

From a *normal* and a *post-normal* science ethos towards a *survival science* ethos?

What ethos and what role repertoire can scientists bring to bear in the face of the current climate emergency without risking the very legitimacy and authority of science? In this article, I draw on Max Weber's and Robert K. Merton's conceptions of normal science, as well as on reconstructions of science's ethos and role repertoires in post-normal science regimes. I put up for discussion whether current survival science constellations require yet another, radically new ethos and role set.

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The present era presents contemporary societies with radically new challenges, fundamental shifts, and intricate uncertainties. Of the major disrupting factors, the unfolding climate emergency poses probably the most pressing issues, albeit intricately linked to other disruptive phenomena like the growing pressure on liberal democracies around the globe or the ever-growing capitalization of our lifeworlds. Some might argue that these challenges have arisen neither unexpectedly nor abruptly; but they nonetheless question some of the basic beliefs in our societies. Moreover, recent pandemic and geopolitical crises have left us with very tangible experiences of and sensibilities for new (social) norms, captured (foremost in Europe) as “new normals”. They also keep resonating with academia, its institutions, members, and practices.

In this forum paper, I address and scrutinize potential shifts within the core of academic self-understanding, its habitus and ethos. What are, and what should be, our new norms for science-in-society? I start by introducing two anchor points of what has been established as an ideal of *normal science*: the functional specification of science within modern societies as elaborated by Max Weber, and the distinct ethos of science as elaborated by Robert K. Merton. I go on to hint at analyses of shifts within the science-society relationship and the ethos of science within the era of *post-normal* (or late-modern) *science*. My conclusion offers some provocative theses regarding a new era of *survival science* or *science at the abyss*. Overall, this contribution aims to encourage broader discussions about the topic, rather than offer definitive solutions.

The differentiation of science and its role sets at the science-policy interface

The idea of a functional differentiation of modern societies at large, and of science in particular, prominently relates to the work of Max Weber. In his view, the demarcation of science and politics has to be maintained in all respects for the sake of both realms; especially in a historical situation in which democracies were under siege. In his 1919 treatise on *Science as a Vocation*, Weber claimed that university lecture halls were not the place to articulate value statements, not even in defense of democracy (Weber 1994). The overarching imperative to safeguard the modern differentiation between science and politics thus trumped all other ambitions. Moreover, this goal could be translated into specific, practical guidelines.

The insight that functional differentiation was essential for modern societies also informed later work on the interplay between science and policy, when science-based, and later science-informed, decision-making emerged as a corner stone of good governance ideals in reflexive societies (Beck 1992). It informed the three modes of rationalization of political decision-making, the *technocratic*, the *decisionist*, and the *pragmatic* mode (Habermas 1989), the “three views on the appropriate role of the policy analyst” as *objective technician*, *client's advocate*, or *issue advocate* (Weimer and Vining 1988), and the four roles within science-based policy advice – the *pure scientist*, the *science arbiter*, the *issue advocate*, and the *honest broker* (Pielke 2007).

It is important to note though, that these later approaches support an active engagement of science with policy, far beyond the politically abstinent ideal of science put forward by Weber in 1919. They seek to bridge the boundary between science and policy, while still upholding the functional differentiation of both these societal subsystems. They can thus be categorized as late modern from a sociological perspective, or as *post-normal* from an epistemological perspective. But I will come to these historical shifts later, after introducing a second anchor point of *normal*

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science. As for now, I want to emphasize how modern societal differentiation is inscribed in our understanding, institutionalization, and functioning of science-in-society.

The demarcation of science and the scientific ethos

While Max Weber provided us with an in-depth understanding of the functional differentiation of modern societies, with an appreciation of its relevance for science as a social sub-system, and with some concrete ideas about what this meant for academic practices, he did not further theorize the (abstinent) ethos he evidently wanted to instill in academia with his 1919 treatise. This task was fulfilled by Robert K. Merton in an essay published in 1942. Merton, as a fervent advocate of science's demarcation from other social sub-systems, outlined a distinct ethos of science that consisted of four sets of institutional norms, often referred to as CUDOS, comprising Communism, Universalism, Disinterestedness, and Organized Skepticism. The norm set of *communism* acknowledges the communal generation of knowledge and the communal sharing of knowledge in science; the norm set of *universalism* asserts that everyone can contribute to the production of knowledge and that scientific knowledge applies universally; the norm set of *disinterestedness* ensures that science

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does not advocate partisan interests; and the norm set of *organized skepticism* stipulates constant and institutionalized quality control by peers.

Much later, Merton also discussed role sets and took – not surprisingly – a rather purist stance, confining the scientist to a fourfold role set of *researcher*, *teacher*, *administrator*, and *gate keeper* (Kalleberg 2010, pp. 202–203, referring to Merton 1973). Kalleberg (2010) adds that in other work Merton had also (if implicitly) introduced the role of the expert, and that the young Merton himself had clearly taken on the role of a public intellectual, by “insisting on the dissemination of a scientific culture into the general culture of society”, while the “mature Merton [had been] identified as an important [or exemplary] public intellectual” by others.

