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RESEARCH ARTICLE



The new spirit of technoscience: recalibrating symmetrical STS critique

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ABSTRACT

This article situates Responsible Innovation (RI) as part of a larger shift in science and technology governance demanding a ‘social fix’ for innovation, which we argue amounts to a new *spirit of technoscience*. Inspired by Luc Boltanski and Eve Chiapello’s analysis of the development of a ‘new spirit of capitalism’ from late twentieth century, we observe the rise of a new governance rationality in technoscientific innovation which places society, its needs, and desires at the center of scientific and technological development. This shift has significant implications for the field of science and technology studies, and the modes of critique that STS scholars mobilize in understanding and intervening in the politics of sociotechnical change. The new spirit of technoscience calls for a reassessment of familiar formulas of STS critique, with a renewed symmetrical approach to the prescription and production of democracy for science and technology governance.

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Introduction

Following a decade of institutionalization of Responsible Innovation (RI), this special issue posits the current moment as pivotal for STS scholarship in reorienting itself productively toward the protean landscape of science and innovation politics. RI proponents have focused on bringing society into technoscientific production, by helping ‘societal actors and innovators become mutually responsive to each other’ (Von Schomberg 2011, 49), or ‘taking care of the future through collective stewardship of science and innovation in the present’ (Stilgoe, Owen, and Macnaghten 2013). Having emerged from a much longer history of scholarly concern with responsibility in scientific practice and a series of political crises around new technologies (Randles, Tancoigne, and Joly 2022), the concept gained strength from the malleability of its definition and possibilities of operationalization, as well as its seemingly irreproachable formulation (Guston 2015). RI has been coproduced with the rationalities of British and European governing

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institutions since the early 2000s, and finally enshrined as Responsible Research and Innovation (RRI) in Europe's research funding programs in the 2014 *Rome Declaration* (Italian Presidency of the Council of the European Union 2014). Although the accompanying acquisition of controversial RRI keys¹ causes enduring consternation for more conceptually minded scholars looking to advance differently formulated strategies for RI (Owen, von Schomberg, and Macnaghten 2021; Pansera et al. 2020), this institutionalization allowed for the expansion of available resources and the multiplication of well-funded research projects that include RRI in one form or another.²

A decade later, RRI has now been deemphasized in EU funding schemes, and is viewed by many of the scholars that have supported its institutionalization as in crisis and in need of reconsideration and reanimation of various kinds (Fisher 2021; Owen, von Schomberg, and Macnaghten 2021). Although RRI no longer holds a preferential place in how the EC frames its science in society funding initiatives, the 2021–2027 Horizon Europe Research and Innovation Program continues to emphasize key dimensions which were previously defined as under its aegis – ethics, gender, open science, citizen science and science communication (“Horizon Europe” 2023). The nature of this shift demonstrates that the imagined role of society in fostering innovation continues to grow and evolve, even as references to RRI have been drastically reduced. It makes RRI visible as both having played a prominent role in driving a significant shift in the construction of credibility and legitimacy in spaces of technoscientific production and governance, and as having itself in the process ostensibly lost its *raison d'être*. As such, RRI offers an opening to consider the forms, roles, and tools of technoscience critique and the dynamic ways in which power is exerted through them, as well as how they are adapted and become obsolete.

In this paper, we consider how governance rationalities in science and technology policy interface with the mobilization and institutional uptake of RI in various forms. Shifting from a traditional ethos promoting ‘technological fixes,’ contemporary policy instruments and discourses now advance an eclectic set of ‘social fixes’ to the problems, risks, and harms that might arise from technological innovation in the future (Frahm, Doezeema, and Pfothenauer 2022). Even as public discourses around science and technology are denounced as conspiratorial and uninformed, social fixes focus on increasing the involvement of publics in technoscientific decision-making. They foreground attention to ethical questions in research and development, and a discursive turn from self-governance to democratization of science and technology. This *new spirit of technoscience* mutates from the long-held premis that science and technology occupy a separate domain from society, from which they were envisioned to drive social progress and well-being. This vision of rightful order has guided science policymaking since WWII, when it was famously codified in what Vannevar Bush proposed as a social contract with science (Bush 1945). The new spirit instead grants a central role to individuals and collectives in steering science and technology toward socially desirable ends.

