Utrecht University

HISTORY AND PHILOSOPHY OF SCIENCE
MASTER'S THESIS

What ails them? Reassessing the ethical and epistemological underpinning of Open Academia

Author:
Stefan Gaillard
3962903

Supervisors:
Prof. dr. L.T.G. Theunissen
dr. D.M. Baneke

Abstract

Both virtue epistemology and the Open Science movement have identified problems in contemporary academic practices and have proposed various solutions. In this thesis, I investigate how self-interested academics should relate to various academic reform movements, grouped together under the umbrella term Open Academia. After giving a general background on Open Academia and virtue ethics, I argue that that academics are best off by adhering to specific virtues such as honesty and integrity. It is then in their best interest to align Open Academia with those virtues. To further prove this point, empirical evidence is provided of the benefits of Open Academia for individual academics.

Table of Contents

Introduction 5

A Note on Terminology 6

Structure of the Thesis 9

Chapter 1: Understanding Open Academia 10

FOSTER Open Science Taxonomy 10

Open Access 11

Open Data 12

Open Reproducible Research 12

Open Science Definition 13

Open Science Evaluation 13

Open Science Policies 13

Open Science Tools 14

Discussion 14

Open Science: One Term, Five Schools of Thought 15

Infrastructure School 15

Democratic School 16

Public School 16

Measurement School 17

Pragmatic School 18

The Role of Mertonian Norms in Open Academia 18

Conclusion 20

Chapter 2: The Relationship Between Ethics and Epistemology in Open Academia 21

The Example of Publication Bias 22

Chapter 3: Open Academia During COVID-19 25

Case Studies 28

Case Study Selection 28

Case Studies Discussion 35

Scientometric Analysis 35

Scientometric Analysis Discussion 38

Conclusion 39

Chapter 4: Open Academia Grounded in Egoistic Virtue Ethics 39

Rationality 41

Honesty 43

Independence 46

Justice 48

Integrity....51
Productiveness....52
Conclusion....55
Chapter 5: Empirical Evidence of Individual Benefits Open Academia....56
Open Access and Citation Numbers....56
Open Academia and Funding Benefits....57
Increased Chances of Publication....57
Reputational Gains....58
Badges....58
Rankings....58
Negative Consequences Open Academia and Trade-offs....59
Conclusion....60
Reference List....62

Introduction

> Practitioners of VE [Virtue Epistemology] may be in a position to offer aid and comfort to afflicted scientists, or at least an accurate description of what ails them.[1]

Ethics and epistemology are intertwined in many ways, from meta-ethics all the way down to applied ethics and from formal epistemology to social epistemology. Depending on one's philosophical worldview, these two branches of philosophy relate in differing ways. Besides metaphysical considerations about how epistemology and ethics are related to each other and normative considerations about how agents *should* relate ethical and epistemological concerns, there are also questions about how people in the real world relate ethical and epistemological concerns in different times and places. Due to their fundamental and interrelated nature, ethics and epistemology often form the (implicit) underpinning of many worldviews.

In this thesis, I shall concern myself with the ethical and epistemological underpinning of Open Academia. More specifically, I shall reassess the ethical and epistemological underpinning of Open Academia. Much has been written about Open Academia over the past few years, indicative of the increasing popularity of the movement/paradigm. Open Science, Open Scholarship, and Open Academia communities are proliferating all around the world and Open Academia policies are being implemented at an increasing rate. It is therefore increasingly important to reflect on Open Academia. If Open Academia becomes the norm in academia, and we want academia to function well, we must understand what Open Academia currently entails and what it should entail. My research question is therefore as follows: How should self-interested academics relate to Open Academia?

Despite the increasing interaction between Open Science movements and humanities scholars, there currently remains a large philosophical lacuna. Explicitly philosophical analyses of the Open Science movement have not been carried out in any significant capacity. This is regrettable for four main reasons. First, Open Science movements and debates provide fertile ground for case studies that can inform longstanding debates within philosophy of science, (virtue) ethics, and epistemology. Second, philosophical analysis can make explicit the implicit philosophical assumptions and worldviews underlying many debates within Open Scholarship movements and between Open Scholarship movements and 'orthodox' academia. This has the benefit of sharpening debates, as well as making researchers aware of their own possible biases and oversights, allowing them to come to new insights, rectify mistakes or advance their ideas and arguments. Third, philosophical analysis of Open Science movements provides concrete new academic insights into age-old questions such as *what is (good) science?*, *how should proper research be conducted?*, and *what are the culture and norms of science?*, as well as more recent questions such as *how can the replication crisis be solved?*, *what should the recognition and reward system in academia look like?*, and *how can academic resources be efficiently allocated?* Fourth, philosophical considerations can provide normative

[1] John Turri, Mark Alfano and John Greco, 'Virtue Epistemology' (version 7 November 2017), https://plato.stanford.edu/entries/epistemology-virtue/ (6 October 2021).

recommendations. Branches of philosophy such as ethics and epistemology provide insight into not only how things are, but how things *should* be. Ethical theory can show which considerations should be at the heart of Open Scholarship and what academic practice ought to be like. Currently, (implicitly) consequentialist, contractualist and/or altruistic ethical theories dominate Open Science movements and debates surrounding Open Science. I hope to show that these ethical underpinnings can be detrimental to individual scientists and thus to Open Science movements as a whole. As an alternative, I present a defense of Open Academia based on rational virtue ethics – showing how Open Academia is in the self-interest of individual scientists. In doing so, I sidestep the argument made by some scientists that Open Academia is just another obligation that they do not have time for, and which damages their careers. In a rational virtue ethics framework, Open Academia is not an obligation, but it *is* the moral choice, precisely because it advances the self-interest of the individual scientist.

Although philosophical analysis of ethical and epistemological concerns within Open Academia contributes to all aforementioned discussions, this thesis will not provide (definitive) answers to or guidance for all these issues. However, it will provide a foundation for further philosophical analysis and debates, which can subsequently enable the formulation of (tentative) answers to these questions. As such, the thesis will contribute to many different fields, including epistemology, ethics, philosophy of science, science and technology studies, and sociology of science.

A Note on Terminology

Throughout this manuscript, I shall use the term Open Academia as a broad umbrella term covering many different interpretations of and views on Open Science and adjacent practices. This inherently means that even though the term *science* in English is often associated with a limited number of fields such as geoscience, natural science and social science, many Open Science cases in practicality also concern other academic fields such as law, economics, and the humanities. This trend has not been uncontroversial. In the next paragraphs I shall outline the debate surrounding the term Open Science in relation to academic fields not traditionally considered science, and further explain why I shall use the term Open Academia instead. Sometimes, when referring to open practices in natural science disciplines, or when referring to movements which specifically present themselves as Open Science, I will still use the term Open Science.

Some advocates of open methods have argued that the term open science is not inclusive enough, and even that it might deter researchers from 'non-scientific' fields from joining the Open Science Movement. Dutch professor of computational and digital humanities Rens Bod has been an ardent proponent of using the term Open Scholarship instead of Open Science to refer to the umbrella of movements advocating for more openness in academia. Bod argues that, etymologically, the English word science does not cover fields such as the humanities. This differs from many other languages such as Dutch and German, where *wetenschap* and *Wissenschaft* respectively encompass all academic disciplines. *Open wetenschap* and *Offene Wissenschaft* therefore do not have the same problem as Open Science does etymologically.

Others have argued that academic fields outside of the sciences should develop their own open paradigm. In the blogpost 'Open Humanities: Why Open Science in the Humanities is not

Enough', sociologist Marcel Knöchelmann argues that the methods being used and developed by the Open Science community are inadequate for the humanities. For him, one of the most salient examples is the role of digital tools. According to Knöchelmann, scholars in the humanities treat digital tools as 'external and supplemental to their research and scholarship practices'.[2] Digital practices are not integrated but compartmentalized, most notably by creating the field of digital humanities.[3] As an example of why the humanities are better served by their own open paradigm, Knöchelmann uses the example of preprints in relation to open peer review. According to Knöchelmann, both preprints and open peer review can be implemented in scientific fields on their own, but in the humanities they need to occur together to prevent problems. Knöchelman argues:

> For instance, if a publisher implemented preprints, but worked on a closed peer review process, future readers are posed with the confusing scenario that they can read both the manuscript and the final version, but have no idea why something was changed and who was involved in the process. In disciplines that emphasise the importance of editorial history and individual authorship, scholars cannot neglect that there are different versions published and, when discussing such a publication, always have to refer to both published versions in a way such as: author A claims that X and unknown reviewer R adds XY. This may sound trivial. But neglecting such a discursive process would question where the line is drawn between necessary and neglectable editorial historicity. An open humanities discourse would allow such issues to be addressed comprehensively, rather than in a piecemeal fashion.[4]

The example of preprints in relation to open peer review serves to illustrate the broader point that any open paradigm must be sensitive to the context in which it is implemented.

Although Knöchelmann justly raises a few points of criticism, his insights can easily be incorporated into open academia or have already been incorporated since he wrote down his concerns. In addition, for the purposes of this thesis, I am mostly concerned with what open academia looks like in practice, its philosophical underpinnings and how self-interested academics should relate to open academia in all its facets. In practice, the terms open science, open scholarship, open research, and open academia are often used interchangeably, or different terms are used by different institutions that do work together towards common goals. Because of these practical considerations, I will group together the aforementioned terms into the common denominator *Open Academia*, although when necessary in a specific context I will refer to open science, open scholarship, open research, or open humanities as well.

---

[2] Marcel Knöchelmann, 'Open Humanities: Why Open Science in the Humanities is not Enough' (version 20 March 2020), https://www.rug.nl/library/open-access/blog/open-humanities-why-open-science-in-the-humanities-is-not-enough-19-03-2020?lang=en (1 June 2021).

[3] Marcel Knöchelmann, 'Open Humanities: Why Open Science in the Humanities is not Enough' (version 20 March 2020), https://www.rug.nl/library/open-access/blog/open-humanities-why-open-science-in-the-humanities-is-not-enough-19-03-2020?lang=en (1 June 2021).

[4] Marcel Knöchelmann, 'Open Humanities: Why Open Science in the Humanities is not Enough' (version 20 March 2020), https://www.rug.nl/library/open-access/blog/open-humanities-why-open-science-in-the-humanities-is-not-enough-19-03-2020?lang=en (1 June 2021).

There are two main reasons for choosing the denominator Open Academia. First, for etymological reasons. In the English language, science has come to mean 'a system of knowledge concerned with the *physical world* and its phenomena' [emphasis own]. Although the author considers every academic discipline to be concerned with the physical world, this definition is clearly meant to refer to the natural sciences and perhaps some of the social sciences, thereby excluding fields like the humanities. Another common definition of science is a 'system of knowledge covering *general truths* or the operation of *general laws* especially as obtained and tested through scientific method'. Let us ignore the tautological nature of the second part of the definition. General truths or laws are more likely to be pursued in the social sciences and natural sciences. Many humanities disciplines, such as postmodern historiography, are extremely skeptical of either the existence of or the possibility of discovering such general truths or laws in their field. Clearly then, this definition of science does not encompass the humanities either. Academia, defined as 'the environment or community concerned with the pursuit of research, education, and scholarship' *does* encompass research done in fields like the humanities. So why are the humanities interesting to investigate?

In the humanities, there has traditionally been less focus on societal relevance and applications than in other fields like biomedicine or chemistry. Consequentially, ethical and epistemological concerns are necessarily different – for example, if the perceived societal impact of research is not the main concern, then ethical consequentialist arguments about societal impact will carry less weight. In addition, much research in the humanities, with notable exceptions such as linguistics, does not depend on the use of participants – making contractualist arguments less likely as well. Differences in epistemological underpinnings can give rise to different epistemological debates; the nature of replication is different for the humanities compared to the social sciences, which is different compared to the natural sciences. Looking at the humanities therefore broadens the scope of the ethical and epistemological topics that can be investigated and thus provides more or deeper insights compared to an analysis which excludes the humanities.

The second reason to use the term open academia instead of other options, is that open academia is more likely to accurately describe and encompass all the methods and views covered in this manuscript. As already indicated, we shall for example look at trends and debates in the open humanities that the proponents themselves don't consider as open science and some open science advocates might not consider open science. Another example is developments within academic libraries which aren't really scientific developments or directly related to science education or dissemination but do exert an influence. These trends and debates can still be interesting to investigate, because academics not (directly) concerned with research can play a crucial role in implementing open scholarship in practice. Libraries for example negotiate open access deals with big publishers. University administrators and managers try to implement open scholarship policies top-down. So, even if some academics are not directly involved with open academia, they can certainly be involved indirectly and are thus interesting to analyze.

Structure of the Thesis

The thesis is structured to best answer the research question. First we need to know what Open Academia entails before we can judge how self-interested academics should relate to Open Academia. The first chapter will therefore concern a review of the different existing taxonomies of Open Science and Open Academia. For the purposes of this thesis, not all taxonomies will be as useful and thus not all will be covered. Some taxonomies for example use a classification system that bears little relation to epistemology and ethics and are therefore more difficult to relate to the topic of this thesis. This chapter also covers Robert K. Merton and his Mertonian norms, which remain influential in contemporary Open Academia. The purpose of this chapter is both to emphasize the plurality of the movement, as well as giving an indication of some of the worldviews or philosophies underlying particular Open Academia movements. This will be important to recognize and understand implicit philosophical arguments in contemporary Open Academia discourse, which differ from but also overlap with self-interested arguments. Understanding these philosophical worldviews then helps better understand how self-interested academics relate to Open Academia by explicating the differences and similarities.

The second chapter enriches the analysis of the previous chapter by delving specifically into the relationship between ethics and epistemology, both in the traditional sense and within the context of virtue epistemology, a relatively contemporary approach to epistemology which focusses on the normative nature of epistemology. The theory in this chapter is important for better understanding the (implicit) philosophical underpinnings of contemporary Open Academia movements and debates. Because the motivation for self-interested academics to engage in Open Academia is mostly ethical and epistemological, it is important to outline the relationship between the two in further detail. This chapter then provides the background needed to understand the rational egoistic case made for Open Academia in later chapters, which is partially grounded in virtue ethics.

The subsequent chapter further strengthens our understanding of contemporary Open Academia worldviews by examining Open Academia discourse during a time of crisis, namely during the COVID-19-pandemic. It deals with contemporary debates between opponents of or sceptics towards Open Academia on the one hand, and proponents of Open Academia on the other. These debates often concern potential epistemological and ethical issues related to implementations of Open Academia, such as ethical concerns surrounding privacy and epistemological concerns surrounding public understanding of science.[5] Additionally, we shall also look at contemporary debates *within* Open Academia movements, because such debates elucidate differing worldviews – differing ethical and epistemological concerns. This provides us with a clearer understanding of what Open Academia does and can look like in practice, further elucidating which aspects of Open Academia connect to the interests of individual academics.

[5] Simon Dennis, Paul Garrett, Hyungwook Yim, Jihun Hamm, Adam F. Osth, Vishnu Sreekumar and Ben Stone, 'Privacy versus open science', *Behavior Research Methods* 51 (2019) 4, 1839-1848, passim; Siraprapa Chavanayarn, 'The Epistemic Value of Open Science', *Open Science Journal* 3 (2018) 3, 1-8, passim.

In the last two chapters, a normative ethical case is made for Open Science from a virtue egoist perspective. These chapters solidify our understanding of how self-interested academics should relate to Open Academia. The current debates surrounding Open Academia often center around altruistic concerns. Scientists are often (implicitly) expected to put the concerns of the scientific community, or even the concerns of society at large, before their own. Open Academia can provide benefits to self-interested academics by moving away from altruistic expectations. I will first demonstrate philosophically how some aspects of Open Academia can benefit self-interested academics and subsequently provide empirical backing, thereby showing that self-interested academics should embrace and apply those aspects of Open Academia which are conducive to their own well-being.

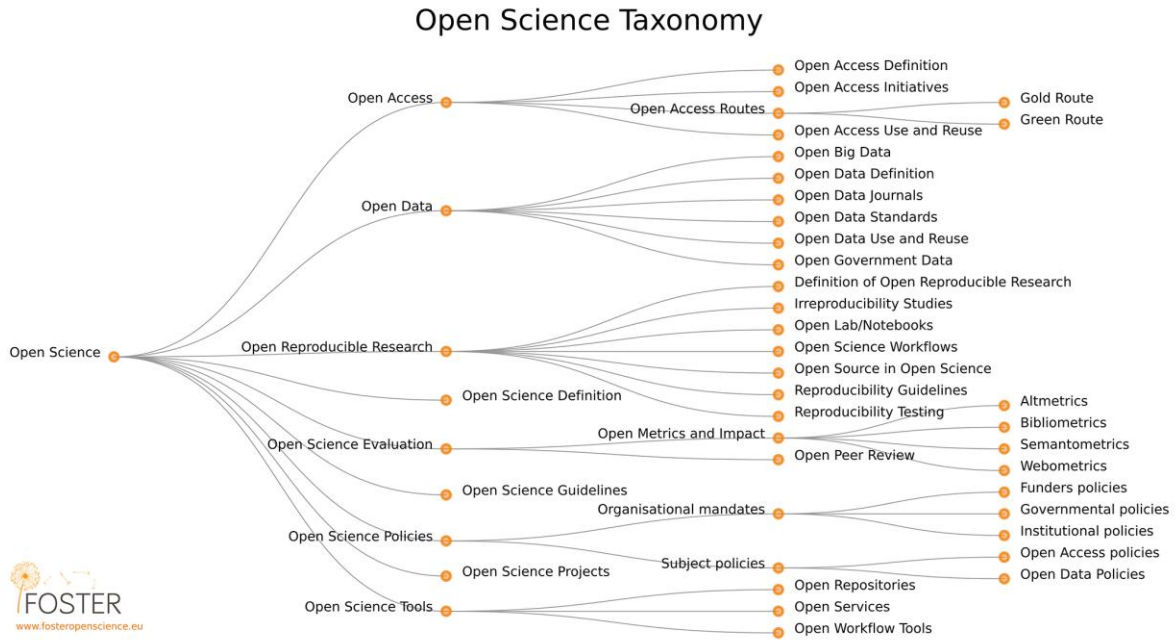
Chapter 1: Understanding Open Academia

Open Academia, being an umbrella term, is difficult to conceptualize. Each conceptualization will inevitably leave out certain characteristics and have its own focal point, thereby fitting better in some contexts and worse in others. Instead of trying to find an all-encompassing definition of Open Academia, I will look at existing taxonomies. This provides two benefits. First, it enables a better understanding of debates concerning Open Academia, where specialist terms are often used. Second, these taxonomies can be indicative of implicit philosophical worldviews underlying different Open Academia movements. Two Open Science taxonomies in particular are worth taking a look at, namely one taxonomy that divides Open Science into subcomponents based on methods, providing a better understanding of specific terminology, and one taxonomy that divides Open Science into different schools of thought, providing a better understanding of underlying worldviews. Additionally, this chapter will cover Robert K. Merton and his Mertonian norms, which (implicitly) inform the worldview of many different Open Academia movements and advocates.

FOSTER Open Science Taxonomy

A taxonomy of Open Science by Scholarly Communications expert Nancy Pontika and colleagues for *FOSTER Open Science*, divides open science (or open scholarship) into seven different categories, namely open access, open data, open reproducible research, open science definition, open science evaluation, open science policies, and open science tools. FOSTER is a project focused on 'promoting the practical implementation of Open Science, with activities targeting academic staff, young scientists and policy-makers in particular'.[6] The taxonomy by FOSTER is distinctly methodological: the different categories correspond to different open scholarship methods.

[6] European Commission, 'Fostering the practical implementation of Open Science in Horizon 2020 and beyond' (version 25 May 2022), https://cordis.europa.eu/project/id/741839 (12 August 2022).



Open Access

The definition Pontika et al. use of open access is 'online, peer-reviewed scholarly outputs, which are free to read, with limited or no copyright and licensing restrictions'.[7] I would change this definition to 'online scholarly outputs, which are free to read, with limited or no copyright and licensing restrictions', to include preprints which have not (yet) been peer-reviewed. This more accurately reflects open access in practice – preprints are often considered open access as long as they concern scholarly outputs which are free to read with limited or no copyright restrictions.[8] Different conceptions and executions of the concept of open access exist, for example Green Open Access, Gold Open Access and Diamond Open Access. Green Open Access refers to when a publication or a version of it

> is archived online, e.g. in a repository. It does not include any of the work typically carried out by the publisher, such as e.g. copyediting, proofreading, typesetting, indexing, metadata tagging, marketing or distribution. It is usually not listed on the publisher's website. It can be freely accessed but sometimes only after an embargo period, and there can be barriers to reuse. The author usually does not retain the copyright.[9]

[7] Nancy Pontika, Petr Knoth, Matteo Cancellieri and Samuel Pierce, 'Fostering open science to research using a taxonomy and an eLearning portal', *Proceedings of the 15th international conference on knowledge technologies and data-driven business* (2015), 1-8, there 1.
[8] Jenny Knowles, 'Preprints—The Future of Open Access Publishing?' (version 1 April 2022), https://blog.mdpi.com/2022/04/01/preprints-the-future-of-open-access-publishing/ (18 August 2022); open-access.network, 'Preprints' (version 11 July 2022), https://open-access.network/en/information/publishing/preprints#c17415 (18 August 2022).
[9] Lucy Barnes, 'Green, Gold, Diamond, Black – what does it all mean?' (version 22 October 2018), https://blogs.openbookpublishers.com/green-gold-diamond-black-what-does-it-all-mean/ (20 Juli 2022).

