



# Relating Democratic and Scientific Ethos in Academic Self-Governance

Governing Science Through Peer Review and the Democratizing Potential of Lotteries

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## Abstract

Robert K. Merton envisions science as embedded in a social order and explicitly links the ethos of science and the ethos of democracy. This contribution argues that the Mertonian norms are best seen as a set of procedural norms. Thus, the normative integration of science and society is to be conceived by means of the procedures that form the "in-between" of academia and democratically governed societies. We elaborate how peer review can be understood as a central mechanism of self-government in science. We analyze to what extent the governance of science through peer review aligns with the Mertonian democratic ethos. We investigate to what extent lotteries as a procedural element may hold the potential for new linkages between science and (democratic) social order. In conclusion, we summarize the benefits of conceiving of Merton's norms as procedural norms with regard to the ethos as well as the autonomy of science considering the integration of scientific and social order.

### Keywords

scientific ethos, democratic ethos, peer review, governance, lotteries

#### INTRODUCTION

Mertonian Sociology of Science may seem like a set of more or less separate concepts, mechanisms, or theorems that aim for the "middle range." The Matthew effect, obliteration by incorporation, or the reward system in science are delimited phenomena for which Merton provided concise descriptions and explanations, as well as a memorable name. As such they have traveled well, because they can be lifted from their original context and applied elsewhere. We think, however, that the original context still matters and that this is especially true for arguably the most famous of these middle range concepts: "the ethos of science." The four norms—universalism, communalism, disinterestedness, and organized skepticism—can easily be applied to a plethora of phenomena in and around

science, while much of their descriptive and explanatory power rest, however, on two further Mertonian arguments that provide the general context: the Merton thesis and the idea of a social order that embeds science in society.

While Merton was prompted by the historical context of rising fascism and totalitarianism to think about the normative relation between science and democracy, we take this special issue as an occasion to think about this relation in the current historical context. Despite the long time span in between and the many obvious and not so obvious societal changes, a current narrative, again, emphasizes conjoint threats to science and democracy. Diagnoses of a "postfactual age" (Jasanoff/Simmet 2017; Sismondo 2017) or a "post-democratic era" (Crouch 2004) rely on an intimate link between the epistemic and the deliberative capacities of current societies. All the while science has produced reform movements from within that call for more open and democratic forms of governance (Open Science). We argue that a strictly Mertonian approach, conceptualizing the link between science and democracy as primarily normative, remains too restrictive. We, therefore, advocate conceptualizing the link between science and democracy as primarily procedural through modes of self-governance. Since peer review plays a pivotal role in this context, we focus on how peer review is practiced to link epistemic and deliberative ideals. One of the current challenges or extensions of peer review—experiments with lotteries to distribute funding for research—will serve as a case to discuss the normative implications of different self-governance practices.

#### THE CONCEPTUAL CONTEXT OF THE ETHOS OF SCIENCE

Merton envisions science as embedded in a social order, which is the precondition for the ethos of science to be realized. This is not to say that this relation must be a harmonious one, as social order and scientific norms are prone to come in conflict with each other (Merton 1973: 271). There is a dynamic associated with this conflict which forms the core of what has become known as the Merton Thesis (Shapin 1988). Building on Max Weber's claim that Protestant ethics played a pivotal role in the history of capitalism (Weber 2016), Merton argues that Puritanism played a similarly pivotal role in the history of science. Puritanism provided "the cultural soil of seventeenth century England [that] was peculiarly fertile for the growth and spread of science" (Merton 1938a: 597). Once science is established as an institution with its own ethos, it may, paradoxically, turn against this cultural soil from which it came: as capitalism subverts religious values and beliefs in Weber's account, so does science in Merton's. This dynamic then extends to one more paradoxical turn: "As a result of scientific advance, therefore, the population at large has become ripe for new mysticisms clothed in apparently scientific jargon" (Merton 1938b: 333). As with scientific advance fostering societal backlash in the context of a dictatorial social order, Merton emphasizes the self-defeating potential of normative orientations.

While pointing out that scientific knowledge production is not necessarily tied to a democratic societal order (Merton 1973: 269), he explicitly links the ethos of science and the ethos of democracy. He claims that "the imperative of universalism is rooted deep in the impersonal character of science" (ibid.: 270) and that "however inadequately it may be put into practice, the ethos of democracy includes universalism as a dominant guiding principle" (ibid.: 273). Merton's reflections on the normative structure of science are thus inseparable from his reflections on social order and the role of science in society:

In a liberal society, integration derives primarily from the body of cultural norms toward which human activity is oriented. In a dictatorial structure, integration is effected primarily by formal organization and centralization of social control (Merton 1938a: 335).

This prompts us to think about the relationship between the normative orders of academia on the one hand and of (democratically) governed communities on the other. Since that relationship is not a static one, we argue that the ethos of science is best thought of as more than the (static) content of these four norms and primarily as a set of procedural norms. As such, the normative integration of science and society is less about the fit of the norms themselves and more about the procedures that form the "in-between" of science and (democratic) societies.

In consequence, while Merton emphasized how science and society were integrated (or disintegrated) normatively, we ask how science and society are currently integrated through procedures functioning as mechanisms of government to make up this "in-between". Merton's norms will serve as tools to analyze such procedures, e.g., peer review, that integrate science and the social order. Along the way we will consider to what extent Merton's norms may serve as a heuristic for discerning the government of academia through peer review. We will proceed as follows: As the first step, we give a brief overview of the peer reviewing processes in academia and elaborate how peer review can be understood as a central mechanism of self-government in science. Second, we ask to what extent the governance of science in peer review aligns with the Mertonian democratic ethos or at least is compatible with democratic social structures in which it is often embedded. We therefore explore and compare central mechanisms of government at work in academia and in democratic societies. Third, we focus on the debate over the integration of lotteries into peer review processes, in order to analyze the potential of an integration of lotteries into peer review for self-governance in science that takes democratic demands into account. To conclude, we take stock of the opportunities, challenges, and risks of an integration of lottery-elements into peer reviewing procedures for the ethos as well as the autonomy of science. Finally, we summarize the benefits to conceive Merton's norms as procedural norms and conclude with considerations regarding the integration of scientific and social order through peer review as a central mechanism of the government of science in society.

