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The University As Infrastructure of Becoming: Re-Activating Academic Freedom Through Humility in Times of Radical Uncertainty

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ABSTRACT

Traditionally, the field of science and technology studies (STS) considered the scientific laboratory as the central site of knowledge production and technological development. While providing rich analyses of the social construction of scientific knowledge and the role of non-human actors, STS scholars have often neglected the university – the very context in which laboratories themselves are embedded – as a relevant object of research. In this paper, we argue for re-introducing the university as a relevant category and object of analysis by using the notion of epistemic virtues to link epistemic culture – traditionally the focus of STS – and epistemic structure – traditionally the focus of higher education studies. Advancing this line of argumentation, we make three analytical moves. First, we explore academic freedom as a specific version of negative liberty that extends beyond disciplinary boundaries. We suggest that academics continuously negotiate academic freedom considering culturally and socially situated epistemic virtues such as objectivity and neutrality. Second, we introduce the notion of humility to revisit scientific knowledge production more generally and academic freedom in particular. Finally, we argue that practicing humility leads to enacting the university as an infrastructure of becoming otherwise, thereby enriching our understanding of universities as distinct and highly complex social spaces with a logic of their own.

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1. Introduction

Higher education institutions (HEIs) matter. As key knowledge-making infrastructures of the 21st century, they sit at the nexus of knowledge and power. They educate large proportions of the future workforce, host a wide range of research activities, own real estate across cities and regions, employ thousands of people, make their expertise available to wider sections of society and preserve knowledges of the past (Berman 2012; Frank and Meyer 2020). The COVID-19 pandemic provides a case in point for the central role of universities in shaping societies. Whether in developing life-saving vaccines, legitimizing the use and adoption of technologies or mediating between key policy-makers, HEIs illustrate highly intriguing prisms for investigating the intricate interplay of science, technology and society.

Universities come in different shapes and forms, advancing different configurations of the three key missions of teaching, research and innovation. Some mark themselves as globally networked,

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entrepreneurial institutions driving innovation-based economic growth, while others adhere to more traditional notions such as the 'ivory tower' and perceive themselves as autonomous bodies 'of self-governing professionals, accountable to and monitored by itself' (Baert and Shipman 2005, 159). In this paper, we propose a different understanding of HEIs that departs from traditional ideal types. We suggest viewing universities as *infrastructures of becoming* – i.e. socio-material spaces that are ontologically multiple and come to life by the complex interplay of epistemic practices, technological development, data circulation and scholarly context. By focusing on becoming, we suggest that these forces contain the possibility to become otherwise.

Interestingly, the field of science and technology studies (STS) has often neglected the university as a relevant object of research (Kaldewey, 2023; Sørensen and Traweek 2022). Since the 1970s, the focus has mainly been on the laboratory as the central site of scientific knowledge production and technological development (Knorr-Cetina 1999; Latour and Woolgar 1986). Ethnographically exploring the process of knowledge construction, scholars in the sub-field of laboratory studies have presented detailed analyses on how scientific 'facts' are made and what role non-human agents play in aligning the 'scientific' and the 'non-scientific'. While providing extremely rich methodological and analytical insights on the world-making power of science and technology and building the foundation of actor-network theory, the university – the very context in which laboratories themselves are embedded – has been largely neglected as a relevant object of research and analytical category.

Instead, other academic fields – most notably the multidisciplinary field of higher education studies (HEIS) (Harland 2012; Macfarlane and Grant 2012) – have focused explicitly on the university as a relevant agent in the social organization of knowledge. Rather than exploring science as practice and culture, higher education researchers have conceptualized universities predominantly as formal organizations. Concepts such as Slaughter and Leslie's (1997) 'academic capitalism' or Gibbons et al.'s (1994) 'mode 2' trace the increasingly applied, entrepreneurial and interdisciplinary nature of academic work and reflect on underlying recalibrations between science and society. More recently, scholars have introduced the notion of the 'civic university' in order to describe an organization that places its research and education in the service of the community (Goddard, Kempton and Vallance 2012). Crucially, what is missing from these accounts, however, is an examination of universities as highly complex, concrete and materialized places with multiple actors, diverse interests and practices of critique (Durán del Fierro 2023) that produce a strong internal logic of their own.

In this paper, we argue for re-introducing the university as a relevant category and object of analysis into STS by interrogating the relationship between epistemic culture and organizational context. Doing so, we explore academic freedom as a specific form of negative liberty and simultaneously as 'a specific institutionalized version of positive liberty' (Fuller 2023, 39) that allows us to link culture and structure. Advancing this line of argumentation, we make three analytical moves. First, we revisit 'academic freedom' as the fundamental condition of knowledge production that permeates disciplinary and organizational boundaries. Second, we introduce the notion of 'humility' in order to reactivate academic freedom. Third, we argue that practicing humility leads to enacting the university as an 'infrastructure of becoming', thereby enriching our understanding of universities as distinct and highly complex social spaces with a logic of their own. Conceptualizing the university as an *'infrastructure* of becoming', this paper brings STS and HEIS into conversation by acknowledging the co-productionist relationship between scientific communities and organizational context.

2. Two Points of Departure: Epistemic Virtues and Academic Freedom

2.1. Epistemic Virtues in Academia

Traditionally, the history of scientific knowledge is narrated in terms of the emergence of objective knowledge claims (Daston and Galison 2007). From this perspective, what makes objective knowledge possible is the suppression of 'some aspect of the self' (Daston and Galison 2007, 36). Despite attempts to 'suppress the self', scientific personae or epistemic

subjects, including their ways of seeing, knowing and behaving, still play an essential role in scientific research. This has not only been recognized by scientific communities themselves but also by critical approaches to science such as feminist epistemology, philosophy of science and anti-colonial literature (Bhambra et al. 2018; Harding 2008; Keller 1995). Indeed, research on 'scientific personae' is indicative of the importance of epistemic subjects in social studies of science (Daston and Sibum 2003; Niskanen, Bosch and Wils 2018). The scientist, as an epistemic subject, is irreducible to a mere passive or rational entity. Instead, they 'actively pursue knowledge by exercising specific capacities for searching and processing information' (Henning 2013, 2).