Gold Open Access is different in that there is no embargo period, the author retains the copyright, and there are generally no barriers to share or reuse. In some cases, a fee is charged for publication.[10] Diamond Open Access does not require a fee to be paid. In other aspects it is identical to Gold Open Access.[11]

Open Data

Open data is similar to open access, but focusses specifically on making research data openly accessible, useable and shareable. All aspects of the data should be available, such as the raw data, i.e. the data that has not been processed for use, the processed data, the data analysis, and the results of the data analysis. Hybrid forms where only parts of the data are available can sometimes still be considered open data practices.

Open Reproducible Research

Open reproducible research refers to 'the act of practicing OS [Open Science] to enable the independent reproducibility of the research results'.[12] In practice this means that the information needed for replication is openly available, so for example providing access to the methods used (Open Access) and code used (Open Code). In reality, more information is needed for reproductions than is commonly published in articles. Difficult to convey or seemingly irrelevant information can turn out to be crucial for a successful replication. Sometimes such information is tacit, i.e. 'knowledge that cannot be expressed directly in words' and is therefore difficult to convey in academic papers.[13] An example of such tacit knowledge is how to tie your shoelaces. It is quite hard to write down a manual on how to tie your shoelaces, but it is relatively easy to show someone.

Sociologists of science such as Harry Collins have shown that such tacit knowledge also plays a big role in research and thus in replications. For example, in physics, lasers have been built that are hard to replicate based solely on written information. Collins and several physicists specifically looked at replication of a TEA laser – a particular variant of a gas laser. Despite there being a rich body of literature on how the laser supposedly worked, attempts to build the same laser in other labs was at first unsuccessful. Only through intense collaboration with the original team that build the laser, were Collins and colleagues finally able to build a replica – what had been missing was the tacit knowledge available to the physicists who built the first laser.[14]

Other times the information is not necessarily hard to convey, but is considered irrelevant or not though about at all – while in reality often being relevant at the very least for purposes of replication. For example, in chemistry experiments, humidity can have an unexpected influence on

[10] Ibid.
[11] Ibid.
[12] Pontika, 'Fostering open science', 1; Victoria Stodden, 'Enabling reproducible research: Open licensing for scientific innovation', *International Journal of Communications Law and Policy* 13 (2009), 1-55, passim.
[13] Richard Brock, 'Tacit knowledge in science education: the role of intuition and insight in teaching and learning science', in: Keith S. Taber and Ben Akpan (eds.), *Science Education: An International Course Companion* (Rotterdam 2017) 133-142, there 133.
[14] Harry Collins, *Changing Order: Replication and Induction in Scientific Practice* (Chicago 1992), passim.

the outcome of an experiment. If the researchers do not realize this – for instance, because the original experiment succeeded and the researchers had no reason to look for further unknown influencing variables – then the humidity levels will not be mentioned in the final, published article. Replication attempts in other laboratories subsequently fail if the humidity levels differ from those in the laboratory where the original study was conducted. As long as the scientific community remains ignorant of the role that humidity plays in the experiment, it will remain unclear why the experiment cannot be replicated.

Open reproducible research thus not only necessitates open access and open data so that all reported or collected information is available, but also requires rethinking how and which information is conveyed.

Open Science Definition

Open science definition refers to the definition of open science. The Organisation for Economic Co-operation defines open science as 'to make the primary outputs of publicly funded research results – publications and the research data – publicly accessible in digital format with no or minimal restriction'.[15] FOSTER Open Science expands on this definition by adding that open science is about 'extending the principles of openness to the whole research cycle […], fostering sharing and collaboration as early as possible thus entailing a systemic change to the way science and research is done'.[16]

Open Science Evaluation

Open science evaluation concerns, as the name implies, the evaluation of open science through Open Metrics and Impact and Open Peer Review. (Open) Peer Review can mean that the peer review process becomes openly available after an article has been published, for example by openly publishing the peer review comments and the response(s) by the authors after the article has been accepted for publication. Whether the identities of the peer reviewers should be revealed after publication is a matter of debate within open academia movements. On the one hand, revealing the names of the peer reviewers could incentivize more well-thought-out and fairer reviews, because their reputation would suffer from low-quality, unfair reviews. On the other hand, revealing the names of peer reviewers could incentivize worse reviews, because reviewers might fear negative consequences if they review academics in high positions too harshly.[17]

Open Science Policies

Open science policies can refer to all manner of policies. The FOSTER Open Science taxonomy differentiates between operational mandates and subject policies. Operational mandates are policies such as funders policies, governmental policies, and institutional policies. Funders policies refer to Open Science related policies that funding bodies set up. An example of this is Plan S, an initiative by

[15] Organisation for Economic Co-operation and Development, 'Making Open Science a Reality', *OECD Science, Technology and Industry Policy Papers* 25 (2015), 1-108, there 7.
[16] Gema Bueno de la Fuente, 'What is Open Science? Introduction' (n.d.), https://www.fosteropenscience.eu/content/what-open-science-introduction (12 August 2022).
[17] Nature Neuroscience, 'Pros and cons of open peer review', *Nature Neuroscience* 2 (1999), 197-198, passim.

a consortium of funders that aims to accelerate the transition to Open Science.[18] Plan S requires researchers who are funded by aforementioned consortium to publish open access. Governmental policies concern laws or decrees that specify how open science and related aspects should be handled. For example, the Netherlands has the so-called Taverne Amendment, article 25fa of the Dutch Copyright Act, which stipulates that

> The maker of a short academic work for which the research has been wholly or partly funded by Dutch public funds has the right to make that work available to the public free of charge after a reasonable period of time after its first publication, provided that the source of the first disclosure is clearly stated.[19]

Institutional policies are similar to funders and governmental policies, but drawn up and enforced by institutions rather than funders or governmental bodies. An example of such an institutional policy is the 'You Share, We Take Care!' pilot, which all Dutch universities participated in.[20] During the pilot, all participating universities implemented institutional policies with the aim of helping researchers make use of the Taverne Amendment. Concretely, this meant that resources were allocated to supporting researchers who tried to make their previously published articles open access, for example by having library staff help these researchers.[21]

Open Science Tools

Open science tools refer to technological and organizational instruments that facilitate open science or open scholarship. The three tools included in the taxonomy are open repositories, open services, and open workflow tools. Open repositories are digital platforms which host freely accessible research output such as data and articles. Open services are services provided by for example universities or libraries to help academics implement open academia in their own work, such as library personnel helping academics to make their previously non-open access published work open access. The third tool, open workflow tools, is any tool that enables an open workflow, i.e. sharing each step of the research process openly 'through clear documentation that makes the research project transparent and reproducible'.[22]

Discussion

For the purposes of this thesis, the methodological taxonomy is useful only insofar as it helps to better understand the terminology used in debates surrounding Open Academia. However, the methods themselves give little context. A far better taxonomy would be one which uses schools of thought as

[18] open access.nl, 'Plan S' (n.d.), https://www.openaccess.nl/nl/in-nederland/plan-s (15 August 2022).
[19] open access.nl, 'You share, we take care!' (n.d.), https://www.openaccess.nl/en/in-the-netherlands/you-share-we-take-care (12 August 2022); Dutch government, 'Auteurswet' (version 7 June 2022), https://wetten.overheid.nl/BWBR0001886/2022-06-07 (12 August 2022).
[20] open access.nl, 'You share, we take care!' (n.d.), https://www.openaccess.nl/en/in-the-netherlands/you-share-we-take-care (12 August 2022).
[21] Arjan Schalken, 'Evaluatierapport pilot You share, We Take Care (publieke versie)', *Nationaal programma open science*, n.d.
[22] The University of British Columbia, 'What is an Open Workflow?' (version 25 October 2021), https://pose.open.ubc.ca/open-research/open-workflows/what-is-an-open-workflow/ (21 Juli 2022).

the distinctive categories. The advantage of such a taxonomy is that, unlike a categorization based on methods, it provides insight into deeper philosophical assumptions, theories, and arguments underlying different movements and practices in Open Science. The second taxonomy that I shall discuss is therefore one that bases its categorization precisely on these criteria.

Open Science: One Term, Five Schools of Thought

One of the most comprehensive accounts of different schools of thought within Open Science is the chapter 'Open Science: One Term, Five Schools of Thought' by research policy specialists Benedikt Fecher and Sascha Friesike. The five schools they discern are the *infrastructure school*, the *public school*, the *measurement school*, the *democratic school*, and the *pragmatic school*.[23] Unlike some other classification schemes that rely on anthropological research, the classification by Fescher and Friesike relies on their personal identification after making a compilation of the literature on Open Science, which includes not only scientific literature but also scientific blogs and newspaper articles.[24] They 'do not claim a consistently clear-cut distinction between these schools' and admit that some of the schools 'share certain ontological principles' – the first indicator that this classification can shed light on underlying philosophical worldviews.[25] By combining an analysis of the Mertonian norms this literature analysis and other anthropological and political analyses, a clearer picture will emerge of the different 'camps' within Open Academia.

The main way of distinguishing between the schools is by detailing their 'central assumptions, the involved stakeholder groups, their aims, and the tools and methods used to achieve and promote these aims'.[26] This way of distinguishing is more useful for the purposes of this thesis, because some of the elements are more clearly philosophical in nature. Central assumptions include philosophical assumptions such as how knowledge is (best) gained and what is desirable in academia. This also holds for involved stakeholder groups. Stakeholder groups are individuals, groups or organizations that have an interest in how academia functions. The stakeholders a certain school focusses on are indicative of what that school considers important, and thus indicative of some underlying epistemological and normative considerations. Focusing mostly on experts can be indicative of a technocratic worldview, for example.

Infrastructure School

The infrastructure school focusses on the technical infrastructure which is necessary for and facilitates Open Scholarship. It therefore concerns itself mostly with technological tools, applications and platforms. The infrastructure school is maybe the least clearly normative of the schools within this taxonomy; it focusses on pragmatic solutions to technological challenges. An example of a pragmatic solution to a technological challenge would be the use of distributed computing to increase the

[23] Benedikt Fecher and Sascha Friesike, 'Open Science: One Term, Five Schools of Thought', in: Sönke Bartling and Sascha Friesike (eds.), *Opening Science: The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing* (Heidelberg 2014) 17-47, there 19.
[24] Ibid., 18.
[25] Ibid., 18.
[26] Ibid., 18.

available computational power for simulating protein dynamics. However, *which* problems the infrastructure school identifies and aims to tackle, *is* indicative of an underlying worldview. Based solely on the analysis by Fecher and Friesike, it is hard to determine what that worldview is, because they only provide a non-exhaustive list of examples of infrastructure related problems and solutions, which are not necessarily paradigmatic. However, based on the provided goals, such as increased efficiency, and the focus on technical infrastructure, the infrastructure school seemingly concerns itself mostly with productivity.[27]

Democratic School

The democratic school focusses mostly on making research and academic products freely available. The rationale behind this is, as the name suggests, democratic: everybody should have access to scientific output such as articles or data. The democratic school thus focusses on Open Access and Open Data, but also on making 'source materials, digital representations of pictorial and graphical materials, or multimedia material' *freely* available.[28] One prominent argument as to why academic products should be freely available is that everybody, by paying taxes, contributes to the funding of science. Those that contribute are then entitled to receive something in return, namely free access to scientific findings. This argument is based on an underlying principle or duty of reciprocity, i.e. exchanging things for mutual benefit, common to contractualism and other deontological ethical frameworks, as well as traditional virtue ethics.[29]

Public School

The public school concerns itself with making science accessible to the public, building on the assumption that 'science *needs to be* accessible for a wider audience'.[30] [emphasis own] Needs to implies a necessity, and in the current context is clearly meant normatively. This obligation (supposedly) exist, because involving the public can be beneficial for science. The public school aims to involve citizens through citizen science, i.e. have citizens contribute to scientific research by providing data, computer power or other non-monetary contributions, and crowdfunding of research. The latter is a way to have citizens contribute to scientific research by providing funding directly. The public school thus does not focus so much on Open Academia aspects that directly contribute to the public, but more on Open Academia aspects that directly contribute to science, through use of the public. It could be argued that the public school still contributes to society by optimizing science and thus eventually its contributions such as technology or policy interventions, as well as by involving citizens in the scientific process.[31]

So, although the public school might seem very similar to the democratic school, because they focus on similar goals and projects, there is a subtle difference in their motivation that is important to

[27] Ibid., 36-40.
[28] Ibid., 25.
[29] Ibid., 25-32.
[30] Ibid., 19.
[31] Ibid., 19-25.

realize. The public school focusses more on what the public can do for academia, whereas the democratic school focusses more on what academia can do for the public. The public school might therefore be especially interesting for self-interested academics.

Measurement School

The measurement school is most concerned with measuring academic output, specifically developing new ways of measuring academic output and critiquing existing ones. One of the most famous and most used way of measuring academic output is the Hirsch-index, more commonly known as the H-index. The H-index tries to indicate 'both the quantity and quality of quality of a scientist's research output' by counting the number of their papers (N) that have N or more citations. Much criticism has been directed at the H-index, mostly concerning how well it measures productivity and citation impact as well as its predictive power.[32]

The measurement school is quite clearly concerned with epistemology and ethics. Measuring academic output and impact is not a goal in itself, but a way of determining who should be rewarded more opportunities than their peers, either in funding, promotion or awards. For this to be justified – an ethical consideration – the measurement must be an accurate representation of reality, which is an epistemological consideration. If a measurement indicates that an academic has a big impact on society, whereas in reality the impact of the academic is negligible, promoting them based on their impact would be unfair. In addition, *what* is measured is an indication of what is considered important; metrics are often used to determine promotions and funding allocation – academics are rewarded for adhering to what is considered important. A university which employs an education-focused metric during hiring processes, signals that education is valued as much as, if not more than, for example research is. Dominant metrics are indicative of what is valued at universities; that which is valued is measured so that agents who display valued behavior can be rewarded.[33] Alternative metrics, such as social media are then an indication of a growing concern with public engagement and science communication.

One so-called altmetric, or alternative metric, is the transparency metric developed by the ERC-funded project 'Curate Science'. Curate Science claims to be a 'platform to crowdsource the credibility of scientific research by curating its transparency, analytic reproducibility, analytic robustness, and effect replicability of published scientific findings.' Curate Science turned out to be controversial in practice, especially so within open academia communities and movements themselves. Critics pointed out that Curate Science was not opt-in, that team members of Curate Science were highly ranked on their own metrics, that the transparency metric further exasperated science-as-a-competition, and lacked diversity.[34] Academics such as communication scientist Juliëtte

[32] For a good overview of these critiques, see Lutz Bornmann and Hans-Dieter Danie, 'What do we know about the h index?', *Journal of the American Society for Information Science and technology* 58 (2007) 9, 1381-1385, passim; Michael Schreiber, 'A skeptical view on the Hirsch index and its predictive power', *Physica Scripta* 93 (2018) 10, 1-15, passim.

[33] I would like to thank Willem Halffman for this insight.

[34] See the comments and retweets of this Twitter thread by Curate Science (version 16 March 2021), https://twitter.com/curatescience/status/1371927234899017731 (17 August 2022).

Schaafsma and science and technology scholar Sarah de Rijcke have criticized the tendency to replace one metric with another instead of exploring other options such as doing away with metrics altogether.[35]

The example of Curate Science illustrates how academics can disagree about specific methods, theories, or normative considerations while still being proponents of open academia, or even falling under the same school of thought. However, in general, the measurement school concerns itself with productivity, impact, and outreach.

Pragmatic School

The pragmatic school focusses on making the academic environment more efficient, particularly research and knowledge dissemination. In that regard, it shares similarities with other schools such as the infrastructure school – both have a facilitating focus and a focus on efficiency. The main difference between the pragmatic school and the infrastructure school is that the pragmatic school has a stronger focus on the collaborative aspect of research. In the words of Fecher and Friesike, the pragmatic school 'considers science as a process that can be optimized by, for instance, modularizing the process of knowledge creation, opening the scientific value chain, including external knowledge and allowing collaboration through online tools'.[36] An empirical study on researcher collaboration found various potentially self-interested reasons for academics to engage in collaborative research, such as access to expertise, aggregation of different kinds of knowledge, and productivity.[37] Due to its focus on optimization, the pragmatic school can also be considered to be mainly concerned with efficiency and thus productivity as well.

The Role of Mertonian Norms in Open Academia

Open Academia is a rather broad term with differing meanings and a far from linear history. To be able to understand the contemporary arguments made by differing proponents of Open Academia, it is necessary to differentiate between different 'schools of thought', as I did in chapter 1. Although the schools of thought are certainly not homogeneous in their methods or ideologies, there are at least some common characteristics, such as the ideal of making academic research and its dissemination accessible to both professional scientists as well as the general public. Many of the common characteristics are routed in the scientific norms described by sociologist Robert K. Merton.

Many Open Academia advocates see the work of American sociologist Robert Merton as one of the modern starting points of many ideas that influence the contemporary Open Academia movement.[38] We shall first give some general background on Merton, then discuss some of his

[35] Journal of Trial and Error, 'Open Science rankings: yes, no, or not this way?' (version 15 June 2021), https://www.youtube.com/watch?v=TMGaNvo-SgM (15 August 2022).
[36] Fecher and Friesike, 'Open Science', 32.
[37] Ibid., 35.
[38] For examples of the prominent place that Merton takes in Open Academia discourse, see Frank Miedema, *Open Science: the Very Idea* (Utrecht 2022), passim; Nadine Levin and Sabina Leonelli, 'How does one "open" science? Questions of value in biological research', *Science, Technology, & Human Values* 42 (2017) 2, 280-305, there 289.

sociological work on science and then more extensively discuss the so-called Mertonian norms. These 'sets of institutional imperatives', which would later become referred to as norms, have had a large enough impact on the Open Academia movement to merit extra attention.

Merton's academic career started at around 1927, when he started working as the research assistant of George E. Simpson, a sociologist researching race and media. In 1942, Merton wrote about the '[f]our sets of institutional imperatives' which were 'taken to comprise the ethos of modern science': universalism, communism, disinterestedness, and organized skepticism. According to Merton, these imperatives are inherent to science. If one practices science, these imperatives are present. That is not to say that people who claim to practice science will necessarily adhere to these imperatives, but rather – for Merton – that when and where science proper is conducted, these imperatives will be followed.

According to Merton, universalism means that 'truth-claims, whatever their source, are to be subjected to *preestablished impersonal criteria*'. [emphasis original] In other words, scientific claims are independent of the personal or social attributes of the scientists. A female atheistic scientist in Germany would make the same scientific claims based on certain evidence as a male Muslim scientist in Iceland. Merton does recognize that universalism is by no means consistently present in enterprises which call themselves scientific, which should be distinguished from science. Having witnessed the Second World War, Merton uses examples from Germany during the First World War to illustrate how the imperative of universalism is not always followed by those claiming to conduct science:

> Thus, in 1914 the manifesto of ninety-three German scientists and scholars - among them, Baeyer, Brentano, Ehrlich, Haber, Eduard Meyer, Ostwald, Planck, Schmoller, and Wassermann - unloosed a polemic in which German, French, and English men arrayed their political selves in the garb of scientists. Dispassionate scientists impugned "enemy" contributions, charging nationalistic bias, log-rolling, intellectual dishonesty, incompetence, and lack of creative capacity.[39]

For Merton, this deviation from the norm only reaffirmed universalism as a norm, because deviation from the norm 'actually presupposed the legitimacy of the norm'.[40]

Communism, which later became better known as communalism, Merton defined as the 'common ownership of goods'.[41] When a scientific theory or law is discovered or established, these become public knowledge. Neither the discoverer nor heirs of the discoverer should have any special rights with regards to the theory. Concretely, this means that, according to Merton, scientists should not have intellectual property rights to their scientific discoveries or any practical applications thereof. The only merit a scientist should be able to obtain from individual discoveries is the prestige that comes with the discovery; often this prestige comes in the form of attaching one's name to a theory surrounding the discovery. It is interesting to note that Merton does recognize the need for some form

[39] Robert K. Merton, 'The Normative Structure of Science', in: Norman W. Storer (ed.), *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago 1979) 267-278, there 271.
[40] Ibid., 271.
[41] Ibid., 273.

of recognition and competition *for* this recognition. He called this system competitive cooperation, with the competitiveness stemming from the competition for prestige and the cooperation stemming from scientists working together towards common goals.

Disinterestedness for Merton does not refer to any motivation on the part of individual scientists. He acknowledges that scientists have been motivated by many different reasons, ranging from altruism to pure curiosity.[42] Rather, institutional control in the form of sanctions and instilled norms are what prevent scientists from letting their personal interests take preference over the scientific facts. Merton even goes so far as to boldly proclaim that there is a 'virtual absence of fraud in the annals of science', which he ascribes to the 'distinctive characteristics of science itself'.[43] As we shall see in subsequent chapters, Merton's view turned out to be overly optimistic. Merton believed that 'the activities of scientists are subject to rigorous policing, to a degree perhaps unparalleled in any other field of activity'[44], a sentiment still echoed in many Open Academia movements.

Lastly, organized skepticism refers to 'both a methodological and an institutional mandate'.[45] Briefly, this norm concerns the suspension of judgement. Every aspect of society can be scrutinized by science, even if that means questioning dogmas and/or coming into conflict with other aspects of society.[46]

Interestingly, some historians also trace a connection between Open Academia and the Mertonian norms. American economist and historian Paul A. David argues that the foundations for Open Science can be found in the development of the scientific patronage system of the late sixteenth and early seventeenth century. Although David does not trace the origins of the Open Science movement directly to Merton, the sociologist's norms are very much a core component of David's analysis; the common values of Open Science that David aims to historically trace are precisely those that Merton identified.[47] Many ethical and epistemological considerations in Open Academia must be understood in the light of the Mertonian norms. It is to these considerations and their relationship that we turn to next.