#### THE GOVERNMENT OF ACADEMIA THROUGH PEER REVIEW

Peer review processes in science can be understood as procedures in which a qualitative assessment takes place, and a specific value is attributed to the object to be reviewed. This value is set in relation to other evaluations and weighed up (Krüger and Reinhart, 2016). These processes produce a relational valuation, which is consolidated in the course of decision making. It is decided whether the manuscript is worthy of publication, whether the research project is worthy of funding, or the job candidate is worthy of tenure. These judgments on the worth of scientific objects are multi-dimensional, as they address the quality, integrity, and legitimacy of past and future academic work. Hence, we conceive of peer review as a procedure that governs science by legitimizing expert judgment and is, thereby, formative for the social structure in science.

Peer review comes in many formats and varieties that can differ substantially between them. Instead of using a typology of different peer review procedures (e.g., along organizational types: publishing, funding, and recruitment) we focus on the central activities and how they are combined to constitute a peer review procedure. Eight activities can be distinguished: First, the postulating activities claiming the publishability of a manuscript, the eligibility of a research proposal, or the employability of a

candidate for a position. Second, the consulting activities achieve qualified expert judgments to ensure a competent assessment and evaluation of the postulates. Third, the decision-making activities decide on the acceptance or rejection of the postulates on the basis of collected information and its weighted evaluation. Fourth, the administrative activities coordinate the submission, any preselection, and the evaluation and decision processes under the respective organizational frameworks. These four activities are the core elements of peer review, as they constitute a minimum procedure. Additionally, further activities occur in different combinations depending on the format, field of application, framework conditions, and subject area. Fifth, debating activities comprehending all written or verbal exchanges, comments, and discussions contribute to the assessment. Sixth, presenting activities consist of the oral presentation and explanation of the postulating authors or applicants. Seventh, observing activities encompass the monitoring of assessment procedures as well as the control of procedural compliance and its documentation regarding role-specific rights and duties and the overall purposes. Eighth, moderating activities that are needed, when procedures are complex and multileveled, involve explaining the procedure, accompanying and guiding participants through the process, and chairing discussions to uphold administrative and pragmatic rules, timeline, chronology of procedural steps, etc. (Schendzielorz and Reinhart 2020).

The diversity of peer review formats remains relevant, especially for comparative purposes (Reinhart 2012: 188-189). Not only depending on the goal of the respective procedure—worthy of publication, worthy of funding, worthy of hiring—but also within one of these categories, the procedures show a remarkably high variance. For example, with regard to questions of transparency, we find almost all conceivable variants within journal peer review, from open procedures to semi-open, so-called "transparent peer reviews", to single, double, and triple-blind procedures. Sometimes they are reviewed in parallel, sometimes remotely in different rounds, or both may be combined (Hesselmann et al. 2021). In peer review of grant proposals, multileveled procedures predominate, and their design varies depending on the size of the project, the scope of the funding, and the format (careerfunding, project funding, funding of research centers, or large collaborations and consortia). Some are based primarily on individual reviews; in others, panel reviews play a decisive role; still others combine both, and sometimes a personal presentation is included. The amount of review work tends to increase with the amount and scope of funding, and accordingly these complex procedures are designed in several stages (Reinhart and Schendzielorz 2021b). Similar considerations apply to the peer review processes to select suitable applicants for scientific positions. The more long-term and influential the position to be filled, the more multi-stage the review processes are. In the course of this, all the more comprehensive information can be gathered on the basis of the postulates, various reviews, panel discussions, and personal presentations and interviews, which are then negotiated in a review process that is often as controversial as it is thorough and at times lengthy (Forsberg et al. 2022; Schendzielorz and Reinhart 2020).

As we can see, further functions of peer review consist of opening up a space for discussion and animating organized skepticism. Peer review thereby plays a crucial part in the continuous self-comprehension and self-assertion of the scientific community through mutual feedback, thematic curation, accreditation, and suitability assessment among peers. Against this background, we argue that the ethos of science manifests itself in peer review as the norms of communalism, disinterestedness, and especially organized skepticism, which are put to work in varying procedural designs of peer review (Reinhart: 131-145). The Mertonian norms are inscribed in the procedures demanding an examination of the research proposal in terms of methodology, its position in the common knowledge base, and a critical review by consulting peers from the scientific community. The way Merton's norms are operationalized in peer review thereby animate an investigation of fundamental

demands on academia in terms of quality, legitimacy, and integrity. Hence, these norms are not used as individual criteria in peer review but as regulative ideals orienting the procedure as a whole, implying that deliberation and decision-making are needed to satisfy these norms.

This general assessment that Merton's norms at least partly manifest themselves in peer review procedures and are related to the function and role of peer review in scientific knowledge production is not uncommon (see prominently a. o. Weingart 2015: 11). Furthermore, recent empirical studies support the thesis that the "ethos of science", as historically and normatively infused it may be, still persists as the Mertonian norms remain present as guiding principles widely shared among scientists (Philipps 2021: 106-109). Mulkay's criticism (Mulkay 1976), that these norms are often broken and not followed by scientists in their behavior, does not preclude the effectiveness of these norms. Merton's conception of norms already considers this deviation:

These imperatives, transmitted by precept and example and reenforced by sanctions are in varying degrees internalized by the scientist, thus fashioning his scientific conscience or, if one prefers the latter-day phrase, his super-ego (Merton 1973: 269).

Indeed, the very characteristic of a norm is that its validity is not directly measured by whether and how precisely it is consistently followed in practice. Rather, it can be argued that the validity of norms proves itself precisely in the reactions to their disregard.<sup>1</sup> The latter should be kept in mind in view of the abundant literature on academic peer review, focusing on the deficits of this instrument through which the scientific community performs its self-regulation.

