

# Open Science? Conceptualizing Openness as an Emerging Moral Economy of Science

Thomas König<sup>1</sup>, Eric Vilain<sup>2</sup> and Jonathan Edward LoTempio<sup>1,2,3</sup>

<sup>1</sup> Institute for Advanced Studies (IHS), Vienna, Austria

<sup>2</sup> University of California, Irvine, United States of America

<sup>3</sup> Institute on Comparative Regional Integration Studies, United Nations University

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**Abstract.** In this paper we aim to address a few of the complexities that revolve around “openness” of science as an emerging moral economy of science. First, we briefly assess the current state of discussion when it comes to Open Science in the academic literature. We show that these discussions have begun a more analytical look at Open Science, yet the term remains tied to opinions and emotional response. Accordingly, we pose that a more distant perspective is needed. We establish that, since openness is the goal of Open Science, it provides a useful term for the coalescing of discussion. Indeed, this term can be used to identify an emerging moral economy within science. Then, we discuss why this is the case - the changing context, as well as the dynamics inherent in science as an enterprise. We finish this article with an initial discussion of how the use of this mode of thinking will impact science and the study of science. This positions us to consider the needs for the study of openness in science as a moral economy, the potential models which could be to assess different interpretations of openness, and finally the questions which this mode of thinking may help us ask.

## 1 Introduction

Is Open Science here to stay?<sup>2</sup>

In its present form Open Science is an explicit construct, emerging from its implicit home, rooted in the Mertonian norm of communalism of science, where “open” is used once, to

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<sup>2</sup> This paper is the early result of our consideration of the discussion in three inspiring conference panels over two sessions in 2022 and 2023 that we had the opportunity to organize. We invited remarkably diverse contributions that shed light on how openness is currently discussed, and also implemented, across academic disciplines, which helped to move our thinking on Open Science and openness. We are grateful to the participants of the panels for those stimulating discussions, as well as the comments by two anonymous reviewers on an earlier version.

describe communication. Indeed, what can be thought of as Open Science is implicit to Merton's informative line: "Secrecy is the antithesis of this norm; full and open communication its enactment" (Merton, 1957, p. 557). This articulation is important due to the nature of current expressions that prompt our initial question. As of the beginning of the 2020 decade, Open Science stipulates that science be as open as possible, and as closed as necessary. This is a concession since it is not necessarily in an individual or a society's interest that everything be placed in public domain. Open Science is not neutral, hence tempering it is reasonable.

The prevalence of Open Science requires us to develop new modes of thinking to ensure that discussions do not get stuck in the muck of prior opinion. This can be done through distancing from the term but must be done in light of the goals of Open Science. In the following article, we make a case that openness is the goal of Open Science (section 2). Specifically, we argue that openness can be conceptually understood as an emerging moral economy of science. Based on this argument, we explore the factors that have been contributing to this emerging moral economy (section 3). While this article is restricted to this conceptual argument, we briefly discuss in the final section how this conceptual understanding of openness may serve to better frame study and advancement of Open Science (section 4).

## **2 The Need for Distance: The Case for a Move from Open Science to Openness**

Open Science has become a rallying cry in science policy: there are myriad initiatives and movements under the umbrella term of Open Science that aim to make publications, data sets, methods, more open. Universities and research funding agencies have published policy documents that entail how to do Open Science (University of California, 2013; Ayris *et al.*, 2018; Ivy Plus Libraries, 2023; NIH, 2023); governments have set out to define Open Science strategies (OSTP, 2022; European Commission, 2023); the UNESCO has dedicated a recommendation on Open Science (UNESCO, 2021).

### **2.1 Open Science as a Policy Term**

All the documents and initiatives referred to in the previous paragraph are laudable. Also, they indicate that Open Science is a topic in science policy that is to be taken seriously. Yet what is Open Science? UNESCO suggests that it is "about making sure not only that scientific knowledge is accessible but also that the production of that knowledge itself is inclusive, equitable and sustainable." While mostly in line with this ambition, the academic literature is more sobering: Open Science is "an ambiguous and deeply political concept", as Ross-Hellauer *et al.* state (Ross-Hellauer *et al.*, 2022, p. 13).

Typically, policy papers concerned with Open Science follow an approach of “addition”, that is: they identify different areas of scientific practices that can be, or are supposed to be, further opened. For example, the concept developed specifically for Austrian science policy identifies different areas in the scientific field, from “open access” and “open research data”, through “open methods” and “open evaluation” to “open education” and “citizen science” (Mayer *et al.*, 2020).

