The Promises of Responsible Open Science: Is Institutionalization of Openness and Mutual Responsiveness Enough?

Commentary on "Towards a New Ethos of Science or a Reform of the Institution of Science? Merton Revisited and the Prospects of Institutionalizing the Research Values of Openness and Mutual Responsiveness" by René von Schomberg.

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INTRODUCTION

Von Schomberg offers a compelling examination of key open science principles and their potential role in fostering responsible research and innovation (RRI). Utilizing Merton's Ethos of Science framework, the paper constructs a series of arguments supporting a central thesis: "the transition towards open science is vital to facilitate RRI." This transition necessitates significant institutional reforms within the scientific community and adjustments to incentive structures that promote the adoption of open and mutually responsive practices.

The manuscript reframes the discourse surrounding responsibility and responsiveness in light of the evolving landscape of open science, shifting the focus from normative commitments to actionable frameworks in research and open science practices. Overall, the position

paper strives to bridge the gap between idealised models of scientific communities based on RRI principles and the reality of actual scientific endeavour (Anderson *et al.*, 2007; Politi, 2021, 2024).

However, it is important to acknowledge certain omissions that could enrich the analysis. Firstly, a more comprehensive examination of the profound crisis facing science amidst the increasing marketisation and commodification of academia and research would provide valuable context beyond discussions of system failures related to productivity and reproducibility. Secondly, a more nuanced and critical approach to conceptualising open science would enrich the discussion, considering its multifaceted nature and potential pitfalls. Thirdly, the validity of the Mertonian framework and its selective analysis of values, particularly its exclusive focus on the norm of communism. Lastly, a deeper exploration of the challenges and promises inherent in the pursuit of responsible Open Science within ongoing institutional processes.

The following sections provide further details on these aspects, highlighting how von Schomberg's contribution opens the Pandora's box about the challenges and promises of a Responsible Open Science.

1. EXPLORING OPEN SCIENCE, NEOLIBERALISM, AND RESEARCH MARKETIZATION AMIDST THE SCIENCE CRISIS

The intricate and evolving terrain of Open Access and Open Science,[1] alongside the emergence of a new scientific ethos, necessitates consideration of the profound influence exerted by the neoliberal context and the proliferation of the academic capitalism[2] (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2008; Kauppinen, 2012; Hackett, 2014; Jessop, 2018; Slaugther, 2020).

Several authors have thoroughly scrutinized the growing commodification of academic research and the shifting ethos within the academic profession (Radder, 2010; Cantwell & Kauppinen,

[1] For a detailed description of European policy milestones and evolution from Open Access to Open Science in Europe see the Chapter 6 written by Carla Basili in *Science, Innovation and Society: achieving Responsible Research and Innovation*, Deliverable 3.3 Stocktaking Study (pp. 124-152).

[2] The concept of academic capitalism started in the 1990s with the publication of Slaughter and Leslie (1997). Hackett, a colleague of the aforementioned authors, claims to have coined the term to describe, at that time, the emerging circumstances within engineering and academic sciences in the United States (Hackett, 2014).

2014; Cantwell *et al.*, Bauwens *et al.*, 2023). Academic capitalism represents a shift in universities and research institutions from a model centred around the public good of knowledge and learning – guided by the ideal of the Mertonian Republic of Science – to a model where institutions, faculty inventors, and corporations prioritise their own interests over those of the public, viewing knowledge as a commodity to be capitalised upon. Science and higher education organisations have been progressively pushed towards the corporate archetype and have witnessed an instrumentalisation of knowledge and the establishment of a culture of performativity justified by the belief that economic growth, especially driven by technological innovation, will benefit society as a whole (Slaugther, 2020; Slaughter & Rhoades, 2008). Numerous studies examined the impact of market forces on science values and norms related to aspects such as the pursuit of efficiency and competitiveness, precarisation of academic labour, as well as recurrent complaints about the replication and reproducibility crisis, and the extent of fraud and misconducts in several science fields (Martinson *et al.*, 2005; Anderson *et al.*, 2007; Fanelli 2009; Begley, 2013; Marco-Cuenca *et al.*, 2021; Carvalho *et al.*, 2022). The crisis in science encompasses a decline in the quality of generated knowledge content, coupled with a diminishing credibility and relevance, and claims for a deepen ethical reflection on the values, structures, incentives, and underlying academic practices (Hasselberg, 2012; Macleod *et al.*, 2014; Jessop, 2018; Dominik *et al.*, 2022).