#### Intermediate results

Summing up, what does it mean to conceive of peer review as an instrument of self-governance? It signifies that peer review is not only a procedure to assess and evaluate scientific work in forms of manuscripts, project proposals, and job applications. It implies that peer review is a mechanism enabling the assurance of scientific quality as well as the legitimacy of the decisions made and the integrity of the whole endeavor. Given this, peer review is an instrument that allows to orchestrate different claims to the quality, legitimacy, and integrity of scientific work and scientific knowledge production in one procedure and to relate them to each other in a specific way. This also concerns various ontological-epistemological, normative, and not least organizational-pragmatic claims (e.g., in order to enable collective action) already contained in Merton's norms. Thus, an essential function of peer review is to operationalize claims and norms that are constitutive of science's self-understanding and particular nature in variable procedures. As such, peer review is the paradigmatic governing mechanism to understand the mechanisms shaping the "in-between" of science and (democratic) societies. As explained, the negotiated claims invoke several normative dimensions at once: those of quality, integrity, and legitimacy, which are separable only heuristically but are intertwined in practice. It is precisely because of this comprehensive negotiation, self-understanding, and governing function of peer review that we conceive of peer review as a mode of government in academia.

<sup>&</sup>lt;sup>1</sup> See also the argumentation of Weingart 2015: 12-13.

#### SCIENTIFIC AND DEMOCRATIC ETHOS IN PEER REVIEW

We can now take Merton's entanglement of democratic and scientific ethos further by examining the forms of government at work in science and society. In order to investigate whether the governance of science through peer review is compatible with democratic government, we will briefly juxtapose the social structure of democratic society and the scientific community. We therefore draw a parallel between the population of science in diverse disciplines and the population of nation-states, namely citizens in societies describing themselves as democratic. This seems appropriate considering that scientific and democratic modes of government show fundamental analogies in how the execution of power is legitimized: First, just as power should emanate from the people or at least from citizens entitled to vote (Cheneval 2015: 21-23), scientific decisions in academia should come from scientists. Second, both populations are deemed to be involved in the distribution of power and to participate in its execution. Similar to Cheneval's basic determination, Buchstein highlights the equality postulate (Buchstein 2016: 28) as fundamental and defines it as a minimum condition and basic principle of all the different and plural democratic forms at the normative level. Likewise, these fundamental democratic principles converge with Robert Dahl's minimum "criteria of procedural democracy", consisting of "voting equality" and "effective participation" as "standards against which proposed procedures are to be evaluated" (Dahl 1997: 61ff.). He considers these two criteria as sufficient "to say that any association satisfying these two criteria is, at least to that extent, procedurally democratic [...] in a narrow sense" (Dahl 1997: 63, emphasis in original).<sup>2</sup> Continuing the comparison, just as in democracy the people are supposed to be "the source of competence in law-making and law-application" (Cheneval 2015: 16)<sup>3</sup>, in science scientists with knowledge of the scientific field, its structures, and the subject concerned are supposed to help shape decision-making procedures and exercise power in them (e.g., elected review board members in the DFG and appointed reviewers elsewhere, as well as elected staffing committees with representatives from different status groups). According to this claim, citizens in a democratic state, as well as scientists who commit themselves as part of the scientific community to the ideal of 'freedom of science' "should not be subject to just any political institutions, but to those they recognize as their own" (Cheneval 2015: 17). The differences are primarily in their goals. While democracy aims to organize the coexistence of citizens according to maxims of equality, freedom, and justice, science aims to produce knowledge and generate findings that are as valid and robust as possible, and at the same time amenable to revision in the search for truth. Given this, the essential equality postulate (Buchstein 2016; Cheneval 2015) in science could translate into the claim of scientific and epistemological equality of all scientists. In light of the variety of peer review procedures, such equality is conditional on the different levels of participation resulting from separation of roles and division of labor, especially regarding the speech act,<sup>4</sup> which needs to be considered. Robert Dahl emphasizes that any evaluation requires "additional judgments about the facts of the particular situation" (Dahl 1997: 63). Regarding this, the differentiation between minimum and maximum procedures of peer review mentioned above is particularly pertinent. Furthermore, scientific and democratic modes of government are equally characterized by the fact that an extremely heterogeneous variety of manifestations, formats, and procedures are subsumed under one label. The diversity of peer review in its procedures and practices as a governing

<sup>2</sup> To further accomplish and delineate its understanding of a fully procedural democracy Dahl argues for additive criteria: Enlightened understanding, final control of the agenda; inclusiveness. (Dahl 1989).

<sup>&</sup>lt;sup>3</sup> This and all subsequent translations of quotations from German-language publications into English were made by the authors, unless otherwise indicated.

<sup>&</sup>lt;sup>4</sup> For more detail see Goffman elaboration in "Forms of talk" (Goffman 2005). For the relevance of diverging participation status in peer review procedures see also Schendzielorz and Reinhart 2020: 106, 111–112.

instrument corresponds to the diversity of "forms, shapes and constellations of democracies" (Buchstein 2016: 20). This counts on the part of the theories of democracy, which, especially in the empirical theory of democracy, is thought of as a "pluraletantum" as well as for the actually existing democratic forms of government.

Let's take the analogy of scientific and democratic ethos one step further: The democratic ethos finds its expression not only in free elections of representatives of a population which form a democratic government. A democratic government is also committed to the interplay of separate powers-legislative, executive, and judiciary. What about the separation of powers in peer review? Relating the eight peer review activities distinguished above to the separation of powers in legislative, judiciary, and executive authorities, we find the following picture: The legislative power is concentrated in the hands of the administrative actors and thus in the organizations that initiate and design peer review processes. The executive power consists of consultative activities and, depending on the type of procedure, may also include debating, moderating, and observative activities. In addition to the reviewers, the process managers, supervisors, and any rapporteurs can play a crucial role. The judicative function is realized in the judgment, i.e., in the peer review in decision making activities, which are usually carried out by actors (editors, committee/panel members, commission members, etc.) who belong to decision making bodies. It is more difficult to classify the postulating and presenting activities as one of the three powers: Postulating and presenting roles are subject to the "constitution" of the respective peer review process and thus do not have any governmental power in these activities. However, from one peer review process to the next, the same individuals may find themselves in other roles as reviewers and/or part of decision-making bodies or representatives of a funding agency, and as such may then assume executive, judicative, or even legislative governmental functions in science. Since the scientists alternate between the roles of governors and governed in the context of peer review, the postulating and presenting activities are located in their internal procedural role on the side of the governed. But as the governed often take on the role of the governors elsewhere, it can be assumed that these activities are in practice considered to be part of the executive power, which can always correspond to past or future parts of the judiciary and, depending on the career path, also of the legislative power.