Our invocation of a new spirit of technoscience draws on Luc Boltanski and Eve Chiapello's ([1999] 2018) seminal text, *The New Spirit of Capitalism*, in which the authors emphasize the important role of critique in transforming and stabilizing capitalism. They argue that capitalism is necessarily accompanied by a spirit³ – a justificatory account of the practices of capitalism that allows people to take part in and work on behalf of the imperative of endless capital accumulation, without which the

misguidedness of such pursuit would be evident. This spirit animates a moral order in which critique is an essential stabilizing modality, articulating notions of justice that challenge the central logic of capital accumulation, which are in turn incorporated into and made the basis for new justificatory logics for capitalism. The authors explain, 'Because critique makes it possible for capitalism to equip itself with a spirit which ... is required for people to engage with the profit-making process, it indirectly serves capitalism and is one of the instruments of its ability to endure' (Boltanski and Chiapello [1999] 2018, 1225).

Our analysis takes up this heuristic as particularly helpful for considering the role and shape taken by STS critique in recent transformations in both the ideological and material ordering of technoscience, public institutions, and citizens across diverse governance settings. Rather than establishing an analogy to the role of critique in the enduring power of capitalism, we examine the relationship between STS critique and the centrality of innovation in governing rationalities. We reflect on RI as a mode of critical STS intervention in the governance of technoscience, which we suggest has significantly transformed in the last decades regarding the logics that justify technoscientific innovation as central to and worthy of public support. We do not aim at providing a detailed account or explanation of this transformation but are interested in better understanding the role of STS critique within it, including, but not limited to, its recent expression in the form of RI theorizing and intervention.

In particular, we take a perspective on RI inspired by a pragmatist approach to and analysis of critique (Barthe et al. 2013), and propose that returning to the foundational principle of symmetry might generate fruitful inroads to a renewal of STS critique.⁴ The essay is hence neither primarily an attempt at empirically evidencing what we describe here as a historical transformation in the *spirit of technoscience*, nor at formulating a radically new set of analytical principles for critique of such spirit. By drawing on some of the key insights developed by pragmatic sociologists in the analysis of critique and its role in transforming the spirit of capitalism, we hope to provide, in the words of one of our reviewers, an 'energetic reminder of a set of classical formulations' shared among STS and pragmatic sociology, which we argue offer a new understanding of the contemporary politics of technoscience.

In the following, we begin with an account of the rise of participatory frameworks as an outgrowth of critiques of scientific authority targeting techno-determinist rationalities, the role of expertise, and the exercise of state and corporate power. We situate RI as the culmination of a set of dynamics that has elevated such interventions as a necessary and desirable 'social fix' for innovation. We argue that in the process by which these critiques were advanced, and in the associated transformations of the science governance rationalities that they accompanied, the new spirit of technoscience has incorporated the critiques upon which RI rests. As such the form of critique that RI mobilizes has a stabilizing effect on the core dynamics whereby science and technology are centered as the necessary modalities by which societies should pursue human wellbeing. Finally, we argue for a return to the foundational principle of symmetry, away from which RI has evolved. A renewed orientation toward methodological symmetry offers the possibility of opening up modalities of RI critique that take the new spirit of technoscience within the field of analysis, presenting expanded possibilities for the conceptual and

practical development of RI itself, including an expanded field of spaces, subjects and avenues of intervention.

The coproduction of a social fix

Since the 1970s, STS critique – and engagement – has played an important role in envisioning changes in technoscientific governance rationalities, not least due to early critique of realist conceptualizations of scientific authority and technological change. Drawing on David Bloor's proposal for a Strong Programme in the Sociology of Knowledge, STS theories have been informed by evolving notions of methodological symmetry – initially articulated as the principle that the same kinds of explanations should be sought for 'true and false beliefs' (Bloor [1976] 1991, 7). This foundational proposition has facilitated pragmatist research approaches foregrounding impartiality toward knowledge claims in scientific controversies (Bloor [1976] 1991; Collins 1981), problems and solutions mobilized in technological development (Pinch and Bijker 1984), human and non-human agency in the stabilization of scientific facts (Callon 1984; Latour and Woolgar 1986), and the production of epistemic and normative order through science and the law (Jasanoff 2007; 1995).

