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Responsibility

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Openness has become fashionable. Governments, software and even humans are furnished with the adjective 'open'. This is not a quiet and modest adjective, but entails a demanding cluster of requirements. To be open means to be transparent, responsible, accountable and inclusive. In other words: to be open is to be good.[1]

What does this mean for science? If we understand openness as the commitment to make the tools and processes of science replicable and open to scrutiny, then science has had a particularly close relationship with openness from its earliest beginnings. It is true that science has been, and still is, to a large extent an elite activity. But the idea that people other than those involved in the creation of a scientific finding need to be able to scrutinise claims in order to find possible errors and to corroborate or falsify hypotheses and claims is intrinsic to the very concept of science. It is the requirement of transparency, intelligibility (if only to peers) and openness to scrutiny that distinguishes science from other instances of skilful practice or from an informed debate. Openness about how we arrive at conclusions on the basis of evidence is what enables the type of empirical self-corrective knowledge creation that science has (often rightly) claimed to be.

Why is it, then, that openness – in science, but also in other domains of life – has become such a buzzword in the twenty-first century? There

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1 Dave Eggers's 2013 novel *The Circle* is a stark illustration of this, particularly since it was meant as science fiction and yet seems to describe the cult of transparency as a solution to social problems.

are several answers to this question. One answer lies in our political economy. The shift from familial to corporate capitalism (Fraser, 2015) and the financialisation of capitalism have together solidified the dominance of commercial interests over politics. Corporate actors have easy access to national power centres, to the extent that they co-regulate important national policies (Gamble, 2014). As a result, not only governments but also citizens have lost control over important policy domains such as housing, work and energy (Wagenaar, 2016). Social inequalities have been reified; even most left-wing progressive movements no longer see them as something that needs to be abolished but instead as something to be managed. Within this political economy, openness – particularly when interpreted as an appeal to transparency as means to unmask inequalities and corruption – assumes the role that gallantry had in the eighteenth and nineteenth centuries: while seemingly easing the relationship between women and men, but not also between the rich and the poor, it can also be associated with a system that reinforces underlying inequalities and benefits one group at the expense of the other.

Making science open bears the connotation of democracy and equality, a bit as has been the case with the internet. There has been an assumption for some time that, because everybody in principle has equal access to web-based tools, the internet will make societies more democratic. As is well known by now, the supposed openness and accessibility of the internet has indeed given voice to some people who would not have been heard otherwise, but it has also given powerful actors even more power (Taylor, 2014). It has become clear in many contexts that fostering transparency does not always foster meaning making and intelligibility. Sometimes it may instead draw attention away from all the obstacles to equality and democracy that stem from the dominant global and socio-political order.

Another answer is rooted in the development and proliferation of digital tools and instruments to produce data. Once data are available in digital form, three key questions arise, either explicitly or tacitly: who owns them, who should have access to them and who should be allowed to use them. This is true for any digital data set – including our postings on social media, billing data held by health insurance companies or geolocation information collected by mobile phone companies. Scientific data, however, are under particular pressure to

be available, intelligible and usable to a wide range of users, because of the expectation that knowledge production (particularly that sponsored by public money) should benefit society at large and be accessible by citizens at all times and in all available formats. There is an emerging consensus that, wherever ethically and legally possible, research data should not only be open to any interested scientist but also to the general public as the funders and stakeholders of science. At the same time, the expertise required to make data open in the sense of intelligible and reusable is often disregarded, with several open-data initiatives targeting the general public but providing few tools for them to meaningfully engage with the data and extract information from them.

There are other answers to the question why the notion of openness has assumed so much cultural importance, which we have discussed elsewhere (e.g. Leonelli, 2016; Levin and Leonelli, 2016; Prainsack, forthcoming). What the examples that we have given here show is that open science is a political project to an even greater extent than it is a technological one. The chapters in this part illustrate the range of these political aspects and how they may intersect and converge with scientific, technological and organisational concerns in the running of large research initiatives. In the remainder of this introduction we will discuss some of the themes and tensions that the chapters highlight and bring them in dialogue with the political and epistemic characteristics of the open-science movement.

Centralisation and epistemic diversity

Whenever they try to disseminate information and resources, including data, models, specimens, software and papers, beyond their immediate work circles, researchers encounter issues of standardisation (Bowker and Star, 1999). There is a strong and often unresolvable tension between attempting to preserve the diversity of practices that constitutes the epistemic richness of research and its outputs, and setting up common venues and formats where outputs can be shared, discussed and reused (Leonelli, 2016). Such difficulties become particularly jarring when attempting to manage and distribute information, and foster participation in massive multiheaded institutions and projects, where a strongly centralised structure is combined with multiple approaches and types of practice.