Conclusion

Open Academia can be implemented in a variety of ways. It can refer to journal policies like green or gold open access, to technologies such as open science tools, and to a combination of required changes such as with open reproducibility. With so many ways of conducting Open Academia, it is no wonder that different movements and actors have differing viewpoints on the main goals and priorities of Open Academia. These differing viewpoints can be grouped together into schools of thought, giving a better insight into the underlying premises of these views. Many of these schools of thought are at least partially influenced by Mertonian norms of universalism, communism,

[42] Ibid., 275-276.
[43] Ibid., 276.
[44] Ibid., 276.
[45] Ibid., 277.
[46] Ibid., 277-278.
[47] Paul A. David, 'The Historical Origins of 'Open Science': an essay on patronage, reputation and common agency contracting in the scientific revolution', *Capitalism and Society* 3 (2008) 2, 1-103, passim.

disinterestedness and organized skepticism. Self-interested academics would to well to align with those schools of thought which focus less on altruistic and contractualist concerns, such as the pragmatic and infrastructure schools. To further understand the ethical and epistemological considerations for self-interested academics, we take a closer look at the meaning of these terms and their relationship.

Chapter 2: The Relationship Between Ethics and Epistemology in Open Academia

Ethics and epistemology are related in almost every philosophical framework. The most obvious connection is the relation between knowledge and (ethical) decision making – either an agent knows what the most ethical course of action is and subsequently should take that course, or they do not know the most ethical course of action and must rely on moral principles. However, depending on one's philosophy, ethics and epistemology can be related in many ways and on many levels. Within academia, scholars hold differing views on the relationship between academic epistemology and ethics – if they even hold an explicit view at all. Nonetheless, also implicit views about ethics and epistemology influence worldviews and argumentation. As we shall see in chapters four and five, within open academia movements academic knowledge is often seen as something that *should* benefit society and/or something that we have an obligation to share with society.

Another dominant strand of ethics in academia is virtue ethics. Virtue ethics emphasizes the virtues or moral character of agents.[48] These virtues can be seen as character traits, such as bravery, humility, and fairness, or as acts, such as honesty, generosity, and prudence.[49] Contrary to other ethical theories, virtue ethics considers virtues and vices as foundational and thus other normative notions will always be grounded in virtues and vices.[50] If virtues are seen as character traits, then the virtues are those acts which virtuous people conduct.[51] If virtues are seen as actions, then virtuous people are those that act virtuously.[52]

For the purposes of this thesis, I am not concerned with meta-ethical justifications for or debates within virtue ethics, but rather with the role and application of the virtues in the practical context of academia. We already know through the work of sociologists and historians of science such as Lorraine Daston, Peter Galison, and John Turri that epistemic values, ethical virtues and pragmatic considerations are intertwined. For example, during the COVID-19 pandemic, the perceived need to gather scientific knowledge faster than normal was due to ethical considerations and could only arise

[48] Rosalind Hursthouse, 'Virtue Ethics' (version 8 December 2016), https://plato.stanford.edu/entries/epistemology-virtue/ (13 November 2021).
[49] For the view of virtues as character traits, see
[50] Rosalind Hursthouse, 'Virtue Ethics' (version 8 December 2016), https://plato.stanford.edu/entries/epistemology-virtue/ (13 November 2021).
[51] Ryan Darr, 'Virtues as qualities of character: Alasdair Macintyre and the situationist critique of virtue ethics', *Journal of religious ethics* 48 (2020) 1, 7-25, passim; Nicholas J.H. Dent, 'Virtues and actions', *The Philosophical Quarterly (1950-)* 25 (1975) 101, 318-335, passim.
[52] Dent, 'Virtues and actions', passim.

because the necessary methods, namely those of Open Science, existed but were not yet widely used. Not only is epistemology a normative discipline, but intellectual agents and communities are the locus of epistemic evaluations.[53] Agents adhere to intellectual virtues (and vices) and express those via their actions. Institutions encode dominant norms into their reward systems.

Daston and Galison have investigated the history of objectivity through the lens of virtue ethics, showing how seemingly unconnected practical concerns such as the availability of reliable photography can have profound effects on epistemic virtues such as objectivity. What is considered to be objective has changed between communities in time and might differ between distinct scientific communities in our time as well. In addition, the development of new techniques and methods can influence which epistemic virtues exist and are dominant.

Although Daston and Galison provide an extensive overview of the history of one specific epistemic virtue, i.e. objectivity, they strangely enough do not provide a clear definition of what an epistemic virtue exactly is. For a comprehensive definition of virtue epistemology, we turn to philosopher James A. Montmarquet's appropriately named 'Epistemic Virtue'. Montmarquet defines an epistemic virtue as 'a quality or character trait thought to be truth-conductive'.[54] It follows from this that an epistemic vice is a quality or character trait thought to be truth-adverse.

Not every ethical or epistemological concern covered in this article needs to be an epistemic virtue or vice; there can be ethical and epistemological concerns that can be intertwined without being epistemic virtues or vices. Indeed, I will argue that self-interested academics should concern themselves with several virtues not traditionally considered epistemic virtues. I will therefore cover ethical concerns, epistemological concerns, practical concerns, and epistemic virtues and vices.

The Example of Publication Bias

Let us make the relation between ethics and epistemology in open academia movements and debates clearer by looking at an example, namely discourses on publication bias. Although publication bias seems, on the face of it, to be an epistemological problem, there are again ethical concerns as well. We shall concern ourselves here with the *consequences* of publication bias, which are epistemological and ethical, and not yet with its *source(s)*, which might be for example financial in nature. Traditionally, most ethical concerns are grounded in consequentialist theories such as ethical altruism or implicitly in contractualist notions. Common discussions deal with the effects of publication bias on society as a whole and with what scientists owe to their participants. I shall first explain the framework that many sciences use to gain new information, then link that to positive publication bias, subsequently outline debates surrounding these two topics, i.e. knowledge formation and positive publication bias, and then explain why self-interested academics should be wary of publication bias.

First, to understand the consequences of publication bias for the process of science and thus, sometimes, subsequently for artifacts (policy proposals, technology, medicine) that affect society, it is important to understand how new information is supposedly gained in some of the sciences.

[53] John Turri, Mark Alfano and John Greco, 'Virtue Epistemology' (version 7 November 2017), https://plato.stanford.edu/entries/epistemology-virtue/ (6 October 2021).
[54] James A. Montmarquet, 'Epistemic Virtue', *Mind* 96 (1987) 384, 482-497, there 482.

Although we should be weary of trying to find an all-encompassing method of gaining knowledge in science, there is a framework that is currently dominant in many of the social sciences and some of the natural sciences: null hypothesis significance testing. Null hypothesis significance testing works as follows. We assume that an effect doesn't exist, then we conduct an experiment to test this null hypothesis and we try to reject the null hypothesis in favor of an alternative hypothesis – usually one drawn up by the investigators themselves.[55] Rejecting the null hypothesis means the p-value is under a certain threshold; indicating 'how likely we are to observe a particular effect over a large set of samples if the null hypothesis is true and all test assumptions are true' [translation own].[56]

Determining whether a theory is likely to be true thus does not depend on one singular study, but a whole range of studies. So-called meta-analyses, or statistical analyses over multiple studies, can give more certainty about scientific claims. They are often considered the gold standard for scientific evidence: 'they [meta-analyses] are at the top of the pyramid of evidence and consolidate previous evidence published in multiple previous reports. Meta-analysis is a powerful tool to cumulate and summarize the knowledge in a research field'.[57] Their perceived importance has grown over the years, as evidenced by the increasing number of citations they receive, partly due to the ever-increasing number of studies being undertaken and published about – although, as we have seen, not always the latter. We shall return to the phenomenon of publicizing too many articles when examining Open Scholarship in the context of the COVID-19 pandemic.

The traditional way of conducting a meta-analysis, i.e. analyzing large amounts of studies, is by analyzing written accounts about those studies: scientific articles. This is where the problem of publication bias becomes relevant. If studies with negative or null results are not published, it is very hard to take them into account for meta-analyses. After all, if there is no written record of the results, how are they to be taken into account? In practice, scientists conducting meta-analyses have found ways to somewhat mitigate the effects of publication bias, but the main problem remains; meta-analysts can contact those that they suspect conducted a relevant study but did not publish about it and ask them for their results, but then the accuracy of analysis remains dependent on a) the amount of researchers that react favorably to the request for access to their data and b) on the meta-analyst accurately assessing which researchers to contact in the first place – if a researcher with relevant null or negative results is never contacted in the first place, their results are unlikely to be taken into account. In the article 'Ten simple rules for carrying out and writing meta-analyses', part of the

[55] Stefan Gaillard and Sean Devine, 'Het wordt tijd om negatieve resultaten wetenschappelijk serieus te nemen' (version 10 November 2021), https://esb.nu/blog/20061600/het-wordt-tijd-om-negatieve-resultaten-wetenschappelijk-serieus-te-nemen (25 november 2020); Rex Kline, *Beyond Significance Testing: Statistics Reform in the Behavioral Sciences* (Washington 2002) 29-94.

[56] Stefan Gaillard and Sean Devine, 'Het wordt tijd om negatieve resultaten wetenschappelijk serieus te nemen' (version 10 November 2021), https://esb.nu/blog/20061600/het-wordt-tijd-om-negatieve-resultaten-wetenschappelijk-serieus-te-nemen (25 november 2020).

[57] Diego A. Forero, Sandra Lopez-Leon, Yeimy González-Giraldo and Pantelis G. Bagos, 'Ten simple rules for carrying out and writing meta-analyses', *PLoS computational biology* 15 (2019) 5, 1-7, there 1; Amit X. Garg, Dan Hackam and Marcello Tonelli, 'Systematic review and meta-analysis: when one study is just not enough', *Clinical Journal of the American Society of Nephrology* 3 (2008) 1, 253-260, passim; T. Greco, A. Zangrillo and G. Landoni, 'Meta-analysis: pitfalls and hints', *Heart, lung and vessels* 5 (2013) 4, 219-225, passim.

academic *best practices* series 'Ten simple rules for', the fifth 'rule' or recommendation is to '[c]ontact authors of primary articles to ask for missing data'.[58] This recommendation is based mostly on the fact that authors usually do not provide all the relevant information for a meta-analysis in their published articles. It is often the case that researchers only report aggregated data (such as means, averages, and ranges) and/or the statistical analyses, but not the raw data. By getting access to the raw data, meta-analysists can conduct more accurate statistical analyses. This advice illustrates the blind spot created by positive publication bias. Meta-analysists are advised to contact the authors of published articles for more information and data, but what about research and thus data which were never published at all, not even on an aggregated level?

Another possible way to mitigate the effects of positive publication bias on meta-analyses is through the use of techniques for handling missing data, i.e. complete case analysis, mean imputation, likelihood-based methods, Bayesian methods, weighting approaches, and multiple imputation, with regression-based single imputation and complete case analysis being two relatively popular techniques specifically within meta-analysis studies.[59] A common problem is that many researchers who carry out meta-analyses are not familiar enough with missing data analysis techniques to (properly) use them. Although one could argue that scientists carrying out meta-analyses have a *duty* to be up to date with the latest and best missing data analysis techniques, one could just as easily make the case that this is an impossible requirement given the already demanding nature of modern academia. More importantly, even if all researchers conducting meta-analyses were up to date with the latest missing data techniques, it wouldn't solve all the problems. Although the mitigating measures are definitely useful for meta-analyses, they remain exactly that: *mitigating*. The measures would not be needed if all the relevant information was clearly, easily accessible, for example by having it outlined in an article that is published open access and is easily findable through most common data base searches. Having all the relevant available information leads to more accurate results than inferences from incomplete data sets.

Now that the impact of meta-analyses and their relation to positive publication bias and open science has been made clear, we can more easily work out the (perceived) ethical consequences of positive publication bias. Consider the (very) simplified example of research into the efficacy of two pills, pill A and pill B, both meant to treat the same disease. Assume that the efficacy, i.e. 'the capacity of a given intervention under controlled conditions', is the same as the efficiency, i.e. 'the ability of an intervention to have a meaningful effect on patients in normal clinical conditions'.[60] In other words, assume that the pill works as well in daily life as it does in the lab. A hundred studies each are conducted to test the efficacy of both pills, with all the studies using the same experimental setup and

[58] Forero, Lopez-Leon, González-Giraldo and Bagos, 'Ten simple rules', 2.
[59] Marina Soley-Bori, 'Dealing with missing data: Key assumptions and methods for applied analysis', *Boston University* 4 (2013) 1, 1-19, passim; Alex S. Halme and Cara Tannenbaum, 'Performance of a Bayesian Approach for Imputing Missing Data on the SF-12 Health-Related Quality-of-Life Measure', *Value in Health* 21 (2018) 12, 1406-1412, passim; Julian P.T. Higgins, Ian R. White and Angela M. Wood, 'Imputation methods for missing outcome data in meta-analysis of clinical trials', *Clinical trials* 5 (2008) 3, 225-239, passim.
[60] Enrique Burches and Marta Burches, 'Efficacy, Effectiveness, and Efficiency in Health Care: The Need for an Agreement to Clarify its Meaning', *Int. Arch. Public Health Community Med* 4 (2020) 35, 1-3, there 1.

number of participants. 50 out of 100 studies concerning pill A show it to be effective and 50 show it to be not effective; in ((50/100) * 100%) 50% of the studies the pill was effective. However, due to publication bias, only 25 of the studies which show the pill to be not effective are published, whereas all 50 of the studies which show it to be effective are published. Thus, based on the published material, it looks like the pill is effective in ((50/75) * 100%) 66.67% of the time. For pill B, 60 out of 100 studies prove to be effective, with 40 studies showing the pill to not be effective. For pill B no publication bias occurs, so all studies are published. Based on the published material, it looks as if pill B is effective ((60/100) * 100%) 60% of the time.

Based on these findings, meta-analysists will conclude that pill A is likely to be more effective than pill B. Doctors will probably trust this conclusion and start prescribing pill A – all else being equal (costs of production, ease of use, etc.). Thus, the in reality less effective pill A will be used for treatments instead of the more effective pill B. This will, depending on the disease it is meant to treat, lead to diminished quality of life and/or fewer years of life on the part of hundreds to millions of patients. From a consequentialist viewpoint, this is clearly undesirable.

Next to more classical ethical considerations concerning the common good and what we owe each other, many discussions of publication bias also consider scientific virtues. Common concerns center on standards of objectivity, validity and reproducibility and their interrelations. Another common concern is efficiency, defined as achieving the maximum desired productivity with minimally wasted effort or expense. Efficiency is thus, by its very definition, concerned with epistemology (scientific knowledge) and ethics (social benefits). Positive publication bias is inefficient, both because it limits the growth of scientific knowledge and because it reduces social benefits. Consider the ethical efficiency of drug trials. Publishing negative trial outcomes can help rule out experimental agents or hypotheses from further consideration, which in turn reduces the number of participants who are exposed to harmful or ineffective interventions.[61] Efficiency played a central role in many debates surrounding Open Academia during the COVID-19-pandemic.

Chapter 3: Open Academia During COVID-19

During the COVID-19 crisis, the call for Open Academia, specifically with regard to scientific research into COVID-19, seems to have increased. Both moral and pragmatic arguments play a role in this. For example, a moral argument could be 'it is unethical for scientists not to use methods (such as those of Open Academia) that accelerate knowledge dissemination while people are dying.' A pragmatic argument is, for example, 'fighting the virus would go faster if knowledge dissemination is accelerated through Open Science'. These claims are interrelated: it is only considered, by some, to be unethical to not use certain methods precisely *because* those methods are considered to be more effective.

These examples highlight what we already knew through the work of sociologists and historians of science such as Lorraine Daston, Peter Galison and John Turri: that epistemic values,

[61] Spencer Philips Hey, 'Ethical Challenges in Biomarker-Driven Drug Development', *Clinical Pharmacology & Therapeutics* 103 (2018) 1, 23-25, there 24.

ethical virtues and pragmatic considerations are intertwined. After all, the need to gather scientific knowledge faster than normal is due to ethical considerations and can only arise because the necessary methods exist but are not yet widely used. Not only is epistemology a normative discipline, but intellectual agents and communities are the locus of epistemic evaluations.[62] Agents adhere to intellectual virtues (and vices) and express those via their actions. Institutions encode dominant norms into their reward systems.

Daston and Galison have investigated the history of objectivity through the lens of virtue ethics, showing how seemingly unconnected practical concerns such as the availability of reliable photography can have profound effects on epistemic virtues such as objectivity. What is considered to be objective has changed between communities in time and might differ between distinct scientific communities in our time as well. In addition, the development of new techniques and methods can influence which epistemic virtues exist and are dominant.

Although Daston and Galison provide an extensive overview of the history of one specific epistemic virtue, i.e. objectivity, they strangely enough do not provide a clear definition of what an epistemic virtue exactly is. For a comprehensive definition of virtue epistemology, we turn to philosopher James A. Montmarquet's appropriately named "Epistemic Virtue". Montmarquet defines an epistemic virtue as 'a quality or character trait thought to be truth-conductive'.[63] It follows from this that an epistemic vice is a quality or character trait though to be truth-adverse. Not every ethical or epistemological concern covered in this article needs to be an epistemic virtue or vice; there can be ethical and epistemological concerns that can be intertwined without being epistemic virtues or vices. We will therefore cover ethical concerns, epistemological concerns, practical concerns, and epistemic virtues and vices.

To investigate how COVID-19 has influenced the discourse surrounding and the use of Open Science methods, we will conduct a qualitative discourse analysis to investigate the discourse surrounding Open Science and a quantitative statistical analysis to investigate the use of Open Science, both in the tradition of Science and Technology Studies.[64] The quantitative data will be gathered from global sources, to get the most accurate representation of global trends. At first the plan was to conduct some of our own scientometric analyses as well, but review of the current existing literature showed that this would be superfluous. Therefore, we opted to base our quantitative assessment on the existing literature. For the qualitative analysis, we shall focus on mostly Anglo-Saxon and Dutch sources, both due to language constraints and the fact that the Anglo-Saxon countries are among the best for scientific research in general and the Netherlands is a forerunner in COVID-19 research and Open Science.[65]

---

[62] John Turri, Mark Alfano and John Greco, 'Virtue Epistemology' (version 7 November 2017), https://plato.stanford.edu/entries/epistemology-virtue/ (21 September 2020).
[63] James A. Montmarquet, 'Epistemic Virtue', *Mind* 96 (1987) 384, 482-497, there 482.
[64] Sally Wyat, Staša Milojević, Han Woo Park en Loet Leydesdorff, 'Intellectual and Practical Contributions of Scientometrics to STS', in Sally Wyatt, S. Milojevic,, H. Woo Park, and L. Leydesdorff (eds.), *Handbook of Science and Technology Studies* (Cambridge 2016) 87-122, passim.
[65] J. Homolak, I. Kodvanj and D. Virag, 'Preliminary analysis of COVID-19 academic information patterns: a call for open science in the times of closed borders', *Scientometrics* 124 (2020) 3, 2687-2701, there 2693; Xingjia

Why investigate Open Science specifically during the COVID-19 pandemic? The main reason is that one of the best times to find out how well a new policy actually works is during times of crisis and hardship. This is because a crisis does several things that raise the stakes for the policy. First, it puts a time constraint on the situation. It suddenly matters that results are reached in a fairly short period of time or that the society as a whole is kept safe from harm. In a pandemic, the time constraint emerges from the need to both develop a vaccine for the virus and to implement policy aimed at mitigating the negative aspects of the virus (infection rate, fatality rate, etc.). In addition, the policies themselves can have negative consequences. In the case of the COVID-19 pandemic, lockdown and social isolation enforcement led to surges in mental health concerns, economic damage, and physical inactivity induced maladaptations.[66]

Second, due to the time constraints, during crises there is increased pressure on resources. Resources concern not only money and material, but also employees and available manhours. Employees in certain sectors are expected (by their employees, by society and/or by themselves) to work more, which takes a mental and physical toll. In the healthcare system, increased pressure on resources was abundant: there were not enough mouth masks, not enough nurses, not enough vaccines, etc. Also, in academia the increased pressure on resources became clear, especially in those areas considered important by many schools of Open Science. At one point, the number of scientific articles on COVID-19 increased exponentially.

Third, crises usually mobilize actors, such as individuals and institutions, and mechanisms, such as science funding. This was indeed the case during the COVID-19 pandemic. Take a look at science funding. In February, the World Health Organization announced that world experts and funders would set priorities for COVID-19 research.[67] More concretely, this meant that COVID-19-related research got relatively more funding compared to other research than epidemiological research usually does compared to other research. At the end of March 2020, The Dutch Research Council (NWO) – which funds top researchers – urged researchers to make COVID-19 and related research open access. It even provided specific tools for Dutch researchers to do so: it linked to a website which offers tips for openly sharing research and ways to make your already existing, published research open access (a possibility under certain conditions under Dutch law).[68] About 3,5 months later, The Dutch Research Council announced that it had awarded funding to 40 projects

Mao, Lu Guo, Panfeng Fu and Chaun Xiang, 'The status and trends of coronavirus research: A global bibliometric and visualized analysis', *Medicine* 99 (2020) 22, 1-8, there 1.