Drawing these parallels with regard to the legitimate execution of power and its challenges in dealing with varying matters of concern shows how the scientific ethos and its implementation in peer review is intertwined with democratic principles along demands that are equally formative for science and democracy: namely, requirements for collective action, for equal opportunities of participation for those recognized as status equals, for the right to stand for election, for the ability to realize decisions made collectively, and for the periodic auditability of decisions (Cheneval 2015: 10-41).

So *how do Merton's norms relate in detail to democratic principles?* Because the Mertonian norms relate to science, they have most often been thought of as epistemic and thus as connected to the epistemic value of objectivity (Daston & Galison 2007). This seems particularly obvious for the norm of universalism as a regulative ideal. The debates in the philosophy of science surrounding Popper's falsificationism and Kuhn's incommensurability thesis are historical examples of how universalism could relate to objectivity in a procedural way. More recent debates, e.g., around actor-network theory, understand universalism as equally procedural; however, they are less concerned with a strictly epistemological perspective. When looking for meaningful social linkages between science and social order, universalism pushes for connectability and comparability by critically examining the conditions of the possibility of generalization.

However, normative democratic theory also makes a universal claim, that "it derives its considerations from basic values for which it tries to justify that they can be considered worthy of general recognition" (Buchstein 2016: 28). Complementing this formulation as follows, "that they can [under the currently given circumstances] be considered worthy of general recognition" (ibid.), in science we may also approve the effort to strive for such generalization, at least as a part of analytical sharpening. Beyond that, the norm of universalism also alludes to a generalization of the accessibility of science and scientifically produced knowledge. Merton's call "to preserve and extend equality of opportunity" (Merton 1973: 273) in changing contexts points in a similar direction. This current drive for universalism is manifested in the recent but increasingly important and promoted paradigms of Open Access and Open Science.

The questions around the openness of science also connects to Merton's norm of communalism as it qualifies "the status of scientific knowledge as common property" (Merton 1973: 274). It not only claims equitable access to bodies of knowledge but also justifies this claim by acknowledging that the "substantive findings of science are a product of social collaboration" (Merton 1973: 273). The latter emphasizes the importance of partaking, sharing, and engagement of other scientists and the consequences of general participation rights for members of the scientific community. Trying to parallel it with democratic principles, Merton's understanding of communalism has a lot in common with Rosanvallon's concept of democratic openness through legibility. Legibility terms an active relationship, in which interpretative capacities are deployed during the reception of information. It thus means the comprehensive understanding and familiarity with procedures and mechanisms of governing. According to Rosanvallon, along with responsibility and responsiveness, legibility is one of the three principles that characterize the relationship between the governed and the governing in democratic societies (Rosanvallon 2018: 202-206). Asking how to deal with the claims of universal openness, such communalistic legibility, and everything that comes along, the norm of disinterest-edness comes into play.<sup>5</sup>

Again, Merton's explanations on this norm come close to Rosanvallon's characterization of principles for a democratic legitimacy of government, namely impartiality. Defining impartiality as "distancing from party positions and particular interests" (Rosanvallon 2018: 30), it also applies to the requirement of governing science by means of impersonal criteria while restricting biases due to specific interests or certain positionings of different schools of thought.

Finally, the norm of organized skepticism "is both a methodological and an institutional mandate" (Merton 1973: 277). Hence, it connects to the other components of the scientific ethos in multiple ways, as its execution acknowledges that scientific knowledge is open to revision (Bogusz 2018), inquiry, review, amendments, corrections, and further developments as well as to trials of validation and verification, especially from peers. Juxtaposing it with Rosanvallon's principles of democratic legitimacy, organized skepticism parallels reflexivity. The latter involves the "consideration of plural expressions of the common good" (Rosanvallon 2018: 30), and thus with regard to science entails considering diverse regimes of knowledge. In this respect, organized skepticism can also allude to the equitable recognition of all particularities and conflicting approaches and paradigms by questioning claimed connections, systematization, and configurations, including relations of supremacy and subsidiarity.

<sup>&</sup>lt;sup>5</sup> This framing of communalistic challenges also alludes to the "Tragedy of the Commons" (Hardin 1968). However, to discuss the relationship between science and democracy against this paradox is beyond the scope of the paper.

#### Intermediate results

The scientific and the democratic ethos require strong normative references for the foundation of their respective orders as a social collective, be it the scientific community or democratic society. These normative benchmarks are invoked in all attempted definitions and possible codifications, despite the difficulties of empirical measurability:

Although the ethos of science has not been codified it can be inferred from the moral consensus of scientists as expressed in use and wont, in countless writings on the scientific spirit and in moral indignation directed toward contraventions of the ethos (Merton 1973: 269).

Accordingly, Buchstein classifies attempts as self-contradictory when trying to identify their approaches in democratic theory as free from these groundings, since the claim of normative abstinence itself falls into the realm of normative statements. In addition, according to Buchstein, such attempts in democratic theory:

are inappropriate to one's own research practice, because empirical and historical as well as formal theories of democracy must always establish certain references to normative democratic theory (Buchstein 2016: 34).

Otherwise, they would not be able to contour their respective research areas. In this way, the ethos of science and the ethos of democracy show a structural similarity with regard to the persistence of their normative dimension, even when at times some tend to suppress these grounds. To those who may still think the normative formulation of an ethos of science is overly emphatic, one more reasoning paralleling science and democracy should be considered: Democratic governance requires normative goals which, unlike laws, cannot be implemented directly but are fixed in preambles and constitutions. Why? Because without "legally implemented moral principles and rights of members and non-members, it would be indistinguishable from a terrorist group that ensures the equal participation of all members recognized as having equal status in its decision-making procedures" (Cheneval 2015: 15).

Meanwhile, we can note that, depending on the author's slightly varying emphasis (Cheneval 2015: 15ff.; Buchstein 2016: 28-29; Dahl 1997; Rosanvallon 2018; Bogusz 2018; Merton 1973), certain normative characteristics for the governance of communities emerge along the claims of participation rights, social equality, openness, impartiality, justice, reflexivity, and freedom, which, although not congruent, can in relevant parts be aligned with the self-understanding and self-description of science. The overlap seems large enough to contend that the government of democracies and the government of science face similar procedural constraints, in that their regulative ideals point in compatible directions.