Jessop (2018) specifically criticises how academic capitalism affects the creation and sharing of knowledge, contending that the commercialisation of research has led to prioritising financially lucrative projects over socially significant and intellectually robust scholarship, thereby compromising the integrity and autonomy of academic investigation. Radder[3] (2010) refers to a pervasive transformation of academic culture, emphasising that "the commodification of academic research is not

[3] Radder (2010) considers that academic commodification is part of a comprehensive and long-term social development often described as the economisation, or economic instrumentalisation, of human activities and institutions, or even entire social subsystems. From a theoretical perspective, he distinguishes between three ideal-typical models: commodified science and the alternatives of autonomous and public interest science.

strictly novel but has substantially increased and intensified during the past thirty years" (Radder, 2010, p. 9). The creation of research lobbies and university alliances contribute to change the game of cooperation and competition where there are clear winners and losers, affecting core values such as academic freedom, objectivity, and integrity (Bok, 2003; Churchman, 2002; Hasselberg, 2012; Cantwell & Kauppinen, 2014; Jessop, 2018). In his paper "The Democratisation Myth and the solidification of Epistemic Injustices", Knöchelmann (2021) discusses how the commercial Big Deal Open Access that dominates Europe and North America driven by politics of progressive neoliberalism reinforces existing hierarchies and the hegemonic power structures of Western institutions, rather than democratising knowledge on a global scale. Although more radical scholar-driven OA initiatives emerged such as AmeliCA and Redalyc from the Global South, these efforts are often overshadowed by the commercial-oriented OA models that dominate the discourse and practice in the Global North (Chan *et al.*, 2019; Knöchelmann, 2021). A new "knowledge industry," as Fecher and Friesike (2014) have called it, is slowly but surely emerging from implementing Open Science. Fernández-Pinto (2020, p. 6) affirms that "The question arises whether Open Science is properly aligned with the values of transparency, democracy, and accountability that the movement fiercely promotes, or if it ends up compromising such value". In *"Breaking Ranks"* Diver (2022) critiques a point emphasised by von Schomberg regarding the prevailing irrational competition among universities to excel in terms of publication counts and venues, a trend evident in numerous university rankings.
He advocates for a re-evaluation of the role of rankings and suggests alternative approaches such as placing greater emphasis on qualitative assessments, community involvement, and adopting a more comprehensive perspective on academic excellence. Radder (2010) raised the questions: Can regulation mitigate the drawbacks of commodification? What alternatives exist to commodified science?

In addition to this discourse, the uncertain yet substantial impact of Artificial Intelligence (AI) on Open Access and Open Science must be considered, as it profoundly influences transparency, openness, and reproducibility – core characteristics of Open Science as well as responsiveness and responsibility (Buhmann & Fieseler, 2021; Santoni & Mecacci, 2021; Herrmann, 2023). Smuha (2021) has pointed at a race to AI that has engulfed many countries and regions and, therefore, has led to yet another race to regulate AI. Nevertheless, the development of the concept of Responsible AI (Agarwal & Mishra, 2021; Herrmann, 2023) supported the idea of AI for social good, emphasising on five ethical principles of "beneficence, non-maleficence, justice, autonomy, and explicability" regarding the use of AI; and proposed that AI research initiatives be examined in respect to seven factors to determine if they are good for the society. These factors include "falsifiability and incremental deployment, safeguards against the manipulation of predictors, receiver-contextualized intervention, receiver contextualised explanation and transparent purposes, privacy protection and data subject consent, situational fairness, and human-friendly semanticisation" (Fioridi, 2020, p. 1773).

In sum, the examination of the science crisis indicates that systemic failures extend beyond the productivity and reproducibility issues highlighted by von Schomberg (2024). Extensive literature on these failures suggests the existence of a serious ethical crisis, demanding a deeper discussion on values and responsibility. And the pivotal question, "Does the adoption of open science principles require a fundamental shift in research cultures?" gains particular significance.