[66] Betty Pfefferbaum and Carol S. North, 'Mental health and the Covid-19 pandemic', *New England Journal of Medicine* 383 (2020) 6, 510-512, passim; Austan Goolsbee and Chad Syverson, 'Fear, lockdown, and diversion: Comparing drivers of pandemic economic decline 2020', *Journal of public economics* 193 (2021) 104311, passim; Eszter Füzéki, David A. Groneberg and Winfried Banzer, 'Physical activity during COVID-19 induced lockdown: recommendations', *Journal of Occupational Medicine and Toxicology* 15 (2020) 1, 1-5, passim.

[67] World Health Organization, 'World experts and funders set priorities for COVID-19 research' (version 12 February 2020), https://www.who.int/news/item/12-02-2020-world-experts-and-funders-set-priorities-for-covid-19-research (8 July 2020).

[68] Nederlandse Organisatie voor Wetenschappelijk Onderzoek, 'NWO urges COVID-19 and related research to be made open access' (version 31 March 2020), https://www.nwo.nl/en/news-and-events/news/2020/03/nwo-urges-covid-19-and-related-research-to-be-made-open-access.html (9 July 2020).

concerning COVID-19, with another 12 projects receiving funding after additional administrative steps.[69]

Fourth, crises cause (global) disruption, often leaving behind situations with more room for novel ideas, new policies, and other changes to the status quo. This means that the stakes for debates *during* crises are raised, because the 'winner' of these debates has the possibility to play a major role in determining the status quo after the crisis is over. With COVID-19, there have been multiple indications already that this is likely to be the case. This also means that the stakes are unusually high, and scrutiny is especially strong. If there is a flaw in the policy or it does not work, this surely would be the time to notice that. Thus, if a policy lasts throughout this trying time of crisis, we might reasonably expect it to work during a more stable period. Following this reasoning, we will argue that the current covid-19 pandemic is precisely such a crisis and we will explain why the pandemic is a good test for the Open Science movement. So, we aim to take an honest look at how Open Science is currently being employed during the COVID-19-crisis, specifically focusing on the problem areas which seem to arise and on arguments from both proponents of and sceptics towards Open Science. We'll take a look at three case studies that relate to Open Science during the pandemic, namely a discussion in the Dutch national newspaper NRC Handelsblad on the topic, the role of preprint servers in disseminating new scientific insights regarding the disease, and finally the relationship between Open Science and journalistic reporting.

The four increased stakes – time constraints, increased pressure on resources, increased mobilization of actors, and global disruption – make the COVID-19 an interesting time period to focus on when investigating Open Science. Precisely *because* the situation is so extreme, *because* there is so much pressure on the system, the situation is so interesting. Whatever practices are successful in these extreme cases are likely to be successful in normal circumstances as well. In other words, the COVID-19 crisis is *the* first crucial test for open science. It is precisely during this crisis that open science shows its true colors, whether good, bad or ugly. Both proponents and sceptics of open science would do well to pay increased attention to current developments. Especially now will we learn about the viability of new practices and area for improvement.

Case Studies

Case Study Selection

In the months following the outbreak of COVID-19 in China, but especially after the outbreaks in the United States and Europe, the number of articles and discussions on COVID-19 and Open Science steadily increased. The number of articles has become so significant that it is beyond the scope of this paper to quantitatively analyze them all. Therefore, a selection of case studies is made, following the principles outlined in 'Five Misunderstandings About Case-Study Research' by economic geographer

[69] Nederlandse Organisatie voor Wetenschappelijk Onderzoek, 'Gehonoreerd innovatief onderzoek in COVID-19 Programma' (version 17 July 2020), https://www.nwo.nl/nieuws/gehonoreerd-innovatief-onderzoek-covid-19-programma (11 August 2020).

Bent Flyvbjerg. Flyvbjerg argues that there are multiple ways to get more knowledge from case studies by making specific selections rather than random sampling.[70]

Flyvbjerg distinguishes four 'information-oriented selection' strategies for selecting case studies, namely the extreme/deviant cases, the maximum cases, the critical cases, and the paradigmatic cases.[71] Rather than just using one of these, we used all four selection strategies to select and analyze three case studies in total. For each strategy we first explain what the strategy entails, and then outline and analyze the selected cases study/studies. It is important to note that although the different strategies are presented and used in a manner that demarcates clearly between them, there is often considerable overlap between the different strategies. For example, a case can be simultaneously an extreme, a critical and a paradigmatic case.[72] Despite the fluidity of the cases, it is still useful to differentiate between the four selection strategies for the analysis of the case studies. The strategy chosen influences how a case study is approached and which aspects are focused on. This in turn determines what kind of information is gained from analyzing the case study. To get a well-rounded view of the relation between Open Science and COVID-19, all case study selection strategies were used. This also allows for a more robust interpretation of the quantitative part of the research. Although numbers and trends can be informative, on their own they can often be interpreted in a multitude of ways. They become truly instructive when put in the right context, which case study analysis enables.

[70] Bent Flyvberg, 'Five Misunderstandings About Case-Study Research', *Qualitative Inquiry* 12 (2006) 2, 219-245, passim.
[71] Ibid., 230.
[72] Ibid., 229-233.

Critical Case Strategy

The critical cases strategy consists of selecting a case which can 'be defined as having strategic importance in relation to the general problem.'[73] In other words, information gained from critical cases can form the basis for generalizations of the type 'If it is valid for this case, it is valid for all (or many) cases.'[74] Due to unusual nature of the COVID-19 pandemic, every selected case is a critical case, but only for the positive instances. If open sciences practices can work during a pandemic, they can work in normal circumstances. If open science practices do not work during a pandemic, it does not necessarily follow that they will not work in normal circumstances.

Extreme Case Strategy

The extreme case strategy consists of selecting a case study which allows the researcher to "obtain information on unusual cases".[75] In other words, extreme cases allow for obtaining information about especially problematic or especially good situations.[76] In the case of COVID-19 case studies, each case will already be somewhat extreme compared to normal conditions due to the inherent nature of pandemics. However, even in the limited, already relatively extreme population from which we can select case studies, there will again be outliers. So, from the extreme options available, an extreme case compared to the other available cases was selected.

One extreme peculiarity during COVID-19 was the sudden increase in preprints, as multiple quantitative studies have shown. Most particularly extreme cases related to preprint publication concerned the spread of false information. We deliberately use the term false information to differentiate from misinformation, disinformation, and fake news, because those carry a connotation of deliberateness, whereas many of the false information cases were not necessarily purposeful. A well-recorded example of this, which will be the topic of our case analysis, is the article by a team of Indian researchers on the supposed similarities between proteins in H.I.V. and COVID-19.

On January 31st, a day after the World Health Organization declared the outbreak of the new coronavirus a "public health emergency of international concern", a preprint by a team of Indian researchers was published on bioRxiv, a preprint server for the biological sciences.[77] The article, called 'Uncanny similarity of unique inserts in the 2019-nCoV spike protein to HIV-1 gp120 and Gag', argued that 2019-nCoV can lead to

[73] Ibid.,
[74] Ibid., 230.
[75] Ibid., 230.
[76] Ibid., 230.
[77] World Health Organisation, 'Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV)' (version 30 January 2021), https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov) (18 January 2021); Prashant Pradhan, Ashutosh Kumar Pandey, Akhilesh Mishra, Parul Gupta, Praveen Kumar Tripathi, Manoj Balakrishnan Menon, James Gomes, Perumal Vivekanandan and Bishwajit Kundu, Uncanny similarity of unique inserts in the 2019-nCoV spike protein to HIV-1 gp120 and Gag (preprint on bioRxiv).

> 4 insertions in the spike glycoprotein (S) which are unique to the 2019-nCoV and are not present in other coronaviruses. Importantly, amino acid residues in all the 4 inserts have identity or similarity to those in the HIV-1 gp120 or HIV-1 Gag[78]

At the time, 2019-nCoV was the name for what would later become known as COVID-19. The very next day after publication, the social media platform Twitter was flooded with messages about the (supposed) link between 2019-nCoV and human immunodeficiency virus (HIV), the virus that sometimes leads to acquired immunodeficiency syndrome (AIDS). Even more worryingly, theories circulated that the link implied that 2019-nCoV had been manufactured, concocted by humans in a lab. This theory arose from the article, where the authors implied that the similarities between HIV and 2019-nCoV were unlikely to be due to chance. This implication was quickly picked up on social media, resulting in a proliferation of fake news concerning the (supposed) man-made nature of the virus. The study was quickly retracted, but the damage had already been done. The retraction was far less likely to be picked up on social media, and the misinformation kept reaching and convincing new people.

The case study of the retracted study may seem indicative of structural problems with preprints, especially in relation to journalistic practices. Preprints come out without any peer review, journalists report on these preprints or people talk about them on social media, and subsequently some retractions might occur which are not reported on and gain less attention on social media.

One shortcoming in the current academic literature on retractions is the lacuna in comparisons in retraction rates between open access articles and articles behind a paywall. Because open access articles are accessible to more people, it could be the case that they receive more scrutiny than articles behind a paywall. Subsequently, retraction rates would be higher because the more researchers scrutinize an article, the higher the chances of finding serious flaws. This would mean that higher retraction rates need not be indicative of worse quality. So even if retraction rates were indeed higher for articles published during the COVID-19 pandemic period or for articles about COVID-19, this need not be problematic. The increase could be caused by the fact that those articles are more likely to be open access, which could in turn lead to increased scrutiny and thus higher retraction rates.

This debate is exemplified by the article “An alarming retraction rate for scientific publications on Coronavirus Disease 2019 (COVID-19)”, the response “An ‘alarming’ and ‘exceptionally high’ rate of COVID-19 retractions?”, and the response to the aforementioned response: “Letter to the Editor: Response to An ‘alarming’ and ‘exceptionally high’ rate of COVID-19 retractions? by Oransky”. In the first article, researchers Nicole Shu Ling Yeo-Teh and Bor Luen Tang argued that the retraction record appearance rate for COVID-19-related research is exceptionally high, even when compared to other research on viral epidemics/pandemics.[79] According to their analysis, the retraction record of their sample of COVID-19 papers was 0.074%, whereas retraction records for titles relating to different virus epidemic/pandemic keywords ranged from 0.021% to 0.024%. The authors blame the perceived

[78] Ibid.

[79] Nicole Shu Ling Yeo-Teh and Bor Luen Tang, ‘An alarming retraction rate for scientific publications on Coronavirus Disease 2019 (COVID-19)’, *Accountability in Research* 28 (2021) 1, 47-53, passim.

exceptionally high retraction rate on three causes: lapses in stringency and standards, a decrease in the typically careful and reserved nature of scientific research review and dissemination, and "authors exploiting the thirst for articles relating to COVID-19 of any kind".[80]

In the response article "An 'alarming' and 'exceptionally high' rate of COVID-19 retractions?", several Retraction Watch employees rebut some of the points made in the article which they are responding [henceforth referred to as original article or original research] to.[81] First, they argue that the original research made several mistakes. The retraction rate was calculated based not only on retractions, but also expressions of concern and corrections. Yeo-Teh et al. also did not take into account several thousand preprints, which has significant effects on the calculation of the retraction rate (amount of retractions are compared to total amount of articles published, so if the retractions stay the same but the total amount increases, the retraction rate drops).[82] Second, the authors argue that COVID-19 papers are scrutinized more than papers on other topics and therefore mistakes are more likely to be *found*, not necessarily *made*, which leads to more retractions.[83] Indeed, the self-correcting mechanisms of science are strong enough to find the flaws in the system. Open science practices such as preprinting lend themselves especially well for this, for example due to them being open access – giving more people the opportunity to scrutinize and correct them.

[80] Ibid., 51.
[81] Alison Abritis, Adam Marcus and Ivan Oransky, 'An "alarming" and "exceptionally high" rate of COVID-19 retractions?', *Accountability in Research* 28 (2021) 1, 58-59, passim.
[82] Ibid., 58.
[83] Ibid., 58-59.

Maximum Cases Strategy

The maximum cases strategy consists of selecting a couple of case studies that vary a lot on one dimension. In the case of attitudes towards Open Science during the COVID-19 crisis, three different types of 'extreme' attitudes can be discerned: the view that Open Science is important and *especially* during times of crisis, the view that Open Science is important but delays progress during times of crisis, and the view that Open Science is detrimental during times of crisis.

The discussion surrounding the (lack of) transparency for the epidemiological models used by the Dutch Government was exemplary of two of the aforementioned attitudes. On one side were a group of scientists, led by Open Science Community Utrecht Faculty Ambassador Caspar van Lissa, who argued for increased transparency. According to them, the calculation models and research that the government uses to base COVID-19 related policy on, should be freely accessible to everyone.[84]

> Transparent research practices, also known as Open Science, are the most effective way to detect and correct errors early and to accelerate the development of reliable knowledge. Several scientific publications in recent years have argued that Open Science is an essential part of an effective response to a pandemic.[85] [translation own]

The authors clearly make an epistemological claim, namely that the research practices inherent to Open Science are better than other methods at developing robust knowledge of COVID-19, but also an implicit ethical claim: because scientists *must* help combat pandemics, and quickly, they *should* use the most effective way to do so.

Elsewhere in the article a more classic epistemic virtue is mentioned, in line with the epistemic virtues as investigated by Daston and Galison, namely transparency:

> But expertise and hard work alone are not always enough to arrive at reliable insights. This also requires transparency.[86] [translation own]

Transparency clearly falls under the definition of Montmarquet of epistemic virtue as "a quality or character trait thought to be truth-conducive". This epistemic virtue was seen by the authors as inherent to open science and, by implication, less so to normal science.

On the other side of the debate was professor Jacco Wallinga, professor of mathematical modelling at Leiden University and head of the unit Modelling Infectious Diseases at the Dutch National Institute for Public Health and the Environment. Wallinga falls into the camp that considers Open Science to be important, but also believes that it should take the backseat during the COVID-19 pandemic.

---

[84] Caspar van Lissa, 'Overheid, wees transparanter in de strijd tegen het coronavirus' (version 28 April 2021), https://www.nrc.nl/nieuws/2020/04/27/overheid-wees-transparant-in-strijd-tegen-het-coronavirus-a3997982 (17 July 2021).
[85] Ibid.
[86] Ibid.

Paradigmatic Case Strategy

Paradigmatic cases are cases that 'highlight more general characteristics of the societies in question'.[87] The problem then becomes to identify what counts as a paradigmatic case. Flyvbjerg himself acknowledges the difficulty: "No standard exists for the paradigmatic case because it sets the standard." In personal communication with philosopher Hubert Dreyfus, Dreyfus also noted that he thought there couldn't be any rules for selecting a paradigmatic case.[88] In addition, Dreyfus believed that even when people would try to give justifications for a selection, they would have to make up a reason and that reason would not be the real reason.[89]

Yet, there is another way of looking at paradigmatic cases that could provide more clarity for selecting an appropriate case study. Paradigmatic cases can also be seen as 'examplars' of the studied topic. Using this heuristic, we can select a study that is exemplary of how Open Science was used during COVID-19. This is where the quantitative aspect of this study again becomes useful: by analyzing the most common characteristics of Open Science during COVID-19, we know which characteristics the case study should have to truly count as exemplary, e.g. the most common ones. From a scientometric analysis by Nicola Di Girolamo and Reint Meursinge Reynders it became clear that the most common characteristic of COVID-19 articles during the first few months was that they were 'secondary articles'. Secondary articles are articles which discus or summarize what is already known, as opposed to primary articles which are original research articles.[90]

In an opinion piece in the Dutch national newspaper *Trouw*, historian and open access advocate Hieke Huistra criticizes the academic tendency to publish too much, also about COVID-19.[91] Indeed, the title of the article translates to 'Scientists publish far too many articles. Yes, also about corona'. Huistra's main problem with publishing too much is precisely the proliferation of 'secondary articles' that Di Girolamo and Reynders talk about. The article starts with an attack on paywalls and barriers to truly open access. Not having open access means that for example general practitioners and municipal officials do not have access to all the knowledge pertaining to COVID-19. Subsequently, Huistra argues that, in a way, neither do scientists; even though they have physical or digital access to most if not all published articles, the output has become so much that it is impossible for a single scientist or even group of scientists to be aware of everything on a single topic. At the time of writing, 23 May 2020, 23.000 articles had been published specifically about COVID-19 according to Huistra's calculations. In addition, she estimated that, at the time, the number of articles on COVID-19 doubled every two weeks. Artificial Intelligence 'solutions' to the problem started proliferating at the time.

---

[87] Flyvberg, 'Five Misunderstandings', 232.
[88] Ibid., 232.
[89] Ibid., 232.
[90] Nicola Di Girolamo and Reint Meursinge Reynders, 'Characteristics of scientific articles on COVID-19 published during the initial three months of the pandemic: a meta-epidemiological study', *Scientometrics* 125 (2020) 1, 795-812, there 795-796.
[91] Hieke Huistra, 'Wetenschappers publiceren veel te veel artikelen. Ja, ook over corona' (version 23 May 2020), https://www.trouw.nl/nieuws/wetenschappers-publiceren-veel-te-veel-artikelen-ja-ook-over-corona~b014972a/?referrer=https%3A%2F%2Fwww.google.com%2F (20 August 2020).

However, AI models soon faced problems not unlike the ones scientists themselves faced: they were dependent on datasets with small samples, possibly biased samples, and not yet peer reviewed information.[92]

At the end of the opinion piece, the epistemological and ethical considerations become explicit. Huistra couples the reward system of academia, which focusses on publications more than quality of research, with the amount of bad quality research coming out – speculatory but not evidential, using small, statistically non-significant numbers, or rehashing old findings.[93] These articles not only obscure the good articles – because scientists have to navigate through the whole body of literature to find the articles that are truly helpful – but can also actively negatively influence policy and public opinion. In this regard arguments about too much publication mirrors the debate surrounding and arguments against positive publication bias.

Case Studies Discussion

In conclusion, although the current research indicates that there is a strong chance that the scientific enterprise will seriously change over the coming years as a consequence of trends that arose or solidified during the COVID-19 crisis, there remain potential pitfalls that should be taken into consideration. Examples include the (perceived) extra time it takes to properly conduct open science and standards of quality control. By addressing these potential pitfalls, open science adherents can convince sceptics while at the same time refining their own practices.

Scientometric Analysis

Besides the qualitative analysis of multiple case studies, more quantitative analyses are needed to understand more fully the relation between the COVID-19 crisis and Open Science. Questions that cannot be answered by qualitative analyses but can be answered by quantitative analyses concern information about how often certain open science methods have been used, increases in open science usage, and the relative use of open science in COVID-related research compared to other research. This information is useful for numerous reasons. First, it provides a solid foundation for the qualitative research later on. For example, when choosing a case study that is exemplary for the relation between open science and COVID-19, it is useful to know what the most commonly shared characteristics of science during period are. Second, it provides a useful indication of whether stated ambitions are actually followed through on. It is easy to state intentions, to make promises, and in general to talk about best practices. However, that talk is mostly meaningless unless followed through with actual actions such as policy change or changes in publication practices.

A short, initial non-peer reviewed data collection was carried out at the beginning of the research using the scientometrics tool *The Lens*. The initial analyses showed that a large amount (49%)

[92] Wim Naudé, 'Artificial intelligence vs COVID-19: limitations, constraints and pitfalls', *AI & society* 35 (2020) 3, 761-765, passim.

[93] Hieke Huistra, 'Wetenschappers publiceren veel te veel artikelen. Ja, ook over corona' (version 23 May 2020), https://www.trouw.nl/nieuws/wetenschappers-publiceren-veel-te-veel-artikelen-ja-ook-over-corona~b014972a/?referrer=https%3A%2F%2Fwww.google.com%2F (20 August 2020).

of scientific articles published in 2020 with the word "pandemic" in the title, in the abstract, or as one of the key words was *not* open access. However, compared to the average of 30% open access articles and 70% not open access articles, it seemed as if articles concerning COVID-19 were more likely to be open access than other articles. Based on these (very) preliminary results, two hypotheses were formed. First, that COVID-related science is more likely to incorporate open science principles and second that the usage of open science principles has increased during the COVID-19 pandemic.

The usage of open science principles during the COVID-19 crisis does indeed seem to have increased. Scientometric research by pharmacologists John Homolak, Ivan Kodvanj, and Davor Virag shows that the usage of multiple open science methods has increased during the period from January 2020 until April 2020, among the first few months of the pandemic. The researchers looked at preprint publication, open access of data (also known as open data), and the *submission-to-publication* time – which, although it might not immediately look like it, is also related to open science.

Preprint publication is a form of open-access publishing where articles are published already "before they are peer reviewed or accepted to any journal".[94] Already at the beginning of March 2020, preprint publishing was considered to be "one of the most rapidly growing forms of open-access publishing".[95] Preprint publication often occurs on special publication archives, also known as preprint servers. Preprint publication indeed increased during the COVID-19 pandemic. Indeed, so much so that some preprint servers were no longer able to properly vet incoming articles.

COVID-19 articles were far more often published ahead of print than other articles: more than 50% of COVID-19 articles were published ahead of print, whereas less than 25% of other articles were published ahead of print. Comparison occurred within the same journals, so this difference cannot be explained by differences in journal policy combined with COVID-19 research being more likely to be published in certain journals. The proliferation of papers disseminated through preprint servers also had a negative aspect to it. For example, journalistic reports on not yet peer reviewed articles can have disastrous consequences. We will come back to this in the case study analysis.

Although the analysis by Homolak et al. provides a good starting point for the scientometric analysis of the use of open science during the COVID-19 crisis, it is far from complete. Fortunately, other scientometric analyses have been conducted about other topics related to open science. Examples include bibliometric analysis of research activity[96], bibliometric analysis of research hotspots, bibliometric analysis of coronavirus research breakthroughs, and scientometric analysis of safety-related research dimensions. These studies showed an increase in the usage of open science principles *and* an increased likelihood of open science practices being used in COVID-19 related research.

