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ORIGINAL RESEARCH

Against global aims for science: values, epistemic priority, and a local aims approach

Greg Lusk[1] · **Kevin C. Elliott**[2]

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Abstract

Philosophers commonly make claims about the aims of science, and these claims have played a significant role in debates about topics like scientific realism, modeling, and idealization. Nevertheless, there has been little discussion about the basis for those aims or the source of justification for claims about those aims. We use recent debates about the appropriate roles for values in science to bring this lack of discussion to the fore. These debates raise the question of whether there are global aims that apply to all areas of science. In response to this question, we examine a variety of different ways of conceptualizing the aims of science and conclude that no matter how one conceptualizes them, there do not appear to be convincing arguments for the view that science has global aims that constrain the influence of local aims on scientific practice. Thus, we place the burden of proof on those who claim that science has one or more global aims of this sort to show how those aims can be justified. Furthermore, we develop an account of scientific normativity that relies solely on local aims. When applied to debates about values in science, this view vindicates the cogency of what we call an "equal aims" approach to managing roles for values in science. Abandoning global aims might seem to raise the potential for epistemic corruption in science, but we argue that this concern is not compelling. We conclude that a local conception of scientific aims provides the foundation for a highly naturalized and engaged approach to the philosophy of science.

Greg Lusk and Kevin Elliott have contributed equally to this study.

✉ Greg Lusk
Gregory.lusk@durham.ac.uk

Kevin C. Elliott
kce@msu.edu

1 Department of Philosophy, Durham University, Durham, UK

2 Lyman Briggs College, Department of Fisheries and Wildlife, Department of Philosophy, Michigan State University, East Lansing, USA

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1 Introduction

Philosophers have not been shy about making claims regarding "the aim of science"; those with perspectives as varied as Dewey (1931), Popper (1972), Kuhn (1970, 1977), and Levi (1967) have all discussed the aim(s) of science to varying degrees (see Niiniluoto, 2019).[1] Notably, philosophers engaged in debates over scientific realism have appealed to the aims of science as a means of arguing for the proper epistemic stance towards theories (e.g., van Fraassen, 1980). Debates about scientific modeling and idealization have also appealed to the aims of science (De Regt, 2020; Potochnik, 2017). Now, philosophers interested in the role of values in science have begun to develop significant interest in science's aims. Some have developed an "aims approach" that explicitly appeals to non-epistemic aims of science to justify the inclusion of non-epistemic values in scientific reasoning (e.g., Elliott, 2013; Hicks, 2022; Intemann, 2015). Others, while accepting some roles for non-epistemic values in scientific reasoning, appear to be appealing to science's epistemic aims as a way to limit or constrain those roles (e.g., Douglas, 2009; Steel, 2017).

Despite science's aims being widely invoked in the philosophical literature, there has been little explicit discussion about their ultimate basis or justification. We address this deficiency by bringing together multiple philosophical discussions in an effort to analyze the nature of science's aims and explore how claims about those aims can be justified. To motivate this analysis, we examine recent debates about values in science. The paper examines three significant approaches to values in science—which we will call the value-free ideal (VFI), epistemic priority views, and the equal aims approach—and shows how views about science's aims play a role in disputes between them.[2] Specifically, the "equal aims" approach, as we will define it here, is the view that science has multiple local aims but no global aims that constrain which local aims are acceptable. Thus, this view is inconsistent with the common notion that science has global aims that generate constraints on local aims.[3] As a result, those who accept such global aims are committed to adopting other approaches, such as the VFI or an epistemic priority view, for characterizing the proper role of values in science.

To help address this dispute over the cogency of the equal aims approach, we examine a variety of ways of conceptualizing and justifying the aims of science. For the purposes of this analysis we interpret science broadly, including what some might

[1] While acknowledging the potential for disagreement about whether science has a single aim or multiple aims, for the sake of readability we will, unless otherwise noted, refer to "aims" in the plural throughout this paper.

[2] As discussed below, we will be using the term "equal aims approach" to refer to views that are sometimes called the "aims" approach to values in science (see e.g., Steel, 2017).