This implies that a key question must be addressed when examining scientific investigation: what has to be true about the self in order for objective knowledge claims to be possible? Assuming the importance of the self, scientific institutions like universities are increasingly paying attention to the professional identity of scientists, that is, subjects' ideals, interests, values, commitments, ethical standards, moral obligations and aspirations (Eteläpelto et al. 2014). It is regarded as vital to developing the scientist-subject beyond the limits of their knowledge base (Gabriel 2020). That is, scientists' skills and personal qualifications such as patience, tenacity and imagination have become an essential part of the development of knowledge within science communities (Henning 2013). However, as Daston and Galison (2007) point out, 'these qualities have been seen in most accounts of modern science as matters of competence, not ethics' (39). This means that skills and qualities are more than scientific practices and entail the cultivation of a certain kind of self.

A fundamental concept to understand how the self is transformed or identity negotiated within science is that of *epistemic virtues*. Daston and Galison (2007) define these virtues as 'norms that are internalized and enforced by appeal to ethical values, as well as to pragmatic efficiency in securing knowledge' (40–41). For them, objectivity, an often uncontested category in scientific practice, has become one of the most relevant epistemic virtues within scientific epistemology. Other virtues highlighted by the literature are honesty, accuracy, creativity (Ziche 2023), completeness and selectivity (Stevens, Wehrens and de Bont 2020), courage, temperance and generosity (de Bruin 2013). These virtues mold the self according to the demands emerging from epistemic cultures which are 'bonded through affinity, necessity and historical incidence' (Knorr-Cetina 1999, 1). For example, how objectivity in chemistry, astronomy or psychology is mobilized varies between these fields according to specific values, commitments and moral obligations.

However, what is of prime importance is that these virtues, as Paul and van Dongen (2017) point out, 'are not confined to specific disciplines' (1). That is, they are flexible enough to adapt to specific demands and, at the same time, robust enough to provide a common identity across disciplinary boundaries (Stevens, Wehrens and de Bont 2020). This happens because epistemic virtues 'are often imbued with moral, social, religious, and/or political meaning' (Paul and van Dongen 2017, 1). In that respect, epistemic virtues are always in the making: new virtues come into being while old ones are reconfigured. Although this resonates with a longstanding discussion on 'the epistemic unity of the sciences' (Galison and Stump 1996), epistemic virtues appear to move beyond the dichotomy of particular/universal and serve as an intermediate between culture and structure.

In that context, we want to bring back the question underpinning this conceptual paper: how can we re-connect epistemic cultures and university structures? Epistemic virtues offer some points of departure for this endeavor. They might be defined as cultural identity that molds the scientific self and creates a collective subject with a shared and recognizable identity across disciplines. They, therefore, contribute to understanding identity formation practices that extend beyond disciplinary boundaries. As Stevens, Wehrens and de Bont (2020) state, epistemic differences between disciplines are negotiated by appealing to shared epistemic virtues. That is to say, epistemic virtues not only provide a common identity across disciplines but also contribute to negotiating differences, conflicts, misunderstandings and tensions between disciplines (Heidler 2017). As such, these virtues provide a picture in which epistemic cultures and epistemic structures are connected meaningfully.

What is at stake here, then, is understanding how the transformation of these virtues redefines both the logic of epistemic cultures and university structures.

2.2. Academic Freedom

Academic freedom has a special status within society due to the historical place universities have held as centers of debate, inquiry and the development of new ideas and technologies (De Gennaro, Hofmeister and Fuller 2023; Lüfter 2022). In fact, the protection of academic freedom has been recognized by culture and law. Or, scientific outcomes depend on ensuring knowledge producers' freedom. What is at stake is the use of public reason free of external intervention, or what Berlin (2002) defined as *negative liberty*. Although some authors have described academic freedom as simply a tool, an essential one, for doing a job (Fish 2014), we argue that, regardless of how we understand or enact freedom, it is still the fundamental *condition* for the possibility of knowledge creation. It allows knowledge producers to generate and disseminate scientific outcomes *within* and *outside* the university.

Yet, academic freedom is not only a condition but also requires some conditions to exist – it needs to become real. In this article, we start from the observation that today, under the norms of the Western university (e.g. colonial, patriarchal and marketized), academic freedom depends on the mobilization of two epistemic virtues that require further critical examination: objectivity and neutrality. Traditionally, the former points to being free of internal biases (the suppression of subjectivity), while the latter from external elements (political intervention) – i.e. two versions of negative liberty. Thus, it is believed that academic freedom needs objectivity and neutrality because they secure independent enquiry and valid knowledge claims. However, it is possible to say that academic freedom is not only an abstract ideal culturally and legally recognized but also a value to be internalized and constantly cultivated by academics – i.e. it is always going-beyond-itself. In what follows, we want to justify these assumptions and provide an alternative approach (Section 4) to scientific practice which might help us link epistemic culture and university structure.

2.2.1. Two Conditions for Academic Freedom to Exist: Objectivity and Neutrality

Agazzi (2014) argues that objectivity is so relevant that it replaced truth in modern science. In other words, claims in science do not need to be necessarily *true* but *objective*, or as Connell (2019) puts it, 'truth is not defined by a single state of knowledge, but is a property of the practices through which knowledge is developed' (173). This is part of a broader process in science characterized by the transition from an emphasis on content to a focus on methods (Agazzi 2014). Yet, for Daston and Galison (2007), scientific objectivity is more than following formal and methodological requirements. It constitutes the effort to separate the knower and truth to advance knowledge in scientific investigation. This separation is traditionally referred to as the attempt to suppress subjectivity; that is, the values, personal views and emotions of knowledge producers. According to this view, willful interventions are seen as the most dangerous aspect of research. Knowledge is secure when claims are free of judgements, emotions and values. An extreme case is the current vision according to which some crucial research practices need to be automated using artificial intelligence or even conducted by 'robot scientists' (Hutson 2023). Therefore, what is at issue in modern science is not truth but the mediation between the knower and truth. Objectivity is the attempt to maintain this separation beyond methodological requirements.