At the policy level, this approach is sound, as it explicates the policy imperatives as well as the potential challenges for the respective field of action. Yet, from a sociology of science perspective, the approach lacks analytical depth. Specifically, a framework that allows one to distinguish between implicit and explicit positions, interests, and meanings that go along with different explications of Open Science is missing. A more analytical approach is needed -- one that allows us to understand the source of a specific claim to openness, what it entails, and what policy directions follow from it. To do so, the first crucial step is distancing, that is, the deliberate decision to look at Open Science as an object of (social) scientific explanation in itself – instead of being a topic that needs to be argued for.

This broadly follows the ambition of previous work that already attempts to look at Open Science from a more analytical perspective. For example, Fecher and Friesike examine Open Science literature and identify “iterative motives and patterns of argumentation that [...] form more or less distinct streams”, or, specifically, “five distinct schools of thought” (Fecher and Friesike, 2014, p. 18). And in their analysis of the (unintended) consequences of different policies aligned under the umbrella term of Open Science, Ross-Hellauer *et al.* provide important details about “those areas where Open Science implementation potentially endangers the aim of greater equity in science” (Ross-Hellauer *et al.*, 2022, p. 4).

The work of scholars such as Fecher and Friesike as well as Ross-Hellauer *et al.* can be understood as attempts to examine Open Science from a more distant perspective, i.e., a perspective that is interested in Open Science as an object of (social) scientific explanation. However, in some crucial aspects, both contributions are still somewhat stuck half-way through. While it provides a useful overview of “schools” of Open Science, the article by Fecher and Friesike does not include a methodical approach to sort through different utterances and texts concerning Open Science. Similarly, while Ross-Hellauer *et al.* achieve an important change of perspective by looking at the unintended consequences of Open Science, their work is motivated to identify “inequities” produced by Open Science policies in order to “re-orient implementation strategies and optimize outcomes wherever possible and desirable” (Ross-Hellauer *et al.*, 2022, p. 4). Neither of them sets the emergence of Open Science in a broader historical context, and neither

achieves a more analytical approach towards the forces and arguments underlying Open Science as a political concept.

## **2.2 Openness: The Goal of Open Science**

To get a full and analytically coherent understanding of Open Science, we suggest abstaining from the notion of Open Science and instead focus on openness. This is not a merely rhetorical shift. Open Science has become a powerful, yet also ambiguous, term in its own right in the world of science policy. This is clearly expressed by the capital letters that are used when it is written. However, to look at Open Science from an analytical perspective requires understanding the intent of those who use or oppose the intent of Open Science. What, then, is the goal of Open Science? In short, the goal is openness. This statement might be perceived as being almost tautological, but it is important to make nonetheless: If Open Science is a political term, openness is the term that describes the (implicit) goal of Open Science.

Our suggestion to shift from Open Science to openness is to be understood as a deliberate form of analytical distancing: openness allows for the address of a policy goal without muddling the support or opposition that may be paired with Open Science. Openness is the vision of a future of science (or aspects of the scientific endeavour) that serves as the foundation of the policy term Open Science. We deem it therefore more appropriate for analytically approaching policy instruments, and (more broadly) policy statements and initiatives directed at Open Science. At this point of our analysis, however, openness is hardly more precise or specific than Open Science.

To give openness a conceptual meaning, we suggest to interpret it as a relatively new facet of the ever emerging “moral economies” of science. Specifically, we refer here to an important aspect of the scholarship by Lorraine Daston. Daston, an eminent historian of science, has described moral economies as “web[s] of affect-saturated values that stand and function in well-defined relationship to one another... a balanced system of emotional forces, with equilibrium points and constraints” (Daston, 1995, p. 4). These moral economies refer to the ethical and values-based considerations that underpin and shape the practices, norms, and governance of a particular domain or field. They encompass the moral principles, beliefs, and ideals that guide the interactions, decision-making, and distribution of resources within that domain.

Daston details a few historical examples along which the moral economies of science have been changed (and, arguably, resulted in the modern-day shape of distinct “norms” famously described by Merton (1957)).<sup>3</sup> Specifically, she looks at the concepts of

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<sup>3</sup> It should be noted that Daston herself has commented rather critically on Merton’s norms, suggesting that those were “immune to the vagaries of history and the pressures of context”, while moral economies

“quantification”, “empiricism” and “objectivity” that, in the history of science, have been controversially discussed, until eventually a common understanding has emerged. Like the build-up of new stone from sedimentary dust, sediments in science are the common understanding of the concepts that inform scientific practices, which built on the previous layers of progress. Like these rocks, science is evolving, and so too are its moral economies.