[3] While it is relatively clear that authors like Elliott and McKaughan (2014) reject the view that there are global aims for science that constrain which local aims are acceptable, it is possible that others writing about values in science from an "aims" perspective might hold that there are some global aims of science. The arguments in this paper presuppose an interpretation of the "equal aims" approach that denies the existence of global aims that provide these constraints.

classify as basic science, applied science, and regulatory or policy-relevant science, and many of our examples come from more "applied" areas of science. In our view, to carve up science more narrowly would be to beg the very question at issue, which is whether there are one or more aims that define science and distinguish it from other endeavors. We conclude that philosophers have not provided convincing arguments to establish that science possesses global aims that limit the pursuit of local aims. Thus, this paper places the burden of proof on those who claim that science has one or more global aims to show how those aims can be grounded or justified in a manner that constrains local aims. It is important to emphasize that we are not claiming to provide decisive evidence against the view that there are such global aims. To do so would require a much more detailed discussion than we can provide here. Our goal is more modest: we want to show that the main arguments in favor of global aims are not convincing, and so the equal aims approach remains a live—and perhaps superior—option for handling values in science. Although one might worry that the abandonment of global aims would leave science rudderless and susceptible to epistemic corruption because there would be no universal epistemic constraints on science, we argue that this is unlikely to be a significant problem if one adopts a sufficiently rich view of local aims.

If our preferred local conception of scientific aims stands, it not only supports the cogency of the equal aims approach to values in science but also has implications for the many other areas of philosophy of science that appeal to the aims of science. For example, as we discuss below, views about the aims of science have played an important role in debates about scientific realism and modeling (e.g., Potochnik, 2017; van Fraassen, 1980). Discussions about the nature of science in the field of science education also appeal to the aims of science (Dagher & Erduran, 2016; Irzik & Nola, 2011). Thus, our efforts to clarify the status of the arguments in favor of global aims of science have the potential to inform a number of different discussions.

2 The aims of science and values in science

The aims of science have received significant attention in the philosophy of science, although the depth of engagement in this topic, and indeed the very importance of aims themselves, has varied significantly across the discipline. Throughout the twentieth century, philosophers largely focused on analyzing cognitive or epistemic aims.[4] Karl Popper emphasized that, strictly speaking, "science itself" has no aims; rather, scientists have aims, and different scientists have different aims (Popper, 1972). Nevertheless, he ultimately focused on satisfactory explanation as the primary aim of

[4] Throughout the paper, we will be employing a rough distinction between epistemic or cognitive aims/values as opposed to non-epistemic aims/values. The distinction between the epistemic and the non-epistemic has come under significant criticism in discussions of values and science (see e.g., Longino, 1996; Rooney, 2017), but we will assume that there is a distinction because many of the authors working on the topic of aims have employed that distinction. If one were to abandon the distinction between epistemic and non-epistemic aims/values, that would merely strengthen our position that there are no global epistemic aims that constrain local aims. (Nevertheless, it is worth noting that even if one abandoned the notion that there were global *epistemic* constraints on local aims, one could still hold that there were *some sort* of global constraints, so one cannot immediately conclude that there are no global constraints on science simply by abandoning the epistemic/non-epistemic distinction.)

science. Thomas Kuhn (1970) famously challenged the idea that science is directed toward a single, true representation of the world. Rather, he argued that science aims at solving problems or puzzles, and this requires weighing multiple values, such as scope, consistency, fruitfulness, and simplicity (Kuhn, 1977; see also Laudan, 1977). Logical empiricists like Hempel (1965) and Levi (1967) discussed multiple aims or "epistemic utilities," such as truth, information, explanatory power, and predictive power (Niiniluoto, 2019).

These discussions about the epistemic aims of science continued during debates over scientific realism and were often subsumed by those debates. Some definitions of scientific realism and anti-realism were formulated specifically in terms of the aims of science (see Chakravartty, 2017). According to this definitional approach, realists hold that science aims to produce true descriptions of the world (e.g., Lyons, 2005), whereas anti-realists hold that science aims for something else. For example, constructive empiricists claim that science aims to develop theories that are empirically adequate (van Fraassen, 1980). These debates tended to reinforce the assumption that science is focused on epistemic or cognitive goals, and they often focused on a singular aim of science.

Reflections on the aims of science have also played a significant role in recent discussions about scientific explanation, understanding, modeling, and idealization. For example, Potochnik (2015) has argued that the widespread use of idealization in science calls for a rethinking of science's aims. She points out that idealization has often been regarded as a weakness that needs to be addressed to fully achieve aims like truth, explanation, and prediction. In contrast, she argues that the centrality of idealization in scientific practice provides a reason to question the importance of these traditional aims of science and to focus greater attention on other aims (e.g., understanding and various "nonepistemic" aims; see also Potochnik, 2017). Similarly, Bhakthavatsalam and Cartwright (2017) have argued that the aims of understanding and managing the world merit greater attention relative to the more traditional aim of empirical adequacy. De Regt (2017) and Khalifa (2020) have also been exploring the nature of scientific understanding and the extent to which it can be subsumed under traditional scientific aims, such as the pursuit of truth.