#### CAN LOTTERIES DEMOCRATIZE PEER REVIEW?

After discerning these parallels, the further discussion of peer review as a mode of government in academia focuses on the debate over the integration of lotteries into peer review processes. This is for two reasons: First, the question to what extent the government realizes a scientific ethos through peer review that meets democratic norms can only be examined incrementally and via systematic comparative analysis of peer reviewing procedures. We have already pursued this path by conducting an empirical comparative analysis of peer review procedures in the German and Swiss research

systems, developing an analysis heuristic that results in the activity modules of peer review described above, structured along minimum and maximum procedures (see Schendzielorz and Reinhart 2020). Second, we choose to debate the procedural innovation of introducing lottery elements in peer review instead of other currently debated procedural innovations in peer review formalizations along remote assessments, rapporteur, or synthesizing reviewer functions etc. because lotteries are brought up as governing mechanisms to bring to bear the overall range of deliberation in selection procedures in both science and democracy. We thus suggest seeing lotteries as a procedural element in democratic government that may hold the potential for new linkages between science and (democratic) social order.

Hence, we ask: what would an integration of lotteries into peer review mean for the democratic potential of self-governance in science? At present, a small number of funders are experimenting with lotteries as part of their grant peer review procedures and justifying these experiments by claiming that there is widespread dissatisfaction with existing peer review procedures. The typical criticism of peer review is first and foremost directed at the outcome of the selection by peer review. It bemoans conservatism in the selection of eligible projects, that peer review is prone to cronyism and biases. From this derives the commonly invoked claim that peer review selection is not sufficiently fair and results in the diagnosis that the peer review system in its current form is deficient. Unfortunately, it is rarely addressed to what extent the very heterogeneous peer review formats generate legitimacy through their procedures (Luhmann 1983) and thus vary in terms of their fairness, issues of equal treatment of all submissions, and equity of subject matter (Reinhart and Schendzielorz 2021a, Schendzielorz and Reinhart 2020). Against the background of this narrowly output-centered criticism, the integration of lottery methods in peer reviewing procedures is discussed as an innovation in peer review with the potential to improve fair decision making (Brezis 2007; Gillies 2014; Avin 2015; Fang & Casadevall 2016; Roumbanis 2019: Liu et al. 2020). It is also increasingly put to the test in practice by different stakeholders, such as the Health Research Council of New Zealand since 2015 with the Explorer Grant, the Volkswagen Foundation since 2017 with the Experiment Funding, the Swiss National Science Foundation since 2018 with its postdoctoral mobility grant, and since 2021 with lottery elements as a tiebreaker (Adam 2019). The recent discussion considers the introduction of a lottery in peer review for the allocation of research funds foremost as a complementary part in the selection procedure—that is, to be implemented after traditional peer reviewing has been carried out. Given the widespread complaints about the output of existing peer review, the pressing question is what and how potential improvements can remedy the aforementioned shortcomings. How can peer review increase fairness and equity in selection processes through its procedures? We want to expand the current debate on lotteries in peer review by elaborating how peer review procedures can become more adequate and equitable by making this instrument of government in academia more democratic. Sharing the widely held assumption in the literature that "democracy is to be regarded as the system of government that realizes the best possible realization of freedom in collective self-determination" (Cheneval 2015: 25), the insights of political theory on the use of lottery procedures are worth noting. Democratic theory offers elaborate considerations that, as we argue, can also be adapted for improvements of peer review procedures (cf. Röcke 2005; Syntomer 2007; Buchstein 2009; Cheneval 2015: 66-70). Buchstein synthesizes five possible functions of lottery. First, lottery represents a "neutral, unerring, and procedurally autonomous random mechanism" (Buchstein 2009: 331) that may be suitable for making decisions in deadlock situations. Second, unweighted lottery procedures are an instrument that can ensure an equal distribution of opportunities in access to goods and offices through more egalitarian chances of success (ibid.). Third, lottery procedures can be used to relieve "decision-makers and decisionsubjects" (e.g., in the allocation of scarce vital organs or high-risk missions of soldiers in war zones,

etc.) (ibid.). Fourth, lottery procedures function as a generator of uncertainty, which "can be brought to bear as an 'anti-corruptivum" (ibid., quotation marks in original). Fifth, lottery procedures reliably generate "ever new chances" of success in the lottery procedure, which can have systemstabilizing effects, for example, in the allocation of official posts (ibid.). Various elements of these functions echo eclectically in the debate over the use of lottery in peer review. However, a lack of systematic reception of insights from political theory tends to result in a curtailed and decontextualized transmission, entailing inconsistencies and distortions.

Hinting at the *first function*, a prominent argument in favor of integrating lottery elements into peer review consists of promoting the draw as a neutral decision-making instrument, which allows for fairer decision making. Alluding to the second function, this ability to assure an egalitarian distribution of chances is especially pointed to in cases where proposals are considered to be of equal quality and equally good reasons exist for each of the possible choices (Avin 2018, Bedessem 2020). This transfer implies two problematic shortcuts: first, the equal distribution of opportunities counts for unweighted lotteries. But the preceding peer reviewing is not a neutral-decision-making instrument, and it purposely produces a weighted situation. Thus, considering the whole procedure, the discussed lottery complements in peer review do not provide equal opportunities in the strict sense nor can they generate decisions that can be deemed per se fairer due to its neutrality. Second, the same grades after the peer reviewing process does not generate substantial equality and, as we know well from politics, applying formal equality in the case of factual and material inequality can lead to injustice. Furthermore, assuming strict equality subverts the requested differentiation and ranking achieved through work-intensive deliberation in reviewing. Rather, we may find ourselves in a situation of undecidability. Nevertheless, the additive status of lottery elements is particularly emphasized by proponents of integrating lottery methods, for example to counter fears that decisions reached in this way could entail legitimacy deficits.