Having said all this, openness is not a new trend within science at all (as indicated already with reference to Merton in the introduction of this article). When it comes to sharing results, but also methods, even the old Mertonian norms have implied the replicability of experiments and results – at least in theory. Yet the fact that openness is now specifically mentioned and contested, implies that this once nested concept has become itself a top-level concern in many corners of the scientific endeavour, and one that is put into the spotlight. Openness describes the claim to make different (and potentially all) aspects of scientific practices transparent, inclusive, and accessible. This warrants two questions: why is this happening, and how does this potentially impact the future course of the scientific endeavour?

While we think that both questions require a detailed answer, the remainder of this article is limited to tackling the first question (while addressing the second question, albeit only in the most superficial way, in the discussion section). Specifically, the next section aims to unearth the broader context of why openness has become a topic of discussion (if not controversy) in science. Posing this question from a historical point of view allows us to zoom out of the current debates and investigate the material as well as discursive changes of the scientific endeavour. We take a global and general view that we think is necessary to see the broader patterns in the development of science.

### **3. Openness as a Moral Economy in the Making**

The sharing of results and methodical approaches has long been a key feature of promoting progress in science. In that sense, openness was among the first sedimented norms that determine scientific practices (at least when we take norms as stated by Merton in the first half of the 20th century). And yet, openness has transitioned from a facet of consideration within this sedimented set of norms to a concept which stands by itself (i.e., a moral economy in the making). Why? We attribute the answer to this question to three main factors:

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“are historically created, modified, and destroyed; enforced by culture rather than nature” (Daston, 1995, p. 8). See, however, the convincing rebuttal by Weingart (2015, pp. 71–2), who argues that Merton himself was well aware of the historicity of those norms.

- (1) Over the course of the past seven decades, the societal context in which science is embedded has entirely changed.
- (2) As a related consequence, scientific practices have been developing in numerous niches and differentiated (or, fractalized) into many efforts, research fields, subdisciplines.
- (3) The modality of doing science has fundamentally changed due to new media and communication formats, i.e., “digitalization”.

Ad (1) Regarding the societal context, the importance that is assigned to science has enormously increased in the past seven decades (with increasing budgets alongside). A key point in transition from government-funded big military science to big civilian science was Vannevar Bush’s Post-War report, *Science: the endless frontier* (Bush, 1945), which was later backed by economists with the argument that it is in the public interest to fund research (Arrow, 1962). From then on, science as an enterprise has become deeply intertwined with capitalism, and “innovation” has become the buzzword (Godin, 2012) along which entire governance architectures have been created (Borrás and Radaelli, 2011).

This economic importance of innovation has created vastly new opportunities for scientists, but attention has also increased efforts to put science under more and more scrutiny. New Public Management (NPM), a “synthetic definition of ... hegemonic ideas” such as marketization, competition, and managerialization of research (Capano, 2022), has become the dominant force of regulating, policing and administering science.<sup>4</sup> In that sense, openness is a result of, or demand from the increasing scrutiny under which the scientific endeavour is put. The sources of this scrutiny span funding agencies, the public, and scientists themselves, and each result in different interpretations of the needs and purposes of openness. At the same time, openness is also perceived as a business opportunity in the context of platform capitalism (Mirowski, 2018) and even a topic of geopolitical contestation (Sundell, 2021). The morality of “knowledge as a public good” is to be understood as an “economy of openness” (Bacevic and Muellerleile, 2018, p. 173).

Ad (2) The second factor is what has happened to science itself. Over the past 80 years, and not least because of the “magic” ascribed to it, science has solidified itself into a full-fledged subsystem of society – organizationally (Whitley, 2000) as well as politically (Kaldewey and Schauz, 2018) and economically (Stephan, 2012). This is largely an outgrowth of science as a state-funded endeavour in the post-1945 world. While it

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<sup>4</sup> On a sidenote it should be mentioned that New Public Management is itself a popular and contested policy goal in science policy. The publications on the topic are numerous; besides the recent, informative overview by Capano (Capano, 2022), a comprehensive analysis of its impact on university systems can be found in the book by Bleiklie, Enders, and Lepori (2017).

includes the ‘big science’ of nuclear, space, and genome programs, it also includes all fields of study who benefit from the mechanisms of state sponsorship – and those are numerous.

