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Universities as Anarchic Knowledge Institutions

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ABSTRACT

Universities are knowledge institutions. Compared to several other knowledge institutions (e.g. schools, government research organisations, think tanks), research universities have unusual, anarchic organisational features. We argue that such anarchic features are not a weakness. Rather, they reflect the special standing of research universities among knowledge institutions. We contend that the distributed, self-organising mode of knowledge production maintains a diversity of approaches, topics and solutions needed in frontier research, which involves generating relevant knowledge under uncertainty. Organisational disunity and inconsistencies should sometimes be protected by institutional structures and procedures in order for research universities to best serve their purpose as knowledge institutions. The quality control for the knowledge produced stems from knowledge fields, clusters of knowledge and research that exist beyond the confines of individual organisations. The diversity of epistemic contributions is therefore kept in check by the order imposed by the internal logic of science as a social practice. Our argument provides a new defence for the autonomy of research conducted at universities.

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1. Introduction

Universities are knowledge institutions, organisations whose purpose centres around knowledge. Other examples of knowledge institutions include schools, libraries, government research institutes, intelligence agencies and think tanks. Our focus is on modern research universities, which emerged in early 19th century Germany, with the model adopted and developed in national variations around the world (Anderson 2004; Cole 2010; Levine 2021; Menand, Reitter, and Wellmon 2017). Such research universities are characterised by the presence of pure and applied research across the breadth of academic disciplines, research-led teaching and a high proportion of postgraduate research programmes, high levels of external income and an international perspective (Taylor 2006). Research universities create and implement new knowledge, impart it to students and solve problems using it. Compared to many other knowledge institutions, research universities can, however, appear to follow a peculiar, even dysfunctional, organisational logic. Speaking in many voices, the organisation does not appear capable of converging on consensus opinions; researchers appear only partially committed to the organisational agenda, often acting more like private entrepreneurs. Organisational resources are not allocated to resolving a well-determined set of problems, and there is often no agreement even on the quality of the solutions reached. Such

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freedom of research has been viewed with suspicion throughout history by some of those with political power.

In past decades, these misgivings have taken the form of concerns over organisational inefficiency. Various managerial reforms (Shepherd 2018) have been implemented in universities around the world, often introducing auditing measures and strengthening the role of central administration. The (critical) literature on the reforms is extensive (e.g. Amann 2003; Berman 2014; Edwards and Roy 2017; Fuller 2016; Gillies 2008; Hallonsten 2021; Holmwood and Marcuello Servós 2019; Kuusela et al. 2021; Mirowski 2011), and this article does not intend to describe such reforms in detail. This is because the phenomenon we want to focus on is not the managerial reforms as such, but the concerns over inefficiency that have given rise to them: the idea of universities as inefficient organisations. We approach the question of how research universities should be organised from the perspectives of institutional epistemology and the social epistemology of science. Starting from the concept of knowledge, and how knowledge work is characteristic of universities, we probe its implications on the desirable institutional organisation of universities. In doing so, we argue that the apparently anarchic features of universities are not necessarily a weakness. Rather, they reflect the special standing of research universities among knowledge institutions.

Two meanings of 'institution' should be distinguished: institutions as (a) large *organisations*, formally structured social units or entities (e.g. universities, states, corporations), or as sets of (b) *social practices* (e.g. science, laws, economies) governed by explicit and implicit rules and norms. We believe that universities as knowledge institutions can only be understood if we view them as organisations embedded in the social practices of science, namely when we take both notions into account (cf. DiMaggio and Powell 1983). Although our focus in this paper is on research universities as knowledge institutions in the sense of large organisations (a), we will argue that in order to understand the purpose of these organisations, we must keep in mind the aims of the (b) social practice that universities are part of. In the more abstract sense, the institution of science as a social practice is generally taken as striving for the generation of knowledge or the acquisition of truth (Goldman 1999, 221). Widely accepted values in academia, often taken to follow from such aims, include autonomy, freedom and the pursuit of knowledge for its own sake (Miller 2010; Origgi 2018). Knowledge and truth are obviously not the sole aims of universities as organisations focused on knowledge, nor their main function as higher education organisations.¹ Research conducted at universities is expected to resolve societal challenges, bring about economic growth and so on, while university education sustains a skilled workforce and, hopefully, brings about self-discovery and individual development. On a more cynical note, through exclusive admission procedures and their monopoly on granting degrees, universities can be seen to uphold societal privileges, maintain expert guilds and reproduce epistemic elites (e.g. Delanty 1998; Holmwood and Marcuello Servós 2019). Regardless of the view one takes, it is clear that universities are uniquely positioned in societies because despite their independence, they interact and connect with all other major institutional domains, and are capable of simultaneously carrying multiple, even contradictory meanings, making them very flexible as actors (Eaton and Stevens 2020; Stevens, Armstrong, and Arum 2008).

For the purposes of this article, we adopt what we will call *the cognitivist view of universities*. According to this view, the main goal of research universities as organisations (hereafter referred to simply as 'universities') is to further the aim of science² as a social practice, that is, to generate knowledge and seek truth. This decision has the obvious consequence that the conclusions we draw in this article will be conditional upon the cognitivist assumption. We believe that such an assumption is, however, a sensible one to make. Unlike other suggested functions of universities, it is generally agreed that the pursuit of truth and knowledge is a central goal – or the primary goal – of academic research (Delanty 1998). Even though we focus on research, we do not wish to underplay the importance of teaching at universities: we recognise that teaching students (and disseminating knowledge to societies through them) as well as training new researchers are core functions of

universities. As an ever higher proportion of the population has entered higher education since the mid 20th century, this role has increased in prominence (Kerr (1963) 2001).³ However, our focus in this paper is on the kind of knowledge that universities generate, and the institutional preconditions for creating such knowledge. Our question is: if we view a university as an organisation in the pursuit of new knowledge, what follows from this in terms of how universities should be organised?