Views about the aims of science are also important for the contemporary literature on values and science. For example, the notion that science has global aims that can constrain local aims clashes with at least some versions of the "aims" approach to values in science (see e.g., Elliott & McKaughan, 2014). The aims approach is typically characterized by several claims: (1) science can have multiple aims; (2) those aims are sometimes non-epistemic; and (3) the appropriateness of value influences on scientific reasoning ought to be assessed by examining the extent to which those value influences promote the aims of science (see e.g., Elliott, 2013; Hicks, 2022; Intemann, 2015). In principle, one could accept these claims while insisting that some of science's aims (e.g., the epistemic ones) should always receive priority over other aims, but major proponents of the aims approach have tended to reject this move (see e.g., Elliott & McKaughan, 2014). In other words, they reject what Brown (2013) calls the "lexical priority" of evidence over values. Thus, proponents of the aims approach typically affirm a fourth claim as well: (4) the non-epistemic aims of inquiry need not be subordinate to the epistemic ones, and thus epistemic values need not take priority over non-epistemic values. We will refer to this form of the aims approach (i.e., the view that non-epistemic aims need not be subordinate to epistemic aims) as the "equal aims" approach. Although previous discussions of the equal aims approach have typically focused on whether it could be legitimate to prioritize local *non-epistemic* aims over global *epistemic* aims, one could in principle use the equal aims approach to justify appealing to any sorts of local aims over any global aims that would allegedly constrain them.

Because of this clash between the equal aims approach and the view that science has global aims, those who accept global aims must adopt other approaches to characterizing the proper roles for values in science. The two dominant alternative approaches in the literature are the VFI and what we will call "epistemic priority" views. In scrutinizing these approaches, it turns out that they are not only *compatible* with the acceptance of global scientific aims but that the proponents of these approaches even appear to *appeal* to global scientific aims in support of their views. For example, throughout much of the twentieth century, the VFI shaped philosophers' thinking about the proper role of values in science (Douglas, 2009). This ideal specified that non-epistemic values (e.g., social, political, or personal values) were impermissible within core aspects of scientific activity, and this stance was often justified through appeals to the aims of science, and specifically the aim of discovering the truth, or something like it (see McMullin, 1983). For example, the famous sociologist W.E.B. Du Bois claimed that one "must be careful to insist that science as such—be it physics, chemistry, psychology, or sociology—has but one simple aim: the discovery of truth" (1898, pp. 16–17; see also Bright, 2018). In his presidential address to the American Sociological Society, William Ogburn, another notable sociologist, emphasized that this focus on truth required keeping science focused on knowledge and away from non-epistemic concerns: "Sociology as a science is not interested in making the world a better place in which to live, in encouraging beliefs, in spreading information, in dispensing news, in setting forth impressions of life, in leading the multitudes or in guiding the ship of state. Science is interested directly in one thing only, to wit, discovering new knowledge" (Ogburn, 1930, pp. 300–301). Philosophers reflecting on the role of values in science often toed a similar line (see Douglas, 2009 for an overview).

The VFI has recently come under significant criticism (see e.g., Brown, 2020; Douglas, 2009; Elliott, 2022; Longino, 1990), but there are significant debates over how to replace it. One cluster of approaches might be labeled as falling under an "epistemic priority" view. This view permits non-epistemic values to influence scientific reasoning, but it insists that those values have a legitimate role to play only when there are "gaps" left by evidence (Brown, 2013). For example, Douglas (2009) argues that values should not play the role of evidence, but when there is uncertainty left by the available evidence, values have a legitimate role to play in deciding when there is enough evidence available to draw a conclusion. Similarly, Steel and Whyte argue that non-epistemic values can appropriately influence scientific reasoning "when, and only when, epistemic values fail to indicate a unique best option" (2012, p. 170).

Although it is not entirely clear that proponents of epistemic priority views are appealing to global (epistemic) aims for science, some of their claims do seem to appeal to such aims in support of the constraints that they place on roles for non-epistemic values in science. For example, Douglas insists that values should not supplant the role of evidence because to do otherwise would "undermine the core value of science—to produce reliable knowledge—which requires the possibility that the evidence produced could come out against one's favored theory" (2009, p. 100). Although she refers to the production of reliable knowledge as a "value," she seems to be regarding it (like many other philosophers of science) as a central aim that constrains scientific practice. Similarly, Steel insists that "an essential feature of the social role of science has to do with *how* it promotes goals legitimately valued by society, namely, by advancing knowledge" (2017, p. 58, italics in original). In other words, he affirms that science can be influenced by social aims or goals, but he seems to affirm that the advancement of knowledge is a global aim that constrains how science should go about advancing those broader social aims. We have recently argued that insofar as these figures accept roles for non-epistemic values in scientific assessment, they must be at least implicitly accepting that scientific assessment incorporates other aims beyond epistemic ones (see Lusk & Elliott, 2022). However, proponents of the epistemic priority view appear to give priority to one or more global epistemic aims of science.