According to the Stanford Encyclopedia of Philosophy, 'neutrality means that scientific theories make no value statements about the world'. This definition implies something crucial for the argument we are trying to make: the separation between the knower and society. The latter takes the form of the state, the market or any community of interest. This distance determines the manner in which knowledge is produced. What is relevant for neutrality is to avoid external interventions, or make possible what has been called negative freedom in higher education (Durán del Fierro 2023). This means that the knowledge produced within universities needs to be

free of particular interests. That is why the nineteenth and twenty-century university was widely grasped by use of the metaphor of the *ivory tower*. The premise underpinning the existence of this particular way of imagining the university was, and still is, that academics must follow their intellectual interests devoid of state, market and society. However, different legislative and institutional reforms aiming to secure the investment of public funds – e.g. quality assurance – have challenged the distance between the university and the state. This situation entails a struggle to exercise neutrality (Giupponi 2022).

Based on these considerations, it is possible to suggest that academic freedom, objectivity and neutrality are inseparable. However, how research communities enact them varies according to culture and changes in audit regimes. For example, Stevens, Wehrens and de Bont (2020) show how epistemic differences between data scientists and psychiatrists are negotiated through internalized norms about objectivity and certainty. Put differently, community members sometimes renegotiate the conditions for academic freedom to exist. Despite the multiple and sometimes contradictory attempts to recognize subjectivity (redefine objectivity) and reconnect universities with society (redefine neutrality), it seems that objectivity and neutrality still define some fundamental aspects of the scope of academic freedom and how research is conducted. Moving forward, we suggest that the conditions for academic freedom to exist need to be rethought in order to reconsider the role of subjectivity and society in knowledge production practices. Doing so, it is necessary to introduce another essential characteristic of academic freedom as a condition of knowledge production: the difference between abstract principles and practices.

2.2.2. Academic Freedom: An Enlightened Ideal and Institutional Practice

Abstract principles are established ideals – similar to Kant's a priori conditions or Weber's ideal types – guiding social action (Rose 1995). They are 'pure' rules that orient research practices. For example, according to Weber, bureaucracy should be driven by autonomy, impersonality and impartiality to achieve determined goals. These are the conditions of the possibility of policy-making within an institutional structure. The same can be said about academic freedom within universities. It is the abstract condition for the possibility of knowledge. These conditions are commonly shared values and they often become models of academic behavior through institutional protocols such as research integrity policies.

However, academic freedom is not only an abstract ideal but also an everyday practice enacted differently within the university. It represents a freedom that is to be achieved (Lüfter 2022). Despite the standardization of research practices, knowledge producers translate and interpret policy, social and institutional demands creatively (Ball, Maguire and Braun 2012). Those shared values or guidelines sometimes become the site of resistance rather than an orientation for action. The fact that freedom is in reality a *practice of freedom* (Foucault 1997) tells us something fundamental for our argument: freedom needs to be internalized and cultivated.

Therefore, it is possible to say that academic freedom, rather than an abstract ideal or the condition of the possibility of knowledge, is an epistemic virtue that is always a collective and an individual right. The way this virtue is enacted differs according to discipline and contingent challenges scientists face, but it can only be practiced in the context of a scholarly community and protected in an institutional setting. For example, scientists working in small groups using local equipment within the university experience particular freedom compared to those working in global networks using transnational research infrastructures outside of the university. The former have more control over data analysis and findings due to more restricted interactions, while those working on the periphery of the university have less freedom when collecting, analyzing and sharing data. Similarly, the debate about open science, which implies various challenges such as intellectual property and data confidentiality, illustrates how certain research practices might reconfigure academic freedom if they are influenced by commercial research (Mills 2018).

At the same time, academic freedom faces challenges that extend beyond disciplinary boundaries and relate to university structures. This shared experience is fundamental to our argument that

academic freedom might help reconnect epistemic cultures and university structures. Let us insist on this point to develop the next argument: academics across disciplines must internalize and cultivate the freedom they think secures knowledge production.

2.3. Performing Objectivity and Neutrality

Thus far, we have suggested that academic freedom cannot be understood as a mere normative principle or as judgment (Fuller 2023). It is enacted differently according to the epistemic virtues at play at a given time and culture. The question that arises is what role can epistemic virtues play in a context imbued with radical uncertainty. The actions of the UK Government's Scientific Advisory Group for Emergencies (SAGE) during the COVID-19 pandemic provide a helpful lens for grasping the dynamics of objectivity and neutrality in science.

Composed of the country's foremost specialists from academia and industry, SAGE constitutes a government body designed to advise the central government in case of emergencies. In the wake of the COVID-19 pandemic, SAGE was activated in January 2020 and led by Government Chief Scientific Adviser, Sir Patrick Vallance, and the Chief Medical Officer, Professor Sir Chris Whitty. It met over 100 times and acted as the official source of science advice. Despite hosting some of the world's leading universities, having a universal public health system that enjoys widespread citizen trust and well-established advisory structures, the UK's COVID-19 response and, particularly, SAGE, was widely perceived as having failed to provide sufficient science advice. As of July 2022, the UK reported a total of 22,883,995 confirmed cases and 180,718 confirmed deaths[1], making it one of the countries with the highest rates of COVID-19 incidence and mortality.

Tackling the COVID-19 pandemic, the UK government initially adopted an approach of 'following the science'. Defending his decision of not entering an early lockdown, former Prime Minister Boris Johnson, on 12 March 2020, declared: 'at all stages, we have been guided by the science, and we will do the right thing at the right time'[2]. The minimalist strategy was quickly abandoned when the UK, on 23 March, entered national lockdown. Throughout the pandemic, both the UK government and SAGE were heavily criticized for underestimating the severity of the virus and downplaying uncertainties. As a result of increasing distrust in public health messaging and fear of political interference, SAGE was challenged by an unofficial group called 'Independent SAGE[3]' ('InSage'). Chaired by former Chief Scientific Advisor, Sir David King, InSage pressed the Tory government to implement more stringent public health policies on social distancing, face coverings and lockdowns. In sum, the government's approach of 'following the science' – the seemingly linear push from science to policy – glossed over the strong intermingling of science and politics and denied the role of competing interests in navigating the pandemic (Bacevic 2020).

3. The Re-Emergence of Epistemic Humility in Science

The COVID-19 pandemic revealed the inherent contingencies involved in producing and disseminating scientific knowledge in times of radical uncertainty. Predictive methods of control and management – vaccines, masks, lockdowns and risk modeling – were met with public protest, conspiracy theories and populism. In what follows, we contend that the notion of humility confronts head-on humans' lack of perfect foresight by emphasizing the intimate relationship between facts and values, scientific knowledge production and normativity (Jasanoff 2004). Humility refers to a mode of knowledge-making that recognizes the inherent limits of prediction and control and calls for novel forms of public accountability. Rather than rendering issues more technical and 'scientific', expertise is thought of as opening up debate and creating space for reflection.

