Care for the Soul of Science: Equity and Virtue in Reform and Reformation

Mare Knibbe[1], Sarah de Rijcke[2] & Bart Penders[1,3]

1 Department of Health, Ethics & Society, School of Public Health and Primary Care (CAPHRI), Maastricht University, the Netherlands

2 Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands

3 Käte Hamburger Kolleg "Cultures of Research" (CoRE), RWTH Aachen University, Germany

Abstract

In order to build legitimacy, we argue that reform movements need to make their moral programmes visible and account for their value-prioritisation . To support such reflection on moral programmes, we compare moral programs of the protestant Reformation and the reform movement in science. We argue that moral programs play a crucial role in shaping science, and different moral programs offer different promises for sustained support of credible, reliable, fair, and equitable science. We primarily discuss the virtue and equity programmes and through interrogating both reform programmes in relation to the Reformation, we seek to display the relevance of sociopolitical contexts for how key values operate in science and how they generate orders of worth. These conversations will allow us to determine when and where which moral programme would serve us and others best.

Keywords: scientific reform, reformation, moral programme, valuation, virtue, equity

Introduction

On the 31st of October 1517, an academic and activist released a manifesto into the world proposing a long series of concrete changes to eradicate some of the (moral) corruption of the system he was part of himself. The proposed changes were based upon decades of preceding scholarship and expanded over time, especially after 1517 when peers joined the debate to discuss their (lack of) merit. That academic and activist was Martin Luther, professor of theology and priest. That manifesto was the "Disputation on the Power and Efficacy of Indulgences," better known as "The 95 Theses." The system Luther sought to change was the Catholic Church.

In this paper, we will compare some examples of moral reorientation in the Reformation with the reform movement in science. Through this playful comparison we do not highlight empirical similarities, but shed light on the plural moral programmes contained in the scientific reform movement: its various moral components and the moral diversity that is being conflated under the single banner of reform. To that end, we draw from multiple competing framings of crisis and the proposed solutions – a multiplicity that reform and Reformation share. This comparison is neither exhaustive nor perfect. Its purpose is to enrich and diversify the political and moral conversations we have surrounding ambitions to change institutions, to expand the vocabulary and metaphors we can employ, and to offer context to sometimes predominantly technical exchanges. After sketching this complex moral landscape, we will argue that for sustained support of credible, equitable and fair science, not all moral programmes offer equal promise.

Before we briefly visit selected histories of religion and science, we must first make an in principle distinction between moral programmes of reform, which we discuss here, and epistemic programmes, which usually grab the spotlight. Epistemic programmes centre on examining and evaluating methodologies and their strengths and weaknesses, theories, robustness, various notions or manifestations of rigour, or procedures for sharing and protecting data and other ingredients to science: all building blocks for what might become a better science. The moral programmes discuss on what grounds we ascribe value or worth to a modus operandi for science: not rigor or methodologically correctness, but what is morally right. Metaphorically, these moral programmes form the soul of science. Moral programmes indicate how to handle relationships of power, develop research agenda's, distinguish good and questionable collaborations and decide what

voices should be heard in science. Here, we ask how reform offers multiple types of care for that soul, and how different moral priorities relate to social and institutional settings.

A Playful Comparison

We first discuss Protestant Reformation, after which we will highlight a few parallels with scientific reform. We do so to set the stage for a playful comparison that serves to stimulate debate and discussion about the political, social and historical context of processes geared towards social change (and the change of powerful institutions). We then discuss a series of four dimensions to explore differential moral understandings in Reform(ation). Finally, we reflect on our comparison.

Though Luther posting his 95 theses on Wittemberg's Cathedral door is often seen as the beginning of the Reformation, his critique of practices of corruption and exploitation by church officials was in fact a continuation of existing reform attempts (Benedict, 2002). Renaissance Humanists such as Erasmus also critiqued Roman abuse of power through the practice of selling indulgences (which promise to shorten time in Purgatory). They formulated their critique working within the Catholic church and they thought that power and policymaking should remain within an intellectual elite engaging in 'controversia' to identify the most probable truth with regard to matters of religion and politics (Howard, 2005). Luther by contrast was also critical of elites and renaissance culture of the arts and what he regarded as decadence, and he challenged the idea that the church clergy had privileged access to God.

The challenge of Roman power and the ideas that only personal faith and the Bible can form a true source of authority allowed everyone to seek access to God independently of Rome. These ideas were further distributed by evangelical preachers who also argued that ordinary folk can understand the Bible without any need for – possibly corrupt and fraudulent – clergy. Moreover preachers and printed pamphlets called for social change through Christian love and charity and measures against poverty, drunkenness and prostitution. In mass protests and actions farmers and city people pushed for changes in worship and practices that were now seen as un-Christian. Such bottom-up pressures to reform met with willing local rulers who were weary of Roman power. Not only in

protestant or ‘reformed’ churches but also within the Catholic church new moral and social reforms took place to address critiques about decadence.