2. A MORE NUANCED AND CRITICAL APPROACH IN THE CONCEPTUALIZATION OF OPEN SCIENCE

The analysis conducted by von Schomberg clearly articulates the expected benefits of Open Science[4], including enhancing credibility, improving reliability, increasing efficiency, and meeting societal demands. It is an optimistic discourse that embraces a broad and "aseptic" definition of Open Science as "the early sharing of knowledge and data in open collaboration with relevant stakeholders" (von Schomberg, 2019; Burgelman *et al.*, 2019). But today, "the republic of science is hardly but a number of independent nations, all waving their own flag" (Hasselberg, 2012, p. 46). There is much hope in Open Science as a call for that inclusive collaboration of multiple actors, exempt from interactions of power and hierarchies. In the same way, Stracke (2020) maintains that "Open Science can help overcome the post-truth era by increasing the objective and subjective credibility of science and research, and "can serve as radical solutions to address issues of diversity, equity, and quality in research".

First of all, it is necessary to establish a clear distinction between OS and Open Access (OA), which is placed "at the core of a distributed communication system among producers of knowledge" (Guédon, 2017, p.3). As von Schomberg (2024) points out, this is a common misconception of OS by editors, universities and even research policies. It is essential to critically examine this distinction and its implications. While OA is a fundamental step towards democratizing knowledge and promoting inclusivity in academia, it's only one aspect of the broader concept of OS. Merely providing access to research outputs does not necessarily ensure meaningful engagement with scientific processes or foster collaboration among researchers and the public (Chan *et al.*, 2019; Knöchelmann, 2021; Dominik *et al.*, 2022). Moreover, a narrow focus on OA to published papers may overlook other dimensions of openness, such as open

[4] A more restrictive definition of OS comes from the UNESCO's Recommendation on Open Science as "an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community".

data, open methodology, and open peer review, which are equally important for promoting transparency and reproducibility in research. According to Bostrom (2018) openness in Artificial Intelligence can take different forms with different strategic implications, as the term can refer to open research, open-source code, open data, or to openness about safety techniques, capabilities, and organisational goals, or to a non-proprietary development regime generally. Ignoring these aspects could limit the transformative potential of OS in addressing systemic issues like research reproducibility, data sharing, and equitable participation in scientific inquiry. Guédon (2017) states that "while Open Access is now here to stay, it also displays a variety of forms that do not all conform with the project of distributed human intelligence with which it is associated. Lesser and degraded forms of OA have also and gradually emerged, sometimes as the result of power plays by powerful actors, sometimes out of compromises proposed by people of good will. At the same time, the very multiplicity of social actors now involved in Open Access has made the field much more complex than it was fifteen years ago", and adds "Meanwhile, digital culture is progressing apace, and its effects are profound, not just technological" (Guédon, 2017, p. 2)

In the debate on openness and mutual responsiveness it is necessary to take into account the diversity of movements, perspectives and practices that amalgamate multiple tensions on Open Science (Vicente-Saez & Martinez-Fuentes, 2018; Marco-Cuenca *et al.*, 2021; Hosseini *et al.*, 2022). In words of Fecher and Friesike (2014, p. 7) Open Science "is an umbrella term encompassing a multitude of assumptions about the future of knowledge creation and dissemination". In a broad and detailed bibliographic review, they identified five Open Science schools of thought: The infrastructure school (which is concerned with the technological architecture), the public school (which is concerned with the accessibility of knowledge creation), the measurement school (which is concerned with alternative impact measurement), the democratic

school (which is concerned with access to knowledge) and the pragmatic school (which is concerned with collaborative research). More recently, a systematic review of Vicente-Saez and Martinez-Fuentes (2018) describes four orientations of open science: "transparent knowledge", "accessible knowledge", "shared knowledge", and "collaborative-develop knowledge", defining OS as "transparent and accessible knowledge that is shared and developed through collaborative networks".

