conceptual meaning of excellence became part of a neoliberal narrative to make up leeway in global market competition (Keyworth 1982). US science and higher education policy employed excellence to draw off the attention from cutbacks in public spending by arguing that only the excellent could enjoy being selected and funded. With this came along arguments for greater differentiation, for investing into economically useful applied research, interdisciplinarity and centralized research within the university (Barrow 1996). While excellence has become a neoliberal *euphemizer* hallowing political cost-cutting efforts, it seems to have been accepted (Rescher 2015: 93–95) as a ‘gold standard’ in higher education and science policy (Moore et al. 2017).

The original message of excellence to self-mobilize, and even its business version of self-management, was zeroized by quantitative performance measurement regimes (e.g., Ederer and Manso 2012; Sauder and Espeland 2009), that—once dragged into science policy—are most obviously represented by rankings of institutions and ratings of scientific performance.

Excellence in European Science Policy

In the context of an allegedly increasing “global war for talents” (e.g., Michaels et al. 2001), the concept of excellence and its embedded discourse have spread transnationally. The unparalleled advancements of scientific research during and after WWII have made the US appear a global role model, whose success was also attributed to the institutional setup of the American science system (Herbst 2007). Excellence travelled into the vocabulary of education and science policy on the EU level, not least due to the linguistic proximity of the two policy fields (Ricken 2009: 199) and the permanent exchange of ideas between US and European policymaking via transnational organizations, such as NATO’s science council or the OECD (e.g.,

Guzzetti 1995; Krige 2000). As early as in the 1990s, the framework programs under the Euratom Treaty implemented ‘networks of excellence’ (Commission 1996: 15, 44–45). Also, numerous ‘centres of excellence’ or ‘centres of research excellence’ were founded in European states already in the 1990s (Sørensen et al. 2016: 218), whereas making explicit references to the term in scientific articles was still low until the early years of the 2000s (Tijssen 2003).

Both, the geopolitical and the economic objective of excellence were adopted by the EU as strategic goals to make Europe become the most competitive and dynamic knowledge-based economy. In the Lisbon Strategy, the EU saw itself “confronted with a quantum leap that has resulted from globalization and the challenges of a new knowledge-based economy” (European Council 2000: 1), requiring better integration and coordination in terms of research activities, “in order to efficiently and innovatively structure and ensure that Europe can offer attractive perspectives for its best minds” (ibid.: 5). As far as the EU (and the Communities) were entitled to define common goals in education policy, these traditionally followed an egalitarian approach, e.g., to create wide access to information technologies and to ensure comprehensive minimum skills of all EU citizens. In a similar vein, research policy was driven by the political goals of the European Economic Community to serve the member states’ business enterprises as well as to tackle pressing issues of Europe’ societies and, thereby, allegedly creating an integrative momentum via collaborative research projects (e.g., Banchoff 2002; Flink 2016). However, EU research policy has also turned to the concept of excellence, which is construed in its stratificational manner. The aim of encouraging “top research and development in all member states” to support an “increase in top performance” (European Council 2000: 5) is connected to a comprehensive economic system of control, focusing on a more intense and efficient use of available resources, and—at the same time—realizing an increase in goal- and benchmark-oriented human capital (ibid.: 6).

The EU’s strategies unmistakably address global dimensions in the struggle for seizing excellent science as part of a battle for an all-encompassing dominance on the world market. Since its adoption, the Lisbon Strategy has followed the logic of excellence in order to promote “cutting-edge research and development in all member states” and, hence, “the dissemination of excellence” (ibid.: 5). There is a striking parallel between Europe’s current usage of excellence and the US’ employing of the concept during the Cold War: Nowadays, it seems essential not so much to win a material battle but to secure victory via decisive knowledge advancements generated by the best minds.

The Commission’s adapted to US research funding strategies in FP6 (2002–2006) in that its Centers of Excellence and Networks of Excellence were to focus on “building research centres and scientific locations that are recognized and have equivalent standards worldwide through a concentration of initiatives, resources and people” (Ricken 2009: 199). “Networks of Excellence aim to achieve scientific and technological excellence in a single research area by concentrating enough resources and expertise on a European level in order to achieve European leadership in this area” (Commission 2003: 3). The EU strategy for excellence neither strives for a continuous and broad improvement in performance nor a scientific peak performance in basic research that is distant from the market. Rather,

it aims at innovative leadership, which translates into market leadership. Similar to how business management has excellence, the notion of ‘relevance’ was adopted in neoliberal semantics as to gauge excellence in science (Maasen 2008: 25). Societal relevance already became characteristic in the 1990s science debates (Gibbons et al. 1994), which—despite their shallowness (as criticized by Weingart 1997)—seem to have co-shaped EU research policy. “Real science is excellent science”—with this, Helga Nowotny (2006), a prominent representative of the Mode-2-philosophy and former president of the ERC, got directly to the heart of the connection between post-academic science, Mode 2 and the ERC:

“By challenging Europe’s brightest minds, the ERC expects that its grants will help bring about new and unpredictable scientific and technological discoveries—the kind that can form the basis of new industries, markets, and broader social innovations of the future ERC” (ERC Website).

To summarize, the neoliberal semantics of excellence have existed on a European level since the 1990s and aim at turning universities and individual researchers into agents of a knowledge-based economic development. Since the economic competitive advancement of a knowledge-based society is only possible on the foundation of education and research, the focus on excellence has become an imperative of European science policy, which straddles the national discourses on the management of higher education.