The Reformation is often identified with Luther, Zwingli and Calvin as the great Reformers criticizing traditions and authorities and taking Scripture as the basis of faith and of social and moral reform. Moreover, Calvinism is commonly associated with austerity, strict moral standards and disapproval of pleasure. Historians have however pointed out both the diversity within different branches of Calvinism as well as commonalities in moral reform between Reformed Churches and Catholic counterreformation (Benedict, 2002; Bruni & Milbank, 2019). The moral indignation about the abuse of power and the search for renewed moral foundations and rigour resulted in institutions of discipline and oversight in Calvinist, Lutheran and Catholic territories alike. Famous institutions of moral surveillance that intensified during (Counter) Reformation in the Catholic church are, for example, the Inquisition and Confession.

Reformation thus resulted in a big family of reformed churches sharing but also varying in their morals and surveillance instruments. Understandings about puritanism, sobriety, good works, and good citizenship varied from place to place. For instance, the development of different moral programs in Luther’s Wittenberg and Zwingli’s Zurich is only meaningful when understood in the context of different socio-political settings (Benedict, 2002). Situated in the empire of Charles V, the initial rapid reforms in Wittenberg were moderated when neighbouring princes sought opportunities and the emperor's blessing to expand their powers. To avoid these political interventions, moral progress in Wittenberg became less socially visible, something that happened only between individual believers, the Bible and God. Contrastingly, in Zürich, a city in the newly formed Swiss confederation, independent of Rome, moral progress was not an individual matter but a matter of community and good governance. Here Zwingli and other theologians inspired by Renaissance Humanists sought new ways of governing the city. There was no boundary between religious and civil morality: Christ’s presence was located in the community and seeking truth was a matter of public deliberation and hearing different sides.

Scientific reform similarly has prominent spokespersons, proponents of a specific approach to doing science. More importantly, concerns about moral deterioration in

science are far from new. Scientists themselves have for centuries considered and written about behaviours, structures and pressures, as well as dominant values in science. In 1830, Charles Babbage already wrote about the decline of science in England (Babbage, 1830), signalling that many practitioners did not uphold the rules of science and that the institution as a whole was at risk as a result. In the decades that followed, various incarnations of this concern reappeared. Sociologists and critical scholars of science articulated ideal institutional forms for science (Merton) and invited more attention to the norms and ethics of science (Ziman, 1998). Douglas Altman wrote on the poor state of medical research in specific, and Ioannidis provided evidence that a lot of published work was wrong (Altman, 1994; Ioannidis, 2005). They and many others signalled that increasingly the quality of science was not supported by its structures (incentives). This resulted in a very long series of calls to action and requests to care for science, its processes and its communities. These concerns and expressions of care had diverse priorities. Babbage, but also Merton, Ziman and others (Babbage, 1830; Merton, 1968; Ziman, 1996), cared primarily (but not exclusively) for the internal structures of science and the values that determine the internal operations of the institute of science. Others, point out that the boundaries of science are far from clear and their concern was not only about how science made knowledge, but also how that was affecting the world in terms of risks, pollution, inequalities and even war (Krohn & Weyer, 1990; Latour, 1988). Both movements, focusing on care for the internal structure and operations of science and care for its (external) impact, responsibility and alliances, are activist even though the former seems remarkably less so (Penders et al., 2009). Both movements sought to change how science works, but prioritised different value systems, valuation regimes or imposed different orders of worth (Boltanski & Thévenot, 2006) and contributed to what we now call the scientific reform movement. However, the elements they contributed differed, in line with their priorities. The reform proposals that followed, and that we now group under the labels of either ‘Open Science’ or ‘Scientific Reform’ thus have a long history and are rooted in moral programmes that are far from new or uniform. The exact form reform has taken, the political and public attention it has managed to gather and the tools it has built to pursue its goals – those are relatively new - but the concerns of scientists - its *raison d’être* - most certainly are not. However, not unlike Protestantism, scientific reform is a fragmented community with distinct and sometimes irreconcilable notions on what is right, and what is wrong (Field, 2022).