We suggest that the concept of humility – understood as both an epistemic virtue and epistemological lens – can help us re-explore academic freedom and provide intriguing paths for re-imagining the role of universities. The main argument put forward can be articulated as follows: re-introducing the university into STS means 're-exploring' academic freedom *through* the lens of

humility. Unpacking this claim, we will first elaborate on existing accounts in STS that have dealt with the notion of humility. Afterwards, we contend that the notion of humility can shed fresh light on modern sciences' role in *making* the world by prompting us to rethink existing 'politics of certainty'.

How can we make sense of humility in the context of science? In a 2012 Guardian article, British computer programmer Mike Taylor argued that 'science is enforced humility' (Taylor 2012). Science is described as a social system that is shaped by both individual and institutional compulsion to confront inherent fallibilities. Put differently, science must be open to possible errors and limitations as a condition of its own success (Lumbreras, Gismera and Oviedo 2023). While intuitive and non-controversial at first, this portrayal of science does not accurately mirror societal realities. Perceived as *the* key truth-making infrastructure in Western societies, scientific knowledge production was assumed to be guided by norms such as communism, universalism, disinterestedness, emotional neutrality, impartiality or organized skepticism (Kuhn 1962; Merton 1973). Conformity to these norms and epistemic virtues, it was suggested, guarantees the reliable and certified production of scientific knowledge.

The examples given above indicate the intricate relationship between knower, knowledge and society. Science refers not only to a repertoire of specific methods and a stock of accumulated knowledge but also to cultural values and norms of behavior. Scientific knowledge production cannot be separated from normativity. Building on this fundamental insight, sociological contributions have extended Merton's conceptualization of the ethos of modern science by emphasizing the existence of 'counter norms' (Mitroff 1974) such as irrationality and emotional commitment, and by reframing scientific norms altogether as 'vocabularies of justification' (Mulkay 1976). The latter seems particularly relevant in the context of this paper. Critically rethinking what has been described as the 'normative structure of science' (Merton 1973), Mulkay (1976) urges sociologists to 'conceive of science, not just as a community with special professional concerns and with normative components appropriate to those concerns, but also as an interest group with a dominating elite and a justificatory ideology' (654).

Further emphasizing the intimate relationship between science and power, Jasanoff (2003) introduces the notion of 'technologies of humility' to argue for a different relationship between scientific expertise, policy-making and the public. Complementing predictive technologies such as risk assessment or climate modeling, 'technologies of humility' denote 'methods, or better yet institutionalized habits of thought, that try to come to grips with the ragged fringes of human understanding – the unknown, the uncertain, the ambiguous, and the uncontrollable' (Jasanoff 2003, 227). In other words, Jasanoff theorizes humility in the context of scientific uncertainty by encouraging an understanding of science that moves beyond the 'speaking truth to power' model.

More recently, the so-called 'replication crisis' in the social, behavioral and life sciences (Hoekstra and Vazire 2021; Shrout and Rodgers 2018) has drawn new attention to how epistemic virtues such as humility can re-establish trust in science. Besides increasing the credibility of research and publication practices, Hoekstra and Vazire (2021) argue for re-establishing humility as a core value of the scientific ethos. Building on Whitcomb et al.'s (2017) definition of humility, they suggest that intellectual humility implies 'owning the limitations of [scientific] work by being transparent and non-defensive about them' (Hoekstra and Vazire 2021, 1602). More specifically, they stress the power of reviewers in increasing intellectually humble research articles by proposing a list of steps reviewers can take to increase humility. This includes abstracts which reveal the limitations of the study and the boundary conditions of the conclusion, as well as a discussion section that incorporates the statistical uncertainty of the results into the overall argument.

To sum up, existing accounts in STS have persistently emphasized the importance of norms and values in the social organization of scientific knowledge. However, humility – the acknowledgement of scientific uncertainties and the 'owning' of limitations in scientific work – rarely surfaced as an epistemic virtue guiding knowledge production. Instead, 'ignorance of ignorance' (Ravetz 1993) has

dominated the relationship between science and society. Only recently and in the wake of highly complex crises such as the climate crisis and pandemics have scientists started to re-establish the significance of humility in scientific knowledge production.

4. Reconnecting Culture and Structure: Reactivating Academic Freedom Through Humility

Acknowledging the tension-ridden relationship between objectivity and neutrality, we are now in a position to explore how humility shapes ways of seeing, knowing and making science. At this point, it is important to reiterate that scientific knowledge production is shaped by a variety of overlapping, co-constituting and sometimes colliding epistemic virtues. The notion of humility provides just one analytical point of access to re-explore academic freedom. One, however, we argue, that directly challenges objectivity and neutrality and, therefore, sheds new light on academic freedom.

4.1. From Presentation to Re-Presentation

Quintessentially, humility provides an alternative way of practicing science. It challenges the modern 'ontology of knowability' – i.e. 'the idea that the world is finitely knowable' (Pickering 2010) – and, instead, caters for an ontology of unknowability and becoming. Rather than *presenting* facts, humility encourages the *representation* of uncertainty, and, as a result, opens up space for exploration. This claim can be unpacked through the concepts of objectivity and neutrality. Objectivity necessitates the suppression of subjectivity. It constitutes a confrontation with the 'root of both knowledge and error' (Daston and Galison 2007, 374). Humility, in turn, implies a less radical engagement with subjectivity. It represents the acknowledgement of the self that is willing to ask what it doesn't know. It represents the recognition of 'unknown unknowns' and the partiality of scientific knowledge. Neutrality, on the other hand, requires the drawing of strict boundaries between science and society (Gieryn 1983). It necessitates the suppression of society. Humility, in turn, brings to light the intimate relationship between knower, knowledge and society. It reveals the social embeddedness of science and asks us to embrace transdisciplinary collaborations.