Such methodological impartiality, in turn, helped to dismantle grand, asymmetrical narratives of human progress achievable through science and technology; instead, STS has argued for a stance of 'intellectual caution,' allowing for an appreciation of contingency, situatedness, and multivocality in the interplay between science, technology, and society (Law 1990, 6). These modalities of symmetry were advanced and contested through a series of scholarly debates and disagreements, giving rise to different and sometimes conflicting branches of STS theory and practice (Jasanoff 2004; Latour 1993; Winner 1993). By arguing that science, technology, and society co-construct or co-produce each other, STS scholars have not only opened the 'black box' of science and technology to acknowledge the social agency at play in technoscientific development, but have also advanced myriad proposals on how to re-configure governance arrangements so as to grant individuals and collectives greater agency in technoscientific change.

Armed with these foundational critiques to positivist scientific discourse, STS scholars have engaged alongside ethicists and other social scientists, in efforts to get ahead of novel risks from technologies while pointing out the pitfalls of ignoring the political dynamics of technoscientific change. In this spirit, the field has broadly taken controversies around science and technology as not only central objects of analysis, but as sites of intervention and subjects of policy advice.⁵ As such, engaged researchers have taken on responsibility in undertaking precedent-setting efforts of conceptual and institutional development for science governance. These efforts were advanced in part by the momentous decision by U.S. NIH Director Frances Collins to fund a committee on Ethical, Legal, and Social Implications (ELSI) research alongside the Human Genome Project in the 1990s (Hilgartner, Prainsack, and Hurlbut 2017). Critiques of ELSI inspired a series of subsequent related concepts such as ELSI 2.0 (Kaye et al. 2012), midstream modulation (Fisher, Mahajan, and Mitcham 2006), anticipatory governance (Barben et al. 2007), and finally, RI. While not all STS scholarship has advocated univocally for the expansion of public input into science and technology (Collins and Evans 2002), and different schools of thought within the field take distinct approaches to engaged

critique (e.g. MacKenzie 2009; Ottinger 2013), the most prominent interventionist STS frameworks to be taken up and mobilized in policy spheres have been those geared directly toward public participation and other mechanisms by which broader social concerns could be brought into the various modes of technoscientific production.

The new spirit of technoscience

Offered as tools to align innovation and society, these frameworks gained purchase with the promise of not only avoiding public rejection of technologies and scientific expertise, but of achieving better technoscientific futures (Callon, Lascoumes, and Barthe 2009; Nowotny, Scott, and Gibbons 2003; Stilgoe, Owen, and Macnaghten 2013). From this perspective, concepts of scientific democratization that aimed at remedying a diagnosed excess of technocracy in contemporary governance emerged as toolkits offering a social fix that would enable the continued progress of technological innovation (Frahm, Doezenia, and Pfothenhauer 2022). This dynamic takes many forms in contemporary governance of science and technology, including the routine mobilization of ELSI across political and disciplinary boundaries to support the attainment of promised technoscientific futures (Doezenia 2023), the increasing proliferation of ‘ethics’ frameworks for the governance of emerging technologies across sectors (Knopf, Frahm, and Pfothenhauer 2023), as well as the institutionalization and international transfer of RRI (Doezenia et al. 2019; Mamidipudi and Frahm 2020).

STS critique of technocratic governance rationales has in large part served as an inroad to framing, envisioning, and operationalizing alternative narratives and forms of technoscientific governance which today form part and parcel of mainstream policy discourses, as the rise of RRI in various settings of international governance evidences. For instance, efforts by both the Organization for Economic Cooperation and Development (OECD) and the EC to operationalize and internationally propagate RI were advanced by the ‘claim that it is precisely because society is not included in policy-making that innovation fails to be successful in bringing the envisioned benefits to society’ (Frahm, Doezenia, and Pfothenhauer 2022, 178). In these settings RI was mobilized to fit the institutional rationales in question, strengthening their legitimacy in moments of deep institutional crisis (ibid). The initially radical critique of routines and cultures of technoscientific production that RI offered was mainstreamed into a shared common sense across these organizations and throughout prominent networks of scientific production and governance that were included in the process.

Two of our recent empirical explorations consider spaces in which imperatives of public engagement and moral deliberation inform science and technology governance rationales well beyond spaces of RI intervention. In a prestigious international project geared toward simultaneously creating new knowledge about all of the world’s species and leveraging such knowledge for future markets, scientific leaders not only justified the existence of an ELSI committee as a natural element of scientific communication to demonstrate ‘that you’re being ethical’ (Doezenia 2023, 16); but the ELSI committee’s work was imagined to be central for the generation of credible, socially and environmentally beneficial forms of knowledge production. Positioned as indispensable for the settlement of international governance principles and guidelines across countries and stakeholders, the committee carved out certain spaces, issues and contexts in which

public consultations would be necessary. Rather than a by-product, afterthought, or tedious companion to technoscientific innovation, the ELSI committee here figured as ‘of central enabling importance to the enactment of the project’s vision of future public good’ (Doezema 2023, 18).