Reform(ation), Virtue and Equity

Science's moral panic is not one that we can retrace to one person. Retracing the Reformation to Luther's moral panic is similarly a historical fiction. The moral programmes of Reformation and scientific reform can only be understood in their specific socio-political settings. Moral programmes during Reformation were oriented by discussions about predestination, and (un)mediated access to truths in Scripture and Nature, but also by the powers of Rome, aristocracy and popular revolt. How can we understand and situate the moral reorientation in scientific reform? Drawing on Thévenot et al.'s work on orders of worth we identify two valuation regimes in the literature on scientific reform: the virtue and the equity regime (Thévenot et al., 2000).[1]

The virtue regime cares for high quality science through the promotion of individual virtues. Reform is tasked, or tasks itself with raising awareness or by bureaucratically enforcing these virtues. 'Good' science is the responsibility of virtuous individuals and responsible research practices on a collective level are the consequence of the individual behaviours and intentions of individuals. Key notions in this regime are conduct and behaviour, integrity and method (Banks, 2018; Horbach & Halffman, 2017; Macfarlane et al., 2014), often under the heading of 'open science'. Alongside exists an equity programme for reform in science, one that also has a long history signalling the underrepresentation of specific voices in science, the structural inaccessibility of scientific culture to some and active dismissal of others. Under the heading of gatekeeping (Fini et al., 2022), epistemic justice (Fricker, 2007) or diversity and inclusivity (Uriarte et al., 2007), the equity programme also uses the label of 'open science and scholarship to help expand existing emancipatory programmes supporting equity. These moral orders have no clear-cut boundaries, however the virtue-regime seems to be connected to understandings about science as part of a globalized competitive market supported by new communication infrastructures, whereas the equity regime rather sees science as a vehicle for recognizing localities and promoting a global community. These valuation-regimes are a product of our time and its institutions. During the Reformation, feudalism,

[1] These correspond to some extent with the 'Industrial' and 'Civic' orders of worth that Thévenot et al. propose, however insufficiently for us to use exactly these labels. Neither are they the only orders of worth that seem to be applicable and we happily invite complementary conceptualisation of moral programmes that bring those to the fore.

local communities, the Roman catholic church, the empire of Charles V, European intellectual elites, local markets and international trade were tied together in ways that produced moral orders with different valuation regimes and distinctions. We will not attempt to identify moral programmes of virtue and equity of the Reformation, however some comparisons, taking a focus on how to be a good Christian and how to do charitable works or respond to poverty, do help as a mirror to reflect on the oppositions of our time.

Below, we identify four dimensions where parallels offer valuable lessons with respect to the content and direction in both moral programmes. The four dimensions are also key topics of contestation and can therefore be identified in both literature and practices. They are: (1) Excellence, (2) Communality, (3) Trustworthiness, and (4) Participation.

Excellence

In the virtue programme of scientific reform, key players pursue excellence, and institutional policies and practices reward such excellence, rooted in a firm belief of a (near-) metritocracy. Equity-based programmes do not accept the existence of this meritocracy and articulate moral excellence as inclusivity and participation, which we discuss below.

In the 1960s, the word *excellence* was first used in the USA to describe the need to improve upon "mediocrity" in science and technology. A decade later, Merton made an important contribution to the conceptualization of excellence by asserting that researchers who "strive for excellence, [also] have the ability to awaken excellence in others," (Merton, 1973) thereby conceiving of excellence as something that benefits many due to its mobilizing effects rather than seeing it as an end in itself for those who possess it (Flink & Peter, in Scholten et al.). Scientific excellence was seen as an innate quality (Hammarfelt et al., 2017). Excellent researchers ‘are like a horse that can not only walk superbly and pull a chariot, but can also sing’ (Geurts & van der Gaag, 2015). Those who were thought to be excellent meet all the usual quality criteria, but on top of that also have that special something that is difficult to put into words: ‘you know it when you see it’ (Gläser & Laudel, 2007). At the aggregate/institutional level, excellence became synonymous with agency and action. It was something to strive for, and a means to an

end (e.g. fix mediocrity). In OECD countries, the starting point for seeing scientific excellence as a virtue that can be fostered through targeted science policy can be traced back to the end of the 1970s and early 1980s. Subsequent excellence policies came to be aimed at increasing differentiation by offering selective support to a limited number of researchers, groups or organizations who excel, or show the potential to do so, according to a narrow set of predefined criteria and metrics.

In the first decades, preachers and theologians can be considered excellent when they managed to convince a broad public including magistrates, scholars, and lay-people that they were addressing their concerns while speaking from the Bible. In later generations, after new moral and social orders had solidified, excellence was shown by living and preaching in accordance with the principles and rules of accepted doctrines. Finally, reaching salvation can be seen as a form of excellence in the Reformation. The widespread doctrine of predestination meant that God determined who will find salvation and who will find eternal damnation, this was not something humans could influence by their good works. If salvation is rightly seen as a form of excellence, this was thus a matter of divine grace, not individual achievement, however Christians could try to 'read' their own behavior and charitable actions to recognize the workings of divine grace in their own lives (Gurney, 2018). While the scientific 'horse who can sing' may resemble to some extend this divine grace, excellence in scientific reform has, by contrast become part of a story of control through policies and incentives.