In sum, the equal aims approach to managing values in science clashes with the view that science has global aims. In contrast, the two dominant alternative approaches to values in science (namely, the VFI and epistemic priority views) are compatible with the view that there are global (epistemic) aims, and they may even rely on that view for their justification. Thus, these debates about values in science shine a spotlight on a question that has received inadequate attention across the philosophical literature on the aims of science. Namely, what is the ultimate basis or justification for claims about the aims of science? When opposing camps in the philosophy of science make conflicting claims about the content of the aims of science and the extent to which they are global or local, how can one decide who is right? Who or what determines the aims of science?

The following section addresses this question and examines how one could justify aims for science. To do this, it builds on previous articles by Resnik (1993) and Rowbottom (2014). The take-home lesson from this analysis is that there do not appear to be convincing arguments for the view that science has any global aims that would place significant normative constraints on the projects or approaches that scientists might want to undertake. Thus, the burden of proof rests on those who attempt to challenge the equal aims approach to values in science by appealing to one or more global epistemic aims for science. We acknowledge that this analysis is not decisive; we are providing only a cursory evaluation of these arguments in favor of global aims for science. Our goal is merely to show that they do not provide immediately compelling reasons to abandon an equal aims approach to values in science.

3 Conceptualizing global aims for science

There are multiple ways of categorizing approaches to conceptualizing and defending aims for science. As a pragmatic strategy for organizing different approaches, we suggest a categorization scheme that distinguishes human-independent approaches from human-dependent approaches, but little ultimately rests on whether an approach is placed in one category or the other. By a human-independent approach, we mean an approach that does not appeal directly to the intentions, attitudes, or beliefs that human beings have about science. Thus, human-independent approaches focus on the characteristics of science and its institutions rather than the views or perspectives that people have about science. Repurposing a phrase from Ian Hacking (1983), science on these approaches might be thought to have a life of its own, separate from the desires of its human practitioners. These approaches roughly align with the ways aims are discussed in the debates about scientific realism (e.g., in discussions by van Fraassen, 1980). In contrast, human-dependent approaches appeal to the intentions that humans bring to science. On this view, the aims that science may have, if any, are brought to it by practitioners, users, or other stakeholders who have specific intentions.

One can draw a further distinction, as we have throughout this paper, between aims that are relatively global or universal across scientific fields versus those that are relatively local. For example, if the entire scientific community agreed that scientific activity should be geared toward developing the best possible explanations of all natural phenomena, that would result in a global aim for science. However, if a particular community of scientists (say, nuclear physicists) agreed on one or more goals for their field, those goals would be relatively local aims. In this section, we will consider approaches that conceptualize science's aims in a global manner—-first, human-independent global approaches, and second, human-dependent global approaches. In the following section, we will consider approaches that conceptualize science's aims in a local manner. We acknowledge that there is not an entirely sharp distinction between local and global aims for science because aims can be more or less global depending on how universal they are across science or its subfields. However, this section will focus on approaches that assign a single aim or aims to all of science, whereas Sect. 4 will consider approaches that vary widely in terms of the breadth of scientific activity to which they apply.

3.1 Human-independent, global conceptualizations

We turn first to human-independent approaches to conceptualizing and justifying global aims for science. We can envision five ways of conceptualizing aims that would make it possible to justify them in a human-independent manner. One might think of them as: (1) normative ideals; (2) functions; (3) essential characteristics; (4) criteria for success; or (5) corporate goals. In the following analysis, we find that, at least at a cursory level of analysis, none of these approaches provide a convincing justification for a global aim of science that would constrain local aims. Although we have been presuming throughout this paper that there may be several aims for science, we will write throughout this section as if science had a single aim. This approach has the virtue of simplifying our analysis while fitting with the common historical assumption that science has a single overarching or universal aim. We will revisit this assumption at the end of Sect. 3.2 and consider whether it would be easier to justify multiple global aims of science rather than a single global aim.

3.1.1 Normative ideals

David Resnik (1993) argues that many philosophers seem to regard science's aim as a normative ideal. For example, Charles Sanders Peirce (1878) thought that truth was the ultimate ideal toward which science aimed, Hilary Putnam (1981) thought that the ideal was "rational acceptability," and Hempel thought it was explanation (1979). It is somewhat unclear how these figures would have defended these ideals. Depending on how one interpreted them, they could ultimately be either dependent on human intentions or independent of them, so we will consider them both ways. Here, we will focus on justifications that treat these ideals as being independent of human intentions.