On the one hand, this resulted in an exponential growth of new scientific knowledge, and hence academic publications, as already discovered in the 1960s (Price, 1986). On the other hand, science has seen many so-called scandals over the past decades, from outright fraud to the replicability crisis to all sorts of ethical issues (Fischer, 2008; Biagioli and Lippman, 2020). In this context, openness is perceived as a necessary tool to improve science,<sup>5</sup> and to better connect different strands in the scientific endeavour. Ideas about openly sharing data, methods, models, etc. have been invigorating scientists and policymakers alike.<sup>6</sup> If the intention was, at least partially, to make access to scientific knowledge cheaper, the perseverance of increasingly commercial and oligopolistic publishing houses (Larivière, Haustein and Mongeon, 2015) appears to put this in serious question (Bergstrom *et al.*, 2014). Another intention, to make access easier, is similarly put in doubt: Sci-Hub, arguably the largest provider of scientific publications (Greshake, 2017), is illegal in much of the world. Given the unintended consequences that came along with opening up access, the results on improving scientific practices appear to be mixed at best (Hagner, 2018).

Ad (3) Sharing has arguably been the initial form of applying openness to the scientific endeavour, what has initially been called “Open Access” dating back to the late 1990s (*Budapest Open Access Initiative*, 2002).<sup>7</sup> Yet today, openness entails much more than openly sharing publications, data sets, and models – it also encompasses core processes (like open peer review) and research practices (like citizen science). This changing (and expanding) meaning of openness is testament to it being an *emerging* moral economy. It also testifies that one key factor of its emergence is digitalization, that is, the availability, and increasing use, of new modalities of communication thanks to the internet. While this is most obvious in academic publishing (as indicated before), where the idea of libraries (holding a limited number of printed books and journals) has long been abolished by today’s practices of texts of various length and format more or less freely circulating in the web (and within scientific communities), it is by no means limited anymore to this area.

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<sup>5</sup> For example, access to administrative data appears to have an effect on the quality of research publications (Nagaraj and Tranchero, 2023).

<sup>6</sup> For the latest instance, one need only look to the coronavirus pandemic and the emergency scientific measures towards openness. Publications pertinent to the pandemic became free for all to use, fundamental data could be accessed on public facing repositories, and public funds were mobilized to build and to buy vaccines.

<sup>7</sup> For a retrospective assessment of the challenges and learnings from turning an existing field journal into Open Access mode, see König (2020).

The new opportunities have made possible new and creative ways of transdisciplinary research (Neundlinger *et al.*, 2023). Citizen Science is but one key word that highlights the attempts to engage with civil society and its representatives (Martinuzzi and Hametner, 2016), and to set up new forms of deliberation between scientific experts and ‘mini-publics’ (Blue, 2015). This is within the trend towards a more “transformative” research agenda (Schot and Steinmueller, 2018). At the same time, the inherent inequalities of what is sometimes called “academic capitalism” (Jessop, 2018) have only increased. At the minimum, digitalization has not changed the overall power dynamics within scientific disciplines, or reduced implicit hierarchies between world regions, all the while accelerating the race from doing research to publishing (Fochler, Felt and Müller, 2016; Vostal, 2016).

To summarize: as the spectacular growth of science is intertwined with a long tradition of economic expectations for “innovation”, the increase of dedicated resources has raised questions about accountability; the diversification and fractalization of scientific endeavors has made it seem urgent to improve exchange and access to scientific publications and data; digitalization transforms the modalities of doing science. These developments and trends have put openness front and center, making it an emerging moral economy. This is not an automatic or natural process, but one which rests very much on initiatives of various actors, partly reacting to the three factors in time outlined above, and partly attempting to take advantage of them.

Those initiatives, which often intend to reform scientific practices and how they relate to society, explicitly refer to the concept of openness. It is those initiatives, then, that provide the empirical cases along which the development of openness can be examined, and along which the impact of this emerging moral economy on science can be assessed. To do so, an analytical framework is needed (see next section). Before that, it is necessary to state what should be obvious by now: by conceptualizing openness as an emerging moral economy of science, we want to gain some distance from the research object Open Science. But it also does not make sense to dismiss Open Science as merely an accommodation to platform capitalism and neoliberalism, as others have suggested (Mirowski, 2018). Instead, we prefer a more pragmatic stance of inquiring openness.<sup>8</sup>

A second statement refers to the inherent characteristic of openness as an emerging moral economy: unlike the norms already sedimented in the conduct of scientific practices, including Daston’s “objectivity”, “quantification”, or “empiricism”, openness is not about the proper conduct of science *per se*, but about the relationship of science to the public, and to itself. The call for openness relates science to itself, to the public, and

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<sup>8</sup> Our own epistemological background here is informed by what can loosely be called “pragmatist sociology” (Bénatouil, 1999; Reckwitz, 2021; Gross, Reed and Winship, 2022).



to the actors who set the conditions for their continued research. This call itself can be determined by the public funding of research. Thus, the actors, norms, values, and systems are present and in well-defined relation – a moral economy, but one not explicit to the extant norms.