Communality

In the virtue-based moral programmes of reform, the quality scientific methods and procedures are rooted in individual moral character. Echoing Margaret Thatcher's "there is no such thing as society," virtue-based reforms across science place responsibility primarily with individuals (and frequently under the banner of scientific integrity), even to the point that they often understand scientific institutions and cultures as little more than a set of individuals (Valkenburg et al., 2021). Thus, scientific reformers propose that we can do with a lot less of those institutions. Cries to end the journal as a vector for scientific dissemination (Brembs et al., 2021; Stern & O'Shea, 2019) are accompanied by boycotts of publishers and calls to eradicate them from the scientific process. Researchers

are invited to actively resist evaluation bodies and structures, whether that is the REF in the UK or equivalents elsewhere (Derrick, 2021) – up to the point of disobedience (Penders & Shaw, 2020). We don't need communities, radical voices in scientific reform propose, but rather the moral character of individuals, and basic infrastructure to accompany it (Flis, 2019). What such a character looks like, we can learn from Babbage's diagnoses of misbehaviours and decades of discussions on the moral character of individual researchers under the banner of research integrity (Aubert Bonn, 2020; Aubert Bonn et al., 2017).

However, we also see alternative more communitarian conceptualisations of virtue in individuals and collectives in scientific reform at work. For instance, Tunç et al. write that "[w]hat we need are much more nuanced accounts, which recognize the major differences between various strands of the movement" (Tunç et al., 2023, 31).[2] Tunç & Pritchard distinguish between *virtue traditionalism,* where individual epistemic virtues equal collective epistemic virtue; *virtue radicalism,* in which individual virtues are not at all required to build collective virtue; and intermediate positions, suggesting that enough scientists need to be epistemically virtuous to allow structural benefits to become possible (Tunç & Pritchard, 2022). A parallel for moral virtues is not difficult to imagine.

In reform movements, equity refers to the idea that in a global community, all individuals should have equal access to resources and opportunities, regardless of their race, ethnicity, gender, socioeconomic status, disciplinary background, or geographic situatedness in the world. The principle is often central to movements that aim to address social, economic, or epistemic forms of injustice, such as those focused on gender equality or workers' rights. Priority in this work to dismantle systems of oppression and structural inequalities lies with changing institutions to help create more equitable and inclusive institutions, organizations and societies.

A recent initiative that is representative of the equity programme in science is the Unesco Recommendation on Open Science (Bronner et al., 2022). The recommendation is intended to promote the sharing and dissemination of scientific knowledge and data, as well as the participation of diverse communities in the scientific enterprise. It stresses the importance of open science in promoting equity and inclusion in the scientific enterprise

[2] These 'strands' have been called parts of a constellation (Field, 2022).

and addressing global challenges. It calls for measures to ensure that open science practices are inclusive of diverse communities, including women and girls, underrepresented minorities, and researchers from developing countries. The recommendation also calls for the development of policies and infrastructure to support the implementation of open science, such as funding for open science initiatives, and training and capacity building for researchers and other stakeholders. Out of principle and by design, institutions are seen as useful vehicles which can be mobilized to do good, and as crucial support structures for individuals. These and other initiatives in the equity programme focus on building or strengthening infrastructures and institutions to allow more and others to participate.

During the Reformation, charity can be seen as a form of community care that took different shapes in different sociopolitical settings. Calvin gave guidance on individual acts of charity as people are obliged to do good works and help those in need. He also indicated that this should be done without pride and in a way that avoids humiliating receivers (Ardashkin & Bykov, 2016). So acts of charity also required individual virtue. By contrast in Zwingli's Zurich and many other cities in Europe and England, charity was institutionalized in poor houses and inns for the poor, while at the same time begging was forbidden in many cities. In this process charity became part of complex socio-political and religious polemics about relations between God, community and individual believers. A study about charity in England shows that charity involved not only feeding the poor but also 'using a whip' to correct sinners and protect the community, and 'fraternal correction' to further reform institutions and power structures (Gurney, 2018). Such institutional reform through fraternal correction also required examining one's own charitable will. These examples show that in the course of Reformation, in many places institutions and community were prioritized over individuals.

Trustworthiness

The moral character of individual scientists it relies on, is also what the virtue programme is pessimistic about. That moral character requires a guiding hand and sufficient rules and control. Open Science can be, in many ways, the manifestation of that

control in absentio of clear institutional supervision. Ideally, each individual scientist can check and even repeat the work of each individual other scientist. Most work will never be checked or repeated, but the mere possibility implies the largest panopticon science has ever seen. This notion of connected virtue and control or surveillance is also something we find in Merton's work (Hosseini et al., 2022; Wunderlich, 1974), and the focus on replication and replicability can be understood as a manifestation of this. In contrast, the equity programme is optimistic about the potential of individuals to contribute to a commons, through living labs, citizen science and a willingness to share control over the articulation of questions and priorities.