Von Schomberg (2024) affirms that he prefers to talk about 'open research and scholarship', which explicitly clarifies the inclusion of the social sciences and humanities, and mentions the consistent use of the term in policy circles. In this respect, research literature highlights the increased divisions and disciplinary fragmentation not only in the so-called "three cultures" – sciences, social sciences and humanities – but also within each of them (Kagan, 2009; Sidler, 2014). Sub-disciplinary divides across the "three cultures" persist as well, creating pockets, or 'silos' of knowledge and epistemic communities with their own methods, languages, professional organisations, identities, and ethos. Kagan argues that the privileging of the sciences "created status differentials that eroded collegiality and provoked defensive strategies by the two less advantaged cultures" (2009, p. ix). In words of Sidler (2014, p. 83) "Either the movement will have to create and foster a broader definition of 'science' or it will have to replace the term altogether. To use the moniker effectively, the Open Science movement will have to acknowledge and address disciplinary divisions and monetary reward systems that led to this acrimony".

Additionally, it is worth highlighting the role of citizen science[5] (Hecker *et al.*, 2018: ECSA, 2024) and other challenge-incumbents that come from 'undone science' in areas of scientific research that remain incomplete or marginalised due to social, political, or economic factors from mainstream scientific agendas[6] (Hess, 2015, 2016). Overall, 'Undo-

[5] https://citizenscienceglobal.org/

[6] Hess (2015) argues that social movements play a critical role in challenge dominant paradigms, and advocate for alternative forms of knowledge production. He proposes a typology of "undone science" based on the nature of the scientific controversy and the role of social movements: 'Constrained Science' (research limited by external constraints), 'Oppositional Science' (research opposed by powerful interests), 'Counter-hegemonic Science' (research challenging dominant ideologies), and 'Participatory Science' (research involving collaboration with affected communities).

ne Science' offers a nuanced analysis of the complex interplay between science, society, and politics, bringing to the fore the potential of grassroots activism and public mobilisation to shape scientific knowledge and influence industrial transitions (Hess, 2016). Likewise, Stracke (2020) describes three general challenges for practising Open Science: the restrictions on flexibility, the costs of (additional) time required for Open Science, and the lack of an incentive structure. Although researchers serve as both producers and consumers of knowledge, Guédon (2017, p. 26) highlights that in the context of Open Science development "it is a strange paradox that a long – probably too long – discussion of the science communication system should end with the observation that researchers' role in the scientific communication process may well be quite marginal". These aspects need to be considered in a reflection on openness and mutual responsiveness alongside the practices and challenges of research integrity within the context of OS.

Knowledge production is not a monolithic process but varies significantly across fields, disciplines, and research communities, as well as the other actors from the Quadruple Helix (Chan *et al.*, 2019; Knorr-Cetina, 2013). Given the diverse array of movements, perspectives, and constellations of practices within Open Science (Field, 2022), how can we navigate the tensions and complexities inherent in promoting openness and mutual responsiveness across various disciplinary and institutional contexts? What strategies can be employed to address the disciplinary divisions and silos within academia, particularly between the sciences, social sciences, and humanities, in order to foster a more integrated and collaborative approach to research and scholarship under the umbrella of Open Research and Scholarship?

3. THE LIMITATION OF THE MERTONIAN FRAMEWORK AND THE SELECTIVE ANALYSIS OF VALUES

While the text revisits Merton's early contributions and the CUDOS norms, it tends to oversimplify the interpretation of Merton's ethos of science and there is no strong rationale for excluding the other principles. In an era emphasising diversity and inclusion, Universalism related to OS practices can help counteract biases and promote equity in scientific evaluation. Disinterestedness and Organized Skepticism can assist individual scientists in prioritising ethical considerations and upholding the credibility and reliability of science. These principles are essential in combating misinformation, as they emphasise the rigorous evaluation and critical analysis of research facing the 'dark side of competition' in science (Anderson *et al.*, 2007, p. 438). Moreover, Merton's concept of communism is depicted as closely related to the norms of openness and responsiveness. However, Merton's communism primarily emphasises the communal nature of scientific knowledge production and the imperative of sharing findings rather than individual adherence to open practices. This oversimplification may lead to a misunderstanding of Merton's original intentions.

On the other hand, the paper argues for broader governance of the institution of science in its relationship with society at large, questioning the efficacy of relying solely on self-governance within the scientific community. While broader governance is indeed important, dismissing the potential role of a new ethos of science overlooks the significance of fostering cultural shifts within the scientific community itself. An analysis of "openness" should consider in more detail the diversity of 'epistemic cultures' which refers to the diverse ways in which knowledge is created, validated, and circulated within different social, cultural and institutional contexts.