Hinting at the *third function,* a reason frequently brought up in favor of lotteries is the promise that they would reduce the burden of making a final and binding decision for which the competence to judge is lacking or a valid basis for judgment of a comparative selection is in doubt. The scenario of delegating these burdensome decisions to a lottery often comes with the assumption that a random selection would increase the diversity of the selected projects (Adam 2019, Avin 2018:13, Osterloh & Frey 2019). This implies that these types of decisions tend to be conservative and favor research projects that rely on the tried and trusted.

Hinting at the *fourth function*, an advantage of the lottery over the decision that is deliberately made can be seen in the fact that it can act as an anti-corruption instrument. Namely, since it is unpredictable which lot will be drawn, targeted bribery is not very attractive. As plausible as this argument is, e.g., with regard to the allocation of offices in politics, again it cannot be transferred one-to-one to the procedures discussed for scientific peer review. Since traditional peer review remains in place to pre-select projects, it would still be appealing to exert a targeted influence on this first phase in order to favor some of the proposals and prevent others on the way to the final draw.

The *fifth function* shines through when the terminology is changed quite emphatically from naming it a lottery, which is considered a gambling method, to labeling it as randomization, which avoids a positively or negatively biased selection, for example in randomized control trials. The idea behind this is that random selection follows the laws of stochasticity and thus provides the same chances to all who have a lot. But once again, the task of determining who gets into the lottery round is still attributed to "classical" peer review in the debate by proponents of lottery procedures. However, the stochastic distribution of chances would only unfold in the long run when the dice is rolled several

times, though, in the scenarios discussed, the dice is rolled only once in each case. Also, the possibility to participate in the next draw with the same proposal in the case of bad luck is merely debated. Considering this, the luck of the draw appears rather as a delegation of the decision to the fate of the dice. This aspect is also problematized in decision theory regarding the distinction between first and second order decisions. Considering issues "about cognitive burdens and also about responsibility, equality, and fairness" (Sunstein and Ullman-Margalit 1999: 7), Sunstein and Ullman-Margalit come to a similar finding. Asking "why might an institution or agent pick rather than choose?" (ibid.: 24), they determine picking instead of choosing as a form of delegation (ibid.: 10, 20). They further state:

Picking can even be said to operate as a kind of delegation, where the object of the delegation is 'fate,' and the agent loses the sense of responsibility that might accompany an all-things-considered judgment (ibid.: 24).

Thus, their decision-theoretic reasoning concludes that delegation to fate could impair decision makers' sense of responsibility. It thus remains questionable to what extent the apathy of fate towards all proposals in the final round has a recognizable gain for the quality, integrity, or legitimacy of the decision.

One prominent argument frequently raised to promote lotteries does not allude to any of the mentioned functions: It holds out the prospect that integrating lotteries would reduce the expenditures of peer reviewing procedures, saving time for all involved and thereby money, at least for the agencies and institutes organizing the selection processes (Gillies 2014; Avin 2015; Fang & Casadevall 2016; Roumbanis 2019; Liu et al. 2020). Taking a closer look at the debate, this is a doubtable promise, considering that the integration of lottery elements presently is only thought of as a second step after the traditional peer review has been thoroughly conducted or as a kind of equipoise to other funding schemes (see Volkswagen Foundation). Without reducing the assessment and exchange on how to weigh which aspect in the evaluation amongst peers, the certainly high costs of peer review (Avin 2018: 6ff.) cannot decrease considerably by a draw following the peer review. Although this argument makes an arguable promise, it nevertheless remains present in the discourse (Philipps 2021). As this argument deals with questions of efficiency and does not claim to improve the fairness nor ameliorate the quality, legitimacy, or integrity of the selection procedure, it appears to remain, albeit convincingly, as an elusive selling point for funding agencies. Therefore, the question needs to be asked why funding agencies-more than exclusively scientifically staffed committees-want to delegate informed and reasoned selections to the luck of the draw? Why do the same players who argue for stronger incentives to ensure robust scientific research show such interest in and appetite for risk when it comes to experiments with lottery procedures? As pointed out, there is scant indication that they can achieve the effects associated with them. In light of this, it needs to be considered that lotteries, in case they are introduced to shorten proposals and reviewing procedures, would reduce the number of scientists involved in funding decisions. In turn, the weight of organizing practices from administrative personnel in decision-making bodies would increase simultaneously, namely by designing and managing the lottery, which includes deciding on the amount and the mode of allocation of lots. Regardless of who handles these tasks, they still remain prone to interest-driven biases in impartiality, legitimacy, and equality of treatment (Reinhart and Schendzielorz 2020). Hence, increasing efficiency in grant allocation through lotteries would also strengthen governmental power external to science. Therefore, the debate on lotteries has to consider whether lotteries in grant allocation along the way could lead to a loss in the relative autonomy of science and whether, in view of this peril and given the uncertain achievement of the goal, it is worth the current experiments.

The integration of lottery procedures into peer review thus hardly fulfills any of the five positive functions that lottery procedures could develop. Even if the third function, the unburdening of decision-makers, is achieved, the hope attached to it of more diverse project funding can hardly be reliably reproduced as its outcome. This modest result is merely surprising. After all, the mentioned literature concludes that historically, from ancient Greece to the present day, lotteries are generally not applied to resolve matters of fact, but to the allocation of offices and personnel (Cheneval 2015: 68; Buchstein 2013: 386-389). Also, in citizen assemblies, as they are used today, the members are drawn by lot, but the decisions made there are worked out in deliberative discourse.

The arguments and reservations against the integration of lottery procedures in peer review focus on the overall quality and validity of the decision. First of all, it points out that the quality of a decision in science is usually determined by the expertise with which it is made. Thus, a decision in which the experts' competence in judgment is set aside, after a certain point, in favor of a lottery decision accepts a loss in its qualitative foundation and, according to Sunstein and Ullman-Margalit, risks the decline of an encompassing sense of responsibility for the judgment. In addition, as noted above, there is the disadvantage of reducing the legitimacy not only of the decision but also of the distinctive appreciation of the achievement, which for those selected comes with the approval of funding, as they were not selected on the basis of collective consent after intensive deliberation, but in the end by chance. This stands in contrast to the advantages of more or less agreeable outcomes from deliberative and aggregative procedures (Cheneval 2015: 68). This leads to the central insight, that a lack of justification can easily lead to a deficit in qualitative legitimacy (Cheneval 2015: 70). At this point, lottery procedures conflict with the justification requirement of democratic procedures, which also apply in peer review, as elaborated above. We therefore plead *to explore what democratic characteristics in peer review could be strengthened through the functions of lottery procedures*.