Open science has a complicated relationship with debates surrounding publishing output. The current publishing pressure at universities has been coined with the rather unflattering moniker

[94] University of Jyväskylä, 'Publishing of preprints' (version 3 March 2020), https://openscience.jyu.fi/en/self-archiving/publishing-of-preprints (11 October 2020).
[95] Ibid.
[96] Mohammed Chahrour, Sahar Assi, Michael Bejjani, Ali A. Nasrallah, Hamza Salhab, Mohammed Fares and Hussein H. Khachfe, 'A Bibliometric Analysis of COVID-19 Research Activity: A Call for Increased Output', *Cureus* 12 (2020) 3, passim.

'publish or perish': 'an aphorism describing the pressure to publish academic work in order to succeed in an academic career'.[97] On its own this doesn't sound like an unreasonable expectation. After all, is this not precisely what academics are supposed to be doing? They do research and publish about said research. Sometimes they also teach.

The problem with the publish or perish culture is that publications become a goal in themselves instead of a tool. Ideally, publications are a way of communicating research findings to other scientists. A way to make new knowledge known, to give others the opportunity to build on previous work. In some cases, the published work leads to technological applications or policy changes. In all these cases, the publication is merely the vehicle to obtain some other end. In principle, it could be replaced by a video, a conference talk, a poster presentation, or any other means of communicating knowledge. The publication might – debatably – be the most *effective* way of communicating, but this just reinforces the notion that the publication is the means, not the end. Sceptics might wonder if there truly are scientists, academic employees, and/or institutions who see this differently. Not explicitly of course. There is hardly anyone to be found that will state that publications should be a goal in themselves. However, the policies in place in academia reward and acknowledge publications themselves more than the gaining and dissemination of knowledge. A scientist is usually not rewarded for their actual research. If the research was done and not followed up with a publication in a prestigious journal, the research is next to worthless as far as the university is concerned.

As the sociologist Robert K. Merton already recognized decades ago, the recognition and reward system is intricately tied to dominant norms. 'Like other institutions, the institution of science has developed an elaborate system for allocating rewards to those who variously live up to its norms.'[98] That which is rewarded is that which is valued; a reward is something given because of a good deed or action. If it was just something given, it would be a gift, not a reward. What is considered 'good' is a reflection of the prevailing norms and values. That is not to say that what *is* good is subject to a democratic vote, just that what a group of people *considers* to be good is, in part, indicated by the values and norms they adhere by.

Especially the so-called *Measurement School* of the Open Science Movement concerns itself with alternative ways of measuring scientific impact and, relatedly, investigating what would be the best system of rewards and incentives to promote open science.

During COVID-19, the tension between the perceived need for increased publishing on the subject one the one hand and the increased need for quality control have sometimes been at odds. This should not be surprising. Quality control in academia usually happens through the peer review system. Peer review is the system through which academics check each other's' work. How it usually works is that an author sends in their article to a journal, which is then assigned to an editor. The editor decides whether or not to move forward with the article in question. If they do decide to move forward, they will often contact two to three peer reviewers, i.e. academics – preferably with

[97] Wikipedia, 'Publish or perish' (7 February 2021), https://en.wikipedia.org/wiki/Publish_or_perish (20 February 2021).

[98] Robert K. Merton, *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago 1973) 297.

expertise in the field which the article concerns – that read the article carefully and provide feedback. Usually, or perhaps ideally, peer reviewers provide constructive criticism (what could be improved) and spot mistakes. In practice, peer reviewers often do not have enough time to properly carry out peer review.

The publication of preprints presents a particularly salient example of the aforementioned problem. During COVID-19, the amount of preprint publications rose exponentially, causing preprint servers to become increasingly swamped.[99] Scientists tried to get scientific results about COVID-19 out into the open as quickly as possible in the hopes of developing a cure as soon as possible. However, as the amount of research on COVID-19 increased exponentially, the quality is not always something to write home about. Preprints are not peer reviewed and even peer reviewed articles often still contained numerous mistakes. Peer reviewers with actual expertise were too busy peer reviewing other articles or doing their own research, so most research on COVID-19 was peer reviewed by scientists who were not experts in the subject matter. Critics point out that this can be harmful, as preprinted research and faulty peer reviewed research can have an impact on important fields such as medicine, potentially costing lives. In response to concerns about quality, preprint servers have enhanced their usual screening procedures.

The concern about quality is part of a larger debate concerning Open Science: can scientists trust that (preprinted) results that are published openly will be used in a responsible manner by certain stakeholders such as concerned citizens and the media? On the one hand we can hardly expect these stakeholders to make informed decisions without being able to access all the relevant information. On the other hand, it has already happened multiple times that newspapers report on preprinted research as if it was about robust findings.

Scientometric Analysis Discussion

Even though it is very likely that the current COVID-19 crisis will have major lasting effects on the scientific enterprise, some skepticism and caution is also warranted. Pandemics have occurred in the past, during times when (forerunners of) Open Science movements were already somewhat established, which mobilized the international scientific community in similar ways to the current developments. After these pandemics were over, the amount of scientific collaboration and open access articles reverted back to the baseline of before the pandemic.

Although these examples problematize the view of COVID-19 as a likely catalyst of Open Science trends, there are also important differences. Previous pandemics often impacted several but not all continents. COVID-19 severely impacted all continents (with the exception of Antarctica), and – perhaps crucially – thus also impacted the countries and institutions which have traditionally published the most epidemic research: countries like the United States and the Netherlands en

[99] Diana Kwom, 'How swamped preprint servers are blocking bad coronavirus research' (version 7 May 2020), https://www.nature.com/articles/d41586-020-01394-6 (18 August 2020).

institutions like Oxford University. Therefore, in the case of COVID-19 it is more likely that developed best practices will continue to endure in the future.

Conclusion

The relationship between Open Science and the COVID-19 crisis was investigated using both qualitative and quantitative methods. More specifically, we investigated how the discourse surrounding and usage of Open Science was influenced by the pandemic. There were four main reasons for doing so, all relating to the fact that crises tend to raise the stakes for potential new policies and thus also intensifies the surrounding debates. First, pandemics put a time constraint on research. Research must be done as quickly as possible, even more so then usual, to stop the pandemic from claiming lives. Second, and relatedly, there is serious increased pressure on scarce resources. Physical resources such as laboratory space and biomedical research equipment is needed to accommodate the extra research being done. Third, pandemics mobilize actors and institutions, changing how for example funding is allocated. Fourth, pandemics cause (global) disruptions which

For the qualitative analysis, several cases studies were selected based on the principles outlined in 'Five Misunderstandings About Case-Study Research' by economic geographer Bent Flyvbjerg. For each case study selection strategy one or more fitting case studies were selected. For the critical cases selection strategy, we did not analyze a unique case study, because the case studies of all the other strategies could be considered critical. For the extreme/deviating cases selection strategy, we investigated a preprint claiming a relationship between 2019-nCoV (the old name for COVID-19) and HIV and the subsequent discourse surrounding it. We found that although preprints can lead to problematic reporting practices, the self-correcting nature of open science should actually be an indicator of its robustness. For the maximum cases selection strategy, we selected one case which illustrated polar opposite attitudes towards the need for open science during the pandemic.

For the quantitative analysis, we did a literature study of existing relevant scientometric and bibliometric analyses. This was meant to investigate two hypotheses, namely that COVID-related science is more likely to incorporate open science principles and that the usage of open science principles has increased during the COVID-19 pandemic. The results of the literature study and the new scientometric analysis were unequivocal: both hypotheses were confirmed.

Chapter 4: Open Academia Grounded in Egoistic Virtue Ethics

What are the virtues that self-interested academics should consider to be important in the context of academia? Virtues are the actions through which actors gain or keep their values. Virtues can thus be as numerous as the values that agents can hold. Although there are many, we shall focus on five virtues, namely honesty, independence, justice, integrity, and productiveness. All of these can be considered moral virtues, i.e. virtues pertaining to what choices we should make and which actions we should take in all aspects of our lives, thus including in our work. Honesty, independence, integrity, productiveness, and to a lesser extend justice, can also be considered epistemic virtues, i.e

qualities or character traits thought to be truth-conductive.[100] I choose to focus on these virtues for two reasons. First, because these virtues have a clear epistemological component, it is easier and clearer to explicate their relation to Open Academia movements. Second, these virtues have all received attention in one way or another over the past years in discussions about scientific and academic practices. Additionally, it is highly likely these virtues will continue to play a prominent role in future academia, such as in reform movements, ethics committees, and academic conduct codes. This makes it possible to compare how other agents look at these virtues and how self-interested academics should look at these virtues. Additionally, academics of any kind are likely to have to deal with these virtues in the coming years, so self-interested academics are better off knowing how to relate to these virtues in the context of academia.

Open Academia movements often use (implicit) altruistic arguments for academic reform. This is best exemplified by the Mertonian norms of communalism and disinterestedness; as we have seen in chapter 2, Open Academia advocates regularly invoke these norms. Although the Mertonian norms are perhaps more associated with Open Academia than with orthodox science, pressure to put collective or others' concerns above one's own is common in orthodox science as well. An example there would be the peer review system [see also chapter 3]. Peer review is most often done for free, with no direct benefit to the peer reviewer, while often benefiting for-profit academic publishing companies such as Elsevier and Wiley – which have yearly revenues of around £2.64 billion and £1.7 billion respectively.[101]

Open Academia can provide benefits to self-interested academics by moving away from altruistic expectations. If it wants to be successful, it will have to: despite the expectations of Open Academia movements, many scientists continue to be motivated by personal self-interest. In a survey conducted by the Rathenau Institute, 27% of Dutch researchers at universities who answered the survey indicated that '[b]eing able to conduct research of outstanding quality' was their main objective.[102] Another quarter chose '[b]eing able to pursue my research interests' as their main objective, while less than 15% chose '[c]onducting socially relevant work'.[103] It is therefore a very large (moral) burden to altruistically expect Open Academia practices from scientists who are struggling to combine education, research, administrative tasks, and much more, while also pursuing research. On average, scientists spend over 25% more time working than is stated in their contract.[104] It is thus hardly surprising that many scientists seem loath to spend extra time on mastering the knowledge and skills necessary for Open Science, especially if this would result mostly or only in advantages for others. An often-heard question at Open Science workshops is 'What's in it

[100] Montmarquet, 'Epistemic Virtue', 482.
[101] RELX, 'Annual Report and Financial Statements 2019', *RELX* (2019), 1-189, there 135; Business Wire, 'Wiley Reports Fourth Quarter and Fiscal 2017 Results' (n.d.), https://www.businesswire.com/news/home/20170613005509/en/Wiley-Reports-Fourth-Quarter-and-Fiscal-2017-Results (15 August 2022).
[102] Lionne Koens, Robine Hofman and Jos de Jonge, *What motivates researchers?* (The Hague 2018) 5.
[103] Ibid., 23.
[104] Rathenau Instituut, 'Time commitment and overtime of researchers' (version 26 July 2021), https://www.rathenau.nl/en/science-figures/personnel/university-staff/time-commitment-and-overtime-researchers (15 August 2022).

for me?'. Blog posts titled 'Open science needs no martyrs, but we must recognize the need for reform' and 'A Selfish Reason To Share Research Data' indicate a growing recognition of the need for an egoistic case for Open Academia. Although scattered attempts have been made to show the benefits of Open Academia for individual academics, no comprehensive philosophical defense of egoistic Open Academia has been developed so far. In this chapter, I aim to lay the foundations for a virtue egoistic Open Academia movement.

The virtue egoist case for Open Academia is grounded in a naturalistic, teleological conception of meta-ethics. In this framework, morality is aimed at the goal of individual human flourishing. Outlining and defending this entire framework is beyond the scope of this manuscript. Our aim is to defend a virtue egoism approach to Open Science by showing its practical value for individual researchers. We will do this by making philosophical arguments and supporting them with empirical evidence that shows the benefits of Open Science for researchers' careers. First, we will explain briefly which definition of virtue we will use. Then, we outline five moral (and sometimes epistemological) virtues, which have the biggest impact on scientific practice.

Making a virtue egoist case for Open Academia does not mean making a virtue egoist case for all aspects of Open Scholarship. Some, if not many, of the methods, practices, and arguments of Open Scholarship movements are simply incompatible with virtue egoism. Therefore, making a virtue egoist case for Open Scholarship necessitates making a selection of Open Academia aspects that egoistic scientists should rationally adhere to.

Rationality

Rationality is the adherence to reason. For philosophers such as Aristotle and contemporary virtue ethicists such as Philippa Foot, rationality is a master virtue from which other moral virtues can be derived. I take rationality to mean the recognition and acceptance of reason as the means of gaining knowledge, judging values and guiding actions.

Rationality can be argued to be inherent to the academic enterprise. Although many sociologists and philosophers of science have mounted critiques on the idea that rationality is a core component of science and scholarship, for the purposes of this thesis, I shall assume that science and scholarship are, in general, rational.

With rational I do not mean that academics are or should be infallible, nor that their decisions must always follow some utility maximization formula. Two conceptions of rationality have become popular in Western thought. First, the concept of rationality that is most prominent in Western thought, which philosopher John Searle calls the *Classical Model of Rationality*. The Classical Model hinges on six assumptions: 1) '[a]ctions, where rational, are caused by beliefs and desires'[105]; 2) '[r]ationality is a matter of obeying rules, the special rules that make the distinction between rational and irrational thought and behavior'[106]; 3) '[r]ationality is a separate cognitive faculty'[107]; 4) [a]pparent cases of weakness of will, […] can arise only in cases where there is something wrong with the

[105] John R. Searle, *Rationality in Action* (Cambridge 2003) 8.
[106] Ibid., 8.
[107] Ibid., 8.

psychological antecedents of the action'[108]; 5) '[p]ractical reason has to start with an inventory of the agent's primary ends, including the agent's goals and fundamental desires, objectives, and purposes; and these are not themselves subject to rational constraints'[109], and 6) '[t]he whole system of rationality works only if the set of primary desires is consistent'[110].

Second, the concept of instrumental rationality. Adherents of instrumental rationality claim that an agent is acting rational as long as they take actions that further their goals, regardless of what those goals are. Compare Anne and Ben. Anne has the goal of becoming an astrophysics professor and consistently works towards that goal: she studies hard, works extra hours, and publishes in the best journals. Ben has the goal of becoming the most famous conspiracy theorist of all time and also consistently works towards that goal: he familiarizes himself with all the latest conspiracy theories, he pulls bizarre stunts to make the news, and he successfully sabotages his competition of fellow conspiracy theorists. Within the framework of instrumental rationality, Anne and Ben are both being rational – Anne cannot be said to be more rational than Ben. If Anne would take actions that would be detrimental to her goal, for example by not studying hard, she would even be acting more irrationally whereas Ben would be acting rationally.[111]

Following philosopher Kevin J.S. Zollman, I argue that neither of these concepts of rationality is satisfactory for conceptualizing scientific rationality. A scientist who diligently pursues astrology is *not* as rational as a scientist who diligently pursues astronomy, a scientist who fabricates their data in pursuit of their goals is *not* as rational as a scientist who gathers actual data to prove their theory. At the same time, a too strict or wrong definition of rationality would lead to the conclusion that no academic should be considered rational. Taking rationality as the recognition and acceptance of reason as the means of gaining knowledge, judging values and guiding actions leaves room for emotions and rational decisions not based on utility maximization.

Regardless of whether the scholarly enterprise is rational, I contend that academics should be concerned with virtues, both ethical and epistemic, *and* with credit – but only insofar as this credit enables them to pursue their values. The preferable system for the organization of academia is then a system where these concerns align; a system where ethical and epistemic virtues are rewarded. A rational scientist is thus a scientist who adheres to epistemic and moral virtues such as honesty, independence, justice, integrity, and productiveness, and who also desire proper recognition and rewards (which is related to justice). What that looks like in practice and the relation with Open Academia will be described in each of the following paragraphs dedicated to the aforementioned virtues.

[108] Ibid., 9.
[109] Ibid., 10.
[110] Ibid., 11.
[111] Some philosophers might argue that through her actions, Anne reveals that her goal is actually not to become an astrophysicist, thereby retaining her rationality.

Honesty

'Madoff says he is happier in prison than free'. This remarkable headline appeared on the website of news organization company Reuters back in 2011. The Madoff in question was Bernard Madoff, better known as Bernie Madoff, an American former market maker, investment advisor, and financier. In December 2008, Madoff was arrested over alleged 50-billion-dollar fraud.[112] Later he was convicted for one of the largest Ponzi schemes in the history of mankind. So, why was he happier in prison? Madoff lived in constant fear of being caught which, ironically, made his life worse than when he actually ended up in prison.[113]

In his autobiography *Derailment*, psychologist Diederik Stapel describes a similar experience. Every time he presented his (fabricated) results to his completely unaware research group, he felt terrified – with each question and remark he could feel the sweat drip down his shirt.[114] He alienated himself from others more and more, because of his concern that getting too close to other people would increase the chances of his secret coming out.[115] Although Derailment has been criticized for reading more like a justification for Stapel's behavior than an accurate autobiography, there is little reason to doubt this particular passage. Empirical psychological research indicates that there is a strong chance that honesty positively impacts happiness.[116] Madoff's and Stapel's experiences also correspond to what we should expect based on metaphysical and epistemological analysis. I shall first explain what (the virtue of) honesty entails, then explain why self-interested people – and by extension academics – are better off being honest, and subsequently explain the relation between honesty and open academia movements.

So, what is (the virtue of) honesty? Philosopher Christian B. Miller argues that virtue ethicists have not paid sufficient attention to what exactly honesty is. Based on common intuitions, Miller identifies four different behaviors that he considers to be commonly understood as lying: lying, stealing, cheating, and deceiving.[117] The purpose of Miller is to arrive at a definition that covers all these different types of behavior. Miller provides no foundation for his definition or an explanation for why a definition must cover all different types of behavior commonly understood as lying, merely stating that his definition is one of the many possibilities and that he is open to better definitions. Eudaimonist virtue ethics provides one possible avenue for a better definition, as for example developed by philosopher Tara Smith. So, what does this definition look like?

---

[112] Robert Lenzner, 'Bernie Madoff's $50 Billion Ponzi Scheme' (version 12 December 2008), https://www.forbes.com/2008/12/12/madoff-ponzi-hedge-pf-ii-in_rl_1212croesus_inl.html?sh=2d62c979650b (16 August 2022).

[113] Chris Michaud, 'Madoff says he is happier in prison than free' (version 27 October 2011), https://www.reuters.com/article/us-madoff-interview-idUSTRE79Q56H20111027 (27 July 2022).

[114] Diederik Stapel, *Ontsporing* (Amsterdam 2012) 168.

[115] Ibid., 168.

[116] Matthew J. Lupoli, Lily Jampol and Christopher Oveis, 'Lying because we care: Compassion increases prosocial lying', *Journal of Experimental Psychology: General* 146 (2017) 7, 1026-1042, passim.

[117] Christian B. Miller, 'Honesty', in Walter Sinnott-Armstrong and Christian B. Miller (Eds.), Moral Psychology, Volume 5: Virtue and Character (London 2017) 118-135, there 119.

Crucially, Smith takes honesty to mean 'the refusal to fake reality'.[118] Dishonesty then encompasses what we traditionally understand as lying, but also some of the behaviors that Miller classifies as lying, namely cheating and deceiving. Deceiving includes self-deception, which is considered 'dishonesty with oneself, evading certain thoughts or knowledge'.[119] Examples of self-deception abound in cases of scientific fraud, such as in the case of Diederik Stapel, who we will return to later. First, we must understand why and how people benefit from honesty, before turning to the case of self-interested academics.

In 'The Metaphysical Case for Honesty', philosopher Tara Smith describes why a self-interested person should be honest, both for social and individual reasons. The dishonest person, after the first lie, continuously runs the risk of being caught. Getting caught would jeopardize their credibility and other social or even legal consequences (such as broken relationships or jail time). To prevent these consequences from arising, the dishonest person must cover up the initial dishonesty with even more dishonesty. This creates tension: the dishonest person must continuously keep up their guard to prevent these consequences from arising. After all, slipping up by making a mistake while lying can unravel a whole web of lies. A person cheating on their spouse can make up a reason why they are not home certain nights, such as a new hobby – squash. The cheater must then be careful to take their squash racket with them on each of their nightly escapades. After all, not doing so would lead to suspicion and possible detection.

More importantly, the dishonest person is evading reality. The dishonest person constructs an alternate reality that they pretend is real; they act in accordance with their fantasy world. Not doing so would lead to the social problems previously described, or to the need to face reality – something which the self-deceptive dishonest person refuses to do. Take the example of a scientist discovering that the data that they collected could indicate that one of their most famous theories is wrong. Instead of listening to their reason, the self-deceptive scientist tries to convince themselves that the data are incorrect and refuses to further investigate the possibility that their previous research conclusions were wrong. Their refusal to face reality does not change it; the theory remains incorrect, and it will probably become increasingly obvious that it is wrong. By acting in accordance with reality, and thus listening to their reason and engaging with the real data, they could have prevented the situation from worsening.

To understand how and to what extent situations where fraud occurs can worsen, let us return to case of the psychologist Diederik Stapel. In his autobiography *Derailed,* Stapel mentions nudging his results towards what he believed to be the truth.

> When the results are just not quite what you'd so badly hoped for; when you know that that hope is based on a thorough analysis of the literature; when this is your third experiment on this topic and the first two worked great; when you know that there are other people doing similar research

[118] Tara Smith, 'The Metaphysical Case for Honesty', The Journal of Value Inquiry 37 (2003), 517-531, there 518.
[119] Ibid., 526.