Distrust in the virtue of Christians can be identified in the Reformation when civic institutions and politicians as guardians of the common good were discarded (Bruni & Milbank, 2019). In Medieval Christianity as well as Renaissance Humanism human beings were seen as both virtuous and vicious, having a free will to choose the good, and installing institutions was seen as a way to support virtuous development. By contrast, Luther and many Protestants did not believe in institutional mediation of the common good nor in free will of humans to choose for the good. Bruni and Milbank (230) argue that the Protestantism that emerged from the Reformation informed the subsequent shaping of society through its pessimistic anthropology which "no longer depicts human beings as truly capable of positive reciprocity in relation either to Man or to God.". As a result, the Protestant incarnation of the common good became a "rule-observing game, played by isolated interests" (230). Virtue-based scientific reform also critically targets its institutions and the incentives they offer. Whether they are the Catholic Church, scientific publishers, or universities, through their governance processes and their operationalisations of targets and outcomes, they are corrupting individuals' abilities to live in accordance with the Bible or to do science 'properly'.

In the equity programmes in reform and Reformation, the pursuit and propagation of trustworthiness looks remarkably different: a large role is still being ascribed to individuals, but priority lies very clearly toward the collective benefit or common good. Individual scientists and believers are for instance entrusted with awareness-raising and educating others, or with advocating for changes in policies and practices within institutions. Additionally, they would do good by actively engaging and listening to underrepresented communities and by actively seeking out and bringing on board

perspectives and voices that are often being overlooked. For example, notions of rigour need not be confined to strict rules, but can also depend on and be shaped by sociocultural contexts. Research employing this notion of rigour-in-context (Halme et al., 2024) may mean deviating from established conventions to accommodate the underprivileged and build trustworthiness accordingly.

Participation

The virtue and equity programmes in scientific reform communicate differently. The first speaks with a highly regulated and disciplined voice, the second with a diverse chorus of voices. In its quest for good science, the virtue programme prescribes a set of rules, encoded in tools and methods but above all else, a distinct philosophy of science that does the same thing: enlighten the road to the expansion of certified knowledge. The need for new rules was actively articulated through the production of scandal: accusations of corruption and fraud, a narrative of crisis and decline (Harp-Rushing, 2020; Penders, 2022; Peterson & Panofsky, 2023). In scientific reform, the social character of scientific systems - ancient, and well known by those inside - was recast into a scandalous discovery. Where the virtue programme frames this as novelty, panic and scandal, in order to push radical change, the equity programmes stress continuity and seek to continue existing participation and democratisation processes.

In the virtue programme, the pursuit of radical change impacts whose voices are heard. Optimisation through focussing on rules and their articulation and implementation in the context of reform, invites top-down processes and places power to articulate change in the hands of a select few. Here, bureaucratic innovations are at work, including but not limited to pre-registration, registered reports, preprint-based publication and recommended data repositories (Penders, 2022; Rubin, 2023). Deviations from those rules requires, at the very least, explanation. Whether that set of rules is a religious prescription on how to live or a scientific prescription on how to make knowledge, deviations from the protocol are frowned upon. If the deviation is too large, it can result in excommunication, disqualification, or perhaps a schism. Deviation from the proper path is disapproved of, while staying on that path is in itself the reward. In scientific reform, that path has multiple names, but Open Science is one of them. The credo “Open

Science is just science done right" (Imming & Tennant, 2018) is a clear display of the morality at work.

In equity programmes, participatory community based research (Minkler & Wallerstein, 2011) and a range of different forms of citizen-science in which citizens help with data-collection, analysis but also agenda-setting shows how different voices are included in scientific research to enhance its democratic character. The need for such democratizing reforms is based on the role of science in the struggles of groups that have often been misrepresented and overlooked (e.g. Montoya, 2013), however besides this concern for social justice, the call for diversity is also based on epistemic considerations. Compare, for instance, the epistemic arguments Longino offers to locate objectivity in community and not in process (Longino, 1990). A more diverse community can cover, include and balance against one another, more inside and outside threats to the validity of knowledge they produce, thereby merging moral and epistemic arguments towards inclusivity.

Optimisation through continuous democratisation expands the chorus of voices that get a say in the articulation of science. Some common themes and phrases that are often used by equity-driven movements include 'leaving nobody behind' (Kruschick & Schoch, 2023; Stracke, 2020) and 'breaking the barriers to scientific participation' (Parthasarathy, 2010). These phrases reflect the idea that science should be accessible to everyone, regardless of their background or identity, and that research should be conducted in a way that is fair and inclusive for all. The equity programme in scientific reform advocates for research that explicitly draws on and addresses the knowledge, inputs and needs of these groups. Wider participation, democratic modes of organization, and shared values across stakeholder communities take precedence over procedural accuracy and rigor.