As Resnik points out, conceiving of science's aim in this way frees one from having to consider the multiplicity of aims and goals that are revealed when observing the messy practicalities of science and its individual practitioners. Once untethered from practice, however, it becomes difficult to assess proposals for what science's aim should be. As we have seen above, philosophers can reasonably disagree about science's aim. It is unclear in this context what, besides intuitions—which seem to diverge on this very point—could settle debates about its aim. As the long-standing disputes show, there is no good way to adjudicate between the ideals on offer.

Even if one were to try to arrive at these ideals by observing scientific practice, one would face the challenge that actual practices never live up to ideals. To be successful in identifying the normative (human-independent) ideals of science, then, one would need a principled procedure for differentiating practices that fall short of an ideal from those that were never striving towards an ideal in the first place. Such a procedure is difficult to provide. One might, for example, ask scientists about their aims, and use their responses as evidence of some human-independent ideal. Such a proposal simply repeats the difficulty above: the procedure would rely on practitioners' intuitions about a human-independent ideal and there is no clear way to handle differences of opinion. Thus, because philosophers are conflicted over such ideals, and there is no human-independent way to verify them, conceptualizing scientific aims as normative ideals does not provide a convincing foundation for justifying them.

3.1.2 Functions

A second human-independent approach would be to explore whether science has particular functions that could define its aim. Philosophers of biology have developed human-independent ways of assigning functions to the components of biological systems, so one might attempt the same approach to assigning one or more functions to science. In the philosophy of biology, there have been two major approaches to assigning functions: the etiological approach (see e.g., Wright, 1973) and the capacity-based approach (see e.g., Cummings, 1975). According to the etiological approach, something has a function, Z, if it is there because it does Z. For example, one can say that the heart's function is to pump blood because natural selection operated to retain the heart throughout evolutionary history because of the heart's ability to pump blood. Applying this approach to science, one might argue that science itself exists because, for example, it has allowed us to interact with the world in a manner that is effective and reliable. However, this approach suffers from the difficulty that there are arguably many different reasons that science is currently present: it provides reliable information, it facilitates prediction, it satisfies curiosity, it improves health, it facilitates success in warfare, and it promotes economic development. One could try to engage in historical analysis to narrow down the reasons for science's presence, but a straightforward answer is likely to prove elusive.

The other major approach to assigning functions in the philosophy of biology (the capacity-based approach) is to identify the contributions that specific components of a system make to the system's capacities. For example, on this account the function of the heart is to pump blood because its pumping of the blood is the contribution it makes to the organism's capacity for self-maintenance. Taking this approach, one might say that science is part of our overall system of social organization, and its key contribution to that system is to provide reliable knowledge that can be used for many different purposes. For example, Bird (2022, Chapter 2) argues that science has a single aim: the production of scientific knowledge. This aim is the constitutive function of science; as Bird describes it, "science stands to society much as a cognitive faculty stands to an organism; the accepted theories of science thus correspond to belief" (Bird, 2022, p. 20).

However, as seen with the etiological account of function, the problem is that science makes many different contributions to society. Bird (who, admittedly, is focused only on defending knowledge as the proper object of science *over truth*, rather than creating a comprehensive account of aims) offers two lines of evidence in favor of knowledge as science's constitutive function. The first is linguistic evidence about "science" from the *Oxford English Dictionary* and other etymological sources; the second is the aforementioned analogy between science's social function and the cognitive functions of an organism. The former Bird admits is only suggestive but "no knockdown argument" (2022, p. 19). The latter analogy is instructive only if one already accepts a single epistemic aim for science, as other aims (e.g. non-epistemic ones, or producing new technologies) do not obviously have analogs related to the cognitive function of individual organisms. It is not clear that the provision of reliable knowledge (or any other contribution) can easily be singled out as the main function of all science.

3.1.3 Essential characteristics

Resnik (1993) suggests that one might instead interpret the aim of science in terms of science's essential characteristics. He uses a quotation from Popper to illustrate this approach:

> To speak of 'the aim' of scientific activity may perhaps sound a little naive; for clearly, different scientists have different aims, and science itself (whatever that may mean) has no aims. I admit all this. Yet when we speak of science, we do seem to feel, more or less clearly, that there is *something characteristic of scientific activity*.... (Popper, 2013 [1983], 132; emphasis added)

Even if Popper himself was not trying to justify aims for science in this manner, one might still build on the notion that science has distinctive characteristics to formulate a procedure for aim identification: one would observe the way science operates in practice and abstract away until something common to all instances could be identified. This commonality would become an "aim" that was stipulated in light of, or "read off," scientific as practiced. However, as Resnik (1993) points out, the lack of a clear demarcation criterion for science makes it exceedingly difficult to employ this approach. Those attempting to develop a demarcation criterion have run into a great deal of difficulty identifying distinctive characteristics of science that separate it cleanly from other activities (Resnik & Elliott, 2023). Given that failure, it seems unlikely that one could identify a global aim of science based on those characteristics.