At another research site, the EU’s engagement and production of ‘AI ethics’ principles and guidelines, ethical deliberation on AI through a high-level advisory committee was not only framed as a naturally ‘European way’ to take part in the global AI race; a commitment to centering AI development on a set of values and fundamental rights was presented as essential for the harmonization of governance approaches across member-states and hence for the achievement of a Single European Digital Market. Different to the ways through which the EU legitimized its authority to govern in the past, here, the ‘socio-economic benefits of AI are imagined to be harnessed through a dedicated commitment to joint ethical norms in the present, suggesting a novel rationale for European integration’ politics (Frahm and Schiölin 2023, 15).

These cases represent a departure from science governance rationalities centered on scientific independence and insularity, illustrating the key facilitating and legitimizing roles envisioned for ‘society’ (variously figured) in the service of ambitious normative and technoscientific projects of world-making – i.e. the integration of the new spirit of technoscience across organizations and institutions that assume governance authority in sociotechnical change.

Critique and engagement with the new spirit in STS

While STS scholarship has been painstakingly reflexive toward the frames through which ‘society,’ ‘democracy,’ and its ‘publics’ are properly mobilized in policy settings, STS critique of, and engagement with the ‘new governance’ of science and technology (Irwin 2006) remains largely (and surprisingly) unchanged. STS scholars time and again detect ongoing rationales of technoscientific determinism, solutionism, and instrumentalism beneath the turn to social agency in governance, as existing critiques of RI frameworks and wider debates about public engagement exemplify (Bogner 2012; Felt and Fochler 2010; Irwin 2006; Macnaghten, Kearnes, and Wynne 2005; Sadowski 2020). Here, proposals for RI are persistently underwritten by a (sometimes tacit, sometimes quite explicit) ideal of democratic governance in which social agency would be ‘taken seriously’ (Felt et al. 2007) rather than subjected to the normative and instrumental frames of scientists, engineers, and policymakers (Stirling 2008). As Chilvers and Kearnes (2016) have argued, such idealism amounts to a “‘residual realist’ perspective” – treating ‘a set of assumptions that frame objects of interest (like “the public” and “democracy”) as objects with a fixed essence to which the right methodological tools can give access’ (Groves 2017, 410) – *contra* STS’s pragmatist sensibilities and corollary normative aspirations.

This idealism also penetrates those streams of STS thought concerned with advancing radically new forms of science critique targeting the political economy of technoscience (Birch 2013; Tyfield et al. 2017). By making the case for a greater attention to the capitalist market logics that underwrite the politics of technoscience (including emerging regimes of RRI), this scholarship has advanced important STS critique regarding the neo-liberalization (Birch 2018; Lave, Mirowski, and Randalls 2010) commodification, and

assetization (Birch and Muniesa 2020) of science and technology, and concurrent shifts in styles of governmentality (Pestre 2008). Yet, while attentive to the dynamics through which the turn to participation, deliberation, and ethics reflects new forms of legitimizing technoscientific imperatives (such as the ‘knowledge economy’ or ‘open science’), critique is first and foremost oriented toward the entanglements of technoscience with capital(ism) as that ‘imperial power’ which ‘constraints the parameters of engagement’ and ‘political possibility’ more generally (Thorpe 2020, 554), and which is argued to be ultimately finding its way ‘into all aspects of contests over the legitimacy of policies, publics, and participation’ (Thorpe 2020, S63).

As a consequence, critique of capitalist hegemonies is also productive of calls for a ‘radical transformation of science politics’ (Tyfield 2012, 159), including a

vibrant public realm of knowledge production *not* produced in search of immediate profit; R&I directed to significant contemporary challenges, not just the (re)fashioning of consumer desires; and a scientific process that is at least *trusted* to be publicly accountable and actively cultivates that trust. (Tyfield et al. 2017, 12–13)

Others suggest a ‘democratic socialist planning’ that ‘re-orient[s] science policy toward a moral economy based on the satisfaction of human need rather than the drive toward endless growth and the ever-intensifying domination of nature, driven by the pursuit of profit’ (Thorpe 2020, S68). By representing existing democratic practices as hollowed out by, captured by, or subjected to capitalist power, this literature posits a tacit vision of not only ideal science but ideal democracy, both of which would exist but for their degradation by capitalism – a ‘regression for democracy’ (Pestre 2008) – that must be countered by new practices and politics of science and technology governed by society rather than markets.