Building on the above considerations, the university can act as an 'infrastructure of becoming', linking subjectivity and society through the embracing of humility. The latter can be enacted both as an effective virtue guiding scientific knowledge production *within* the university as well as in the ways in which the university engages with the *outside* world. Taking the hype around artificial intelligence as an example and adopting an 'ontology of unknowability and becoming', humility unfolds in two ways. First, in the way that knowledge-making is approached: instead of viewing big data as a tool that helps to calculate risk – thereby suggesting controllability – big data can also be approached as a way of mapping uncertainty, thereby – self-reflexively – acknowledging a potential loss of control and viewing the social world as a space of exploration. Secondly, in the way that science communicates with society: rather than 'speaking truth to power', universities can tell public stories that explain how and why science is the way it is and what impact technologies such as big data might have on the ways in which we engage with the world. Becoming 'institutions of humility' – i.e. acknowledging the contingencies and uncertainties involved in scientific knowledge production – universities can play an important role in restoring trust in science.

4.2. Humility as a Practice of Uncertainty

How can humility challenge traditional performances of science? Building on the SAGE case above, we contend that humility must be conceptualized as a 'practice of uncertainty' (Scoones and Stirling 2020). Rather than upholding artificial separations between 'knower and truth' and 'knower and society', scientists must practice humility to re-explore indeterminacy as a space of possibility. Instead of striving for control, scientists must 'shift towards active advocacy of

qualities of doubt (rather than certainty), skepticism (rather than credulity) and dissent (rather than conformity)' (Scoones and Stirling 2020, 11). Crucially, practicing humility does not imply getting rid of objectivity and neutrality. Instead, it reactivates these traditional epistemic virtues by turning attempts of control into spaces of becoming. This claim can be further illuminated by deconstructing the relationship between academic freedom and humility in the context of the UK COVID-19 response and zooming in on how uncertainty structured the relationship between science and politics.

The first dimension – objectivity – can be illustrated by examining UK science advice in the early days of the pandemic. Highlighting how uncertainties in the virus doubling rate were downplayed in the advice by SAGE, Pearce (2020) points to how the conflation of knowledge production and knowledge use can lead to different perceptions of uncertainty. More specifically, he demonstrates the complexities arising when scientists are both knowledge producers (e.g. creating epidemiological models) and knowledge users (translating outputs into science advice). This point is crucial since it shows how scientists were most likely aware of the inherent uncertainties involved in modeling the spread of the virus – particularly when considering the poor data availability at the beginning of the pandemic – while, at the same time, presenting the virus doubling time of five to six days as reasonably certain (Pearce 2020; SAGE 2020). Put differently, uncertainty can result in role conflation, which, in turn, directly challenges objectivity as an epistemic virtue.

As for 'neutrality', SAGE and the UK government advanced a 'politics of certainty' by separating technoscientific progress from political intent. The Tory government's approach of 'evidence-based policy-making' 'denied the role of competing values in assessing highly uncertain evidence, and ultimately undermined the credibility of official expertise' (Jasanoff et al. 2021, 95). Rather than making transparent the various rationales involved in making decisions in a uniquely complex and poly-dimensional crisis, SAGE performed the scientific virtue of neutrality by downplaying uncertainties, thereby conveying a false sense of control. This clash between hubris and humility was reflected not least in the creation of InSage, which directly challenged the credibility of SAGE. While pushing for a more diverse and inclusive discourse on the role of science advice, however, the undergirding issue – the downplaying of uncertainty and artificial separation of science and politics – remained.

Re-activating objectivity and neutrality through the lens of humility helps to shift from an ontology of knowability to one of 'unknowability and becoming' (Pickering 2010). In other words, complexity and uncertainty are not encountered through enframing and stabilization but through revealing and processuality. This insight is crucial since it points to an alternative way of performing academic freedom. Applying this line of thought to the example given above, one arrives at a different, 'non-modern' (Pickering 2010) enactment of science. Rather than leading to role conflation, uncertainty can result in practicing humility and thus acknowledging the inherent contingencies of epidemiologic modeling in times of radical data unavailability. This, Pearce (2020) aptly remarks, 'could have opened up a wider range of policy options, and at least put on the agenda the rapid lockdown policy which some SAGE participants subsequently wished for' (4). Thus, rather than weakening the credibility of science, the shift towards a performative ontology of becoming 'normalizes' the inherent complexities involved in knowledge production, thereby increasing trust in science and the role played by universities today.

Making this claim, of course, is easier said than done. After all, one of, if not the greatest strength of powerful (Western) scientific institutions is to provide a sense of certainty. Crucially, though, a sense of certainty that is rooted in an ontology of knowability implies an impoverished imagination of control. Rather than engaging with the co-productionist relationship between knowledge and materiality as well as social values and normativity (Jasanoff 2004), performing this mode of control suggests walking away from intellectual fears such as subjectivity and ideology by artificially separating science and society. Instead, embracing an ontology of unknowability and becoming implies confronting those fears *through* humility.

4.3. The University as an Infrastructure of Becoming

How can the university be re-explored in the light of epistemic humility? Historically, the university represents a place where order – understood as an epistemic project – is both installed and contested. It is the locus of epistemic control – what knowledge is legitimate and who can produce it – and critique – challenging and resisting ways of knowing. The intersection of control and critique shows to what extent universities are a place of, so to speak, *disciplined becoming*. For example, Kuhn's (2009) historical analysis of scientific revolutions shows how epistemological consensus – scientific agreements – and paradigm shifts – innovation – play an essential role in advancing science and are fundamental to adequate scientific investigation to new contexts or environments.

However, the transformation – or becoming – at play is also ethical – i.e. a particular relation with oneself and others (Foucault 1991) motivates the transformation of epistemic cultures and university structures. For example, for Popper, a critical attitude towards knowledge – always testing what is taken for granted – is fundamental within scientific life (Fuller 2006). This attitude extends beyond epistemological consensus and instead emphasizes the need to cultivate epistemic virtues that fit with that general critical attitude. If we believe that humility plays a role in equipping epistemic subjects with values and practices that challenge the traditional performances of academic freedom, how can humility make the university an infrastructure of becoming beyond a *disciplined becoming*?