During the Reformation, the voices that mattered were trained to speak based on Scripture while addressing timely social and political concerns. The fragmented religious landscape that grew in the Reformation was politically complex and volatile, however it also showed that many different voices mattered. As a result of continuous disagreement about rules (indulgences, sacraments, predestination, and others), the Reformation witnessed a proliferation of different Churches, a plural landscape of processes and protocols that each argued to prescribe proper worship.

Participation in both scientific reform and Reformation is shaped on the one hand by new rules and regulations that aim to prevent scientists and Christians from going astray. The processes of exclusion that accompany this form of governance invites resistance and the active pursuit of alternative structures that allow greater diversity.

Discussion

We are not claiming that scientific reform is the mirror image of the Reformation or that we may expect religious wars to pave the future path of science and scientific reform (we hope, although credibility struggles under the banner of 'Science Wars' do exist, see (Goldman, 2021)). More abstractly, what we seek to display is the moral concern that gave rise to both movements: how they are rooted in discontent with institutions and distrust of both institutions and individuals' capacity to do the right thing and rely primarily on the identification of virtues. The implicit yet powerful connotation is that virtues require surveillance; individuals are the relevant unit for understanding science; and that many (but perhaps not all) institutions are in our way. In contrast, both reform and Reformation allow a shift of authority and different avenues for participation and gatekeeping in virtue, equity, faith and charity. In fact, Protestantism's promotion of the use of spoken languages in Church, as opposed to Latin, can to be framed as a move towards openness: a step towards more inclusivity, and a move that allowed relative outsiders to engage with faith themselves instead of only indirectly via relying on the authority of learned experts. So too can open science be framed not only as a driver of efficiency and speed in science, but also as a vector for inclusion.

How such shifts and changes pan out, is highly dependent on social and political contexts. In the case of the Reformation, the differences between a Reformed Zürich and a Reformed Wittenberg display how power-struggles shape moral programs, how value or worth is encoded, understood and performed in real life. Similar to the plurality of valuation in the Reformation, scientific reform displays sometimes divergent and sometimes convergent articulation of worth.[3] The continued coexistence of these multiple

[3] This is also recognisable on smaller scales, for instance in peer review. Kaltenbrunner and Waltman recognise four 'schools', driven by different value systems. These different value systems demand different things of review infrastructure and thus demand different infrastructures (Waltman et al., 2022).

parallels, display the fuzzy and permeable boundaries between regimes of epistemic valuation and the moral programmes that accompany and shape science in society.

The institutional embodiment of different rival moralities, each professing a different route and goal for good science, is polarising discussion on reform and influencing trajectories of change. How to do excellent science, build communities, organise trust, and care for plural voices? The answers to each of those questions is dependent on how we assign worth and value. Reform debates, we argue, need to make these moral programmes visible - not just by identifying driving values, but by legitimising why these values deserve priority and by allowing discussion about that legitimacy in connection to their socio-political settings. It will help us decide where to adopt a hyper-rational approach geared towards efficiently and speed, but demands that we make science less social and thus potentially less diverse and inclusive, and where we opt for an equity-based approach geared towards maximising inclusion to accommodate representational justice and diversity-based epistemologies, slower, but also more responsible.

One of the famous mottos of the Reformation rewritten to fit science sounds: *Scientiae reformatae semper reformarae* (the reformed sciences must continue to reform). Continued reform has no end and its direction is neither evident nor uniform. To orient and support this care for the soul of science we mapped out a moral territory of virtue and equity regimes that can help us understand the desirability of change, the just distribution of benefits and costs and our notions of fairness and we invite everyone to expand it.

References

Altman, D. G. (1994). The scandal of poor medical research. *BMJ*, *308*(6924), 283–284. https://doi.org/10.1136/bmj.308.6924.283

Ardashkin, I. B., & Bykov, A. A. (2016). Reformation and transformation of charity work at the beginning of the new time. *SHS Web of Conferences*, *28*, 01146. https://doi.org/10.1051/ SHS 28 shsconf/20162801

Aubert Bonn, N. (2020). *The failure of success – Careers, cultures, and integrity in science* [PhD Thesis, University of Hasselt]. https://orcid.org/0000-0003-0252-2331

Aubert Bonn, N., Godecharle, S., & Dierickx, K. (2017). European Universities' Guidance on Research Integrity and Misconduct: Accessibility, Approaches, and Content. *Journal of Empirical Research on Human Research Ethics: An International Journal*, *12*(1), 33–44.

Babbage, C. (1830). *Reflections on the Decline of Science in England: And on Some of Its Causes, by Charles Babbage (1830). To which is Added On the Alleged Decline of Science in England, by a Foreigner (Gerard Moll) with a Foreword by Michael Faraday (1831)* (Vol. 1). B. Fellowes.