In recent years, there has been a wealth of research exploring the changing normative and practical framework guiding scientists' activities, presenting new interpretations of Merton's normative principles (Kalleberg, 2007; Macfarlane & Cheng, 2008; Lam, 2010; Koning *et al.*, 2017; Kim & Kim, 2018). For example, Macfarlane and Cheng (2008) identified an alternative set of contemporary academic norms, opposed to Merton's, which include capitalism, particularism, and interest. Kim and Kim (2018) express their concern about the persistence of communalism regarding openly communicating research results in the face of increasing academic commercialisation.

The scientific ethos stands as a dynamic social construct, mirroring the evolving currents of its surrounding context. Through the lens of structural and social perspectives on science, Konig *et al.* (2017) assert a tight interconnection between norms and values in contemporary scientific endeavours. These norms not only shape the conduct of science within specific contexts but, following Merton's framework, they manifest as prescriptive guidelines, enforced sanctions, and shared objectives. This combination gives rise to what is termed 'post-normal science', where the primary focus shifts from mere knowledge production to generating robust sociotechnical insights that facilitate decision-making processes and goal achievement. While navigating the discourse surrounding evolving scientific norms, they propose that the Mertonian normative framework serves as a crucial reference point. However, amid the intricate fabric of contemporary scientific landscapes, marked by complexity, uncertainty, and a diversity of legitimate perspectives, normative ambivalence emerges as a significant characteristic. This ambivalence, as highlighted by Lam (2010) through her exploration of hybrid values, underscores the nuanced interplay between diverse norms and values, particularly evident in fields such as applied science and professional consultancy services. Specifically, the Merton framework has constraints in supporting the examination of openness and

co-responsibility within a context of epistemic uncertainty (Hofmann, 2022). Or, as Fuller (2007) affirms, in contexts of power dynamics and epistemic justice ambiguity. Despite of the tendency to update the powerful Mertonian framework as a basis for an analysis of science, it is necessary to recognise that "the institutional and political context which produced the Mertonian values is no longer with us" (Hosseini *et al.*, 2022, p. 18) and its validity remains very limited. As Hosseini *et al.* (2022, p. 18) maintain "if new normative structures for science are to have any traction in reality, they have to look beyond nostalgia and, in view of aspirations and outcomes of Open Science Practices, suggest prescriptive appeal for today's science". How can the institutionalisation of openness and mutual responsiveness within scientific governance frameworks address the oversimplification of Merton's ethos of science and accommodate the diversity of epistemic cultures? Considering the evolving scientific landscape marked by complexity and uncertainty, what incentives can be established to promote Responsible Open Science practices?

4. CONTEMPORARY RESEARCHERS' DILEMMAS: WHY INSTITUTIONALISING OPENNESS AND RESPONSIVENESS IS NOT ENOUGH

The preceding analysis reveals a mix of discourses and practices around Open Access and Open Science, encompassing the regulatory, normative, and cultural-cognitive aspects of emerging institutionalisation processes. While there is consensus on the need to reform science, with numerous bottom-up initiatives worldwide (Chan *et al.*, 2019; UNESCO, 2023), the imperatives of rankings and the rhetoric of quality and reputation associated with large-scale initiatives in the Global North prevail. These initiatives receive the majority of investments and maintain the hegemonic order. In today's academic landscape, heavily influen-

ced by market dynamics and performance metrics, the prevalent 'gold open access model' often undermines efforts to foster genuine adherence to Open Science principles (Hess, 2016; Chan & Gray, 2020; Knöchelmann, 2021). Reflecting on openness and responsiveness, alongside the imperative of ethical reform, inevitably raises researchers' dilemmas regarding research integrity, normative ambiguities, and academic survival.