Recent decades have seen several trends that challenge the original ideal for modern research universities. Hallonsten (2021) observes that there is currently considerable pressure on science to demonstrate its productivity and usefulness to society — pressure which is based on the assumptions that the main function of universities is to produce innovation for economic growth, and that they are unable to do so efficiently without incentives and reforms regarding their funding and governance structures.⁴ In the UK, concerns over efficiency resulted in quasi-market thinking being introduced to the public sector during the Thatcher era (Amann 2003; Gillies 2008). According to Origgi (2018, 219), science increasingly resembles entrepreneurial activity due to factors such as the prominence of bibliometric indicators (e.g. journal impact factor and the h-index), the introduction of audits and other quality control mechanisms into national academic systems and the ‘publish or perish’ logic, resulting at least partly from the increased emphasis on measurable performance.⁵ Recently, the focus of auditing practices has shifted towards trying to measure the social impact of research (Derrick 2018). Origgi (2018, 228) argues that these new dynamics are driven by commercial logic and serve to increase the value of productivity indicators, rather than furthering the view of science ‘as a calling devoted to the advancement of knowledge’. Such devotion has also been challenged by universities’ heightened management of intellectual copyrights. The interest on commercial value challenges the role of knowledge as the sole aim of research and the Mertonian norm of disinterestedness reflecting such role (Cole 2010, 170). This has led to concerns about the commercialisation of science harming the practice of science (Mirowski 2011).⁶

The special features of universities as knowledge institutions, discussed in the sections below, all stem from the freedom and autonomy of scientific research, more so than from the (economic) autonomy of universities as organisational actors. We will argue that when the institutional infrastructure supports research driven from the grassroots by the curiosity of scientists, it serves the core purpose of universities (i.e. the pursuit of truth and knowledge) better than if it would directly aim for research with a societal impact and/or commercial purposes. When it comes to how research should be organised, universities should not aim to become organisations with centralised top-level planning and neat division of labour.⁷ While we do not deny that modern research universities are clearly managed institutions, our argument conflicts with the management trend that tries to make universities more like large (bureaucratic) business corporations, a direction that they have been pushed towards by governments and market forces mainly due to concerns over inefficiency. Instead, our argument suggests that the somewhat anarchistic nature of universities as knowledge institutions should be embraced. In sum, in this article we present an instrumental argument for the autonomy of research conducted at universities. We refer to the argument as instrumental because it does not defend autonomy by starting from the intrinsic value of new knowledge as such, or by building on the rights of those conducting research. Instead, we contend that the autonomy of research enhances the university’s ability to serve its broadly agreed-upon societal function. In summary, our article’s main contribution is theoretical rather than descriptive: we propose a new line of argument in defence of the ethos of the modern research university.

We begin with a theoretical characterisation of the processes that can give universities the appearance of dysfunctional institutions. After that, we explain why the anarchistic features are not a weakness, but rather a reflection of how universities are at the frontier of creating new knowledge. Then, by introducing the concept of *knowledge fields*, we conceptualise the ways in which order is established within scientific research activities. Tension exists between the institutional domains of knowledge fields and universities as organisations. We argue that understanding the dynamic between the two domains makes it possible to reconcile the apparent contradiction between the somewhat anarchic functioning of the organisation when it comes to knowledge and the ideal of collective rationality in scientific research.

2. University as a Dysfunctional Organisation?

Compared to several other knowledge institutions (e.g. government research organisations, schools), universities have some unusual organisational features. Cohen, March and Olsen (1972) maintained that organisational decision-making in universities is far from what is suggested by the rational choice model. According to the rational model, an organisation can be seen as a vehicle for solving problems. A decision situation consists of (1) a well-defined problem requiring attention, (2) a set of possible actions generated as potential solutions (the choice set) and (3) the consequences of those actions. Based on the evaluation of the possible consequences, a rational decision-maker chooses the best action according to (4) a decision rule.

As an example, consider the task of hiring a new dean for a faculty (cf. Olsen 2011). The rational model portrays the task as a well-defined decision situation where the most suitable individual is chosen from a group of candidates who are compared according to clearly defined criteria. Obviously, the rational model is a strong idealisation. Large organisations are not mechanistic machines, where individual actions steadily and predictably unfold based on a master plan. Rather, they are often somewhat messy entities, where numerous viewpoints and motives coexist. Individual role-occupiers or sub-groups often advance their own agendas in addition to the collective agenda (or instead of it). Official procedures, such as voting and committees, are accompanied by unofficial debates and compromises between members (Hess 2018). Due to such considerations, Little (2020) has suggested that the choices of individual actors are only imperfectly directed by the authority structure and that the organisation might have poor overall direction. Even the best organisational design cannot guarantee consistency and rationality. Therefore, according to Little, disunity and inconsistency can only be minimised, not eliminated.

According to a model presented by Cohen, March and Olsen (1972) – and apparently acknowledged by management consultants concerned about efficiency – decision-making at universities departs particularly strongly from the rational ideal. The actual decision processes at universities are often not characterised by any of the aforementioned features (1–4): The set of possible actions is typically open-ended (~2) and not known beforehand. The consequences of different actions are often unknown (~3). There is often no agreed-upon criteria for evaluating the consequences (~4), often even no agreement about what the original problem was (~1) and, consequently, sometimes no consensus – even after actions have been taken – on whether the problem was solved or not. As an example, consider again the task of hiring a new dean. Olsen (2011) describes an episode at the University of California, Irvine, in which the hiring process showed several chaotic features. Instead of proceeding according to the rational model, decisions were driven more by constraints on time and participation than by rational calculation. Members of the search committee attended the meetings irregularly and decision-making was influenced by ambivalent non-verbal communication during the meetings, such as head nods. Ultimately, the process ended with none of the potential candidates being chosen and the head of the search committee taking the position of the dean.