> elsewhere who are getting good results; then, surely, you're entitled to adjust the results just a little?[120]

Stapel was clearly deceiving himself. He realized that the data indicated that his theory was wrong, yet he kept convincing himself that his theory was right and the data were wrong. This analysis is confirmed just two paragraphs later, when Stapel describes changing his data and subsequently running a statistical analysis.

> I looked at the array of data and made a few mouse clicks to tell the computer to run the statistical analyses. When I saw the results*, the world had become logical again. I saw what I'd imagined*.[121] [emphasis own]

Stapel's self-deception led him to continue to falsify his data and findings – his refusal to face reality stopped him from preventing further escalation. Stapel continued to lie on a large scale about his findings, to commit scientific fraud. When he eventually got caught, the extent of his deception had grown so much that his subsequent exposure became almost inevitable. Stapel was fired and charged with forgery and fraud. He voluntarily handed in his doctorate.

Not being fired or charged with forgery and fraud is clearly more beneficial for your well-being: an academic who keeps their position and does not have to deal with legal matters is better able to pursue other values, which in turn are conducive to well-being. With their self-deception – a form of dishonesty towards oneself – the dishonest person has prevented themselves from achieving the highest level of human flourishing which they are capable of reaching. Again, this is underlined by Stapel's account: Stapel was unhappy during a large part of his research career and continued to be unhappy for a few years after his fraud was discovered.[122] Robert K. Merton also identified this relation between scientific values, or norms in his case, and well-being; researchers conformed to norms 'on pain of psychological conflict'.[123]

A common objection to the virtue of honesty, or always being honest, concerns specific cases where it might be better to lie. Could it not be the case that an academic is usually better off by being honest, but in some specific cases it is better for their wellbeing to lie? Smith poses two objections to this potential exception. First, she argues that virtues require continual practice. Just like with other habits, exercising virtues becomes habitual the more you practice them. In other words, the more we practice a particular virtue, the easier it becomes for us to exercise the virtue in new and difficult situation.[124]

---

[120] Diederik Stapel, *Faking Science: A True Story of Academic Fraud* (n.p. 2014) 103.
[121] Ibid., 103.
[122] Marcel Wiegman, 'Diederik Stapel: 'Niemand hoeft mij aardig te vinden'' (version 14 September 2016), https://www.parool.nl/nieuws/diederik-stapel-niemand-hoeft-mij-aardig-te-vinden~b5b9f9d2/ (16 August 2022).
[123] Merton, 'The Normative Structure', 276.
[124] Smith, 'The Metaphysical Case', 522-526.

Aristotle already recognized that moral virtues are learned primarily through habit and practice.[125] Modern psychological research reinforces the philosophical insights of virtue ethics with regards to habits. Habits are 'behavioural patterns enacted automatically in response to a situation in which the behaviour has been performed repeatedly and consistently in the past'.[126] Habit strength increases when the behavior is repeated, especially in similar contexts.[127] Habit strength subsequently decreases the cognitive effort required to act in a similar manner in the future.[128] This is no different for habits related to virtues, such as telling the truth and treating others justly. The habitualness of virtues then logically also applies to the virtues covered in subsequent paragraphs. Although I don't explicitly mention the habitual character of the virtues again from now on, it is important to keep in mind when considering why self-interested academics should always adhere to moral principles.

Second, the argument that self-interested people might be better off in *some* situations by being dishonest assumes that people are able to accurately assess in which cases it is beneficial to lie. Smith justly argues that individuals live in too complex a world to be able to accurately assess in which cases it is beneficial to lie. If an individual could assess every single ethical dilemma independently, there would be no need for moral principles. However, because humans are fallible, individuals are therefore better off using the heuristic that honesty leads to better outcomes than dishonesty.[129]

Independence

In his seminal work *The Structure of Scientific Revolutions*, historian and physicist Thomas Kuhn posits the theory that there are periods of great upheaval in science, where individual scientists or small groups of scientists went against the grain – despite what the majority of their field thought at the time, these scientists stood their ground and let their own reasoning and intellect dictate their thoughts and theories.[130] These scientists displayed, among others, the virtue of independence.

In this paragraph, I shall first explain what (the virtue of) independence entails, then explain why self-interested people – and by extension self-interested academics – are better off being independent, then put independence in the context of academia, and subsequently explain the relation between independence and Open Academia movements. I shall use this structure for all subsequent paragraphs concerning individual virtues.

First, to know what the virtue of independence is, it is important to keep in mind what it is *not*. Colloquially, independence is often taken to mean that an agent is not materially dependent on others. An independent student could then be taken to mean a student who is not dependent on their parents to make ends meet. However, that is not the independence that we shall concern ourselves with here. In the context of moral and epistemic virtue, an independent person is not someone who

[125] Richard Kraut, 'Aristotle's Ethics' (version 2 July 2022), https://plato.stanford.edu/entries/aristotle-ethics/ (16 August 2022).
[126] Phillippa Lally and Benjamin Gardner, 'Promoting habit formation', *Health psychology review* 7 (2013) sup1, S137-S158, there S137.
[127] Ibid., S137.
[128] Ibid., S137-138.
[129] Smith, 'The Metaphysical Case', 524-525.
[130] Thomas Kuhn, *The structure of scientific revolutions* (Chicago 1970), passim.

has no (mutually) beneficial relations with others. Just because the supermarket owner depends on the production by the farmer, does not mean she is not morally or epistemically independent. Independence, in the virtue sense that we shall consider here, is an intellectual independence.[131] Instead of depending on others to make decisions and arrive at conclusions, the independent person recognizes that they themselves are responsible for their intellect. The independent person does not orient themselves to others, but to reality. For example, an individual's sense of accomplishment should come from their own evaluation of their actions, not from the views of others. Consider two seemingly very different yet in reality very similar cases: a tyrannical director who derives their sense of worth through bossing around their employees and the employees' fear of the boss, and a sensitive person who tries to please everyone around them solely because the sensitive person wants to be liked, regardless of whether those around them are people whose opinion should matter. The director might temporality feel better about themselves after giving orders, but they are dependent on their subordinates. If the employees were to stand up for themselves or quit, the sense of worth of the boss would disappear because it depends on the boss being able to command others. Similarly, the sensitive person has no own positive self-evaluation; their self-esteem and consequently their happiness is fully dependent on others. If their friends were to leave, their self-esteem would have to rely solely on their non-existent self-evaluation and thus their sense of worth would disappear.

Self-interested people are therefore better off being independent, because their self-worth and happiness are not fully dependent on others. Of course they can derive happiness and intellectual insights from others, but they remain the final arbiter of their own moral and intellectual judgements.

Independence in the context of academia would mean that the individual academic takes responsibility for their own work and does not let pressure from others dictate their research and/or theories. A common example of this in academia is the little checkbox that authors have to tick when submitting an article to a journal: 'All authors are aware of and approve the submission of the manuscript, its content, and its authorship.' (Or some variant thereof.) Although an Aristotelean conception of independence does not necessarily have a material component, material considerations do play a role for the independent academic. The independent academic need not be a martyr. So, although independence already plays a role in academia, Open Academia can still benefit the self-interested academic who stays independent in several ways. First, by promoting broader and more accurate ways of assessing the merit of individual academics, which can make it more likely that independent academics are rewarded for their work. This makes it easier for independent academics to continue working on their academic endeavors and to pursue their (other) values, because less time has to be allocated to tasks and activities which they feel obligated or are forced to conduct, but do not contribute to the pursuit of their values.

Second, by democratizing the creation and spread of knowledge. Having academic work accessible (in the sense of being able to be reached) for everyone regardless of (institutional) background, enables judgement of the work based on merit instead of reputation. The more people

[131] J. Adam Carter, 'Intellectual autonomy, epistemic dependence and cognitive enhancement', *Synthese* 197 (2020) 7, 2937-2961, there 2937-2938.

have access to an article, the more people can judge the arguments The independent academic can therefore determine the validity of a claim, idea or theory because of open access and open data practices. In reality, reputational mechanisms will of course continue to play a large role simply due to the fact that hyperspecializing and limited available time make it almost impossible to accurately assess each individual work. However, the very fact that is becomes *possible* for researchers to check each other's work decreases intellectual dependence on others.

In contemporary academia, open practices have indeed led to academics being able to more easily and/or rigorously checking work published by their colleagues. A common example is scientists within the same field examining each other's data. Numerous cases exist where scientists examined data from other scientists because they suspected malpractice or believed they themselves would interpret the data differently.[132] In some cases, these intuitions proved to be correct, exposing errors, flaws or even fraud. Examining data is made easier or even made possible by open data practices. Without open data, scientists are dependent on the willingness of other scientists to share all of their data. Take an article that is not open access and without open data – only the statistical analyses and outcomes are mentioned. It is often impossible for an academic to check whether the outcomes are sound, because they are unable to investigate the underlying data, the steps taking to clean the data, et cetera.

As previously discussed, material considerations such as funding will inevitably influence the independence of academics. Academics are dependent on funders and commissioning parties do be able to for example do research. Open Academia movements would do well to further investigate how funding and commissioning structures can be changed to increase independence.

Justice

Justice concerns how we treat others. In the context of virtue egoism, justice is still a personal virtue, not a social one – meaning that the main concern of the exercise of justice is the benefit to the one who exercises it. Additionally, justice is a continuous activity; instead of the need for justice only arising in exceptional cases, each human activity can be judged and often needs to be judged. Take something as simple as grading. A just teacher will judge a student's assignment solely by criteria such as how well the student did and any extenuating circumstances, not based on how much the student will like the teacher if the student were to get a higher grade. This daily, mundane task is thus an exercise in justice.

Justice means judging a person and their actions in light of reality. In other words, treating them as they deserve to be treated. Virtuous people should be rewarded and unvirtuous people

[132] See for example Kai Kupferschmidt, 'Researcher at the center of an epic fraud remains an enigma to those who exposed him' (version 17 August 2018), https://www.science.org/content/article/researcher-center-epic-fraud-remains-enigma-those-who-exposed-him (26 July 2022); Ira Glass, 'Canvassers Study Has Been Retracted' (version 24 April 2015), https://www.thisamericanlife.org/extras/canvassers-study-in-episode-555-has-been-retracted (26 July 2022). For a comprehensive account of detecting data errors, see Ziawasch Abedjan, Xu Chu, Dong Deng, Raul Castro Fernandez, Ihab F. Ilyas, Mourad Ouzzani, Paolo Papotti, Michael Stonebraker and Nan Tang, 'Detecting data errors: Where are we and what needs to be done?', *Proceedings of the VLDB Endowment* 9 (2016) 12, 993-1004, passim.

should not be rewarded or in some cases punished. Self-interested people benefit from exercising justice precisely because it serves their own long-term interests. By punishing those who do wrong, the just person signals to others and themselves which kind of behavior he or she deems appropriate; no longer working together with a fellow researcher who behaves immorally indicates that the person who was wronged will not tolerate such behavior. By rewarding certain behavior and results, the just person builds a stronger relationship with people who share their values, thus enabling mutually beneficial exchange. Additionally, it indicates that the just person appreciates and values that behavior and those results.[133] The self-interested person is therefore better off by acting justly: by judging others, they can make 'prudent decisions about whom to confide in, whom to distrust, whom to support, subsidize, hire, fire, befriend, and so on'.[134] Treating someone better than they deserve runs the risk of negative consequences for both sides. Hiring someone for a job they are not actually equipped for leads to poor job performance and a dissatisfied employee.

In a multi-agent environment such as academia, agents interact with many other agents. One person exercising the virtue of justice while nobody else treats each other justly will have little impact on the system as a whole or on other individuals. However, that is not to say that self-interested academics should not exercise the virtue of justice in an unjust system. As with the other virtues, exercising the virtue of justice is in itself good for the self-interested academic. Rather, it is perfectly logical for a just academic to leave an unjust academic environment. After all, they know that being treated unjustly is not in their self-interest. They might gain more from working in a private research environment, where they can pursue their values *and* be treated justly. Science and Technology Studies scholar Maximilian Fochler interviewed researchers working in academia and researchers working at research and development departments which were part of private companies. From these interviews it became clear that the interviewed company leaders at private companies were better able to 'preserve space for other registers of valuation that are relevant to their understanding of good research'.[135] Although academic group leaders reported similar experiences, the overall conclusion was that academics are less able to pursue long-term epistemic agenda's and other values.[136]

If it is truly the case that researchers can get appointments elsewhere where there are more opportunities to cultivate their other values, we would expect a significant number of researchers leaving academia in favor of similar research positions elsewhere, such as with research and development departments at private companies. Preliminary studies do indeed show such an outflow occurring. A study which tracked 109,514 scientists (71,164 from astronomy, 20,704 from ecology,

[133] Tara Smith, 'Justice as a Personal Virtue', *Social theory and practice* 25 (1999) 3, 361-384, there 367-380.
[134] Ibid., 370.
[135] Maximilian Fochler, 'Variants of Epistemic Capitalism: Knowledge Production and the Accumulation of Worth in Commercial Biotechnology and the Academic Life Sciences', *Science, Technology, & Human Values* 41 (2016) 5, 922-948, there 942-943.
[136] Ibid., 943.

and 17,646 from robotics) found that half of those left academia after only five years.[137] Although not everyone will leave academia for similar positions at research and development departments, the outflow is indicative of a system where people do not feel valued and/or find themselves incapable of pursuing their values.

For those academics that do stay in academia, justice plays a large role in their working environment. A just academic would for example give appropriate credit to a co-author; if the co-author made a bigger contribution to an article, the just academic will propose that the co-author be given first author credit. Selection committees for funding or promotion try to make a just selection in who gets awarded what. On a daily basis, interaction with colleagues and students requires exercising the virtue of justice: grading fairly; awarding grants to those who are deserving; hiring competent, hardworking people; helping out newcomers.

In relation to Open Academia, justice is most clearly related to the measurement school of Open Scholarship; academics should be judged by their merit and rewarded accordingly. Although what constitutes merit can and should be up for debate, a system with more just allocation of credits and rewards is almost certainly beneficial to the vast majority of academics. It is currently vastly more likely for early career researchers to be disadvantaged by unjust treatments than for them to benefit from it. Both empirical data and game theoretical models show that minority groups in academia are currently more likely to be treated unjustly, i.e. get treated worse than they deserve.[138] For example, women are less likely than men to be first author even when they have contributed more to an article.[139] Moving to a more just academic system, in line with the goals of many Open Academia movements, would lead to better treatment for many of these academics. Even more senior, well-established researchers would benefit from a more just academic system, even though they got their position through the mechanisms in place in the old and/or contemporary system, providing them with benefits such as their fame, prestige, position, and resources. Even for them, Open Academia provides benefits, such as increasing the reputation of science and funding benefits.[140] In addition, senior academics receive the same psychological benefits from being virtuous. Take the example of honesty. Diederik Stapel, despite being a successful academic, still suffered from his dishonesty. He was deeply unhappy during his career and in the end he even had to give up his employment. Both he and his science suffered. In the long run, being honest would have been better for his mental health

[137] Staša Milojević, Filippo Radicchi and John P. Walsh, 'Changing demographics of scientific careers: The rise of the temporary workforce', *Proceedings of the National Academy of Sciences* 115 (2018) 50, 12616-12623, there 12617-12620.

[138] Hannah Rubin and Cailin O'Conner, 'Discrimination and collaboration in science', *Philosophy of Science* 85 (2018) 3, 380-402, passim.

[139] Benoit Macaluso, Vincent Larivière, Thomas Sugimoto and Cassidy R. Sugimoto, 'Is Science Built on the Shoulders of Women? A Study of Gender Differences in Contributorship', *Academic Medicine* 91 (2016) 8, 1136-1142, passim.

[140] Erin C. McKiernan, Philip E. Bourne, C. Titus Brown, Stuart Buck, Amye Kenall, Jennifer Lin, Damon McDougall, Brian A. Nosek, Karthik Ram, Courtney K. Soderberg, Jeffrey R. Spies, Kaitlin Thaney, Andrew Updegrove, Kara H. Woo and Tal Yarkoni, Point of View: How open science helps researchers succeed', *eLife 5* (2016), 1-19, passim.

and career. Stapel, just like other senior academics, would have benefitted from a system which incentivized and encouraged honesty.

The long-term interests of the self-interested academic are thus aligned with conceptions of justice within open academia movements. A self-interested person benefits from the implementation of most Open Academia principles and benefits from an Open Academia system. In the next chapter, I aim to show how even in the current system, self-interested academics benefit from adhering to certain Open Academia principles.

Integrity

Integrity has received a lot of attention lately in academia. Prolific instances such as the Diederik Stapel affair and the 'Piltdown Man' case showed that academic fraud occurred more often and more seriously than previously thought.[141] More recently, cases such as Piero Anversa's fraud and Dan Ariely's alleged data tampering show that large-scale fraud can and indeed does still happen in academia, despite continued efforts to combat dubious research practices. Partly because of past and present occurrences of fraud, integrity is one of the virtues most paid attention to within academia – research integrity committees, research integrity rapports, and research integrity code of conducts are just a few examples of research integrity related academic documents and practices.

Fraud is not the only instance of a breach of integrity. Integrity is being true to one's self; not letting pressure from outside sources dissuade you from pursuing your values and acting virtuously. It differs from independence in the sense that integrity is more concerned with the alignment between principles and action. In my treatment of justice in this paragraph I am not concerned with the dictionary definition of integrity as 'the quality of being honest and fair' – being honest and fair are already covered by honesty and justice respectively.[142] I will only concern myself in this paragraph with integrity as 'firm adherence to a code of moral values'.[143]

The academic with integrity will act in accordance with their values, not only moral and epistemological, but all their values. This means that values such as family and career can also play a role in the exercise of the virtue of integrity. The academic with integrity who values family should not consistently sacrifice quality time with their family just to please their supervisor.

One can of course value multiple values at the same time and situations can arise where one must choose between values; take for example an academic who values both their career and their family, who is offered a promotion which necessitates them moving away from their family for a long period of time. Similarly, academics can value both their research *and* the financial stability that comes with keeping their job – money that can be used to gain or keep other values. In these situations, the academic has to weigh off different values and choose between them. They can do so with integrity,

[141] See the paragraph on honesty for the Diederik Stapel case. For the Piltdown Man case, see for example Natural History Museum, 'Piltdown Man' (n.d.), https://www.nhm.ac.uk/our-science/departments-and-staff/library-and-archives/collections/piltdown-man.html (16 August 2022).
[142] Merriam-Webster, 'integrity' (n.d.), https://www.merriam-webster.com/dictionary/integrity (7 January 2022).
[143] Merriam-Webster, 'integrity' (n.d.), https://www.merriam-webster.com/dictionary/integrity (7 January 2022).

as long as they do adhere to the moral virtues *and* consciously make a deliberation between their other values.

Open Academia can facilitate integrity in a variety of ways. Most importantly, it can reward academics who display integrity. In the next chapter we shall for example see how the use of registered reports can reward integrity via a mechanism which enables more negative and null results to be published. More generally, Open Academia facilitates integrity by allowing academics to stay true to a wider range of values without facing negative consequences.

Productiveness

Although productiveness might not be first on one's mind when one thinks of moral virtues, I would argue that productiveness can and should be seen both as a moral virtue and an epistemological virtue. Indeed, there is precedent to consider productiveness as a moral virtue. In Christianity, diligence, i.e. persistent effort or work, is considered one of the seven heavenly virtues.[144] Due to the influence of utilitarianism in ethics, productiveness is also often seen as moral in contemporary secular ethics.[145] However, these theories often focus on either the benefits of productiveness for the so-called common good, or the benefits of productiveness in a religious context, such as the chances of entering heaven or similar concepts. I shall instead focus on why productivity is virtuous for the individual, specifically the self-interested academic.

Productiveness, for the self-interested person, is the means through which they can control their existence. Productiveness is the continuous process of acquiring knowledge and shaping reality in accordance with your purpose. Productiveness should not be confused with merely exerting labor. Someone who washes their clothes manually 10 hours per day is less productive than someone who invents the washing machine and proceeds to spend their time mostly on hobbies. Or consider the following story, which appears in different versions around the globe.

> A businessman recalled traveling to an Asian country in the 1960s and visiting a worksite where a new canal was being built. He was shocked to see that, instead of modern tractors and earth movers, the workers had shovels. He asked why there were so few machines. The government bureaucrat explained: "You don't understand. This is a jobs program." To which the businessman replied: "Oh, I thought you were trying to build a canal. If it's jobs you want, then you should give these workers spoons, not shovels."[146]

[144] Prasasti Pandit, 'The Transition within Virtue Ethics in the context of Benevolence', *Philosophia: International Journal of Philosophy* 23 (2022) 1, 135-151, there 139.
[145] Judith R. Halasz, 'The Ethics of Work: Productivity, the Work Ethic, and Bohemian Self-Determination', *Journal of Humanities and Social Sciences* 2 (2012) 4, 209-222, passim; Michael Cholbi, 'Philosophical Approaches to Work and Labor' (version 2022), https://plato.stanford.edu/entries/work-labor/#JustPoliWork (27 July 2022).
[146] Quote Investigator, 'If You Want Jobs Then Give These Workers Spoons Instead of Shovels' (version 10 October 2011), https://quoteinvestigator.com/2011/10/10/spoons-shovels/ (16 August 2022).

Productiveness thus has a component of efficiency; all else being equal, it is better to exert less effort and/or resources to achieve a goal than it is to exert more effort and/or resources to achieve the same goal. The reason for this is related to values and their achievement; the time and resources saved can be used to achieve other values.