Banks, S. (2018). Cultivating researcher integrity: Virtue-based approaches to research ethics. In *Virtue ethics in the conduct and governance of social science research* (Vol. 3, pp. 21–44). Emerald Publishing Limited.

Benedict, P. (2002). *Christ's Churches Purely Reformed: A Social History of Calvinism*. Yale University Press. https://doi.org/10.12987/9780300127225

Boltanski, L., & Thévenot, L. (2006). *On justification: Economies of worth* (Vol. 27). Princeton University Press.

Brembs, B., Huneman, P., Schönbrodt, F., Nilsonne, G., Susi, T., Siems, R., Perakakis, P., Trachana, V., Ma, L., & Rodriguez-Cuadrado, S. (2021). Replacing

academic journals. *Zenodo. DOI: Https://Zenodo. Org/Badge/DOI/10.5281/Zenodo*, *5793611*.

Bronner, M., Meijer, G., Yam, V., & Friedrich, B. (2022). *UNESCO issues a powerful endorsement of Open Science*.

Bruni, L., & Milbank, J. (2019). Martin Luther and the different spirits of capitalism in Europe. *International Review of Economics*, *66*(3), 221–231. https://doi.org/10.1007/s12232-019-00324-x

Derrick, G. (2021). *Assessing the broader value of research culture: The hidden REF experience*.

Field, S. M. (2022). *Charting the Constellation of Science Reform* [Thesis fully internal (DIV), University of Groningen]. https://doi.org/10.33612/diss.229114775

Fini, R., Jourdan, J., Perkmann, M., & Toschi, L. (2022). A New Take on the Categorical Imperative: Gatekeeping, Boundary Maintenance, and Evaluation Penalties in Science. *Organization Science*. https://doi.org/10.1287/orsc.2022.1610

Flis, I. (2019). Psychologists psychologizing scientific psychology: An epistemological reading of the replication crisis. *Theory & Psychology*, *29*(2), 158–181. https://doi.org/10.1177/0959354319835322

Fricker, M. (2007). *Epistemic injustice: Power and the ethics of knowing*. Oxford University Press.

Geurts, J., & van der Gaag, H. (2015). *Het zingende paard: Een dialoog over voortreffelijkheid*. Prometheus.

Gläser, J., & Laudel, G. (2007). The social construction of bibliometric evaluations. *The Changing Governance of the Sciences: The Advent of Research Evaluation Systems*, 101–123.

Goldman, S. L. (2021). *Science Wars: The Battle over Knowledge and Reality*. Oxford University Press.

Gurney, E. (2018). *Love's Quarrels: Reading Charity in Early Modern England.* University of Massachusetts Press.

Halme, M., Piekkari, R., Matos, S., Wierenga, M., & Hall, J. (2024). Rigour vs. Reality: Contextualizing Qualitative Research in the Low-Income Settings in Emerging Markets. *British Journal of Management*, *35*(1), 36–51. https://doi.org/10.1111/1467-8551.12690

Hammarfelt, B., de Rijcke, S., & Wouters, P. (2017). From Eminent Men to Excellent Universities: University Rankings as Calculative Devices. *Minerva*, *55*(4), 391–411. https://doi.org/10.1007/s11024-017-9329-x

Harp-Rushing, K. O. (2020). *Fixing Science: Innovation, Disruption, Maintenance, and Repair at a North American Open Science Non-Profit*. University of California, Riverside. https://search.proquest.com/openview/05f3764d5fd14cf93d6a3dd26a8e0ba5/1?pq-origsite=gscholar&cbl=44156

Horbach, S. P. J. M., & Halffman, W. (2017). The extent and causes of academic text recycling or 'self-plagiarism.' *Research Policy*. https://doi.org/10.1016/j.respol.2017.09.004

Hosseini, M., Senabre Hidalgo, E., Horbach, S. P., Güttinger, S., & Penders, B. (2022). Messing with Merton: The intersection between open science practices and Mertonian values. *Accountability in Research*, 1–28.

Howard, R. G. (2005). The double bind of the protestant reformation: The birth of fundamentalism and the necessity of pluralism. *J. Church & St.*, *47*, 91.

Imming, M., & Tennant, J. (2018). *Sticker open science: Just science done right*. https://doi.org/10.5281/zenodo.1285575

Ioannidis, J. P. (2005). Why most published research findings are false. *PLoS Medicine*, *2*(8), e124.

Krohn, W., & Weyer, J. (1990). Die Gesellschaft als Labor. In J. Halfmann & K. P. Japp (Eds.), *Riskante Entscheidungen und Katastrophenpotentiale: Elemente einer*

soziologischen Risikoforschung (pp. 89–122). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-322-94149-7_4

Kruschick, F., & Schoch, K. (2023). Knowledge equity and Open Science: An attempt to outline the field from a feminist research perspective. *Research Ideas and Outcomes*, *9*, e85860.