Chapter 6 by Eleanor Hadley Kershaw highlights this beautifully by discussing Future Earth, one of the most complex bodies of individuals, resources, tools, approaches, groups, institutions and data ever assembled to confront a broad and all-encompassing set of environmental and social challenges across the globe as a whole. The ambitious scope and remit set for Future Earth by its governing council (comprising the International Council for Science (ICSU), the Belmont Forum and other international partners) is reminiscent of the open-science goals of bringing together all potential stakeholders and sharing knowledge and tools widely for the greater good. This is justified, since addressing global challenges arguably requires as inclusive and pluralistic an approach as possible, and thus seeks to combine efforts by experts in all fields and methods, capitalising on the variety of existing skills and knowledge. At the same time, this huge scope has resulted in an organisation that has little coherence or cohesion. Attempts to unify or even just coordinate approaches can and often do fail, as the multiplicity of challenges and approaches involved (which go well beyond disciplines, since interdisciplinary perspectives and innovative methods are typically very useful to such an endeavour) defy easy standardisation and harmonisation across participants. The inability to resolve the tensions outlined by Hadley Kershaw, particularly the one between the will to harmonise and cooperate and the importance of respecting and preserving diversity, risk making Future Earth a monstrous enterprise that nobody understands in its entirety, and in which operations are disjointed and out of synch with one another. At the same time, as argued by Hadley Kershaw, such tensions and differences in interpretation could be seen as productive openings for negotiation.

In sum, this case in turn raises questions about the relation between openness and pluralism in approaches (and, particularly, disciplines), given the various ways in which researchers working in different fields and locations understand the notion of openness, the challenges and opportunities that it can bring, and the ways in which it can be instantiated (Levin et al., 2016; Tenopir et al., 2015).

Inclusiveness and social justice

Another type of pluralism, which is a motor for openness but also a potential obstacle to sharing and exchanging data, is geographical

and cultural. Chapter 7 by Alison Mohr on energy transitions research brings the power differentials and diversity of location and research environment between the North and the South into sharp relief, thus highlighting the challenges of social justice and spatial positioning that underlie attempts to apply the notion of openness across national boundaries. Mohr emphasises how translating Northern ideas into global South contexts involves deep structural changes to the latter, which are difficult to implement and whose systemic implications are hard to predict and manage. And, indeed, the situation that she describes parallels attempts to construct digital infrastructures for open-science projects that benefit the developing world. Whether such infrastructures target citizen scientists or professional researchers, they are often devised and developed by individuals based in high-income countries, which makes it difficult for prospective users in low-income countries to share the same assumptions and conditions for entry. Open science can certainly serve to enhance social justice by fostering better exchange of data, better quality control of the information data exchanged, and cooperation in the ways in which research is organised (e.g. by helping researchers interested in exploring the same phenomenon to find each other and network). Open-science initiatives can also enhance the social, cultural and economic effects of research outputs on the various publics who, directly or indirectly, engage with them or are affected by them (e.g. how participants think about the impact of their work, what are their publics, what and whom they address). However, to reach these goals, openness advocates need to take account of the staggering differences between research environments in various parts of the world, which include not only available funding and resources, but also the wider infrastructure and institutionalisation of scientific work (Bezuidenhout et al., 2016). Many open-science projects, no matter how well intentioned, do not treat their prospective participants as equals and tend to impose their own vision of what it means to do research and share information without taking account (and in many cases, without being fully aware of) the conditions under which some of their publics and users work. As Chris Kelty (2008) has argued in his study of the development of the open-source movement, an effective way to engage in open research is to create one's own public through deep engagement and the distribution of stakes and responsibilities, so as to reflexively identify and

take into account existing inequalities – an approach that some citizen-science initiatives are already successfully using.

Transparency

Both Hadley Kershaw and Mohr address the scale of nested international structures, disciplines and institutions at global and local levels. Within such systems it is not clear that making knowledge open, in the sense of making everything accessible (for instance via online dissemination), enhances the transparency of the efforts at hand in a meaningful way. In many cases, understanding a given intervention or claim requires expertise and familiarity with the issues. Furthermore, the sheer quantity and scale of information that can be made available can baffle and confuse readers, rather than providing them with useful information (Floridi, 2014). Too often is the offer of unlimited information accompanied by interpretative moves left unacknowledged, such as with WikiLeaks (Rappert, 2015). In many instances people who make data accessible to others are not even aware of the assumptions and interpretations that have become part of the data sets, if only by ordering and classifying them (Bowker and Star, 1999). In sum, obtaining transparency is not merely a matter of making information available but rather a matter of explicating one's own assumptions, providing critical tools to unravel complex claims or situations, and engaging with them critically.