Common to all of these forms of critique is that they reinforce an (often tacit) boundary between types of public engagement deemed justified by the field of STS and those forms of governance considered to be instrumental performances of democracy that ultimately cater to the interest of the market, scientific authority, or technological rationality. They engage in a traditional mode of critical sociology that ultimately rests on ‘disclos[ing] vested interests supposedly concealed behind more general arguments’ and ‘track[ing] down hidden agendas or more or less conscious ulterior motives behind actors’ ... statements’ (Barthe et al. 2013, 15), thus positioning the analyst as ultimate explainer or even judge of what actors do, why and how they do so, and how they describe and justify their actions. They are characterized by an asymmetrical projection of an *a priori* desirable outcome (‘truly democratized science,’ ‘truly deliberative democracy,’ ‘truly socialist planning’), while setting out to discern its degree of failure or success in successive case studies (Tabarés et al. 2022). Due to such asymmetry in analysis, power relationships between technoscientific authority and public agency seem perpetually asymmetrical, and, somehow paradoxically, even irreversible, at the expense of the legibility of their de-facto contingency and indeterminacy (Barthe et al. 2013, 32–33). This analytic stance has the effect of making only some dynamics visible, while lacking the scope to adequately take into account the new modalities in which science and technology governance are undertaken and justified. It precludes a symmetrical reading of the plurality of claims, interpretive frames, and practices brought forth by actors in the current governance of technoscience, which across the board are

characterized by the declared goal to drive innovation with, in, and for society as a *sine qua non* for the achievement of desirable socio-technical futures.

Taking the new spirit seriously

Boltanski and Chiapello describe the core dynamic between critique and capitalism as one in which capitalism ‘has discovered routes to its survival in critiques of it’ (Boltanski and Chiapello [1999] 2018, 206). Shifting the focus away from the relationship between capitalism and critique, we are concerned here with the parallel (and not unrelated) dynamics by which technoscientific authority has been transformed and stabilized through deconstructive and interventionist critique. Mobilizing a powerful formula of STS critique – against technocratic governance rationales and for a greater democratization of technoscientific development – RI and its predecessors have been successively incorporated into science governance rationalities, while maintaining core dynamics whereby human well-being is positioned as inextricably linked to technoscientific progress.

Instead of changing these core dynamics, RI has been incorporated as a tool to support the continued reliance upon them, and put to work instead to make so-called processes of ‘innovation’ more socially acceptable. As such, we can view the role of STS critique as playing the role of ‘a motor’ (Boltanski and Chiapello [1999] 2018, 205) in changes in the spirit of technoscience with wide-ranging repercussions for both the ‘steam’ of STS critique (Latour 2004), and the contemporary governance of science, technology, and society (Jasanoff 2003). Rather than argue that STS is the primary site of causal agency in bringing about this shift,⁶ we rather seek to highlight how STS critique has not only shaped but been shaped by the dynamics whereby society is positioned as providing a fix for technoscience. Accordingly we consider RI (along with RRI), as an important site at which we can observe the dynamic tension between critique *as disturbance* to the centrality of innovation in contemporary governing institutions, and its *systemic reintegration* as a justificatory logic wherein ‘the democratic participation of society is envisioned as capable of repairing the underperformance of innovation governance around the world’ (Frahm, Doeze, and Pfoth 2022, 177).

What has changed through this process of critique is the imagined relationship between technoscience and society, and in particular the modalities by which innovation is legitimized as a central organizing principle for the pursuit of human wellbeing – what Boltanski and Chiapello refer to as ‘the spirit of capitalism’ (Boltanski and Chiapello [1999] 2018, 147), and which in this case we are referring to as the spirit of technoscience. They describe such justificatory ideologies as subject to change over time, with critique playing a key role in how and in which ways this change occurs. Associated changes in practice accordingly have ‘the effect of temporarily disarming critique’ itself (Boltanski and Chiapello [1999] 2018, 213), which must in turn transform in response to the new routines and ideologies with which they are faced, in order to remain relevant. This is because the conditions change such that ‘the development of the dominant ideas takes a direction that [the critique] demanded, and it finds itself partially satisfied’ (Boltanski and Chiapello [1999] 2018, 229). This satisfaction is only ever partial in their account because the system has taken the premises of the critique on board, justifying itself in these terms, while maintaining the core accumulative function.