## 4. Discussion

How is the emergence of openness as a moral economy impacting science? This is the second research question formulated in the introduction, one that follows once we have established that openness is indeed – as we have shown – a moral economy in the making. It is, unfortunately, also a research question that we can only briefly touch upon here as a view to the future. Within the context of Open Science, understanding openness as a moral economy involves recognizing and critically examining the ethical dimensions and moral obligations associated with openness in scientific research and knowledge dissemination. It entails exploring the values and principles that govern the conduct of researchers, institutions, and other stakeholders involved in Open Science initiatives.

The moral economy approach also prompts reflection on the responsibilities and obligations of researchers and institutions within the framework of Open Science. It considers questions of integrity, accountability, and the social contract between science and society. These questions will have related, but different answers at each level of society from the local to the global. Use of this perspective will encourage deeper engagement with the ethical dimensions of openness, fostering discussions on issues such as data sharing, research ethics, authorship, and the dissemination of scientific findings in a manner that upholds moral values and societal well-being. This has already begun to impact the course of the scientific endeavour – and shows no sign of stopping.

There is a need for the articulation and study of the models of openness to advance the study of the moral economy of openness. We end this article by suggesting three modes of analysis:<sup>9</sup> first, with the consideration of the positionality of actors under the chapeau of Open Science; second, with examination of the different levels and purviews of actors in Open Science, and third, the semantics, that is, the intent of words sometimes used synonymously with open, including transparency, frankness, and the concepts of FAIR (findable, accessible, interoperable, and reusable). Each of these modes of analysis requires a more detailed explanation. Each addresses a specific aspect of openness;

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<sup>9</sup> As mentioned in the introduction, work on these modes of analysis are currently under development by our team, based on the discussions we nucleated at STS Graz 2022 and 2023 on the topic. We expect to explore these more deeply in future sessions at STS Graz, and in further manuscripts, and indeed hope that scholars in other disciplines will add their contribution to the literature in this vein.

together, they provide an analytical framework for empirically assessing case studies of Open Science in a coherent and systematic manner.

Embracing the notion of openness as an emerging moral economy may lead to a more critical, comprehensive, and conscientious approach to Open Science. By recognizing and addressing the ethical dimensions and obligations through analysis of openness, we can foster a scientific ecosystem that upholds integrity, accountability, and social justice. We think that the best lens for this is openness, and hope that it will serve to improve additive discussion while also providing firm sediment for evaluative consideration of Open Science. This will certainly help us to find a way to ensure that the policy goals implicit and explicit to Open Science can be realized in a useful, situationally aware manner. But which situations?

With a more analytical perspective and more distance from Open Science, we can ask hard questions while eliciting fewer feelings. For example, we can consider national differences and unintended consequences. What does a researcher owe the nation who funds them? What does the nation owe the researcher? What forces do they exert beyond the conditions of the funding? Furthermore, nations disagree on Open Science. Sometimes it is extractive and colonial, sometimes it can promote equity. The unintended consequences of Open Science extend past inter-state and inter-people relations – the openness of data can stymie innovation if data must remain private, or the closedness of data can prevent replicability. The scales seem to be tilted towards open because it is consonant with Open Science. This should be a more assessable question and can be better achieved with openness thinking. This will help us to express more clearly the obstacles to sharing, and the obstacles of privacy or closedness of data on the part of both participants and researchers.

## **5. Conclusion**

Open Science is here to stay. It is too useful of a policy term, it is too sedimented into the common language. The ambition of this paper has been to provide a more distant, analytical perspective on Open Science as a science policy term which already has a huge impact on science itself as well as its relation to policymakers, businesses, and society as a whole. Providing more analytical perspective is aligned with previous research that has made first steps into this direction, but it aims to go beyond this by suggesting focussing on openness as the core concept undergirding the science policy term Open Science. Here we provide a first step towards understanding openness as something within the scientific endeavour that can be analysed with more analytical

distance and depth. Instead, we provide consideration and justification of openness as the goal of an emerging moral economy for the study of Open Science.

By viewing Open Science through the lens of openness itself as the goal of Open Science and, hence, an emerging moral economy in its own right, researchers (and, subsequently, policymakers) can more critically evaluate the potential consequences, benefits, and challenges associated with promoting openness towards Open Science. This perspective acknowledges the inherent ethical dilemmas and trade-offs involved in implementing open practices, including a transparency-privacy axis, promoting multi-stakeholder collaboration while respecting intellectual property rights, and ensuring access to knowledge while mitigating inequalities.

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