Latour, B. (1988). *The pasteurization of France* (A. Sheridan, Trans.). President and Fellows of Harvard College.

Longino, H. E. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton university press.

Macfarlane, B., Zhang, J., & Pun, A. (2014). Academic integrity: A review of the literature. *Studies in Higher Education*, *39*(2), 339–358. https://doi.org/10.1080/03075079.2012.709495

Merton, R. K. (1968). The Matthew effect in science: The reward and communication systems of science are considered. *Science*, *159*(3810), 56–63.

Merton, R. K. (1973). The Normative Structure of Science. In R. K. Merton (Ed.), *The Sociology of Science: Theoretical and Empirical Investigations*. The University of Chicago Press.

Minkler, M., & Wallerstein, N. (Eds.). (2011). *Community-based participatory research for health: From process to outcomes.* John Wiley & Sons.

Montoya, M. J. (2013). Potential Futures for a Healthy City: Community, Knowledge, and Hope for the Sciences of Life. *Current Anthropology*, *54*(S7), S45–S55. https://doi.org/10.1086/671114

Parthasarathy, S. (2010). Breaking the expertise barrier: Understanding activist strategies in science and technology policy domains. *Science and Public Policy*, *37*(5), 355–367.

Penders, B. (2022). Process and Bureaucracy: Scientific Reform as Civilisation. *Bulletin of Science, Technology & Society*, *42*(4), 107–116. https://doi.org/10.1177/02704676221126388

Penders, B., & Shaw, D. M. (2020). Civil disobedience in scientific authorship: Resistance and insubordination in science. *Accountability in Research*, *27*(6), 347–371. https://doi.org/10.1080/08989621.2020.1756787

Penders, B., Verbakel, J. M. A., & Nelis, A. (2009). The Social Study of Corporate Science: A Research Manifesto. *Bulletin of Science, Technology & Society*, *29*(6), 439–446. https://doi.org/10.1177/0270467609349047

Peterson, D., & Panofsky, A. (2023). Metascience as a scientific social movement. *Minerva*, *61*, 147–174.

Rubin, M. (2023). Questionable Metascience Practices. *Journal of Trial and Error*. https://doi.org/10.36850/mr4

Scholten, W., Franssen, T. P., van Drooge, L., de Rijcke, S., & Hessels, L. K. (2021). Funding for few, anticipation among all: Effects of excellence funding on academic research groups. *Science and Public Policy*, *48*(2), 265–275.

Stern, B. M., & O'Shea, E. K. (2019). A proposal for the future of scientific publishing in the life sciences. *PLOS Biology*, *17*(2), e3000116. https://doi.org/10.1371/journal.pbio.3000116

Stracke, C. M. (2020). Open science and radical solutions for diversity, equity and quality in research: A literature review of different research schools, philosophies and frameworks and their potential impact on science and education. *Radical Solutions and Open Science: An Open Approach to Boost Higher Education*, 17–37.

Thévenot, L., Moody, M., & Lafaye, C. (2000). Forms of valuing nature: Arguments and modes of justification in French and American environmental disputes. *Rethinking Comparative Cultural Sociology: Repertoires of Evaluation in France and the United States*, 229–272.

Tunç, D. U., & Pritchard, D. (2022). *Collective epistemic vice in science: Lessons from the credibility crisis*.

Tunç, D. U., Tunç, M. N., & Eper, Z. B. (2023). Is Open Science Neoliberal? *Perspectives on Psychological Science*, *18*(5), 1047-1061. https://doi.org/10.1177/17456916221114835

Uriarte, M., Ewing, H. A., Eviner, V. T., & Weathers, K. C. (2007). Constructing a broader and more inclusive value system in science. *BioScience*, *57*(1), 71–78.

Valkenburg, G., Dix, G., Tijdink, J., & de Rijcke, S. (2021). Expanding Research Integrity: A Cultural-Practice Perspective. *Science and Engineering Ethics*, *27*(1), 10. https://doi.org/10.1007/s11948-021-00291-z

Waltman, L., Kaltenbrunner, W., Pinfield, S., & Buckley Woods, H. (2022). There are four schools of thought on reforming peer review–can they co-exist? *Impact of Social Sciences Blog*.

Wunderlich, R. (1974). The Scientific Ethos: A Clarification. *The British Journal of Sociology*, *25*(3), 373–377. https://doi.org/10.2307/589402

Ziman, J. (1996). " Post-academic science": Constructing knowledge with networks and norms. *Science & Technology Studies*, *9*(1), 67–80.

Ziman, J. (1998). Why must scientists become more ethically sensitive than they used to be? *Science*, *282*(5395), 1813–1814. https://doi.org/10.1126/science.282.5395.1813