With such changes, old modes of critique and questioning are made obsolete and new forms of critique emerge in response to the changed conditions. What STS critique is currently faced with is the changed justificatory ideological landscape of science and technology governance, in which the core critical orientations have been incorporated to uphold rather than challenge the centrality of technoscientific progress as the object and agent of governance. In RI we see the continued mobilization of a formula of critique which was developed alongside a spirit of technoscience that has through its influence been dramatically transformed. While this ‘isomorphic relation’ (Boltanski and Chiapello [1999] 2018, 1272) between STS critique and science policy is repeatedly subject to debate within the field (Jasanoff 1999; Webster 2007), it is also a key condition for the effectiveness of critical mechanisms advanced by STS.

In the process whereby its critique has been partially taken on board, RI has lost the power it once had to introduce novel correctives to the science-governance system, even while those scholars who brought it to the table continue to observe many of the same problematic patterns ongoing in the systems that they sought to change through RI interventions. Recent obituaries and visions of resurrection for RRI, responding to the European Commission’s move to deemphasize the framework in its Horizon funding schemes (Fisher 2021), have reflected on its failure to achieve ‘lasting institutional change’ (Owen, von Schomberg, and Macnaghten 2021, 11) and to meet the original ‘more ambitious vision for RRI’ (Owen, von Schomberg, and Macnaghten 2021, 7). These researchers acknowledge the complicated history of RRI and the impossibility of turning back the clock, calling to ‘re-energise the challenge’ to the dominant framing of ‘innovation as being inherently good, desirable and the engine of choice to foster economic growth, productivity and prosperity.’ They envision a return to the founding critique of RI, while focusing on the ‘norms, logics and institutions which compete and resist RRI as a process of transformative change’ (Owen, von Schomberg, and Macnaghten 2021, 11–12).

Indeed, the new spirit of technoscience demands ‘a revival of critique’ (Boltanski and Chiapello [1999] 2018, 214) in RI. But such a revival should recognize the transformed justificatory landscape that RI played a role in bringing about, and reconstruct its ‘interpretive schemas’ accordingly, ‘making it possible to give meaning to these transformations’ (Boltanski and Chiapello [1999] 2018, 229). In much RI analysis, the interventionist stance situates the analyst as responsible for delivering democratic intervention to sites of otherwise technocratic rationality, and as such in the modality of speaking for and performing the ideal of democracy rather than situating it as a site of inquiry (e.g. Brand and Blok 2019; Reber 2018). Instead of continuing to diagnose and seek measurable solutions for a resistant technocracy (e.g. Reynolds, Kennedy, and Symons 2023), a different modality of critical attention needs to be oriented toward the ‘social fixes’ that have been made central to the governing logics of science and innovation. We propose that engaged STS should take an explicitly symmetrical approach to democracy itself, directly contending with the meanings that democracy takes on and the diversity with which it is practiced.

Recalibrating symmetry

Seeking to take into account shifts in the spirit of technoscience that STS itself has played such a pivotal role in bringing about – toward the vision of social agency and inclusion as

a governing fix for innovation – we argue that different formulations of STS critique are called for, especially in those spaces and discourses where it has been taken up and institutionalized.

An explicitly symmetrical analytical stance toward democracy could help reorient and clarify attempts to account for the ‘failures’ of RRI by shifting focus in a way that takes the modalities in which it has ‘succeeded’ alongside and within the same frameworks of analysis as accounts of its ostensible failings. In the new spirit of technoscience it is insufficient to argue for introducing society into the technoscientific enterprise, as such broad arguments validate more than challenge institutional rationalities. Rather, an explicit critical interrogation of how democracy is mobilized, shaped, and practiced within such settings opens the scope of analytic and interventive possibilities, where RRI can not only provide a powerful critique of problematic power relations, but undertake a clear justification of the normative foundations of the critiques and corollary interventions it advances. As Boltanski and Chiapello make clear,

to be valid, critique must be capable of justifying itself – that is to say, clarifying the normative supports that ground it – especially when it is confronted with the justifications that those who are subject to critique supply for their action. (Boltanski and Chiapello [1999] 2018, 207)