Research processes at universities have similar anarchic features. According to the rational model, research proceeds linearly from (1) formulating the problem, (2) choosing appropriate methods to (3) analysis of results and (4) a decision on whether the hypothesis has been confirmed or perhaps falsified. However, Martin (1981) argued that the research process also has properties of an *organised anarchy*: first, research problems are not always chosen for theoretical reasons. Instead, problems are often taken up because of personal concerns of researchers, or for economic or other socio-political reasons. Secondly, the actors in the field have no agreed-upon set of preferences. Instead, each typically follows their own agenda, navigating opportunities like an academic entrepreneur (cf. Bourdieu 1975). Methods, instruments and technology used for solving problems are often borrowed from neighbouring fields, sometimes with the opportunistic aim of simply finding ways of applying available methods; problems to be solved can be chosen not because they are the most pressing ones, but because applicable methods happen to be available in the field. Finally, participation in the research process is fluid: researchers come and go, some join the field only for graduate

studies, some fail to obtain funding or employment and only a minority of actors engage in research in the long term. As a result of all these factors, the portfolio of active research projects in a university department can differ significantly from the one that would have been produced by centralised rational planning.

In their article, Cohen and co-authors put forward the garbage can model of organisational decision-making as a description of the functional logic of organised anarchies. Instead of viewing organisational decision-making as a rational process, they portray an organisation as consisting of three relatively independent streams, with components of each floating around in a kind of Brownian motion: (i) problems looking for solutions, (ii) solutions looking for problems to solve and (iii) decision-makers looking for work. In the model, decision-making follows an opportunistic logic: the three streams come together when a decision situation (e.g. hiring personnel, funding call, positive project funding decision) arises. Decision situations are the metaphorical garbage cans into which available problems and solutions get thrown and from which decisions occasionally emerge.⁸

The Cohen, March and Olsen (1972) depiction of the anarchistic decision process, inspired by their own experiences of academic life, albeit dated and caricature-like, still rings true. This applies both when we look at decision-making within the university administration and at decisions involved in research: actors do not always share a set of agreed-upon preferences; they constantly face various demands on their attention and are only partially committed to the organisational agenda. Furthermore, Cohen and colleagues' claim that the processes at university and consequences of decisions are often not clearly understood by participating actors appears plausible in light of our own anecdotal evidence. In administrative processes in particular, university personnel are often involved in decision processes at a late stage without being given the opportunity to develop an in-depth understanding of the background and implications of issues being decided (Kuusela et al. 2021). Yet despite not consistently pursuing a set of goals, the institution is far from paralysed: by reacting to opportunities, time pressures and availability of resources, decisions are made and problems solved.

3. Institutional Knowledge: Operating vs. Shared

The anarchic nature of the university organisation also manifests in the domain of knowledge: universities exhibit major discrepancies between what the leaders know and what the university as an organisation knows. This is especially true if we refer to the administrative leaders. Universities could not be run without the administrative facilities and infrastructure, but both administrative and academic leaders typically have relatively weak control over what, precisely, is being researched. Knowledge might be shared (horizontally) among researchers, but not (vertically) between the researchers and their (non-academic) superiors. Consequently, the leaders are only vaguely aware of what the institution knows: knowledge within universities does not accrue the higher up we go in the organisational hierarchy. Is this a case of poor knowledge management and a symptom of inefficiency, or is there another reason for this organisational feature?

At this point, it is useful to consider what is meant by saying that an organisation knows something. For this purpose, we introduce the distinction between *operating knowledge* and *shared knowledge* (Hormio 2022). Shared knowledge refers to knowledge that is widely shared within a group of individuals (even all the actors within an organisation). Shared knowledge is required for things like the smooth running of a particular operation or for coherence of message in a report commissioned from a think tank. However, shared knowledge within large organisations is relatively scarce because of an internal division of cognitive labour. It is economical for an organisation to consist of groups of experts that can work together when needed, as this allows for a wide range of skills and expertise. The capacity of an organisation to have broad and deep knowledge is based on its ability to pool knowledge from various individuals and sources. Operating knowledge refers to knowledge held by individual actors (e.g. experts, research groups) about something specific, be that a domain, topic or question. With operating knowledge, you know how to do something specific in

either a practical sense, or you possess expert knowledge of something in a theoretical sense, or both, which makes you an operative member in terms of that knowledge within your organisation. Examples of operating knowledge are a climate researcher who knows how to build a device that measures the carbon concentration in the atmosphere or a historian who knows about the specifics of the Indus Valley Civilisation. Operating knowledge can also resemble distributed cognition, where various distinct subtasks contribute to an overall task. In these cases, the operating knowledge is held jointly by the researchers working on the topic and contributing to the research. This is the case with complex scientific experiments, like those conducted at CERN's particle physics laboratory (Bird 2014).