On the one hand, the relevance of creating knowledge aligned with mission-oriented research and co-responsibility in addressing societal challenges and advancing the green, digital, and social transitions and RRI, as von Schomberg's paper highlights. On the other hand, the realm of social practices of research institutions and individual researchers is strongly influenced by market forces, hierarchical structures, and network mechanisms controlled by publishers, funders, and governments. This contributes to fostering competition and a culture of individualism and self-interest, which tests collaborative relationships between scientists and erodes norms such as transparency and openness (Anderson *et al.*, 2007b). Research integrity practices are significantly shaped and threatened by the incentive structures of publishers and funders (Edwards & Roy, 2017; Field, 2022; Labib *et al.*, 2023). These competitive pressures lead to ethical dilemmas, such as conflicts of interest, exploitation of junior researchers, and scientific misconduct.

Hence, the intended adherence to the values of openness and responsiveness transcends merely reforming incentives and is linked with Pierre Bourdieu's concept of 'illusio' commented by Knöchelmann (2021). Many researchers are complicit in the deeply ingrained, often unconscious belief in the value and importance of the academic game, navigating the ambivalence, ignoring the arbitrary nature of certain rules and stakes, accepting them as natural. By participating, they reinforce the legitimacy of these rules and stakes, even

if they question specific outcomes or aspects of the game.

In this respect, Labib *et al.* (2023) mention three modes of governing research integrity: markets (using incentives), bureaucracies (establishing rules), and network processes (via commitment and agreements). They maintain that fostering research integrity requires a balanced combination of these governance modes, as each has its strengths and weaknesses. For instance, while the network mode is more collegial and collaborative, it tends to be slower and influenced by group dynamics compared to market and bureaucratic modes.

Therefore, openness and responsiveness should be considered in dialogue with the performative role of scientific communities and research cultures that, in turn, shape the construal of integrity and build responsible research systems and cultures (De Peuter and Conix, 2023; Field *et al.*, 2024). The institutionalisation of openness and responsiveness should be for 'all the gamers', and this demands careful thinking about the Global North, the Global South, and beyond. And ideally, sharing knowledge should be rooted in solidarity, not driven by taxes or rewards. As Joy (2020) forcefully puts it, this approach to openness involves "taking back from commercial publishers the full reins of the means of production of academic publishing and reinventing the academic press as a critical arm of both the research and teaching mission of the University" (Joy, 2020, p. 324). Considering the evolving scientific landscape marked by complexity and uncertainty, what kind of incentives can be established to promote Responsible Open Science practices?

5. CONCLUSION

The debate on self-governance within the scientific community is multifaceted and critical to the future of Responsible Research and Innovation. Von Schomberg (2024) asks the question: Should we prioritise self-governance

through a set of prescribed norms for individual scientists, or should we focus on institutional values guiding the broader institution of science? But is today the consideration of self-governance enough? Likely not. The complexity of contemporary scientific practice and its impact on society necessitates a more comprehensive approach. Only by integrating responsiveness and responsibility in science, *from within* into dialogue with other knowledge producers in wider society, can we hope to foster a robust, inclusive and effective framework for co-responsible scientific governance.

Institutionalising openness and responsiveness hold great promise for advancing Open Responsible Science at the core of RRI, but it also faces substantial challenges. These challenges include aligning consensus across diverse epistemic cultures and communities of practice, searching for appropriate incentive structures, and ensuring that the adoption of Open Science principles goes beyond mere compliance to incorporate genuine ethical commitments. Above all, it is about changing and institutionalising practices that contribute to overcoming epistemic injustices by creating more inclusive research agendas and ensuring that diverse voices – including undone science and citizen science movements – are heard in the decision-making process. The insights and efforts of scholars hailing from the Global South are frequently disregarded or underestimated. This disregard is exemplified by the marginalisation reinforced by the prevalence of English-language journals and the focus on metrics like rankings and citations, which can skew research priorities towards topics deemed prestigious or suitable for high-impact publications. And marginalise relevant research that may not fit neatly into traditional academic evaluation frameworks.

Continued dialogue on these issues is crucial for developing robust, inclusive, and effective frameworks that underpin the broader governance of the institution of science in its relationship with society. This includes responsive research,

which involves shifting towards open science and engaging with societal needs, and responsible research, anticipating socially desirable outcomes by integrating foresight and technology assessment into research missions (von Schomberg, 2024). Through such dialogue, we can better navigate the complexities of integrating openness and responsiveness into the fabric of scientific research and fostering a genuinely Responsible Open Science.

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