Responsible Innovation

In the 1960s and 1970s several organisations and initiatives in Europe and in North America sought to 'radicalise' science (Bell, 2013; Rose and Rose, 1976, 1979). Fuelled by the experience of how science had put itself in the service of imperialistic and martial interests, culminating in the atrocities of World War II, initiatives associated with the radical-science movement challenged the perception that science is something neutral, something independent of economic and political interests. The radical-science movement was not an attempt by people to tame or even govern science from the outside. On the contrary, it was driven by professional scientists. Organisations such as Scientists and Engineers for Political and Social Action in the USA and the British Society for Social Responsibility in Science in the UK argued that

science should be seen and analysed as an integral part of a particular social and political order. Responsible science thus meant that professional scientists and publics alike reflected critically on the questions that science asked, the methods it used and the resources it obtained.

For many national and international organisations today, responsibility in science has a very different meaning. Politics has largely been sucked out of it. Responsibility has mostly become synonymous with complying with ethical codes. Also, most of the 'radical' scientists of today, including citizen scientists and those who are self-proclaimed proponents of 'forbidden' research (e.g. MIT Media Lab, 2016), are no longer asking the big question of what kind of society we want (see also Delfanti, 2013). While some of them – among them, for example, do-it-yourself biologists – do challenge the norms and goals of institutionalised science, which they see as compromised by commercial interests, many of them help to make science 'better' within the epistemic commitments and rationale of institutionalised professional science (see Irwin, 2015; Prainsack and Riesch, 2016). They often fill the void that public actors have left, for example, by crowd-funding scientific research or by undertaking tasks that would be too onerous or too difficult for professional scientists to do (Del Savio et al., 2016; Prainsack, 2014). Here, responsibility no longer means a collective responsibility to ensure that science contributes to making our societies more just and more dignified for everybody to live in. Instead, it increasingly connotes a duty for individual scientists – professional scientists or citizen scientists – to be useful to existing systems.

In its worst instantiation – and unfortunately this is the case for the EU's pet concept of responsible research and innovation (RRI) – responsibility boils down to the duty to create a societal impact, which in turn is seen as an incentive – or even a societal need – to partner with industry. In its less depressing instantiations, contemporary interpretations of responsibility in science include the duty to think carefully about its societal impacts and to increase inclusiveness (e.g. Kreissl et al., 2015). Viewed in this context, Stevienna de Saille and Paul Martin's approach in chapter 8 to analyse RRI using the notion of the monster is both intriguing and useful. Drawing upon monster theory (e.g. Smits, 2006) these authors argue that an entity's monstrosity is not so much determined by the extent to which it is seen as infringing supposedly natural principles, as it is shaped by its inhabiting mutually exclusive categories (see pp. 152–153). To de Saille and Martin, RRI

represents both the fear of monsters and the fear of what they call the 'monstrous regiment' (see p. 150). According to the authors, this is because RRI can be seen as serving two mutually exclusive goals. The first is to generate private wealth while socialising public risk, and the second is to involve publics and give them the chance to 'destroy the new market' (see p. 156). While this is an original way of analysing RRI, it may not be the only way in which RRI can be seen in the current political and economic landscape. Following scholars such as Slavoj Žižek (2006) and Philip Mirowski (2014), what sets the current situation apart from previous eras is that the goals of economic growth, wealth creation and creating public benefits are seeing as entirely compatible.[2] This has become possible because our societies have naturalised social inequalities and injustice. RRI could be seen as one of the tools that help to manage such inequalities.

Conclusion

Openness is not more important today than it has been in earlier decades. But the wide variety of goals and uses to which this notion is now routinely subjected has generated a complex nexus of expectations and associations. Many of these expectations fail to materialise in reality, or they do so only for a highly selected public and in ways that only partly reflect the intended aims. That the various meanings and functions of openness are often flattened in scientific and public discourse is unhelpful here, as it suggests that questions about the success or value of openness can be answered with a simple 'yes' or 'no'.

   Some of the tensions and challenges pertaining to open science that are addressed in this part – and in this volume more broadly – cannot be resolved very easily; in fact, some of them may not be soluble at all, because they reflect the fact that openness can be interpreted in many different ways, and yet each interpretation can work to the benefit or at the expense of others. The lesson to draw from this is that, rather than treating openness as a term that describes the value system or political commitments of an institution or practice, we must take a

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2 The current boom of concepts such as effective altruism (effectivealtruism.org) and practices such as social-impact investing (e.g. Bugg-Levine and Emerson, 2011) are but two examples of this.

deeper look at the values, goals and purposes that openness supports and realises in concrete instances. The contributions by Mohr, Hadley Kershaw, and de Saille and Martin all do this in different ways and with different results, once again illustrating the breadth and partly contradictory nature of practices and institutions of openness.

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