With a high level of specialisation, fragmentation of knowledge inside an organisation is to be expected, meaning that no one person knows what the institute itself knows about a given topic. For example, operating knowledge on a particular experiment or line of research resides usually at the level of the researchers, whereas the laboratory leaders might not possess it, at least not in the same detail. What is crucial is that to count as organisational knowledge, the knowledge must be attached to an organisational structure of roles and lines of communication. Such a structure can make knowledge more broadly available when required. Requiring all knowledge to be shared knowledge within a large organisation would be implausible, as humans have limited cognitive capacities. However, one potential downside of operating knowledge is that it can be difficult to access (e.g. researchers working on somewhat obscure issues with relative autonomy). It is up to the organisation to determine what kind of knowledge can remain operating knowledge and what should become more robust shared knowledge. The transmission and dissemination of knowledge can turn operating knowledge into shared knowledge.

Compared to other knowledge institutions, universities seem to have an *excess of operating knowledge* and relatively little shared knowledge, which can make them appear fragmented and even quarrelsome compared to other knowledge institutions, such as think tanks and vocational schools. This raises the question, however, of whether universities should be seen simply as somehow dysfunctional, or at least as less than ideally effective organisations. Universities are rich in operating knowledge thanks to self-governing (quasi-autonomous) researchers engaging in a search for knowledge in their narrow areas of expertise. These experts can disagree among themselves and the overlap between their knowledge bases is limited. We will argue that it is not always desirable to try to minimise such disunity and inconsistencies. This is a consequence of the kind of knowledge institution that the university is.

4. Characteristics of Universities as Knowledge Institutions

Universities differ from other types of knowledge institutions, such as private research centres and polling companies, in at least four ways.⁹ Firstly, universities aim to produce knowledge as a public good. Knowledge produced at universities is, after publication, open for everyone to use, scrutinise and improve upon (although this does not always happen in practice because much research is still behind expensive paywalls or protected by patents). Secondly, in comparison to 'task-funded' knowledge institutions such as think tanks and consultancies, universities have a mandate to pursue knowledge for its own sake. In other words, not all knowledge generation at universities needs to be justified by its direct economic or societal impact. Nor does knowledge generated at universities need to directly serve as grounds for organisational decision-making, as would be the case, for example, when a firm conducts business analysis to steer its behaviour in the market. Thirdly, it is characteristic of universities that teaching is based directly on research. This distinguishes universities from other schools offering education at lower levels and gives researchers the possibility to train their successors. Finally, the kind of research conducted at a university distinguishes it from several other knowledge institutions. Although applied research and research and development (R&D) work are also carried out at universities, basic research, which is driven by curiosity and the aim to advance knowledge, is a key part of

the research university mandate – such universities operate at the knowledge frontier, attempting to push the boundaries of our actual knowledge (Bush [1945] 2020).

The above is not meant to serve as a definitive list of all the characteristics of universities as knowledge institutions, but it covers sufficient ground to distinguish the key characteristics. Although none of these features alone distinguishes a university from other knowledge institutions, we believe that their conjunction does warrant a unique position in the field of knowledge institutions. Furthermore, these features, especially the last one, go some way towards explaining the apparent ineffectiveness of universities as organisations, exemplified in anarchic decision-making processes and excess operating knowledge.

First, we believe that the nature of a university as a knowledge institution is compatible with a high operating-to-shared knowledge ratio.

There seems to be a requirement for at least some degree of coherence in the output of knowledge institutions, and this requires shared knowledge. For example, if a report commissioned from a think tank included widely different viewpoints on a topic, this might be confusing and unhelpful for the users of the report. Similarly, it might hamper the education of school children if they are taught conflicting things on the same topic by different teachers. In both of these cases, it seems that the knowledge institutions must rely on shared knowledge to fulfil their missions. Such constraints do not apply to university teaching and research outcomes. The teaching offered at universities aims to support intellectual autonomy and critical thinking skills in students. Being faced with different, sometimes conflicting, viewpoints expressed by different experts corresponds to a common epistemic situation in the real world. We suggest that from the perspective of reliability of knowledge, universities should often have a higher tolerance for different views on a topic than other knowledge institutions. After all, as argued by Longino ([1990] 2020), (epistemic) diversity is a precondition for the functioning of the critical argumentation process underlying objectivity, meaning that the interaction between different views often leads to better epistemic results (see Rolin et al. 2023).

Knowledge creation in research also benefits from a diverse pool of operating knowledge. Predominance of operational knowledge over shared knowledge may, in fact, be a *precondition* for the kind of intellectual activities conducted at universities. Compare measuring solar radiation from meteorological purposes with the research efforts involved in trying to capture the first image of a black hole. Whereas in the first case the research problem is well-defined and delimited, the second case is an example of *frontier research* (European Commission High-Level Expert Group 2005), which leads to new discoveries and operates mostly in the domain of the unknown — until a problem is solved, the path to a solution remains out of sight. Measuring solar radiation addresses a *known unknown* (the spectrum of sunlight from radiation across different wavelengths), whereas frontier research is faced with *unknown unknowns* (i.e. knowledge that is beyond anticipation: something we are not even aware of being ignorant about at a specific point in time, Roberts 2013).

Unknown unknowns give rise to a *value assessment problem*. We explain the problem below but, preliminarily, it can be described as follows: the relevance of a research contribution is determined by the epistemic context (Anderson 1995). Future epistemic contexts lie beyond our current knowledge. It is therefore difficult, often impossible, to reliably anticipate what kind of theories or findings, research questions or research approaches will appear relevant or valuable in the future. In curiosity-driven frontier research, resource allocation decisions are future oriented, meaning that we do not care only about the current value of an epistemic contribution, but primarily about its future value. Since such information is not available to an organisational decision-maker, decision-making cannot proceed according to the rational model (see Section 2). The required information is simply not available. In practice, resource allocation decisions tend to be myopic. The future value of an epistemic contribution is incorrectly estimated on its past or current value, leading to a conservative bias (cf. Stanford 2019).