Merton's ethos has triggered a lot of positive resonance, and it has continued to be taken up until the present day (e.g., Anderson et al. 2010, Kim and Kim 2018, Bieliński and Tomczyńska 2019). In parallel, it has been criticized many times. Some of this criticism can be linked to unfamiliarity with his sociological approach. Merton's ethos has been likened to an unrealistic and presumptuous ideal and contrasted to “counter-norms”

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only as the base of science, but that the CUDOS norms should be protected, especially in times of societal crisis, to ensure that science continues to function effectively in, and in support of, democratic societies.¹

From normal science to post-normal science and survival science

As a matter of course, today’s science differs from Weber’s science of 1919 or Merton’s science of 1942. The institutions, actors, and practices of science have changed and further differentiated, as have our expectations of science-in-society. The rise of science-informed policy has already been mentioned as a crucial factor. Moreover, Kuhn (1962) has provided us with the idea that not all science need be “normal”; revolutionary phases can, for instance, follow different socio-epistemological patterns than *normal science*.

More recent literature addresses historical change and differentiation within science-in-society. Funtowicz and Ravetz (1993) have juxtaposed *normal science* and *post-normal science*. They advocate for an adapted approach when facts are uncertain, values under dispute, stakes high and decisions urgent – or, in Rittel and Weber’s (1973) words, when problems are “wicked”. This adapted approach includes integrating the expertise of multiple disciplines by

expanding the peer group, explicitly acknowledging inherent uncertainties, and specifying with more detail the characteristics of the scientific process and its output.

(Mitroff 1974) in “real science” (Ziman 2000), offering empirical proof that his norm sets did not apply in everyday academic life. However, Merton initially presented his ethos as a set of social norms that individuals could choose to follow or counteract. Still, some of the criticism can also be linked to some shortcomings in Merton’s initial presentation of science’s ethos. Most importantly, Merton does not clearly explain to what extent CUDOS describes prevalent norms and to what extent it represents a prescriptive ideal. He also does not specify how the institutionalized norms link to individual convictions. One can assume from the historical context and Merton’s more general sociology of science, that he saw institutional implementation of CUDOS not

¹ Merton’s (1942) essay only hints at and does not fully spell out the functional relation between science and democracy upon which he (mostly implicitly) based much of his argument. Kalleberg (2010) reminds us that this gap can be filled by considering an earlier essay on “science and the social order” (Merton 1968). Kalleberg notes that in this originally earlier text Merton “argues that science is in an essentially better position in a liberal society, guaranteeing a high degree of autonomy to its different institutions” (Kalleberg 2010, p. 183).

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Perfectly misplaced

Gibbons et al. (1995) and Nowotny et al. (2001) have more broadly contrasted a problem-oriented and transdisciplinary Mode 2 of science different from the Mode 1 of classic or *normal science*. Others have developed post-normal conceptions of distinct fields, like that of conservation biology as a “crisis discipline” (Soulé 1985), with a synthetic, eclectic, and multidisciplinary structure. These fields would blur boundaries between pure and applied science and tend towards holism. Ethical norms, as well as normative postulates, would be genuine components and provide academics with “constructive outlets for their concern”. As “the current frenzy of environmental degradation [was] unprecedented”, Soulé noted, “the response [...] also [had to] be unprecedented” (Soulé 1985, p. 733).

All these conceptions and approaches hint at fundamental shifts and appeals for change in academic culture, practice, self-understanding, and societal role definition. They implicitly or explicitly speak to a new ethos for science in the face of major societal challenges, if not crises. Yet further calls for change in academia use labels such as *survival science* (Commoner 1966, Egan 2017) or proclamations such as “no science on a dead planet” (Thierry et al. 2023). Interventions have become more radical, with scientists going on strike and taking to the streets.

But what could be a conceptual, as well as normative, basis for all these stances and actions of academics? Is it possible to delineate a robust new ethos of and for *survival science* that could help us as academics develop both effective and sustainable modes of action? What specific challenges should such an ethos be able to address?

A new ethos and role set for *post-normal science*

With the radical shifts of science-in-society as proclaimed by proponents of *post-normal* and *survival science*, one might pose that an individually internalized and organizationally institutional-



ized scientific ethos could serve as a useful compass and handrail when maneuvering in a multitude of context specific situations and constellations. As the boundaries between the societal sub-systems become ever more complicated and fragmented in late-modern societies, one might argue that an ethos used as a compass and a handrail becomes ever more essential. But what could be a conceptual basis supporting the stances and actions of academics? Is it possible to delineate a robust new ethos of and for *survival science* that could help us as academics develop both effective and sustainable modes of action? What are the distinct challenges or circumstances to which such robustness should relate?