The self-interested person then benefits from productivity indirectly; productivity enables the individual to directly achieve values or gain material benefits which can subsequently be used to achieve values. The self-interested person also benefits directly from productivity: it gives them a sense of achievement and engages their creativity and intellect.

The academic enterprise should be a paradigm of productiveness. After all, the purpose of academic inquiry is to acquire knowledge, the purpose of academia is to facility the acquisition and spread of knowledge – all productive processes. As money is scarce, efficiency is required for these processes. It is no surprise then that funding bodies often focus on most efficiently distributing the available funding – often by introducing artificial competition into the funding application processes.[147]

In practice, academia and/or funders far too often conflate exerting labor with productiveness. This is best exemplified by the policy of evaluating academics by how many articles they publish each year, preferably in prestigious journals. This is not an indicator of productiveness but merely of output, which should not be conflated. Analysis by Science and Technology Studies researchers Willem Halffman and Serge Horbach showed the prevalence of self-plagiarism, or academic text recycling, in academia, most notably in the field of economics. Halffman and Horbach define academic text recycling as 'the reuse of one's own writing in academic publications, ranging from a sentence to several pages or even entire articles, without reference'.[148] Halffman and Horbach investigated text recycling in four fields, namely biochemistry & molecular biology, economics, history, and psychology. In biochemistry & molecular biology, only 3.3% of analyzed papers contained what was deemed 'problematic text recycling'.[149] For economics, the percentage of papers containing problematic text recycling was 14.0%, for history and psychology it was 0.5% and 4.7% respectively.[150] Especially in economics, text recycling or self-plagiarism seems to occur often – if Halffman and Horbach's sample is indicative, around 3 in 7 papers in economics contain self-plagiarism. If self-plagiarism is indeed undesirable, then this amount is problematically high.

Self-plagiarism usually is considered undesirable because of several reasons. First, 'the damage to the reader who is "deceived by false claims of originality"'.[151] Second, 'unfair competition due to skewed rewards' when academics get rewarded for output that is not actually productive.[152]

[147] Jian Wang, You-Na Lee and John P. Walsh, 'Funding model and creativity in science: Competitive versus block funding and status contingency effects', *Research Policy* 47 (2018) 6, 1070-1083, passim.
[148] Willem Halffman and Serge Horbach, 'The extent and causes of academic text recycling or 'self-plagiarism'', *Research policy* 48 (2019) 2, 492-502, there 492.
[149] Ibid., 498.
[150] Ibid., 498.
[151] Ibid., 493.
[152] Ibid., 493.

Third, 'the abuse of publication resources and reviewer's efforts'.[153] From the point of view of the self-interested academic, self-plagiarism should be undesirable if it is unproductive and/or dishonest. Instead of producing new knowledge or making existing findings more robust, old knowledge is used over and over again without merit.

Halffman and Horbach acknowledge the connection between productiveness and text recycling. For example, they claim to have 'found evidence that more productive authors are more likely to recycle their papers'.[154] Halffman and Horbach consider the practice problematic not from the point of view of the individual, but of the community. 'The major argument against text recycling is that it is a form of gaming the reward system of science: text recycling scientists claim more productivity' than their work actually warrants.' The reason why they consider 'gaming the system' undesirable is because 'text recycling is a way to boost scores, at the expense of other researchers by unfair competition for grants or positions'.[155]

Evidently not all text recycling is necessarily unproductive, and can even be considered good when it occurs in an honest manner. Reuse of 'particularly well-formulated expressions for standard methods, disclaimers, or even nuance theoretical positions'[156] can be productive because it saves time by preventing unnecessarily spending time on already robust definitions, theories, or ways of working. This would be an example of efficiency, which, as we already saw, is a necessary component of productiveness. However, in cases of efficient reuse, text recycling can still easily be avoided and should be avoided by using proper annotation – not doing so would be an instance of dishonesty. In academia, standard practice is to provide citations when building on previous work (your own or otherwise) and only not doing so in cases where you are contributing new information, insights, et cetera. By not citing previous work, you are suggesting that the passage without references is original work. If that is not the case, you are being dishonest towards the reader. The paragraph on honesty earlier in this paper outlines in detail the detriment of dishonesty for self-interested academics.

The self-interested academic thus finds their self-interest clearly in line with the pragmatic school, which has a distinct component of efficiency. Self-interested academics can benefit from such Open Academia practices as: sharing data, so that 'different research teams do not have to gather the same material'[157]; publishing negative results, so that they get extra publications and can prevent doing double work; and changing metrics so that actually productive work gets rewarded. Although normative arguments within the pragmatic school often focus on collective benefits and perceived duties towards others, in this paragraph, I have shown the long-term benefits of productivity for the rational self-interested academic.

[153] Ibid., 493.
[154] Ibid., 492.
[155] Ibid., 493.
[156] Ibid., 493.
[157] KU Leuven, 'The benefits of Open Science' (version 18 December 2021), https://www.kuleuven.be/open-science/what-is-open-science/the-benefits-of-open-science (16 August 2022).

Conclusion

Early career academics are demonstrably better off in a system which aligns virtues such as honesty, independence, justice, integrity, and productiveness with the rewards academics receive. Academics are better off in the long term by striving to be virtuous. By aligning the recognition and reward system in academia with their values, academics can gain both career advantages as well as the other advantages such as well-being related to being virtuous. Self-interested academics should therefore welcome new systems which employ open academia principles which benefit individual academics.

While I have shown how self-interested academics should prefer a system which aligns ethical and epistemological virtues with the rewards academics receive, I have not yet covered what they should do in the current system, which is a mix of open academia practices and old practices. Even though self-interested academics might be better off in a system which has fully transitioned to the standards of open academia, they might be worse off embracing open academia principles in a mixed system. Although I hope to have shown philosophically that self-interested academics should always practice moral virtues because they are beneficial, I have not yet provided much empirical evidence for this claim. In the next chapter, I will argue and provide evidence for the claim that *current* self-interested academics would benefit from practicing open academia – either by gaining a first-mover advantage, by profiting from rewards and recognition systems already in place, or both.

Chapter 5: Empirical Evidence of Individual Benefits Open Academia

So far, I have shown how practicing moral and epistemic virtues necessarily leads to better outcomes for individual researchers, but what do these better outcomes look like in practice? Empirical studies have produced robust indications and evidence of career benefits for researchers who engage in Open Academia practices. In this chapter I will provide several examples of concrete benefits academics can acquire by adhering to Open Academia principles.

Open Access and Citation Numbers

Having an article available open access means that more policy makers, scientists, journalists, and businesspeople have access to the article. This would then also make it possible for more people to cite the article, both inside and outside the context of academia. Scientists can more easily reach larger and relevant audiences. Research indicates that open access articles and open data might indeed lead to more citations, the so-called open access citation advantage (OACA). Two of the largest extensive reviews of studies on OACA both found more studies that indicated the existence of OACA than studies which found no effect.[158] Although indications of the benefits of Open Access with regards to citations mostly rely on correlation, there are some preliminary findings which indicate a causal relation as well. One study using a randomized controlled methodology to investigate 3,534 articles published between 2009 and 2013 in 46 hybrid-OA ecology journals found that '[o]verall, OA articles received significantly more citations than non-OA articles, and the citation advantage averaged approximately one citation per article per year and increased cumulatively over time after publication'.[159] Another randomized controlled study analyzing 93,745 articles published between 1990 and 2013 also found evidence for the OACA – more modest than reported elsewhere, but still with a lower bound of 20%.[160]

With regards to open data, a study by data scientist Giovanni Colavizza found 'an association between articles that include statements that link to data in a repository and up to 25.36% (± 1.07%) higher citation impact on average'.[161] This is a significant average increase in citation impact, especially considering the relative simplicity of linking to data in a repository. Online repositories such as the Open Science Framework provide user friendly options for academics to relatively easily upload and label their data.

[158] Colbi Lil Lewis, 'The Open Access Citation Advantage: Does It Exist and What Does It Mean for Libraries?', *Information Technology and Libraries* 37 (2018) 3, 50-65, passim; Alma Swan, The Open Access citation advantage: Studies and results to date (e-Print) passim.
[159] Lewis, 'The Open Access Citation Advantage', 57; Min Tang, James D. Bever and Fei-Hai Yu, 'Open access increases citations of papers in ecology', *Ecosphere* 8 (2017) 7, 1-9, passim.
[160] Lewis, 'The Open Access Citation Advantage', 58; Jim Ottaviani, 'The Post-Embargo Open Access Citation Advantage: It Exists (Probably), It's Modest (Usually), and the Rich Get Richer (of Course)', *PLoS One* 11 (2016) 8, 1-11, passim.
[161] Giovanni Colavizza, Iain Hrynaszkiewicz, Isla Staden, Kirstie Whitaker and Barbara McGillivray, 'The citation advantage of linking publications to research data', *PloS one* 15 (2020) 4, 1-18, there 1.

Open Academia and Funding Benefits

With more and more institutions moving towards Open Scholarship, funding structures are starting to change as well. Several funds exist specifically for Open Scholarship research, either locally such as the Groningen *Open access book fund for UG and UMCG authors*, nationally such as the Dutch fund *Dutch Research Council Open Science Fund* or supranationally such as the European *Horizon Europe* innovation program. Increased funding does not directly relate to any of the virtues that we covered, but just like in life in general, in academia 'money facilitates a person's achievement of values'.[162] Money allows the scholar to research what they find interesting and important, contributing to values such as independence, integrity, and productiveness. Money also allows them to pursue values outside of academia, such as providing for a family or financing a personal project. Although research funding will not directly contribute to personal finances, it can lead to a raise or job security which in turn do contribute.

Increased Chances of Publication

Next to increased chances of open access publications being cited, articles submitted to Open Access journals can have increased chances of being published. This increased chance of publication is due to the increased use of registered reports at Open Access journals – a policy advocated by many Open Academia movements. Registered reports are study proposals which are reviewed before research is undertaken. Many journals which use registered reports systems review them on scientific standards such as methodological rigor and quality of data analysis plan. If the registered report meets these standards, the related article is provisionally accepted on the condition that the conducted research matches the description in the registered report – that means that the article is accepted regardless of the result. Negative and null results then have an equal chance of being published as positive results, unlike in regular journals without registered reports systems. Given the likelihood of negative or null results occurring, the use of these registered reports systems can lead to a significant increase in accepted manuscripts and subsequently publications. In addition, registered reports can facilitate integrity: instead of having to fudge their results to get another publication, academics can stay true to their values and honestly communicate their actual results.

As we have already seen, in the current academic system, more publications often leads to increased chances of being hired, getting funding, and winning awards. An increase in publications benefits self-interested academics by advancing their careers, as well as possibly contributing to virtues such as productivity, honesty, and integrity – provided that the publications are presented in an honest manner and concern actually productive work.

[162] Tara Smith, 'Money *Can* Buy Happiness', *Reason Papers* 26 (2003), 7-20, there 12; Terence R. Mitchell and Amy E. Mickel, 'The meaning of money: An individual-difference perspective', *The Academy of Management Review* 24 (1999) 3, 568-578, passim.

Reputational Gains

There are two major ways an individual academic can get a reputation for adhering to open academia principles, namely through badges and rankings. The signaling mechanism inherent to both enables academics to signal their worth to funders and other academics, enabling the latter to judge whether they want to work with, hire, or fund the individual in question.

Badges

One simple way of conveying an individual's adherence to Open Scholarship principles is through the use of badges. Badges serve as a signaling mechanism, indicating to other members of the community that the scientist displaying the badge has been judged by her peers and found to be in accordance with the principles of Open Academia. For example, by displaying Open Science Badges on published articles or on curricula vitae, academics signal that they care about *and* are capable of practicing Open Academia. Self-interested academics would then do well to use Open Science Badges when employers and funders care about Open Academia. Although there is little research specifically on the benefits of Open Science Badges for individuals, research on Open Badges in other settings has shown that they can provide benefits for individuals when employers use badges for informational purposes.[163]

In addition, displaying badges can facilitate academic reform, because 'seeing colleagues practice open science signals that new community norms have arrived'.[164] Displaying a badge then has a double benefit for the self-interested academic: both by potentially advancing their career, and by facilitating and speeding up the transition to a new system that aligns better with their personal values.

Unlike some other signaling mechanisms, those scholars using badges also actually benefit from the signaling mechanism if they are among just a few early adopters. The badges are easy to display and provide no disadvantage, while at the same time providing a potential advantage in the form of higher chances of getting hired or promoted and higher chances of getting funding.

Rankings

Similarly to badges, rankings can serve as a signaling mechanism. Unlike with badges, individual academics often cannot choose whether or not they participate in this signaling mechanism. This can be beneficial, because bad faith actors cannot simply opt out of the ranking to hide their unsatisfactory credentials – although such an opting out would in itself constitute a signal. On the other hand, if the ranking in question is flawed in some manner, being included in and judged based on such rankings is

[163] Victoria Raish and Emily Rimland, 'Employer perceptions of critical information literacy skills and digital badges', *College & Research Libraries* 77 (2016) 1, 87-113, passim; Daniel L. Randall and Richard E. West, 'Who cares about open badges? An examination of principals' perceptions of the usefulness of teacher open badges in the United States', *Open Learning: The Journal of Open, Distance and e-Learning* 37 (2022) 1, 65-83, passim.
[164] Center for Open Science, 'Open Science Badges enhance openness, a core value of scientific practice' (n.d.), https://www.cos.io/initiatives/badges (27 July 2022); Mallory C. Kidwell, Ljiljana B. Lazarević, Erica Baranski, Tom E. Hardwicke, Sarah Piechowski, Lina-Sophia Falkenberg, Curtis Kennett, Agnieszka Slowik, Carina Sonnleitner, Chelsey Hess-Holden, Timothy M. Errington, Susann Fiedler and Brian A. Nosek, 'Badges to Acknowledge Open Practices: A Simple, Low-Cost, Effective Method for Increasing Transparency', *PLoS biology* 14 (2016) 5, 1-15, passim.

detrimental to the self-interested academic, especially if the academic can not choose to opt out. Just like with any ranking system, such as the H-index, a good score can be beneficial for the scientist receiving the good score. For it to be beneficial for the individual scientist to score high on a specific ranking, that ranking must be used in some way in the reward system of academia. Thus, self-interested academics should pursue both rational new ranking systems, as well as activities which grant them a higher score on such ranking systems – provided these activities align with or at least do not conflict with their values. It therefore remains important to critically assess new rankings to determine whether they indeed accurately measure the criterium they aim or claim to measure and are used to reward what should be rewarded. Only then do the interests of self-interested academics align with the academic system, leading to overall better outcomes for everyone involved.

By being among the first adopters of Open Academia, individual scientists can get a first-mover advantage with regards to ranking scores: they have ability to be better off than their competitors as a result of being first to utilize Open Academia methods. By publishing Open Access, Open Data, Open Methods, et cetera before others start doing so, researchers gain a relatively large advantage because they will be able to reach the tops of these rankings due to comparatively little competition. If these rankings are subsequently used to asses and reward academics, for example during funding procedures or to determine tenure, first movers will have a competitive advantage compared to their peers. The h-index and similar indices were used for years, and in many cases still are, in important and career-determining ways.[165] In places such as the Netherlands, new recognition and rewards systems, including new indices, are already being implemented.[166] These include indices related to Open Academia practices.

Negative Consequences Open Academia and Trade-offs

Of course Open Academia can sometimes have negative consequences or aspects as well. Registered reports can lead to restrictions of flexibility, Open Academia practices are often more time-consuming, and although the recognition and reward system is changing, the incentive structure is not always in place yet.[167] However, as with any reform, academic reform will always be a trade-off. Overall, however, the benefits of Open Academia have been shown to outweigh the costs, and will continue to do so as long as incentives structures align researchers' career interests with those of academia as a whole.[168]

---

[165] Colin A. Chapman, Júlio César Bicca-Marques, Sébastien Calvignac-Spencer, Pengfei Fan, Peter J. Fashing, Jan Gogarten, Songtao Guo, Claire A. Hemingway, Fabian Leendertz, Baoguo Li, Ikki Matsuda, Rong Hou, Juan Carlos Serio-Silva and Nils Chr. Stenseth, 'Games academics play and their consequences: how authorship, *h*-index and journal impact factors are shaping the future of academia', *Proceedings of the Royal Society B* 286 (2019) 1916, 1-9, there 2.

[166] Universiteiten van Nederland, 'Erkennen en waarderen van wetenschappers' (n.d.), https://www.universiteitenvannederland.nl/nl_NL/Erkennen-en-waarderen-van-wetenschappers.html (8 August 2022).

[167] Christopher Allen and David M.A. Mehler, 'Open science challenges, benefits and tips in early career and beyond', *PLoS biology* 17 (2019) 5, 1-13, passim.

[168] Etienne P. LeBel, Lorne Campbell and Timothy J. Loving, 'Benefits of Open and High-Powered Research Outweigh Costs', *Journal of personality and social psychology* 113 (2017) 2, 230-243, passim.

Conclusion

The academic movements grouped together under (mis)nomers such as Open Science, Open Scholarship, Open Academia, and Academic Reform, lack a clear, shared, and realistic philosophical grounding for their reform. Despite overlapping vocabularies and goals, the movements often fundamentally differ in their values, priorities, and approaches. To better understand the various movements, the first chapter outlined various ways of conceptualizing and categorizing key Open Academia terms, as well as various popular schools of thought. This provided additional insights into the underlying motivations of various Open Academia movements. Schools of thought which emphasize efficiency should be of interest to self-interested academics, while those schools which focus more on altruistic or contractualist concerns are of less interest.

In this chapter we also took a look at Robert K. Merton and his Mertonian norms of universalism, communism, disinterestedness, and organized skepticism. For Merton, these norms are inherent to science. Although most Open Academia movements and advocates do not see these norms are inherent, many do consider them important for good science. Merton and his norms are regularly invoked in differing media advocating Open Academia, as well as during presentations on Open Academia. Merton's norms provide an unsatisfactory framework for self-interested academics

The second chapter provided an insight into the relationship between ethics and epistemology as generally understood, as well as in virtue ethics and virtue epistemology. Ethical considerations are always dependent on material considerations, as well as the capabilities and goals of individual agents. Virtue epistemology provided a good starting point for rational virtue egoism in the context of academia by showing how

During the COVID-19-pandemic, increased tension and strain upon academia led to increased calls for Open Academia, as well as increased efforts. However, these increased calls and efforts were often met with resistance, and sometimes disagreements even arose *between* advocates of Open Academia. These debates provided a focal point of analysis, showing how Open Academia is negotiated during times of crisis, revealing the underlying ethical and epistemological concerns of those involved. Many of the concerns involved either revolved around the time gained or lost by implementing Open Academia practices, or around the proliferation of articles, with worries around poor quality control, open access preprints reaching the news before quality control has occurred, and information overload.

If Open Academia movements truly want to become successful, they will have to convince the majority of academics to embrace some form of Open Academia. This will entail convincing overworked academics who are unconvinced by altruistic arguments to fully engage with academic reform. Although some scattered attempts have been made to show the benefits of Open Academia for individual academics, no philosophical grounding had previously been developed.

In this thesis I have provided such a philosophical grounding by applying rational virtue egoism to the context of academia, thereby laying out a strong theoretical foundation for Open Academia and showing how self-interested academics can benefit from academic reform, while also leading to beneficial consequences for academia as a whole. Chapter 4 focused on five virtues, namely honesty, integrity, independence, justice, and productivity. For each virtue, the virtue itself was described; the

benefit to self-interested academics was shown; the relationship between the virtue and academia in general was analyzed, and finally the relationship between the virtue and Open Academia was demonstrated. I have shown how these virtues benefit academics psychologically as well as career-wise.

The theoretical considerations for self-interested academics provided by rational virtue egoism are further corroborated by empirical evidence about the benefits of Open Academia for individual academics. Such benefits include increased citations, increased chances of publication, and reputational benefits. Although Open Academia practices can also have downsides, the overall benefits currently outweigh the detriments.

This brings us to the answer to the research question stated in the beginning: How should self-interested academics relate to Open Academia? As we have seen, self-interested academics relate to Open Academia through their virtues. Adhering to these virtues brings long-term psychological and career benefits. Self-interested academics benefit from aligning their virtues with academic reform – they relate to Open Academia by aiding academic reform and technological development that benefits individual scientists.

All in all this thesis has contributed both to ongoing theoretical debates in epistemology, ethics, and philosophy of science, as well as to ongoing practical debates on academic reform. Future research should further explore the rational egoistic basis for Open Academia, for example by exploring a new set of egoistic virtues and their relation to Open Academia. In addition, further research is needed on how to concretely bring Open Academia in further alignment with egoist virtue ethics – research into which policies should be implemented and which technologies should be developed. Finally, further exploration is needed to identify how and when to best instill rational virtues in students. This research could contribute to further 'offer aid and comfort to afflicted scientists, or at least an accurate description of what ails them'.[169]

[169] John Turri, Mark Alfano and John Greco, 'Virtue Epistemology' (version 7 November 2017), https://plato.stanford.edu/entries/epistemology-virtue/ (18 August 2022).

Reference List

Abedjan, Ziawasch, Xu Chu, Dong Deng, Raul Castro Fernandez, Ihab F. Ilyas, Mourad Ouzzani, Paolo Papotti, Michael Stonebraker and Nan Tang, 'Detecting data errors: Where are we and what needs to be done?', *Proceedings of the VLDB Endowment* 9 (2016) 12, 993-1004.

Abritis, Alison, Adam Marcus and Ivan Oransky, 'An "alarming" and "exceptionally high" rate of COVID-19 retractions?', *Accountability in Research* 28 (2021) 1, 58-59.