At least one claim in the argument above calls for further discussion. Even if we primarily care about the future value of epistemic contributions, what reasons do we have to expect that such

values vary significantly across epistemic contexts? Why would the value of a solution to a research problem not be constant over time and in different settings? Research on scientific problem-solving, recombinant innovation and cognitive diversity provide some evidence for such a claim.

As suggested by Page (2008), scientific progress often results from changing perspective, and the search for research-worthy problems is a crucial part of scientific research activity (Simon 1989). But how should the value of a research question be assessed when the full relevance of questions is often only revealed in a future epistemic situation? For example, carbon dioxide concentration in the atmosphere has been measured since 1958 by the Scripps Institution of Oceanography. The data gathered has become known as the Keeling Curve, providing the longest continuous data on CO₂ concentration. However, even after climate change science became more prominent in the media and public debates some 20 years ago, this did not immediately translate into general awareness of how climate change will affect poverty, migration, local food production, water security and so on. Such issues were not at the forefront when the means to measure concentration was first developed and implemented to gauge whether the concentration was rising steadily relative to the amount of fossil fuel burned. In other words, although the research question concerning the concentration of CO₂ in the atmosphere is now regarded as being of utmost relevance, its wide-ranging implications were not foreseen when the question was first posed and the earliest data collected.

A similar argument can be made for the products of the scientific research process. The history of science and technology includes numerous examples of 'solutions looking for problems', where not all resources generated by the research process solve a currently significant problem. Instead, such a problem may only arise in the future. For example, the rapid development of mRNA vaccines against COVID-19 was made possible by several decades of basic research on synthetic mRNA (Dolgin 2021). Or consider AI infrastructure: graphics processing units (GPUs), originally used only to speed up graphics processing in computer games, have become the workhorse of machine learning systems.

Last but not least, members of the scientific community contribute to the collective research process in diverse ways. When the societal or epistemic situation changes, overlooked methods or marginal research fields may come to have unprecedented epistemic value. In general, there is empirical and theoretical evidence of the importance of social and cognitive diversity for the research process (cf. Smaldino et al. 2023; Sulik, Bahrami, and Deroy 2022).

These examples suggest that the value of resources (research questions, solutions and cognitive styles) in frontier research is variable. We suggest that a fitting metaphor for this can be found from biological evolution: preadaptations, parts of organisms (i.e. lungs, wings, ears) that do not have adaptive significance in the normal environment but which come to have adaptive significance in a new environment (Kauffman 2000, x). In a similar way, the relevance of a research question, solution or method may only be revealed in a new context, where it is combined with the correct set of other components and environmental factors. In this sense, the value assessment problem is a consequence of the nature of the research process operating at the boundaries of actual knowledge.

What, then, should we make of the value assessment problem? How is it connected to the high operating-to-shared knowledge ratio and its relevance to frontier research? One possible conclusion is a pessimistic one, according to which rational resource allocation in a frontier research process is not possible. Another lesson recommends modesty and diversification in the face of uncertainty. Research questions, solutions and cognitive styles – the three flows constituting an anarchic research field (see Section 2) – can all be viewed as 'raw material' or epistemic resources to be wisely managed. Given uncertainty about the future needs of research, sufficient reserves or repertoires of such resources are a precondition for the epistemic sustainability of the research process (Bush [1945] 2020; Cohen and Levinthal 1990; Hess and Ostrom 2007; Kuhn 2011). Thus, the anarchic features of the organisation of university research are not a weakness. Instead, they may reflect the preconditions for the epistemic sustainability of frontier research.

5. Knowledge Fields

In the previous section, we argued that the nature of the research process in frontier research provides a good reason for diversification. This does not mean that we promote something along the lines of Feyerabend's ([1975] 2010) methodological anarchism. Letting all flowers bloom is neither an accurate description of university research nor a good normative guideline to follow. University research is conducted with limited resources and difficult resource allocation choices must be made. However, our argument suggests that decisions on which frontier research should be conducted should be made in a multipolar manner and not centrally.¹⁰ Importantly, such choices should be made by researchers themselves, both on their own and through peer review. In this section, we discuss how science as an institution (in the sense of social practice) performs epistemic quality control on the knowledge produced within universities as organisations through what we will call *knowledge fields*, clusters of knowledge and research. A knowledge field comprises the operative members in a research field (i.e. the experts on a particular topic or a set of questions), who interact directly and/or through means such as publications and conferences relevant to that set of questions. In other words, knowledge fields are made up of scientific peers and the social structure around them. The order provided by knowledge fields is a necessary component in our view of autonomous research: anarchy is not sufficient for autonomy – the internal order ('nomos') reigns at the level of knowledge fields. We do not claim that they work perfectly (we discuss some of the problems later in this section), but they do function as epistemic sources of order in science.

Knowledge fields are typically international, sometimes interdisciplinary and cut across different universities. Importantly, scientific knowledge is created not just within research groups in a particular university, but also between individual researchers and research groups across different universities. Although universities may appear to have little shared knowledge, shared knowledge is not rare in science. Rather, in the age of hyperspecialisation, shared knowledge is increasingly found within a group of experts specialising in a question or an approach. The narrow operating knowledge of one or only a few researchers within a university might be shared knowledge within a knowledge field, for example, how archeologists studying the material culture of Neanderthals will know how to analyse pigments found on ancient bone fragments to confirm the presence of red ochre. The closest reference points for many researchers – the colleagues that work on the same questions or know the most about the issue – can thus be found outside one's own university. These cross-organisational, often international, networks are fundamental for understanding how scientific knowledge is created.¹¹ After all, even when academic knowledge is bound to the local or national contexts, it is still usually disseminated internationally through journals and books, and at conferences and seminars (although there are geographical power discrepancies on what research gets high visibility).¹² It is mainly within this international arena that the anarchic features of universities as organisations are kept in balance by the established social and epistemic practices of science. This means that although the decision processes at universities often display the anarchic features discussed in the previous sections, scientific knowledge production proceeds in a much more orderly, logical fashion. In other words, while universities as organisations might be somewhat anarchic, the institution of science is governed by various internal rules activated mostly within knowledge fields.