Admittedly, one could still try to identify an array of characteristics that often characterize science rather than trying to find one or more characteristics that are necessary and sufficient for science (Resnik & Elliott, 2023). Although this approach might make it possible to identify some aims for science, however, it seems doubtful that aims identified in this manner would end up being global in character. Resnik (1993) points out that science is highly varied in its characteristics. Thus, as we will discuss at the end of Sect. 3.2, while it is plausible that one could identify a set of characteristics/aims such that at least one of them applies to every instance of science, it is implausible that one could identify a single characteristic/aim that is primary in all cases. So, if one tried to identify the aim of science with its characteristics, one would end up with a wide variety of aims that end up being local rather than global. As a result, this would not provide a convincing approach for identifying and justifying a global, human-independent aim for science.

3.1.4 Criteria of success

Another human-independent approach to identifying an aim for science would be to appeal to criteria of success for science. One might assume that this would be a human-dependent approach, but Darrell Rowbottom (2014) contends that prominent figures who have taken this approach glean these criteria not from what scientists directly claim but rather by observing and abstracting from the structure of scientific practice, in a way similar to that proposed above for essential characteristics. Thus, it appears to fall under our category of human-independent approaches. For example, Bas van Fraassen (1980) draws an analogy with chess and argues that even though individual chess players can have all sorts of aims, the aim of chess is determined by what counts as success (namely, checkmating one's opponent). Van Fraassen then examines science to identify a minimal criterion of success.

However, Rowbottom points out that this analogy may not be instructive, since science isn't much like chess. In the case of chess, the game has a clear design with straightforward rules. This permits somewhat easy identification of instances of chess, and pushes (if not completely constrains) players to submit their agency to prescribed goals (see Nguyen, 2019 on games). But the "rules" of science are much less clear cut, and what the goals are is precisely what is at issue. This makes the identification of instances of scientific success a contentious matter.

Rowbottom argues that the very point at issue between van Fraassen and his critics is the question of what counts as success in science, and it is not clear how such a debate could be settled. Rowbottom claims that if one were to treat science as having clear criteria of success, one would be taking "a difference in value judgements, concerning what kinds of inquiry are worthwhile," and treating it "as if it were a difference on a matter of fact about [the aim of] science" (2014, p. 1217). This accords with contemporary characterizations of the realism debate as a stalemate that depends precisely upon *which stance one takes* towards the epistemology of science. In this characterization, "holding a stance is a function of one's values as opposed to one's factual beliefs" (Chakravartty, 2004, p. 175). Importantly, stances are not matters of fact, but sit a level above them and guide their interpretation (Forbes, 2017). Distilled down, this characterization indicates that positions like van Fraassen's may be coherent if we accept the criterion of success that accords with his stance, but there is no demand to select that criterion over any other coherent one on offer (see Boucher & Forbes, 2024).

Therefore, without appealing to scientists' direct intentions about what the criteria for success in science should be, it seems unlikely that these value judgments could be settled in an uncontroversial fashion. Thus, like other approaches to identifying a human-independent aim of science that could limit local aims, appealing to criteria of success appears to be unconvincing.

3.1.5 Corporate goals

Finally, Resnik (1993) suggests that one could potentially cash out an aim for science in terms of goals that are brought to the scientific enterprise. Typically, these goals would involve the intentions or beliefs of scientists, and thus we would classify them as human-dependent. However, Resnik notes that one could also appeal to the corporate goals that drive science, and we are inclined to classify these as human-independent, in the sense that they do not directly involve the intentions, attitudes, or beliefs that scientists bring to their work. In Resnik's view, corporate goals are those that are achieved through "cooperation and effective administration" (1993, p. 227), and he points out that an organization can have corporate goals even if the individual members of the organization do not share them. For example, a corporation could have the corporate goal (i.e., aim) of maximizing profits insofar as it is organized or structured to maximize profits, and this would be the case even if most of the employees had distinct individual goals like retaining their jobs, moving up the corporate ladder, and achieving personal fulfillment. As Resnik points out, however, the problem with applying this approach is that science lacks a uniform corporate structure. For example, there are a variety of scientific funding bodies—public and private—with different agendas, contrasting incentives, and varying degrees of control over researchers. Science is such a diverse and varied endeavor that it would be difficult to argue that science has a global corporate goal that could be interpreted as "the global aim of science."