To re-calibrate STS critique through a renewed commitment to symmetrical analysis requires rejecting not only highly idealized, causal narratives of technoscientific progress and change but, in the same move, realist accounts of democratic politics and practice that guide policy making on science and technology today. Such critique would include greater attention to emerging discourses of social determinism which both interface with and overwrite techno-deterministic rationales in the contemporary governance of technoscience, and which have been at the core of STS attempts to change policy agendas, instruments, and discourses over the last decades. Similar to the critique advanced by Actor-Network-Theory toward critical sociology and early theorizations of the social studies of science, in which ‘society’ was all too often taken as the *explanans* rather than the *explanandum* in analysis of technoscientific controversies (Latour 2005), the new spirit of technoscience demands reflexivity toward the rationales, frames, and imaginaries imported from political theory, philosophy, and the law into STS and its engagement discourses and practices (Brown 2015; Durant 2011; Thorpe 2008). It requires acknowledgement of ‘critique’s work as it is *always already there*, by describing its operations and ‘understanding’ it in the sociological sense (that is, without immediately criticizing it for being defective, groundless, illusory, etc.)’ (Barthe et al. 2013, 49 [emphasis in original]).

In other words, to account for and effectively criticize the co-production of technoscience and democracy (Ezrahi 1990; Hilgartner, Miller, and Hagendijk 2015; Jasanoff 2004), we must ‘use the same resources in explicating closure, stability and change in people’s *knowledge of the world* and their organization of *life in the world*, for each is constitutive of the other’ (Jasanoff 1996, 397). This entails taking democratic politics equally (alongside technoscience) as an explicit site of symmetrical analysis. Rather than offer democracy as an ideal that can be delivered and attained through public engagement, such a research agenda would inquire into how notions and practices of democracy are consistently produced in dynamic relation to technoscientific change.

How can we explain the turn toward society and the different discourses through which society and social expertise are portrayed as key actors in governing the advance of technoscience? Which situated visions of socio-technical progress guide these novel justificatory discourses, and how are they informed by larger, historically grounded imaginaries of democracy and self-governance by the people? And how is the novel attention to social agency and responsibility re-shaping governance arrangements, including the production of new, asymmetrical visions of appropriate relationships between science, technology and society?

Science and democracy are a foundational set of concerns for some areas of STS scholarship (Brown 2009; Jasanoff 2011; Shapin and Schaffer 1985) and symmetrical approaches to their study provide ready examples of the analytical strength of such an approach (Hurlbut 2017; Jasanoff 2007; Miller 2004; Parthasarathy 2017; Reardon 2017). Recent STS literature has explicitly sought to establish a broader research agenda taking an empirical approach to ‘the study of democracy, with a small d, by investigating it as a rapidly shifting and technoscientifically tangled moving target’ (Birkbak and Papazu 2022, 37). Here, the making of science and technology emerges as inextricably linked to the making of political collectives across diverse sites and scales (Delvenne and Macq 2020; Doezenia 2023; Frahm and Schiølin 2023; Laurent 2022; Macq, Parotte, and Delvenne 2021; Ruess, Müller, and Pfothenhauer 2023). Such analysis makes visible how various mobilizations of RI and its predecessors have in fact not only shaped notions of good innovation but of *good democracy* in important ways, helping to stabilize the new spirit, within which it no longer effectively functions as a critique, but as a tool of equilibrium.

A break with the ‘residual realist’ perspective’ (Chilvers and Kearnes 2016) informing contemporary STS critique, however, does not imply a retreat into relativism or need to perform an objective view from nowhere (Haraway 1988; Latour 1987; Nagel 1986) in analysis of and engagement with the new spirit of technoscience. Following the symmetrical method, instead, is a normative and political project in its own right – grounded in ‘a manifesto against reductionist storytelling’ (Jasanoff 1996, 413) and aimed at ‘putting certainties to the test of their collective verification’ (Barthe et al. 2013, 46) – to which no extra layer of critique or engagement must be added in order to gain relevance or transformative power. As pragmatist sociologists have put to point, ‘real political radicalism requires sociological radicalism, not the contrary’ (Barthe et al. 2013, 49). Epistemological relativism – whether toward the construction of scientific facts in knowledge disputes or regarding the production of publics, their participation, and representation in discussions around governance – does not contradict normative belief or political action (Jasanoff 1996, 394), quite the contrary. It has consistently been a fruitful calibrating device for STS scholarship to develop novel perspectives on the co-production of society, science, and technology, equipping STS critique with the ability to explain ‘how meanings and bodies get made, not in order to deny meanings and bodies, but in order to build meanings and bodies that have a chance for life’ (Haraway 1988, 580). It is not only an important tool to open up fixed meanings and interpretations to careful scrutiny, but to ‘propose an alternative policy of explanation’ which ‘is necessarily to define some politics’ (Latour 1988, 175).