Our analysis is inspired by the tradition of field theory. An early analysis of the functioning of fields was provided by Bourdieu (1975), who describes a scientist's choices about the area of research, methods and the place of publication as strategic moves within a field populated by scientific peers, constituted by the distribution of power between them. Bourdieu (1971) also described intellectual fields as being constituted by a system of power lines of social relations, with agents as forces that determine the specific structure of the field at any given moment in time.¹³ To better understand the functioning of these fields, it is useful to employ Fligstein and McAdam's (2012) notion of strategic action fields (SAFs), which they argue are the fundamental units of collective action in society. Actors within a strategic action field interact with each other

under a set of common understandings about its purposes, the relationships within the field and its rules (Fligstein and McAdam 2012). These actors can be individuals or collectives. We conceptualise knowledge fields as a particular form of SAFs. This fits well with Fligstein and McAdam's original idea of all collective actors being composed of SAFs, which are meso-level social orders without fixed boundaries. They describe how you can find SAFs nested within each other like Russian dolls, with many smaller SAFs to be found within a larger SAF. In the case of science, we can find scientific disciplines consisting of several sub-fields. Although we do not suggest that knowledge fields correspond with disciplines, it is useful to illustrate the idea of nesting SAFs with them. For example, philosophy contains branches like epistemology, ethics, logic and metaphysics, and within these you can find sub-branches such as formal epistemology, feminist epistemology or social epistemology, and further sub-specialities within them. On the other hand, a knowledge field could overlap with many disciplines, like is the case with questions within fields such as sustainability science or network science.

We would like to add to the original SAF analysis that the more or less organisationally informal SAFs (institutions understood as sets of social practices) can overlap and cross-cut with different collective actors (i.e. institutions as organisations): knowledge fields can include actors from many organisations, and the members of an organisation often identify with different knowledge fields.¹⁴ By organisationally informal, we refer to SAFs that do not necessarily correspond to any formal organisational structure (think of a loose collective consisting of leading experts in research topic X, instead of a university department). Knowledge fields vary from very informal and unstructured to those that also include more formal components, such as scientific associations (like the International Social Ontology Society or the Society for the Advancement of Behavioral Economics). However, even when they contain these more formal components, the membership of a knowledge field is not decided by these associations. To become a member of a knowledge field, it is neither necessary nor sufficient to pay the membership fees of such scientific societies. The nature of knowledge fields as informal institutions is reflected in how membership in an SAF is mostly based on subjective standing, rather than certain objective criteria, with some members possessing more power than others (Fligstein and McAdam 2012).

We argue that what is distinctive about knowledge fields is that the members are all peers (at least formally): the authority of their judgements crucially depends on them belonging to the same SAF. According to Bourdieu (1971, 1975), when it comes to scientific authority, a position in the field can only be acquired through recognition by others, as claims of legitimacy depend on one's position in that field. Authority, in turn, grants a scientist the capacity to speak and act legitimately in scientific matters. It is this reputational capital, this judgement of peers which determines the value of research, rather than market demand or the opinions of experts outside the circle (Origgi 2018, 232).¹⁵ While academic disciplines can include guild-like features, such as official membership in professional structures (like a bar association for legal scholars, or a medical body, for example) that come with their own rules and disciplinary procedures (for bad professional conduct, etc.), knowledge field is a wider notion, where the main currency is credibility of the researcher (e.g. Bourdieu 1975; Whitley 2000). The more other researchers put faith in you and your research, the more central figure you are likely to become within a knowledge field. This valuing of reputation within a field orients researchers to compete over credibility above other incentives and is one of the strengths of analysing the phenomena through fields, rather than disciplines, as it can incorporate the power dynamics within a knowledge field in its explanations.¹⁶

From a field-theoretic perspective, research is a power game. More generally, academia feeds on reputational capital, with symbolic rewards of eminence built into its institutional structures (Bourdieu 1975; Kitcher 1993; Latour & Woolgar 1986; Merton 1973; Origgi 2018), although there is variation across fields (Whitley 2000). Goldman (1999, 260) speculates that two motives drive scientific research, 'the desire for personal scientific knowledge and the desire for credit'. Such mixed motivations are not necessarily bad for the quest for knowledge, as reputation among other researchers can act as a spur to improve upon earlier scientific knowledge. Although we

agree with Fligstein and McAdam (2012) that knowledge about power relationships is important for being able to interact within a field, the interaction is more than just about competition. There is certainly competition within knowledge fields, but it can also be to the mutual advantage of all actors involved. Knowledge fields are also sites for innovation, collaboration and learning from one another. Importantly, however, this need not conflict with the cognitivist view of science and universities: as long as the norms, rules and practices within a field (and across fields) are appropriate, the resulting activities can lead to desirable epistemic outcomes (cf. Kitcher 1993, Ch. 8)