It therefore seems as if the prospects for identifying and justifying a global aim for science by characterizing aims in a human-independent manner is rather bleak. Each approach to conceptualizing science's aims can be used to generate different (and sometimes conflicting) aims, without a means to adjudicate between them. Given the disputes within each conception, and across different conceptions, no human-independent aim seems sufficiently grounded to provide global limits on the local aims of science.

3.2 Human-dependent, global conceptualizations

Faced with the difficulties involved with conceptualizing global aims for science in a human-independent manner, one might consider whether appealing directly to human intentions, attitudes, or beliefs could help in characterizing one or more global aims for science. The aim of science, on a human-dependent approach, is a reflection of the practitioners, users, or stakeholders involved with science.

There is an obvious benefit to identifying candidate aims in this manner: one can rely on the stated desires of individuals and institutions to define which aims or goals are manifest in a given situation. Such an approach to aims can avoid many of the problems seen with human-independent aims. One need not, for example, rely on philosophical intuitions to justify the desirability of an aim or attempt to glean minimal common goals from scientific practice. Instead, one can appeal to the stated intentions of those involved in doing science. The difficulty, of course, is discerning how human-dependent goals might generate any kind of global limits on science. After all, if the aims of science are derived from the aims of those involved in doing science, then it seems like those aims will vary across different contexts; it is difficult to see how such aims could provide science with any kind of universal limits on local aims.

One way that human-dependent aims might be able to provide such global constraints would be if an aim were universally shared. It is relatively obvious that scientists come to their work with an array of aims that are "local," in the sense that they apply to the small number of projects with which a group of scientists is involved. The more interesting question is whether there is a human-dependent but "global" aim that applies to all of science and that can therefore limit local aims.

3.2.1 Shared goals

Although Resnik (1993) does not explicitly make our distinction between human-independent and human-dependent ways of conceptualizing science's aims, he suggests several approaches that would fall under our category of human-dependent conceptualizations. One of his suggested approaches is to look for one or more shared goals that all scientists hold. According to Resnik, this seems to be how Kuhn (1977), Newton-Smith (1981), and Laudan (1984) interpret the phrase "the aim of science." However, Resnik also points out the obvious difficulty with this view: "different scientists have different goals—some seek truth, some seek prestige, others seek government grants—and there may be no common goals accepted by all (or even most) scientists" (1993, p. 226). Of course, there could be a goal that is widely held (e.g., seeking empirical adequacy or good explanations or predictive power). However, to serve as the global aim of science, this goal would need to apply universally and take priority over other goals. But scientists do not all prioritize goals like truth, explanation, and empirical adequacy in the same way, and they do not always accept the same goal. This is the same problem that arose in philosophical debates over scientific realism: different philosophers and different scientists accepted different goals for scientific practice. Therefore, this does not seem like a compelling approach for arriving at a global aim that would limit local aims.

3.2.2 Designed goals

Even though it does not appear feasible to arrive at a global aim of science by conceptualizing it in terms of shared goals (or the corporate goals considered earlier), one might try to arrive at a global aim by looking at the goals that science was originally *designed* to have. Just like the game of chess was designed with particular rules and criteria for success, one might think that science was also designed for particular purposes. We saw above that it is difficult to "read off" science's criteria for success just by looking at contemporary scientific practice, but perhaps it would be easier to arrive at criteria for success by seeing if science was originally designed to achieve particular goals.

Unfortunately, this approach also seems destined for failure. For one thing, there was never a specific historical moment at which science was designed by a particular person. Rather, it developed over centuries through the work of many different people. And just as current scientists have many different aims, the people who developed science in the past also had many different aims, and (with the exception, perhaps, of a few "cheerleaders" like Francis Bacon) they were not trying to design a unified enterprise. Of course, as we discuss below, some scientists may have developed specific fields or research programs with particular aims in mind, but they would be establishing only *local* aims for those specific areas of science.

3.2.3 Evaluative or normative claims about science

Faced with the failure to identify a human-dependent, global aim for science using these approaches, one might try an alternative tack. In the paper in which he abandoned the search for aims of science, Darrell Rowbottom (2014) concluded that one might nevertheless try to make descriptive, evaluative, normative, or definitional claims about science. Although Rowbottom himself did not try to turn any of these claims into an account of science's aims (rather, he viewed them as alternatives to conceptualizing science in terms of aims), one could still try to do so. However, Rowbottom's descriptive and definitional claims do not appear to be very promising in this regard. They are much like what we considered above under the category of "essential characterizations," and we have already seen that these approaches to arriving at a global aim for science do not work well.