Larkin's (2013) definition of infrastructures as 'emerg[ing] out and stor[ing] within them forms of desire and fantasy' (329) points to something essential for our argument: infrastructures are in a permanent state of becoming since they are desire-driven. The symbolic spaces and temporalities embedded in these infrastructures depend on a form of life emerging from within them. Infrastructures 'create a sensing of modernity' (Mrázek 2002, 336–337) which is always lacking, incomplete and mutable. This state of becoming depends on epistemic subjects' values, ethical standards, moral obligations and virtues, all of which are in tension and permanently negotiated within the limits of these infrastructures. Therefore, we refer to 'infrastructures of becoming' as assemblages of epistemic desire and practice, aligning various human and non-human agencies and temporarily stabilizing social action.

This definition is in line with academic accounts that acknowledge the ontological multiplicity of universities, particularly the notion of universities as assemblages – not fixed objects – which form part of complex ecologies of scientific knowledge production (Bacevic 2019; Barnett 2011). Grasping universities as *infrastructures* that come into being through the performance of epistemic virtues such as academic freedom, we move beyond socio-spatial ideal types such as the 'civic university' that treat universities as mere containers of social action. Rather than conceptualizing universities as free-standing entities, the notion of 'infrastructure' accounts for the complex interdependencies between human and non-human agencies, global knowledge networks as well as the practice-based nature of scientific knowledge-making.

If academic freedom mediates epistemic subjects' desires and practices and, as a result, gives rise to the university as an infrastructure of becoming, the question then is to *what extent and in what sense humility reactivates academic freedom*. We want to provide a general answer as a starting point: humility contributes to moving from negative to positive freedom. Objectivity (the suppression of subjectivity) and neutrality (the suppression of ideology) are drawn from negative freedom – the principle of non-interference (Berlin 2002). Thus, while objectivity requires the absence of the knower's values, neutrality depends on the absence of external control.

How does humility contribute to understanding academic freedom as a form of positive liberty? According to Fuller (2023), the difference between negative and positive liberty lies in the right to be left alone (negative liberty) and the duty to be recognized (positive liberty). Positive liberty can be regarded as the 'mutual facilitation of members' (43), or drawing from Berlin, as 'people coming to realize their objective potential … the recognition of necessity' (43). Considering these differences, we can now provide a general answer: in order to make 'the duty

to be recognized' possible in academia, the cultivation of humility is required – together with changes in the political economy of knowledge production. We suggest that practicing humility can restore positive liberty in academia by nurturing a political *we* instead of propelling competition and individual productivity. As such, we arrive at a form of academic freedom that shifts the focus away from external interferences (subjectivity and ideology) and, instead, creates spaces of becoming in which individual and collective subjects strive to be in the desire of others (Durán del Fierro 2023).

Perhaps most importantly, humility might contribute to positioning oneself and one's knowledge at the borders of *uncertainty*, that is, developing the ability to fail or sacrifice positionality and knowledge deeply ingrained in our academic identity. To fully recognize oneself and others this way, epistemic subjects need to embrace fallibility, that is, the possibility that one's knowledge might be limited or flawed. Cultivating fallibility allows mutual recognition within academia as epistemic subjects are equipped with the ability to 'let go of the academic self'. Thus, epistemic humility reactivates academic freedom as an ethical practice, a new relation to oneself, others and knowledge, beyond judgment or epistemological practices merely concerned with knowledge. Instead of rendering possible the production of objective and neutral knowledge claims, humility facilitates the transformation of various human and non-human agencies.

5. Concluding Remarks

We can summarize the argument of this conceptual paper as follows: the existence of the modern Western university depends on securing *academic freedom* for knowledge to be produced and disseminated. In most cases, academics negotiate their freedom inside and outside universities through putting into practice two distinctive epistemic virtues: objectivity and neutrality. The consolidation of these epistemic virtues in everyday life and particular events, as the SAGE case demonstrates, has led to various questions about the role of experts in society, or more specifically, the extent to which *control* and *certainty* define scientific knowledge-making.

Following Jasanoff (2003), we introduce the notion of *humility* to argue for a different relationship between scientific expertise, policy-making and the public that moves away from traditional performances of science. This means adhering to a 'practice of uncertainty' that transforms how epistemic subjects relate to themselves, others and knowledge, that is, how they negotiate and enact academic freedom. The transformation of epistemic subjects' freedom through humility led us to re-explore the university as an *infrastructure of becoming*. The latter refers to the assemblage of practices, values, ethical standards and moral obligations that create the possibility for individual and collective subjects to become other-than-itself. Humility reactivates – i.e. becomes a new mediation between epistemic subjects, knowledge and society – how academic freedom is enacted – from negative to positive liberty – in a way that transforms epistemic cultures and university structures. In other words, practicing humility means enacting the university not as an institution of control but as an infrastructure of becoming.

In many ways, this paper aspires to start a conversation. There are a range of questions emerging from the conceptual analysis laid out above. Can institutional protocols capture epistemic virtues like humility? What novel forms of public accountability can emerge from exploring the university as an infrastructure of becoming? What would happen if universities told public stories that acknowledged the contingency of knowledge production thereby challenging the politics of certainty? This paper contributes to reimagining scientific practices in the 21st century by shedding new light on universities as highly relevant social spaces and assemblages of various practices, reasonings and materialities with a logic of their own.

Notes

1. Raynor de Best, 'COVID-19 cases and deaths per million in 210 countries as of July 13, 2022', Statista, https://www.statista.com/statistics/1104709/coronavirus-deaths-worldwide-per-million-inhabitants/
2. The full speech can be found here: https://www.gov.uk/government/speeches/pm-statement-on-coronavirus-12-march-2020
3. More information can be found here: https://www.independentsage.org