One can find substantial differences between knowledge fields: some fields are more settled than others, with more consensus within the group about what is at stake and what the rules are. We would expect to find more settled examples around scientific disciplines that have long histories and established lines of questioning, such as oncology or international law. When it comes to frontier research, it is natural to assume that the field is more nebulous or only beginning to form, such as quantum computing. Here there would be very little shared knowledge even between the experts (and possibly little agreement over what credence should be given to which claims and which experts). Instead, emerging knowledge fields may sometimes be held together by paradigmatic exemplars or boundary objects, shared targets of interest between actors with sometimes widely different backgrounds, competencies and beliefs (Bowker and Star 2000). These are not the only situations where we would expect to find considerable disagreement between experts, however. When a paradigm shift is underway, there will be a great deal of conflicting operating knowledge. The same applies when a formerly unified research field splits into sub-fields. All these and similar situations can result in much disagreement between experts. If such experts are operative members of the same institution, it is possible that the disagreement will spill outwards and result in disharmonious institutional narratives about a subject.

Importantly, knowledge fields are the site for epistemic quality control. Such control is typically implemented in the practices of peer review, but also embodied in networks of trust and reputation. While there are many differences between knowledge fields on things like publication culture, all academic knowledge fields share two features: (1) reputation as capital and (2) the role of peer review. Peer review is an integral part of academic life, where contested and conflicting opinions around a concept or a topic can play out (Derrick 2018, 2). Quality control in research happens through peer review of publications and funding applications, and through the partly overlapping mechanisms of trust and reputational capital. In all of these ways, knowledge fields are the main reference group for many researchers. Knowledge fields are the context in which academic competition takes place, but they are also sites for innovation, collaboration and learning from one another as noted above. Researchers within a knowledge field occupy different and ever-changing roles in relation to one another, sometimes acting as judges, sometimes as collaborators and often as producers of knowledge.

We believe that the notion of knowledge fields is also useful for analysing the epistemic and social pathologies of academic research. The explicit and implicit power relations between members affect the functioning of knowledge fields in many ways. Some gatekeepers misuse their positions, going beyond the incumbents-challengers dynamic (Fligstein and McAdam 2012) that is to be expected. The best ideas and research do not always gain the recognition they deserve due to explicit or implicit biases, with issues like gender, race, nationality, social networks and even personal antipathies playing a part. Myopic biases can make it harder for non-mainstream research to get published or funded, with many important research ideas revealed only with the passing of time.¹⁷ Some actors can also wield too much reputational power compared to the epistemic merits of their research. For example, success during the early stages of a career (often thanks to support from senior advisers and high-status institutions) gives scientists a cumulative advantage, as their reputation allows them to attract greater recognition from peers and better resources (Bak and Kim 2019; DiPrete and Eirich 2006). Some conversations that have important societal implications stay within the knowledge field even when they should be debated more widely.

For these reasons and others, we do not suggest that knowledge fields are in any way perfect or equal sites for knowledge production. There is room for improvement within the practices of science, including peer review, and we believe that by increasing the equality of epistemic opportunities, the epistemic quality and robustness of knowledge is also improved. However, knowledge fields function as quality controls for science in a way that local or even national organisational incentives could not: they, not universities as organisations, are the locus of epistemic order in scientific research. Yet it should also be noted that although knowledge fields are autonomous, they do not exist independently of universities as organisations. University affiliation is often a prerequisite for membership in a knowledge field. It is very hard to make a name for oneself as an independent, non-affiliated researcher, and different affiliations give researchers widely different starting positions and social capital for entering knowledge fields.

6. Conclusions

We have argued that universities are somewhat anarchic organisations, but only if we look at the situation from the viewpoint of organisational management logic. Such a vantage point is not ideal for discussing how research at universities should be organised, however, as it fails to take into account the special features of universities as knowledge institutions. Universities should contain reserves of research questions, solutions and researchers with different profiles, allowing useful operating knowledge to appear from unexpected sources. The broad self-autonomy of researchers is the best way we have to realise the societal purpose of universities.

Quality control for the knowledge produced in a university derives from knowledge fields that exist beyond the confines of individual organisations. Therefore, to understand the epistemic implications of interventions and efficiency measurements, they should be considered in light of the juxtaposition of 1) the university as an organisation that centres around knowledge and 2) the knowledge fields as informal social institutions. Knowledge fields operate through two partly overlapping main mechanisms: reputational capital and peer review. Both rely on the shared knowledge of peers within a knowledge field, but also on the friction that somewhat different operating knowledge brings to the discussion. Frontier research, in particular, but also other research conducted under uncertainty, requires wide reserves of operating knowledge, which is curated through the order imposed by knowledge fields. The diversity of epistemic contributions is therefore kept in check by the order imposed by the internal logic of science as a social practice. The functioning of knowledge fields relies on the autonomy and self-containment of researchers, as they are the producers, users and judges of new knowledge. This affords knowledge fields a certain idiosyncratic, autonomous logic.