By recentering a founding methodological principle – symmetry – STS researchers could bring a renewed critical edge to its engaged strands, to continue to dynamically

challenge ever-evolving entanglements of power and knowledge production. For engaged STS, this would not imply a retreat from the interventionist stance, rather such a renewed symmetrical approach would broaden the field of imaginable and actionable spaces and subjects of intervention that are implicated in RI. By shifting the critical position and reframing the questions that guide intervention, engaged researchers might expand beyond ‘the laboratory,’ turning to spaces of governance, of economic ordering, and of normative world-making that play important roles in how technoscience and social order are coproduced. We might reconsider who our collaborators are, as well as what kinds of agency and responsibility they experience themselves as having (and are posited as having by others). We might seek to elicit reflexivity not only around the possible implications of new knowledge and technologies, but regarding the ways that different social formations, modes of participation, and visions of democracy intersect with these – and how they might also be ripe for collective reimagination. We might engage our collaborators around questions of what democracy means in particular settings and in relation to various technological potentialities – its characteristics (desired and de facto) in different contexts, and with what goals and payoffs actors pursue different forms of democratization. Following these questions might produce new ways of imagining desirable alternatives to socio-technical change that depart from those technoscientific *and* democratic fictions guiding policymaking today, opening up new ways for RI and beyond to engage with and critically apprehend the new spirit of technoscience.

Notes

1. The RRI Keys (engagement, gender, open access, science education, ethics, and sometimes governance) stand in uncomfortable relation to more process-based definitions focused on fostering ‘anticipation, reflection, and inclusive deliberation,’ (R. Owen, Macnaghten, and Stilgoe 2012, 755) which are more often referred to more succinctly as RI. As such throughout this text we use RI to refer to the scholarly work and concept and RRI to refer to the institutionalized version adopted and advanced by the EC.
2. This research itself is funded in part by the European Union’s Horizon 2020 research and innovation program under grant agreement No 101003491, as part of the project *JUST2CE: A Just Transition to Circular Economy*. The project responds to the grant call guidelines by including responsible innovation as a key element of the project process and outputs.
3. Boltanski and Chiapello build on Weber’s conceptualization of the spirit of capitalism, wherein capitalism entails a particular moral relationality between people and work, as described in Weber’s *The Protestant Ethic and the Spirit of Capitalism* (Weber [1864] 2002).
4. Following one of our reviewer’s encouragement to better contextualize our mobilization of a key text in French pragmatic sociology vis-à-vis a discussion of STS research and critique, it is important to acknowledge the long-standing dialogue and cross-fertilization (but also ongoing debates) about the many differences between the pragmatic sociology advanced by Luc Boltanski, amongst others, and the anthropology of science advanced by Bruno Latour, amongst others. While we do not aim to ignore these important discussions across disciplines, we cannot possibly pay adequate tribute to them within the scope of this paper and the special issue it is situated in. The interested reader might want to further engage with them in the work of Guggenheim and Potthast (2012) and Latour (2009).
5. As Radder has summarized the politics of engaged STS, ‘there is a quite convincing argument for a certain type of normativity in STS. In broad outline, it goes like this. Almost

everyone will agree with the claim that, in one way or another, and to a considerable degree, science and technology shape the (material, personal, social and cultural) worlds in which we live our lives. Hence from a democratic point of view it is entirely legitimate to try to influence – within the rules of the game – the way science and technology are being practiced and used. Moreover, if STS have really gained relevant insights, including these insights can only improve the quality of the democratic debate and the decision-making process’ (Radder 1998, 327).

6. As Pallett and Chilvers have argued, ‘STS does not come before or after – but is always with – democracy, even though STS scholars sometimes present themselves as being distant and removed from the democratic situations they study. This alerts us to how STS is shaped by and responds to much larger shifts and constitutional developments in science and democracy, while also forcing reflexive consideration of the democratic constitutions of STS itself, in terms of imagined forms of democracy which become prevalent (but often tacit) assumptions at different times and places in the field’s development’ (Pallett and Chilvers 2022, 313).

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