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References

Agazzi, Evandro. 2014. *Scientific Objectivity and Its Contexts: Evandro Agazzi*. Cham: Springer.
Bacevic, Jana. 2019. "With or without U? Assemblage Theory and (de)Territorialising the University." *Globalisation, Societies & Education* 17 (1): 78–91. https://doi.org/10.1080/14767724.2018.1498323.
Bacevic, Jana. 2020. "There's No Such Thing As Just 'Following the Science' – Coronavirus Advice Is Political." *The Guardian*, April 28, sec. Opinion. https://www.theguardian.com/commentisfree/2020/apr/28/theres-no-such-thing-just-following-the-science-coronavirus-advice-political.
Baert, Patrick, and Alan Shipman. 2005. "University Under Siege?: Trust and Accountability in the Contemporary Academy." *European Societies* 7 (1): 157–185. https://doi.org/10.1080/1461669042000327063.
Ball, Stephen J., Meg Maguire, and Annette Braun. 2012. *How Schools Do Policy: Policy Enactments in Secondary Schools*. London: Routledge.
Barnett, Ronald. 2011. *Being a University*. London: Routledge. https://www.routledge.com/Being-a-University/Barnett/p/book/9780415592680.
Berlin, Isaiah. 2002. *Liberty: Incorporating Four Essays on Liberty*. Oxford: Oxford University Press.
Berman, Elizabeth Popp. 2012. *Creating the Market University*. Princeton: Princeton University Press.
Bhambra, Gurminder K., Dalia Gebrial, and Kerem Nişancıoğlu. 2018. *Decolonising the University*. London: Pluto Press.
Connell, Raewyn. 2019. *The Good University. What Universities Actually Do and Why It's Time for Radical Change*. London: Bloomsbury.
Daston, Lorraine, and Peter Galison. 2007. *Objectivity*. New York: Zone Books.
Daston, Lorraine, and H. Otto Sibum. 2003. "Introduction: Scientific Personae and Their Histories: [1]." *Science in Context* 16 (1/2): 1–8. March. https://www.proquest.com/docview/205064106/abstract/56B657E6792A4332PQ/1.
de Bruin, Boudewijn. 2013. "Epistemic Virtues in Business." *Journal of Business Ethics: JBE* 113 (4): 583–595. April. https://doi.org/10.1007/s10551-013-1677-3.

De Gennaro, Ivo, and Hannes Hofmeister, and Ralf Lüfter, eds. 2022. *Academic Freedom in the European Context Legal, Philosophical and Institutional Perspectives*. Cham: Palgrave Macmillan.
Durán Del Fierro, Francisco. 2023. "On the Possibility of a Public Regime in Higher Education: Rethinking Normative Principles and Policy Frameworks." *Critical Studies in Education* 64 (2): 151–167. https://doi.org/10.1080/17508487.2022.2032234.
Eteläpelto, Anneli, Katja Vähäsantanen, Päivi Hökkä, and Susanna Paloniemi. 2014. "Identity and Agency in Professional Learning." In *International Handbook of Research in Professional and Practice-Based Learning*, edited by Stephen Billett, Christian Harteis, and Hans Gruber, 645–672. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-017-8902-8_24.
Fish, Stanley Eugene. 2014. *Versions of Academic Freedom: From Professionalism to Revolution. Rice University Campbell Lectures*. Chicago: The University of Chicago Press.
Foucault, Michel. 1991. "On the Genealogy of Ethics: An Overview of Work in Progress." In *Ethics. Essential Works 1954-84*, edited by Paul Rabinow, 1–329. London: Penguin Books.
Foucault, Michel. 1997. *Ethics: Subjectivity and Truth. Essential Works of Foucault 1954-1984*, edited by Paul Rabinow, Vol. 1. New York: New Press.
Frank, David John, and John W. Meyer. 2020. *The University and the Global Knowledge Society*. Princeton: Princeton University Press.
Fuller, Steve. 2006. *Kuhn Vs Popper: The Struggle for the Soul of Science*. Cambridge: Icon Books.
Fuller, Steve. 2023. "Back to the University's Future: The Second Coming of Humboldt." In *Evaluating Education: Normative Systems and Institutional Practices*, Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-36327-6.
Gabriel, Markus, 2020. *The Limits of Epistemology*. English ed. Translated by Alex Englander. Medford, MA: Polity.
Galison, Peter, and David J. Stump. 1996. *The Disunity of Science: Boundaries, Contexts, and Power*. Stanford: Stanford University Press.
Gibbons, Michael, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott, and Martin Trow. 1994. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: SAGE Publications.
Gieryn, Thomas F. 1983. "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists." *American Sociological Review* 48 (6): 781–795. https://doi.org/10.2307/2095325.
Giupponi, Belen Olmos. 2022. "Academic Freedom from the Perspective of the United Kingdom." In *Academic Freedom in the European Context: Legal, Philosophical and Institutional Perspectives*, edited by Ivo De Gennaro, Hannes Hofmeister, and Ralf Lüfter, 241–257. Cham: Springer International Publishing, Palgrave Critical University Studies. https://doi.org/10.1007/978-3-030-86931-1_10.
Goddard, John, Louise Kempton, and Paul Vallance. 2012. "The Civic University." In *Universities, Cities and Regions for Knowledge and Innovation Creation*, Routledge. https://www.routledge.com/Universities-Cities-and-Regions-Loci-for-Knowledge-and-Innovation-Creation/Capello-Olechnicka-Gorzelak/p/book/9781138903753.
Harding, Sandra. 2008. *Sciences from Below: Feminisms, Postcolonialities, and Modernities*. Durham: Duke University Press. https://doi.org/10.1215/9780822381181.
Harland, Tony. 2012. "Higher Education as an Open-Access Discipline." *Higher Education Research & Development* 31 (5): 703–710. https://doi.org/10.1080/07294360.2012.689275.
Heidler, Richard. 2017. "Epistemic Cultures in Conflict: The Case of Astronomy and High Energy Physics." *Minerva* 55 (3): 249–277. September 1. https://doi.org/10.1007/s11024-017-9315-3.
Henning, Tim ed. 2013. "Knowledge, Virtue, and Action: Essays on Putting Epistemic Virtues to Work." In *Routledge Studies in Contemporary Philosophy*, 51. New York: Routledge.
Hoekstra, Rink, and Simine Vazire. 2021. "Aspiring to Greater Intellectual Humility in Science." *Nature Human Behaviour* 5 (12): 1602–1607. October 28. https://doi.org/10.1038/s41562-021-01203-8.
Hutson, Matthew. 2023. "Hypotheses Devised by AI Could Find 'Blind Spots' in Research." *Nature*. November 17. https://doi.org/10.1038/d41586-023-03596-0.
Jasanoff, Sheila. "Technologies of Humility: Citizen Participation in Governing Science." *Minerva* 41 (3): 223–244. (September 1, 2003). https://doi.org/10.1023/A:1025557512320.
Jasanoff, Sheila ed. 2004. *States of Knowledge*. London: Routledge. https://doi.org/10.4324/9780203413845 .
Jasanoff, Sheila, Stephen Hilgartner, J. Benjamin Hurlbut, Onur Özgöde, and Margarita Rayzberg. 2021. "CompCore Interim Report." January 12. https://compcore.cornell.edu/wp-content/uploads/2021/03/Comparative-Covid-Response_Crisis-Knowledge-Politics_Interim-Report.pdf.
Kaldewey, David, ed. 2023. "Wissenschaftsforschung." In *Sozialwissenschaftliche Einführungen*, 5. 1st ed. Boston: De Gruyter.
Keller, Evelyn Fox. 1995. *Reflections on Gender and Science*. 10th anniversary ed. New Haven: Yale University Press.
Knorr-Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.
Kuhn, Thomas S. 1962. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
Kuhn, Thomas S. 2009. *The Structure of Scientific Revolutions*. 3rd ed. Chicago: University of Chicago Press.
Larkin, Brian. 2013. "The Politics and Poetics of Infrastructure." *Annual Review of Anthropology* 42 (1): 327–343. https://doi.org/10.1146/annurev-anthro-092412-155522.