This shift of perspective adds a new angle to the recent trends in university management. Although managerial interventions have sometimes improved the economic autonomy of universities and made them more governable, this does not necessarily translate into their being better, or more rational, institutions from the epistemic viewpoint. One cannot understand the epistemic implications of various management interventions — such as attempts to streamline organisational decision-making, limit the diversity of research via top-down strategies, coordinate and homogenise the expression of scientific viewpoints in line with the brand of a university, excessive auditing practices or impact measurement — without taking into account the way that the knowledge fields operate. In particular, our argument in this paper suggests that interventions leading to the thinning of (sometimes conflicting) operating knowledge and diversity should be approached with caution, as they threaten the long-term sustainability of (frontier) research. If the autonomy of researchers is capped too tightly through pre-research planning, funding constraints and impact measurements, universities will lose some of their power as knowledge institutions. A university may well be a streamlined and efficient organisation, but this does not necessarily mean that it is also an organisation that best serves the pursuit of truth and knowledge. Rather, what is important is the autonomy of the researchers within universities. Some organisational disunity and inconsistencies

should perhaps be protected by structures and procedures in order for universities to best serve their purpose as knowledge institutions.¹⁸

Notes

1. Nor have the precise meanings of these notions ever been universally agreed upon. The definitions of both knowledge and truth are topics of perennial debates in philosophy. That said, as our central sources indicate, truth and knowledge are regarded as core epistemic values (or goods) in science (e.g. Delanty 1998; Goldman 1999), ideals which to strive towards. We take such statements at face value – our argument does not hang on any particular analysis of the concepts of truth and knowledge.
2. Here, for the lack of a better word, we use ‘science’ in a broad sense (German ‘Wissenschaft’) that also covers research in the humanities and social sciences.
3. We also acknowledge that there are substantial differences between universities when it comes to how much research time is allocated to the academics, but as our interest is in the knowledge created at universities, correspondingly our focus is on research universities.
4. This challenge is not a new one, but instead, has always characterised modern research universities: the emergence of the Humboldtian university model can be seen as a response to the closure of Mediaeval universities in revolutionary France, and Napoleon’s creation of the system of *écoles*, designed as an efficient system for educating state bureaucrats (Anderson 2004; cf. Delanty 1998, 7–8). As Levine (2021, 19–20) points out, the Humboldtian model relies on a contract with the state where the university’s values, autonomy first and foremost, are justified by a promise of eventual practical applications of the generated knowledge.
5. Berman (2014) argues that the push towards making universities more like for-profit businesses, and encouraging science to generally become more market-oriented, reflects the wider trend of economisation in society, where the economics discipline is given epistemic authority and calculative devices for empirical analysis are thriving.
6. Universities have also increasingly adopted more centralised science communication practices, such as wanting to appear to funders as one organisation with one voice, which can put pressure on the academic freedom of individual researchers to speak up, especially on controversial issues (Reijula and Ylikoski 2020; Välvirronen 2008).
7. Universities obviously need centralised management to ensure the day-to-day running as an organisation, etc. Our argument focuses only on how research should be organised.
8. Cohen, March and Olsen (1972) emphasise that problem resolution is only one possible outcome of a decision situation. Alternatively, problems may be solved by accident or oversight, or they may simply drift to another choice situation, a process they call ‘flight’. Conversely, even if a decision is reached, it does not necessarily solve the original problem.
9. The combination of these principles dates back to the 19th-century classic German university model, and despite differences between the different national research ecosystems, such principles still constitute the fundamental values of research universities (see Cole 2010, Ch.1; Delanty 2001, 151; Menand et al. 2017, 1–9). In the Bologna Declaration 1988, various European universities committed to a similar list of principles. See www.magna-charta.org/magna-charta-universitatum/mcu-1988.
10. Central planning includes processes like universities streamlining their research focus through top-level decision-making and instruments like strategic funding. Such things can have their place in the overall research portfolio, but should not be the main channel for research funding.
11. This phenomenon pre-dates the modern technologically interconnected world, with scientific correspondence between researchers mapping out global intellectual fields at the time when letters were still the means of global correspondence and exchange of scientific ideas (Gingras 2010).
12. The ideal of universalisability of academic knowledge fits the reality of some fields better than others. For example, mathematical findings or research in natural sciences can cross borders fairly easily. However, social sciences research conducted in North America and Europe attracts the most visibility and this concentration of citations of journals from these two regions can endanger interest in local research topics specific to peripheral regions (Mosbah-Natanson and Gingras 2014). We thank an anonymous referee for pushing us to say more on this. There are also huge differences in terms of access to journals between universities in different countries, but also within countries, depending on the resources that a university has at its disposal. Open access publishing is often touted as a part of the solution, but the currently large fees associated with making your publications available openly mean that it will be out of reach for most researchers without institutional funding set aside for this purpose.
13. Bourdieu (1971) differentiated the role of the intellectual from that of the scholar; the intellectual field is concerned with creativity and is governed by laws that centre around competition for cultural legitimacy.
14. A researcher can be a member of more than one knowledge field if their research focuses on more than one topic or set of questions. Researchers who identify with more than one knowledge field, at least to some degree,

can act as important mediators of knowledge between different fields of expertise, and can also end up creating new knowledge fields. On such bridging and knowledge brokering, see e.g. Hargadon (2002).

15. Origgi (2018, 235) draws a distinction between the quest for acknowledgement from peers and emulation of masters, both motivated by admiration for rivals, and the new form of academic competition, where you want to surpass your rivals. She likens this to the commercial system imposing its profit-seeking logic on a field that had traditionally been driven by reputation among peers.
16. Although much of scientific knowledge is invariably a public good, since the 1980s, patents and intellectual property rights have become an increasingly important revenue source for universities. However, IPR and patents alone are not enough to create status through reputation, as scientists gain their credence and recognition from their peers within knowledge fields. In their review, Gläser and Laudel (2016) show that it is unclear what effects industry links and the secrecy around IPR and patents have on research, as the evidence is mixed.
17. Gillies (2008) suggests that research assessment exercises may even be harmful, as they rely on contemporary judgements about the kind of research and researchers that can be considered good (and should be supported financially), although such issues can only be properly evaluated with the benefit of hindsight (see our discussion of the value assessment problem in Section 4). He gives a number of examples from the history of science about research that might have been blocked had a strong assessment and auditing culture existed when Einstein or Wittgenstein – for example – were active.
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