Allen, Christopher, and David M.A. Mehler, 'Open science challenges, benefits and tips in early career and beyond', *PLoS biology* 17 (2019) 5, 1-13.

Barnes, Lucy, 'Green, Gold, Diamond, Black – what does it all mean?' (version 22 October 2018), https://blogs.openbookpublishers.com/green-gold-diamond-black-what-does-it-all-mean/ (20 Juli 2022).

Bornmann, Lutz, and Hans-Dieter Danie, 'What do we know about the h index?', *Journal of the American Society for Information Science and technology* 58 (2007) 9, 1381-1385.

Brock, Richard, 'Tacit knowledge in science education: the role of intuition and insight in teaching and learning science', in: Keith S. Taber and Ben Akpan (eds.), *Science Education: An International Course Companion* (Rotterdam 2017) 133-142.

Bueno de la Fuente, Gema, 'What is Open Science? Introduction' (n.d.), https://www.fosteropenscience.eu/content/what-open-science-introduction (12 August 2022).

Burches, Enrique and Marta Burches, 'Efficacy, Effectiveness, and Efficiency in Health Care: The Need for an Agreement to Clarify its Meaning', *Int. Arch. Public Health Community Med* 4 (2020) 35, 1-3.

Business Wire, 'Wiley Reports Fourth Quarter and Fiscal 2017 Results' (n.d.), https://www.businesswire.com/news/home/20170613005509/en/Wiley-Reports-Fourth-Quarter-and-Fiscal-2017-Results (15 August 2022).

Carter, J. Adam, 'Intellectual autonomy, epistemic dependence and cognitive enhancement', *Synthese* 197 (2020) 7, 2937-2961, there 2937-2938.

Center for Open Science, 'Open Science Badges enhance openness, a core value of scientific practice' (n.d.), https://www.cos.io/initiatives/badges (27 July 2022).

Chahrour, Mohammed, Sahar Assi, Michael Bejjani, Ali A. Nasrallah, Hamza Salhab, Mohammed Fares and Hussein H. Khachfe, 'A Bibliometric Analysis of COVID-19 Research Activity: A Call for Increased Output', *Cureus* 12 (2020) 3. .

Chapmanz, Colin A., Júlio César Bicca-Marques, Sébastien Calvignac-Spencer, Pengfei Fan, Peter J. Fashing, Jan Gogarten, Songtao Guo, Claire A. Hemingway, Fabian Leendertz, Baoguo Li, Ikki Matsuda, Rong Hou, Juan Carlos Serio-Silva and Nils Chr. Stenseth, 'Games academics play and their consequences: how authorship, *h*-index and journal impact factors are shaping the future of academia', *Proceedings of the Royal Society B* 286 (2019) 1916, 1-9.

Chavanayarn, Siraprapak, 'The Epistemic Value of Open Science', *Open Science Journal* 3 (2018) 3, 1-8.

Cholbi, Michael, ‘Philosophical Approaches to Work and Labor’ (version 2022), https://plato.stanford.edu/entries/work-labor/#JustPoliWork (27 July 2022).

Colavizza, Giovanni, Iain Hrynaszkiewicz, Isla Staden, Kirstie Whitaker and Barbara McGillivray, ‘The citation advantage of linking publications to research data’, *PloS one* 15 (2020) 4, 1-18.

Collins, Harry, *Changing Order: Replication and Induction in Scientific Practice* (Chicago 1992).

Darr, Ryan, ‘Virtues as qualities of character: Alasdair Macintyre and the situationist critique of virtue ethics’, *Journal of religious ethics* 48 (2020) 1, 7-25.
David, Paul A., ‘The Historical Origins of 'Open Science': an essay on patronage, reputation and common agency contracting in the scientific revolution’, *Capitalism and Society* 3 (2008) 2, 1-103.

Dennis, Simon, Paul Garrett, Hyungwook Yim, Jihun Hamm, Adam F. Osth, Vishnu Sreekumar and Ben Stone, ‘Privacy versus open science’, *Behavior Research Methods* 51 (2019) 4, 1839-1848.

Dent, Nicholas J.H., ‘Virtues and actions’, *The Philosophical Quarterly (1950-)* 25 (1975) 101, 318-335.
Dutch government, ‘Auteurswet’ (version 7 June 2022), https://wetten.overheid.nl/BWBR0001886/2022-06-07 (12 August 2022).

Di Girolamo, Nicola, and Reint Meursinge Reynders, ‘Characteristics of scientific articles on COVID-19 published during the initial three months of the pandemic: a meta-epidemiological study’, *Scientometrics* 125 (2020) 1, 795-812.

European Commission, ‘Fostering the practical implementation of Open Science in Horizon 2020 and beyond’ (version 25 May 2022), https://cordis.europa.eu/project/id/741839 (12 August 2022).

Fecher, Benedikt, and Sascha Friesike, 'Open Science: One Term, Five Schools of Thought’, in: Sönke Bartling and Sascha Friesike (eds.), *Opening Science: The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing* (Heidelberg 2014) 17-47.

Flyvberg, Bent, ‘Five Misunderstandings About Case-Study Research’, *Qualitative Inquiry* 12 (2006) 2, 219-245.

Fochler, Maximilian, ‘Variants of Epistemic Capitalism: Knowledge Production and the Accumulation of Worth in Commercial Biotechnology and the Academic Life Sciences’, *Science, Technology, & Human Values* 41 (2016) 5, 922-948.

Forero, Diego A., Sandra Lopez-Leon, Yeimy González-Giraldo and Pantelis G. Bagos, ‘Ten simple rules for carrying out and writing meta-analyses’, *PLoS computational biology* 15 (2019) 5, 1-7.

Füzéki, Eszter, David A. Groneberg and Winfried Banzer, ‘Physical activity during COVID-19 induced lockdown: recommendations’, *Journal of Occupational Medicine and Toxicology* 15 (2020) 1, 1-5.

Gaillard, Stefan, and Sean Devine, ‘Het wordt tijd om negatieve resultaten wetenschappelijk serieus te nemen’ (version 10 November 2021), https://esb.nu/blog/20061600/het-wordt-tijd-om-negatieve-resultaten-wetenschappelijk-serieus-te-nemen (25 november 2020).

Garg, Amit X., Dan Hackam and Marcello Tonelli, ‘Systematic review and meta-analysis: when one study is just not enough’, *Clinical Journal of the American Society of Nephrology* 3 (2008) 1, 253-260.

Glass, Ira, 'Canvassers Study Has Been Retracted' (version 24 April 2015), https://www.thisamericanlife.org/extras/canvassers-study-in-episode-555-has-been-retracted (26 July 2022).

Goolsbee, Austan, and Chad Syverson, 'Fear, lockdown, and diversion: Comparing drivers of pandemic economic decline 2020', *Journal of public economics* 193 (2021) 104311.

Greco, T., A. Zangrillo and G. Landoni, 'Meta-analysis: pitfalls and hints', *Heart, lung and vessels* 5 (2013) 4, 219-225.

Halasz, Judith R., 'The Ethics of Work: Productivity, the Work Ethic, and Bohemian Self-Determination', *Journal of Humanities and Social Sciences* 2 (2012) 4, 209-222.

Halme, Alex S., and Cara Tannenbaum, 'Performance of a Bayesian Approach for Imputing Missing Data on the SF-12 Health-Related Quality-of-Life Measure', *Value in Health* 21 (2018) 12, 1406-1412.

Hey, Spencer Philips, 'Ethical Challenges in Biomarker-Driven Drug Development', *Clinical Pharmacology & Therapeutics* 103 (2018) 1, 23-25.

Higgins, Julian P.T., Ian R. White and Angela M. Wood, 'Imputation methods for missing outcome data in meta-analysis of clinical trials', *Clinical trials* 5 (2008) 3, 225-239.

Homolak, J., I. Kodvanj and D. Virag, 'Preliminary analysis of COVID-19 academic information patterns: a call for open science in the times of closed borders', *Scientometrics* 124 (2020) 3, 2687-2701.

Huistra, Hieke, 'Wetenschappers publiceren veel te veel artikelen. Ja, ook over corona' (version 23 May 2020), https://www.trouw.nl/nieuws/wetenschappers-publiceren-veel-te-veel-artikelen-ja-ook-over-corona~b014972a/?referrer=https%3A%2F%2Fwww.google.com%2F (20 August 2020).

Hursthouse, Rosalind, 'Virtue Ethics' (version 8 December 2016), https://plato.stanford.edu/entries/epistemology-virtue/ (13 November 2021).

Journal of Trial and Error, 'Open Science rankings: yes, no, or not this way?' (version 15 June 2021), https://www.youtube.com/watch?v=TMGaNvo-SgM (15 August 2022).

Kidwell, Mallory C., Ljiljana B. Lazarević, Erica Baranski, Tom E. Hardwicke, Sarah Piechowski, Lina-Sophia Falkenberg, Curtis Kennett, Agnieszka Slowik, Carina Sonnleitner, Chelsey Hess-Holden, Timothy M. Errington, Susann Fiedler and Brian A. Nosek, 'Badges to Acknowledge Open Practices: A Simple, Low-Cost, Effective Method for Increasing Transparency', *PLoS biology* 14 (2016) 5, 1-15.

Kline, Rex, *Beyond Significance Testing: Statistics Reform in the Behavioral Sciences* (Washington 2002).

Knöchelmann, Marcel, 'Open Humanities: Why Open Science in the Humanities is not Enough' (version 20 March 2020), https://www.rug.nl/library/open-access/blog/open-humanities-why-open-science-in-the-humanities-is-not-enough-19-03-2020?lang=en (1 June 2021).

Knowles, Jenny, 'Preprints—The Future of Open Access Publishing?' (version 1 April 2022), https://blog.mdpi.com/2022/04/01/preprints-the-future-of-open-access-publishing/ (18 August 2022).

Koens, Lionne, Robine Hofman and Jos de Jonge, *What motivates researchers?* (The Hague 2018).

Kraut, Richard, 'Aristotle's Ethics' (version 2 July 2022), https://plato.stanford.edu/entries/aristotle-ethics/ (16 August 2022).

Kuhn, Thomas, *The Structure of Scientific Revolutions* (Chicago 1970).

KU Leuven, 'The benefits of Open Science' (version 18 December 2021), https://www.kuleuven.be/open-science/what-is-open-science/the-benefits-of-open-science (16 August 2022).

Kupferschmidt, Kai, 'Researcher at the center of an epic fraud remains an enigma to those who exposed him' (version 17 August 2018), https://www.science.org/content/article/researcher-center-epic-fraud-remains-enigma-those-who-exposed-him (26 July 2022).

Kwom, Diana, 'How swamped preprint servers are blocking bad coronavirus research' (version 7 May 2020), https://www.nature.com/articles/d41586-020-01394-6 (18 August 2020).
Lally, Phillippa, and Benjamin Gardner, 'Promoting habit formation', *Health psychology review* 7 (2013) sup1, S137-S158.

LeBel, Etienne P., Lorne Campbell and Timothy J. Loving, 'Benefits of Open and High-Powered Research Outweigh Costs', *Journal of personality and social psychology* 113 (2017) 2, 230-243.

Lenzner, Robert, 'Bernie Madoff's $50 Billion Ponzi Scheme' (version 12 December 2008), https://www.forbes.com/2008/12/12/madoff-ponzi-hedge-pf-ii-in_rl_1212croesus_inl.html?sh=2d62c979650b (16 August 2022).

Levin, Nadine, and Sabina Leonelli, 'How does one "open" science? Questions of value in biological research', *Science, Technology, & Human Values* 42 (2017) 2, 280-305.

Lewis, Colbi Lil, 'The Open Access Citation Advantage: Does It Exist and What Does It Mean for Libraries?', *Information Technology and Libraries* 37 (2018) 3, 50-65.

Lissa, Caspar van, 'Overheid, wees transparanter in de strijd tegen het coronavirus' (version 28 April 2021), https://www.nrc.nl/nieuws/2020/04/27/overheid-wees-transparant-in-strijd-tegen-het-coronavirus-a3997982 (17 July 2021).

Lupoli, Matthew J., Lily Jampol and Christopher Oveis, 'Lying because we care: Compassion increases prosocial lying', *Journal of Experimental Psychology: General* 146 (2017) 7, 1026-1042.

Macaluso, Benoit, Vincent Larivière, Thomas Sugimoto and Cassidy R. Sugimoto, 'Is Science Built on the Shoulders of Women? A Study of Gender Differences in Contributorship', *Academic Medicine* 91 (2016) 8, 1136-1142.

Mao, Xingjia, Lu Guo, Panfeng Fu and Chaun Xiang, 'The status and trends of coronavirus research: A global bibliometric and visualized analysis', *Medicine* 99 (2020) 22, 1-8.

McKiernan, Erin C., Philip E. Bourne, C. Titus Brown, Stuart Buck, Amye Kenall, Jennifer Lin, Damon McDougall, Brian A. Nosek, Karthik Ram, Courtney K. Soderberg, Jeffrey R. Spies, Kaitlin Thaney,

Andrew Updegrove, Kara H. Woo and Tal Yarkoni, Point of View: How open science helps researchers succeed', *eLife 5* (2016), 1-19.

Merriam-Webster, 'integrity' (n.d.), https://www.merriam-webster.com/dictionary/integrity (7 January 2022).

Merton, Robert K., 'The Normative Structure of Science', in: Norman W. Storer (ed.), *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago 1979) 267-278.

Merton, Robert K., *The Sociology of Science: Theoretical and Empirical Investigations* (Chicago 1973).

Miedema, Frank, *Open Science: the Very Idea* (Utrecht 2022).

Miller, Christian B., 'Honesty', in Walter Sinnott-Armstrong and Christian B. Miller (Eds.), Moral Psychology, Volume 5: Virtue and Character (London 2017) 118-135.

Milojević, Staša, Filippo Radicchi and John P. Walsh, 'Changing demographics of scientific careers: The rise of the temporary workforce', *Proceedings of the National Academy of Sciences* 115 (2018) 50, 12616-12623.

Mitchell, Terence R., and Amy E. Mickel, 'The meaning of money: An individual-difference perspective', *The Academy of Management Review* 24 (1999) 3, 568-578.

Montmarquet, James A., 'Epistemic Virtue', *Mind* 96 (1987) 384, 482-497.

Natural History Museum, 'Piltdown Man' (n.d.), https://www.nhm.ac.uk/our-science/departments-and-staff/library-and-archives/collections/piltdown-man.html (16 August 2022).

Nature Neuroscience, 'Pros and cons of open peer review', *Nature Neuroscience* 2 (1999), 197-198.

Naudé, Wim, 'Artificial intelligence vs COVID-19: limitations, constraints and pitfalls', *AI & Society* 35 (2020) 3, 761-765.

Nederlandse Organisatie voor Wetenschappelijk Onderzoek, 'Gehonoreerd innovatief onderzoek in COVID-19 Programma' (version 17 July 2020), https://www.nwo.nl/nieuws/gehonoreerd-innovatief-onderzoek-covid-19-programma (11 August 2020).

Nederlandse Organisatie voor Wetenschappelijk Onderzoek, 'NWO urges COVID-19 and related research to be made open access' (version 31 March 2020), https://www.nwo.nl/en/news-and-events/news/2020/03/nwo-urges-covid-19-and-related-research-to-be-made-open-access.html (9 July 2020).

open-access.network, 'Preprints' (version 11 July 2022), https://open-access.network/en/information/publishing/preprints#c17415 (18 August 2022).

open access.nl, 'Plan S' (n.d.), https://www.openaccess.nl/nl/in-nederland/plan-s (15 August 2022).

open access.nl, 'You share, we take care!' (n.d.), https://www.openaccess.nl/en/in-the-netherlands/you-share-we-take-care (12 August 2022).

Organisation for Economic Co-operation and Development, 'Making Open Science a Reality', *OECD Science, Technology and Industry Policy Papers* 25 (2015), 1-108.

Ottaviani, Jim, 'The Post-Embargo Open Access Citation Advantage: It Exists (Probably), It's Modest (Usually), and the Rich Get Richer (of Course)', *PLoS One* 11 (2016) 8, 1-11.

Pandit, Prasasti, 'The Transition within Virtue Ethics in the context of Benevolence', *Philosophia: International Journal of Philosophy* 23 (2022) 1, 135-151.

Pfefferbaum, Betty, and Carol S. North, 'Mental health and the Covid-19 pandemic', *New England Journal of Medicine* 383 (2020) 6, 510-512.

Pontika, Nancy, Petr Knoth, Matteo Cancellieri and Samuel Pierce, 'Fostering open science to research using a taxonomy and an eLearning portal', *Proceedings of the 15th international conference on knowledge technologies and data-driven business* (2015), 1-8.

Pradhan, Prashant, Ashutosh Kumar Pandey, Akhilesh Mishra, Parul Gupta, Praveen Kumar Tripathi, Manoj Balakrishnan Menon, James Gomes, Perumal Vivekanandan and Bishwajit Kundu, Uncanny similarity of unique inserts in the 2019-nCoV spike protein to HIV-1 gp120 and Gag (preprint on bioRxiv).

Quote Investigator, 'If You Want Jobs Then Give These Workers Spoons Instead of Shovels' (version 10 October 2011), https://quoteinvestigator.com/2011/10/10/spoons-shovels/ (16 August 2022).

Raish, Victoria, and Emily Rimland, 'Employer perceptions of critical information literacy skills and digital badges', *College & Research Libraries* 77 (2016) 1, 87-113.

Randall, Daniel L., and Richard E. West, 'Who cares about open badges? An examination of principals' perceptions of the usefulness of teacher open badges in the United States', *Open Learning: The Journal of Open, Distance and e-Learning* 37 (2022) 1, 65-83.

Rathenau Instituut, 'Time commitment and overtime of researchers' (version 26 July 2021), https://www.rathenau.nl/en/science-figures/personnel/university-staff/time-commitment-and-overtime-researchers (15 August 2022).

RELX, 'Annual Report and Financial Statements 2019', *RELX* (2019), 1-189.

Rubin, Hannah, and Cailin O'Conner, 'Discrimination and collaboration in science', *Philosophy of Science* 85 (2018) 3, 380-402.

Schalken, Arjan, 'Evaluatierapport pilot You share, We Take Care (publieke versie)', *Nationaal programma open science*, n.d.

Schreiber, Michael, 'A skeptical view on the Hirsch index and its predictive power', *Physica Scripta* 93 (2018) 10, 1-15.

Searle, John R., *Rationality in Action* (Cambridge 2003).

Shu Ling Yeo-The, Nicole, and Bor Luen Tang, 'An alarming retraction rate for scientific publications on Coronavirus Disease 2019 (COVID-19)', *Accountability in Research* 28 (2021) 1, 47-53.

Smith, Tara, 'Money *Can* Buy Happiness', *Reason Papers* 26 (2003), 7-20.

Smith, Tara, 'The Metaphysical Case for Honesty', The Journal of Value Inquiry 37 (2003), 517-531.

Soley-Bori, Marina, 'Dealing with missing data: Key assumptions and methods for applied analysis', *Boston University* 4 (2013) 1, 1-19.

Stapel, Diederik, *Faking Science: A True Story of Academic Fraud* (n.p. 2014).

Stapel, Diederik, *Ontsporing* (Amsterdam 2012).

Stodden, Victoria, 'Enabling reproducible research: Open licensing for scientific innovation', *International Journal of Communications Law and Policy* 13 (2009), 1-55.

Swan, Alma, The Open Access citation advantage: Studies and results to date (e-Print).

Tang, Min, James D. Bever and Fei-Hai Yu, 'Open access increases citations of papers in ecology', *Ecosphere* 8 (2017) 7, 1-9.
The University of British Columbia, 'What is an Open Workflow?' (version 25 October 2021), https://pose.open.ubc.ca/open-research/open-workflows/what-is-an-open-workflow/ (21 Juli 2022).

Turri, John, Mark Alfano and John Greco, 'Virtue Epistemology' (version 7 November 2017), https://plato.stanford.edu/entries/epistemology-virtue/ (6 October 2021).

Universiteiten van Nederland, 'Erkennen en waarderen van wetenschappers' (n.d.), https://www.universiteitenvannederland.nl/nl_NL/Erkennen-en-waarderen-van-wetenschappers.html (8 August 2022).

University of Jyväskylä, 'Publishing of preprints' (version 3 March 2020), https://openscience.jyu.fi/en/self-archiving/publishing-of-preprints (11 October 2020).

Wang, Jian, You-Na Lee and John P. Walsh, 'Funding model and creativity in science: Competitive versus block funding and status contingency effects', *Research Policy* 47 (2018) 6, 1070-1083.

Wiegman, Marcel, 'Diederik Stapel: 'Niemand hoeft mij aardig te vinden'' (version 14 September 2016), https://www.parool.nl/nieuws/diederik-stapel-niemand-hoeft-mij-aardig-te-vinden~b5b9f9d2/ (16 August 2022).

Wikipedia, 'Publish or perish' (7 February 2021), https://en.wikipedia.org/wiki/Publish_or_perish (20 February 2021).

World Health Organisation, 'Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV)' (version 30 January 2020), https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov) (18 January 2021).

World Health Organization, 'World experts and funders set priorities for COVID-19 research' (version 12 February 2020), https://www.who.int/news/item/12-02-2020-world-experts-and-funders-set-priorities-for-covid-19-research (8 July 2020).

Wyat, Sally, Staša Milojević, Han Woo Park and Loet Leydesdorff, 'Intellectual and Practical Contributions of Scientometrics to STS', in Sally Wyatt, S. Milojevic,, H. Woo Park, and L. Leydesdorff (eds.), *Handbook of Science and Technology Studies* (Cambridge 2016) 87-122.