Latour, Bruno, and Steve Woolgar. 1986. *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press.

Lüfter, Ralf. 2022. "Academic Freedom: To What End? Notes on the Ethical Dimension of Scholarship." In *Academic Freedom in the European Context: Legal, Philosophical and Institutional Perspectives*, edited by Ivo De Gennaro, Hannes Hofmeister, and Ralf Lüfter, 55–74. Cham: Springer International Publishing, Palgrave Critical University Studies. https://doi.org/10.1007/978-3-030-86931-1_3.

Lumbreras, Sara, Laura Gismera, and Lluis Oviedo. "How a Humbler Science Becomes a Better Science." *Religions* 14 (1): 64. (January 3, 2023). https://doi.org/10.3390/rel14010064.

Macfarlane, Bruce, and Barbara Grant. 2012. "The Growth of Higher Education Studies: From Forerunners to Pathtakers." *Higher Education Research & Development* 31 (5): 621–624. https://doi.org/10.1080/07294360.2012.719283.

Merton, Robert K. 1973. "The Normative Structure of Science." In *The Sociology of Science: Theoretical and Empirical Investigations*, edited by R. K. Merton, 267–278. Chicago: University of Chicago Press.

Mills, Michael D. 2018. "Who Owns Your Data? Part III Challenges to Academic Freedom." *Journal of Applied Clinical Medical Physics* 19 (5): 328–329. August 13. https://doi.org/10.1002/acm2.12443.

Mitroff, Ian I. "Norms and Counter-Norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists." *American Sociological Review* 39 (4): 579. https://doi.org/10.2307/2094423.

Mrázek, Rudolf. 2002. *Engineers of Happy Land*. Princeton: Princeton University Press.

Mulkay, Michael J. 1976. "Norms and Ideology in Science." *Social Science Information* 15 (4–5): 637–656. https://doi.org/10.1177/053901847601500406.

Niskanen, Kirsti, Mineke Bosch, and Kaat Wils. "Scientific Personas in Theory and Practice – Ways of Creating Scientific, Scholarly, and Artistic Identities." *Persona Studies* 4 (1): 1–5. (May 4, 2018). https://doi.org/10.21153/ps2018vol4no1art748.

Paul, Herman, and Jeroen van Dongen, eds. 2017. "Epistemic Virtues in the Sciences and the Humanities." In *Boston Studies in the Philosophy and History of Science*. 1st ed. Cham: Springer International Publishing.

Pearce, Warren. 2020. "Trouble in the Trough: How Uncertainties Were Downplayed in the UK's Science Advice on Covid-19." *Humanities and Social Sciences Communications* 7 (1): 1–6. October 13. https://doi.org/10.1057/s41599-020-00612-w.

Pickering, Andrew. 2010. *The Cybernetic Brain: Sketches of Another Future*. Chicago: University of Chicago Press.

Ravetz, Jerome R. 1993. "The Sin of Science: Ignorance of Ignorance." *Knowledge* 15 (2): 157–165. https://doi.org/10.1177/107554709301500203.

Rose, Gillian. 1995. *Hegel Contra Sociology*. London: Verso.

SAGE. 2020. "SAGE 16 Minutes: Coronavirus (COVID-19) Response, 16 March 2020." https://assets.publishing.service.gov.uk/media/62541e6d8fa8f54a91f19c36/S0384_Sixteenth_SAGE_meeting_on_Wuhan_Coronavirus.pdf.

Scoones, Ian, and Andy Stirling. 2020. *The Politics of Uncertainty: Challenges of Transformation*. 1st ed. London: Routledge. https://doi.org/10.4324/9781003023845.

Shrout, Patrick E., and Joseph L. Rodgers. 2018. "Psychology, Science, and Knowledge Construction: Broadening Perspectives from the Replication Crisis." *Annual Review of Psychology* 69 (1): 487–510. January 4. https://doi.org/10.1146/annurev-psych-122216-011845.

Slaughter, Sheila, and Larry L. Leslie. 1997. *Academic Capitalism: Politics, Policies and the Entrepreneurial University*. Baltimore: John Hopkins University Press.

Sørensen, Knut H., and Sharon Traweek. 2022. *Questing Excellence in Academia: A Tale of Two Universities*. London: Routledge.

Stevens, Marthe, Rik Wehrens, and Antoinette de Bont. 2020. "Epistemic Virtues and Data-Driven Dreams: On Sameness and Difference in the Epistemic Cultures of Data Science and Psychiatry." *Social Science & Medicine* 258:113116. August 1. https://doi.org/10.1016/j.socscimed.2020.113116.

Taylor, Mike. 2012. "Science Is Enforced Humility." *The Guardian*, November 13. sec. Science. https://www.theguardian.com/science/blog/2012/nov/13/science-enforced-humility.

Whitcomb, Dennis, Heather Battaly, Jason Baehr, and Daniel Howard-Snyder. 2017. "Intellectual Humility: Owning Our Limitations." *Philosophy and Phenomenological Research* 94 (3): 509–539. https://doi.org/10.1111/phpr.12228.

Ziche, Paul. 2023. "Creativity and Genius As Epistemic Virtues: Kant and Early Post-Kantians on the Teachability of Epistemic Virtue." *Metaphilosophy* 54 (2–3): 268–279. https://doi.org/10.1111/meta.12612.