Since 2000, a corpus of literature has broached the issue of normative shifts in academia; including research (e. g., Shapin 2008) and teaching (e. g., Winter 2009). But only in the past few years have further analyses started to address a potential new ethos of and for² *post-normal science*, including transdisciplinary science and sustainability science (e. g., Kønig et al. 2017, Henze 2021, Ferretti and Guimarães Pereira 2021, Kastenhofer 2022, MacFarlane 2023, von Schomberg 2024). Most of this work maintains that within *post-normal science*, the modern differentiation of science along Weber and Merton's ethos still plays a fundamental role for academics and their trans-academic audiences. These analyses tend to adapt CUDOS. For example, in Kastenhofer (2022), I argue that the CUDOS norms regarding communism and organized skepticism have been extended in *post-normal science* to include many more disciplines, practitioners, societal actors, and various public (cf. Henze 2021), and that universalism and disinterestedness have been “diffracted” and make room for more contextual, positional, and value-sensitive epistemologies. I further claim that the classic norm of relevance has been extended to cater to the quest for positive societal impact, while the classic norm of originality has been “diffracted” in view of the socio-political dimension of scientific work (Kastenhofer 2022).

As to new role sets, I have already enlisted the further differentiations within post-normal contexts (again, broadly speaking) put forward by Habermas (1989), Weimer and Vining (1988), and Pielke (2007). Other suggestions include the role set of historians as *ironists, reformers, unmaskers, rebels, and revolutionists* (Hacking 1999), the role set of social scientists as *designers, organizers, moderators, evaluators, or commentators* in participatory processes (Gisler and Schick Tanz 2009), or the role set of technology assessment practitioners as *decisionist advisers, deliberative practitioners, governance facilitators, and engaged academics* (Bauer and Kastenhofer 2019). Importantly, in Kastenhofer (2022), I conclude with a remark that there might already be a new mode of doing science-in-society and of being an academic-in-society at work, one that could be described under the label of *survival science*.

What role set and ethos for *survival science*?

In 1985, Michael E. Soulé advocated taking a new or distinct stance in his field, conservation biology, which he identified as a “crisis discipline”. Soulé's paradigmatic move clearly came with consequences for the field's ethos, roles, and practices in society. At a point in history at which the “frenzy of environmental degradation [was] unprecedented”, the response also needed to be unprecedented, with conservation biology fortunately “provid[ing] academics and other professionals with constructive outlets for their concern” (Soulé 1985, p. 733). Another, even more galvaniz-

ing term, denoting science's new role in the Anthropocene, has been put forward already in the 1960s by another conservation biologist, Barry Commoner (1966), who coined the notion of *survival science*.

“We might find”, Egan (2017, p. 37) notes, “that human societies are increasingly looking over the precipice and into the abyss”. We might also find that science's ethos shifts again in significant ways. In a policy brief for *Frontiers in Conservation Science*, entitled *In the Climate Emergency, Conservation Must Become Survival Ecology*, Gardner and Bullock (2021) plead for replacing a reactive stance by a proactive one and for conservation scientists to move from advocacy to activism. The authors argue that the failure of conservation science to adequately influence policies in the face of “lobbying, donations and public relations campaigns of billion-dollar industries” (Gardner and Bullock 2021, p. 4) now legitimates direct activism as “non-violent civil disobedience” practiced by movements such as *Scientists for Future* (see Hagedorn et al. 2019, Pohlmann et al. 2021) or *Extinction Rebellion*. This outright move “from knowledge to action” has been propagated on many levels and in many versions since, at least, the 1990s (e. g., Pronk and Hap 1992), culminating in a boom of transdisciplinary science (e. g., Kaiser and Gluckman 2023), mission science (e. g., ISC 2023) and more far-reaching academic movements.