This requires refocusing the context in which the five functions have a positive effect: the context of joint discussion and deliberation for the purpose of a differentiated opinion formation or judgment in the collective. Here, the lot is not used for making a decision on the subject matter by drawing lots between different proposals, but rather for the staffing of the panels. Transferred to the peer review system, this would mean that the reviewers and other evaluators of the panels would have to be drawn by lot. Of course, this raises the question of appropriate representation. It seems obvious that this would first require classification into subgroups: on the one hand, according to expertise, in order to determine which area they can represent and to prevent biases through one-sided dominance of certain subfields; on the other hand, according to sociodemographic factors for which biases are to be feared (status, origin, age, gender, etc.). Nevertheless, the debate about whether the so-called mirror representation, understood as an exact statistical representation of the heterogeneity of the population, is actually fairer reveals the dilemma strikingly (Buchstein 2009: 344). Since every mirror representation can only take place on the basis of previously determined criteria, the following applies despite all efforts: "representation under any system is biased" (De Grazia 1951: 184, quoted after Buchstein 2009). But this does not render obsolete the attempt for an approximate representation of the social and, in view of science, possibly also the epistemological, ontological, and methodological heterogeneity of the population concerned. Research from democracy theory as well as from social psychology suggests that homogeneous groups tend to end up in circular self-affirmation and that members of heterogeneous groups are more receptive to reasonings of other group members. Furthermore, previous experience with social groups formed by drawing lots shows that it is above all the diversity of the group and not necessarily the precision of the representation that is crucial (Buchstein 2009: 345):

In the end, it is diversity that appears to matter most in these procedures. When a group of deliberators is heterogeneous, it is less likely that they will enter into enclave deliberation and reinforce their own positions (Hendriks 2004: 97).

In line with this, studies and experiments with deliberative opinion polls show that members of the discussion in groups formed heterogeneously by drawing lots have a better understanding of the positions of others, tend to be more willing to deviate from their existing beliefs, and thus unusually often change their pre-discussion opinions (Buchstein 2009: 335-340). Hence, there seems to be a chance to improve peer reviewing by preventing prevailing prejudices from coming to bear. With regard to the question of what democratic potentials could profit from an integration of lottery elements in peer review, we arrive at the following conclusion: Lotteries can strengthen widely spread participation in peer review on both sides, but it can only develop deliberative effects if they are used as a representatively quota-based search engine for the relatively heterogeneous and balanced appointment of power positions that intends to determine the composition of decision makers, namely the reviewers.

#### Intermediate results

The scientific debate on lotteries in peer review is currently clearly dominated by its proponents. Bedessem, broadening the debate, stresses the importance of a proper evaluation of broad participation and the relevance of political and ethical normatively charged requirements (Bedessem 2020: 154-155). Seeking to readjust the focus of the debate, we can now answer our question of what an integration of lotteries into peer review means for the democratic potential of self-governance in science. The use of lotteries has a democratizing potential when it comes to the composition of committees, panels, and the allocation of positions therein, and less so when it comes to factual issues whose assessment requires pronounced expertise. Against this background, it is quite consistent that in all the discussed scenarios, the development of the expert judgment in peer review is not abandoned. Another crucial factor determining an effective use of lottery procedures is that the results and decisions reached in these committees are binding and enforced, because otherwise a sufficient motivation to engage seriously in these deliberative processes is at risk (Buchstein 2009: 341ff.). In contrast to many experiments with opinion polls in the field of political citizen participation, this relevance for action of the decisions reached is already given in all the scenarios debated and trialed for use in peer review. Another challenge for productive deliberative group work of panels assembled by lot is usually the definition of the randomly selected population, i.e., who gets a lot. This question has so far been discussed only with respect to the proposals and not with respect to the reviewers to be drawn. For the latter, depending on the purpose and subject of the peer review decision, various definitions are available along existing indicators (academic degree, e.g., B.A, M.A; Ph.D., Habilitation), which in different variants already define thresholds for entry into the scientific community. In order to achieve a promising diversification of the staffing, as well as to ensure a variety of perspectives on the proposals, there is an urgent need to expand the reviewer pool. Thus, there are good reasons not to additionally link these entry thresholds to concrete employment relationships at certain institutions (researcher at a university) and to occupied status positions (chair holder, professor). The larger issue at stake here hence is the integration of scientific selfgovernance through lotteries into the wider democratic social order.

The insights on the democratic potential of lotteries from democracy theory leads us to suggest that the best way to counteract the impairment of a just and proper decision, be it by the one-sided dominance of powerful reviewers, by pronounced peer pressure or group think, or by other biases due to homophily, is to make the composition of the committee as heterogeneous as possible and therefore to enlarge the reviewer pool. In this way, the integration of lottery elements into peer review could be put at the service of improving the deliberative quality of the decision reached. The improvement in governance through peer review would then include the following: First, it would be more democratic because the way power is exercised would meet the standards of democratic legitimacy and integrity to a higher degree. Second, there would be a realistic chance that diversifying the composition of reviewer juries by drawing lots could do much more to increase the diversity of the projects selected, especially if applied regularly, than drawing lots for the projects receiving funding, thus counteracting conservatism in peer review. The fact that, despite existing indications, this democratizing potential for science through the drawing of its mandate holders receives so little attention in the current debate raises questions about the possible interests of the debating actors, as well as about the demands on the culture of a decidedly scientific debate that takes into account the diversity of perspectives, acts reflexively, and is open to criticism. Overall, lotteries in which the reviewers are drawn have the potential to increase the participatory, representative, and deliberative quality of peer review decisions that are part of the government of science. Such procedural innovation would also be consistent with the parallels between science and democracy in its procedural constraints and regulative ideas, by supporting the normative dimensions of the general accessibility of evaluation panels, participation rights in collaborative knowledge production, and systematically organized skepticism in heterogeneous groups.