Conclusions: Excellence, Frontier Research, and Conceptual Analyses in Science (Policy) Studies

By reconstructing the travelling of ‘excellence’ and ‘frontier research,’ we suggest that auxiliary concepts, hitherto rather unattended, may provide for alternative interpretations of the relationship between science and society, in particular as regards the coexistence of old and new narratives (see Flink and Kaldewey 2018). Also, tracing the journey of the two travelling concepts, we revealed how specific meaning was carried from one context to another.

First of all, both concepts became popular within public discourse, and only then did they veer toward science and policymaking. Interestingly enough, this is antipodal to the flow of metaphorical meaning in Maasen and Weingart’s (2000) comparative study on ‘paradigm,’ ‘chaos’ and ‘struggle,’ concepts that were born within distinct scientific disciplines before percolating into other disciplines and proliferating in non-scientific contexts.

Second, ‘excellence’ and ‘frontier research’ remained dominant in the science policy context as geopolitical tokens, and specifically the United States¹⁸ worked as both a competitor and a role model for European science policymaking. Not only was US science admired for setting so many examples of unparalleled success but also did this seem to correspond with the idea that responsibility of scientific actions

¹⁸ See Majone (2006); with respect to science, technology and innovation policy, see, e.g., Lloyd Spencer (1970) and Guzzetti (1995).

would need to be fully assigned to the self-enterprising individual (e.g., Brady 2012: 13). Moreover, the reconstruction of both discursive threads illustrated how different ideas of competition were obscured and glorified: The frontier stipulated that individuals should not expect (social/state) protection when taking the risk of venturing into the unknown and competing against others for new discoveries; the liberalist belief was that they would not develop their necessary fitness and boldness to become successful. As regards the travelling of this idea of competition, one can, for instance, see in continuous debates about whether the ERC should favor people over projects: Only few, i.e., venturesome projects, can expect funding, but since the nature of scientific uncertainty makes it hard for reviewers to tell apart potential success from failure, reviewers tend to *believe* in proposals made by those applicants whose track record promise ‘achiever’ qualities. Since frontiersmen would fight all adversary conditions to become achievers, in a quasi-market environment, such as the science system, this would entail fighting (i.e., competing) against others, as reflected in the ERC funding schemes.

While excellence had initially been connected to the idea of competition as a self-implicating struggle, i.e., getting the most out of one’s own potential, its meaning changed in management discourse so that competition between individuals was added and emphasized. The combination of these two ideas of competition whilst remaining silence about their detriments made excellence a sainting concept for many science and higher education policy reforms in Europe that have justified the distributing of limited resources on a selective basis.

Apart from euphemizing competition, the concepts of ‘excellence’ and ‘frontier research’ further obscure clear social distinctions, hitherto prevalent in science policy. For example, in the old days of linear-model-thinking you would either state that you carry out (and be judged accordingly) ‘basic’ or ‘applied research’ and be categorized accordingly (see esp. Calvert 2006)—nowadays, it doesn’t really matter what kind of research you do, as long as you are ‘excellent,’ part of a ‘grand challenge’ and standing at the ‘frontiers of knowledge production.’ In other words, different from the old discourses that veered toward dichotomous distinctions, the new discourse in science policy employs concepts that can hardly be negated (Flink and Kaldewey 2018: 20): Who does not want to be excellent and who would not want to be described as a pioneer at the frontiers? Also, concepts, such as excellence and the frontier, are not confined to the hallways of science but can travel and proliferate across many functional systems, often at the same time.

In this respect, the social studies of science could profit from integrating new concepts in their portfolio of empirical objects in order to study how these unfold meaning in and across specific social contexts, how they relate to overarching narratives—old and new ones—and how they interrelate to each other. Here, we would like to point out two courses potentially worth studying. One raises the question of how meaning gets translated when concepts in science (policy) are taken up and processed in different language contexts. While the US-American ideal of frontier research got translated into the Japanese RIKEN institutes without using different words and without meaning something different, the ERC, for instance, shows that in the French version of the EU’s legislative decision, ‘frontier research’

is not the central term but ‘recherche exploratoire.’¹⁹ Professional organizational contexts are not about playing on words, but if language is functional, it is pivotal to understand why some organizations take to the original phrases while others need to translate them. The question that would ultimately follow this observation of adaptation and variation is, if the meaning of concepts would change accordingly.²⁰ Linked to this are (*practical turn*) questions that would dig deeper into the daily life routines of the science system: To what extent do concepts govern those working in and around the science system and how is the daily practice of carrying out and publishing research shaped by language concepts and—vice versa—how does the daily routine of science shape concepts?

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¹⁹ See <http://eur-lex.europa.eu/legal-content/FR/TXT/?uri=LEGISSUM:i23027>. The central concept in the legal decision is translated as ‘recherche exploratoire,’ whereas the ‘frontier’ is used literally to denote that research should be done independent of geographical borders (“indépendamment [...] de frontières géographiques”) and that the frontiers of knowledge (“frontières de connaissance”) simply mean that researchers themselves should choose their subjects of study. In the German legal text, the term ‘Pionierforschung’ is closer to the American English meaning, as the pioneers are also in the center of the literal and metaphorical concept.

²⁰ This point has been emphasized by one of our anonymous reviewers whom we owe a debt of gratitude.

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