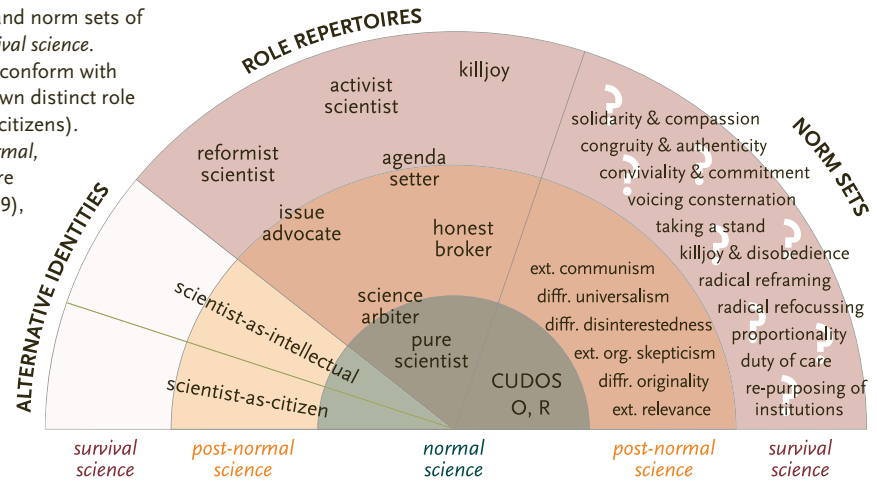
Thierry and colleagues (2023), in a contribution to *Frontiers in Education*, stress the importance of “preserving the socio-ecological conditions for academia” with reference to the slogan “no research on a dead planet”. They advocate against a “business-as-usual” attitude in academia, against “a state of double reality” and against “a process of socially organized denial” (Thierry et al. 2023). They hint not only at the imminent catastrophe, they also refer to the “contemporaneous shift towards an increasingly neoliberal political economy in the higher education system in many countries” (Thierry 2023, p. 3), as well as Western societies' deep roots in coloniality and notions of western dominance that affect this context in multiple ways, from the “normalization of aviation-based hypermobility in academic work” (Thierry 2023, p. 2), institutional green-washing, and an “extractivist growth economy”, more generally to the stabilization of a “climate of silence”, “climate silence” (Scoville and McCumber 2023), and a “culture of uncare” (Weintrobe 2021).

As countermeasures, these authors plea for “process[ing] our own eco-anxiety” and redefining the meaning of scholarly integrity for the Anthropocene (again, with rich reference to other literature). They advocate breaking the climate of silence on our campuses, taking on the role of a climate “killjoy” (Ahmed 2023), “aligning our words and our actions into something more congruous”, “fulfil[ing] the Socratic virtue of parrhesia to which we are tasked – speaking truth for the public good” to ultimately live in (and enliven) “climate truths” (Thierry et al. 2023, p. 5).

I compare Merton's ethos of science and the purist scientists' role set with the ethos and role set of *post-normal science* and a potential ethos and role set of *survival science* (figure 1) based on the literature cited above. I also leave space for the distinct no-

2 As with Merton's ethos, the boundary between reconstruction and description on the one hand, and recommendation and prescription on the other remains fuzzy.

FIGURE 1: Alternative identities, role repertoires, and norm sets of and for *normal science*, *post-normal science*, and *survival science*. “Scientist-as-intellectual” and “scientist-as-citizen” conform with other-than-scientific identities and adhere to their own distinct role and norm sets (i. e., those of public intellectuals or citizens). Moreover, the terms apply for all three regimes (*normal*, *post-normal*, and *survival science*). Role repertoires are based on Pielke (2007), Bauer and Kastenhofer (2019), and the analysis in this article. The norm sets are based on Merton’s (1942) description of CUDOS (communism, universalism, disinterestedness, and organized skepticism); the norm sets of originality (O) and relevance (R) were added later. According to Kastenhofer (2022), in post-normal science these norm sets are either extended (ext) or diffracted (diffr). Norm sets for *survival science* are tentative (indicated by question marks) and based on the analysis in this article.



tion of the scientist as public intellectual and the scientist as citizen – two constellations that seem to be discussed equally for all three modes of science.

It is probably far too early to reconstruct a fully-fledged ethos of *survival science* or “science at the abyss”³ in the way Merton (1942) reconstructed an ethos of *normal science*. Moreover, such a reconstruction suffers from gaps in a social theory of scientific ethos that scholars following Merton’s initial proposition have failed to address during their attempts to either prove Merton right or wrong. We therefore lack any elaboration and clarification of how an ethos of science could be conceptualized theoretically, researched empirically, and applied to changing constellations of science-in-society. An empirical elaboration could draw on the role the recent responsible research and innovation (RRI) movement as well as recent de-colonial and post-colonial turns in various academic communities played in this context; moreover, theoretical elaborations could draw on a growing body of literature on scientific and/or engineering virtues (e. g., Paul 2014).

When scientists radically expand their repertoires of role sets and practices, when they take to the streets and issue political petitions, they also question the existing implicit contracts of science-in-society and science’s function and role in society. These actions may backfire by obfuscating and questioning science’s distinct place and function in liberal democracies or, on the contrary, further invigorate and inspire it. Such themes become especially sensitive in times when democracies are again, if not under siege, at least under pressure and new norms are emerging in public discourse as well as in science governance regimes. A new ethos for *survival science*, in the face of multiple crises, must be robust in various ways and, as Merton (1942) noted over six decades ago, it has to acknowledge the functional relationship between science and liberal democracies.

3 This label hints at a science for “social systems at the abyss” (Egan 2017, p. 37) rather than science and its epistemic practices being “on the verge” (Benessia et al. 2016), albeit the relation between both these phenomena seems worth a closer look.

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