#### CONCLUSION: DEMOCRATIC ETHOS AND THE AUTONOMY OF SCIENCE

The Mertonian sociology of science prompted us to ask where the current relevance of an ethos of science lies for science itself and for the relationship with the social order in which science is embedded. We claimed that the Mertonian norms are best seen as procedural, as it is not the (abstract) norms but rather procedures such as peer review that integrate science and society on a continuous basis. Drawing from political theory, we were able to identify the procedural commonalities in the government of science and democracy. We used this analysis to think through the current attempts at using lotteries in the self-governance of science, finding that drawing lots for appointing members to decision-making bodies could improve effective and broad participation and adequate representation, thereby enhancing democratic deliberation in the distribution of research funding and, by extension, in all of peer review.

Recalling the 80<sup>th</sup> anniversary of Merton's norms, it becomes apparent that the recent debate, relevance, and effectiveness of the norms as procedural qualities are underdeveloped. Yet this discussion of procedural norms helps us to understand how they are also undermined in practice. Regarding the democratic potential of drawing lots to fill decision-making positions, it should be noted that the deliberative democratic models stand out among various models of democratic governance as particularly suitable for non-national governmental entities because they can deal more easily with the problem of boundaries (Buchstein 2009; Habermas 2005; Joerges 2002; Dryzek 2000). Therefore, it seems to fit most as a sparring partner and vehicle for questions of democratization of the government of science in both external governance and self-governance. The findings in this branch of democracy theory show clearly that a pluralism of people in power is an important stability factor

(Buchstein 2016: 17), which emphasizes once more Dahl's minimum criteria of procedural democracy, voting equality, and effective participation. But does a pluralism of power promote stability in science as well? At what level would a pluralization of power positions be required and necessary? And is such stability desirable here? Criticism of the conservatism of peer review suggests that other goals are currently considered more important. For example, that the system remains sufficiently dynamic to be permeable for original and unexpected innovations.

Merton noted that the normative integration of science in a democratic order holds the potential for self-defeating or paradoxical effects. As the democratic and the scientific ethos only partially align, this prompts us to ask whether lotteries might be a case of normative integration that result in a threat to the scientific ethos and maybe also to the autonomy of science. Are there democratic principles that might threaten quality, legitimacy, and integrity in science-for example, if participation is expanded in such a way that it is decoupled from expertise and judgment? Could it then foster populism in science, popularization of science, or even disinformation in a scientific guise? These questions indicate the tension between the democratic demand for participation and the burden of comprehensive participation that broad inclusion and participation necessarily entail.<sup>6</sup> However, this dilemma exists independently from the issue of integrating lottery procedures. It applies to procedures with lottery elements as well as to election, rotation, auction, or co-optation procedures. Considering this, the question arises whether, just as in deliberative democracy where political freedom of decision is limited by the constitution (Buchstein 2016: 5), a functional equivalence to the constitution is also required in peer review and other modes of government in academia. Insofar as a constitution secures inalienable fundamental rights and also protects against majorities that reject them, it can be argued that it preserves the democratic ethos. In turn, what are the inalienable fundamental values of science that must be protected against intrusions and attacks by deliberatively achieved majority decisions? This invokes keywords such as impartiality, openness, curiosity, systematic doubt and testing, formal logic, reflexivity, intersubjective comprehensibility, openness to revision, honesty, integrity, etc. Many of these aspects are part of or derive from Merton's norms and can be found in different formulations in guidelines and codes of good scientific practice or criteria of scientific soundness. Although these do not have constitutional status, as minimum qualitative requirements they are most likely to provide orientation for basic values of scientificity.

The question of social order also adverts to other criteria of procedural democracy: "enlightened understanding", which alludes to the condition of deliberative opinion formation in the discourse (Dahl 1989: 64), and "final control of the agenda by the demos" (Dahl 1989: 66). The latter consists of determining what is or is not a matter of concern, which is decided upon using procedural democracy and usually requires equivalent qualification of the "demos" or correspondingly the members of the scientific community (Dahl 1989: 66ff.). Whether or not the "enlightened understanding" is achieved may depend on the specific peer review constellation. It is apparent that the demand of procedural democracy to control the agenda is not met in peer review, as reviewers and other scientists rarely decide on what is set or not set on the agenda or which decisions are to be made through peer review. These guiding decisions usually fall within the realm of science policy actors. Taking this further in accordance with Dahl's emphasis on this point (Dahl 1989: 90f.), externalizing control over agenda setting carries a high risk of relinquishing control over various other aspects that are tied to it. Considering this, caution is warranted when innovations in peer review entail a shift in governing power regarding the design of procedures, criteria, and implementation areas away from

<sup>&</sup>lt;sup>6</sup> Regarding the "problem of inclusion", see also Dahl 1989: 68ff.

scientists and toward administrative and science policy actors. As Dahl predicts, arguing for procedural democracy leads into a conflict with meritocracy, conceived as a minoritarian government by an elite with outstanding qualifications (Dahl 1989: 90). As meritocratic government of science through peer review appears to be equally or even more prevalent in the current so-called democratic government of states, we dare to close this reflection with the open question: whether a meritocraticlike composition of decision-making bodies in science play a considerable role in the subversion of how Merton's norms can come to bear and thus how the scientific ethos can unfold.

To conclude, up until today Merton stimulates investigation into the relation of science and social order and enables us to think of democratic principles as possible "normative guidance" for the social order of science. Considerations of democracy theory have led to an outlook on the future democratic horizons of peer review. Given the fact that existing peer review as a mode of government clearly does not meet the requirements of democratic governments—as generally the states do neither—it may be worthwhile to envision peer review at least as a kind of a polyarchy in the sense of Dahl. Keeping up the "idealistic" references points as "norms" and "ethos" may help to improve the participatory, representative, and deliberative qualities in the government of science. The indissoluble tension between upholding the norm and its imperfect realization could also be the reason why peer review is so often described as deficient, because it is measured against the democratic ethos as an ideal. Precisely this could also be seen as a sign of quality, that peer review still raises these claims in the first place. At the same time, these claims are in danger of being abandoned if innovation in peer review risks overseeing demands of legitimacy and deliberative qualities, which are equally constituent for democratic as well as the scientific ethos.

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