One might think, however, that Rowbottom's evaluative and normative claims have more potential for generating an aim for science, and they would plausibly count as human-dependent aims insofar as they count as beliefs about science. Rowbottom suggested that evaluative claims would be something along the lines of, "Science is only worth doing if it will achieve *x*," and normative claims would be something like, "Scientists should (as a community) strive to achieve *x* if they are able" (2014, pp. 1218–1219). If scientists and/or philosophers of science could debate these evaluative and normative claims and ultimately come to some sort of agreement about them, one might count the resulting conclusion as the aim of science. For example, returning to the "normative ideals" considered above (e.g., Peirce's idea that the aim of science is truth, or Hempel's notion that it is explanation), one could argue that if philosophers of science could convince each other that one of those is the best ideal, then that ideal could serve as science's global aim. However, the obvious problem with this approach is that neither philosophers nor scientists have come to any sort of agreement about what scientists should be striving to achieve. One might be able to find some rough agreement on a group of things that scientists should typically be striving for (e.g., reliable information about the world, good explanations, predictive power, benefits for society). But there would not be agreement on how to prioritize those goals if they were to come into conflict. Thus, appealing to evaluative and normative claims about science would once again fail to generate a global aim that would limit local aims.

Nevertheless, one might worry that we are being too quick in our dismissal of universal normative claims about science. For example, there might be some universally accepted standards, such as "Scientists should avoid wishful thinking" (see e.g., Brown, 2013; Elliott, 2017) or "Scientists should engage in severe tests of their hypotheses" (see e.g., Steel & Whyte, 2012). These standards might ground a very general aim, such as the goal of improving or revising claims in response to new information. However, we worry that in order to formulate an aim like this in a sufficiently general way that everyone could agree on it as the overarching aim of science, there would be almost no content to it, and so it could not provide any meaningful constraints on local aims.

Consider Steel and Whyte's (2012) insistence that scientists should engage in severe tests of hypotheses, for example. First, it is not clear that this stricture has wide enough scope to be a global aim, as it fails to apply to projects that do not directly involve hypothesis testing or are easily conceived in terms of error. For example, recent literature has examined how data are packaged and the influence of that packaging on data traveling across scientific contexts (see e.g., Leonelli, 2016; Lloyd et al., 2022). Data packaging is clearly a scientific task of importance, as it influences what subjects are studied, among other things. Surely these practices may be better or worse, but there appears to be no general demand to submit them to severe testing. Furthermore, even if we were to form hypotheses about data packaging and its impacts, "error" in this context would need to be interpreted as relative to some pre-specified goal. In such a case, it would seem as if the relatively local (and contestable) goal of making data travel in a particular way would be constraining how the "error analysis" was performed, not the other way around. Moreover, even in cases that involve hypothesis testing, it is not clear that everyone would agree to a universal requirement for severe testing; for example, in some cases of community-based research, it may be more important to engage in exploratory research that focuses on avoiding false negative errors rather than to worry about avoiding false positive errors (e.g., Brown, 1992; Elliott & Rosenberg, 2019; Ottinger, 2017).

3.2.4 Any of the above: multiple global aims

Before concluding this section, it is worth returning to a question we put off earlier: is it possible that science has multiple global aims? For the sake of argument, we have focused on justifying a single global aim throughout Sect. 3. We have found it difficult to justify such an aim. But perhaps there is no single aim, and instead there is a set of aims, or multiple overlapping aims, that could provide normative constraints for science. Maybe multiple aims can do what a single aim cannot.

While it seems conceptually possible that science has multiple global aims, it is unclear how such aims could operate in a manner sufficient to provide universal constraints on local aims. Consider the ways that multiple global aims might operate to provide such constraints. One way would be if there were a set of different aims, all of which apply globally. However, given the arguments that we have just articulated, it seems controversial enough to locate one global aim, never mind many. Furthermore, given that multiple aims are likely to conflict with each other to some extent, at least *some* aims would need to be jettisoned or given lower priority than others. One would need a principled way of selecting between conflicting aims, and as we have seen in trying to identify a single global aim for science, there are no clear grounds for doing so. This is borne out by looking at the history of debates over the aims of science, which illustrate that there is no agreement on any global way of prioritizing among multiple aims. Thus, claiming that there is a set of global aims that provides universal constraints across all of science seems no more realistic than claiming that there is a single overarching aim.

The other way that multiple aims might be organized would be in an overlapping fashion. In such a case, there would be a set of aims that is global not in the sense that all the aims apply across all cases but rather in the sense that at least one of the aims would apply in any particular scientific context. This way of characterizing science's aims sounds a good deal like the "family resemblance" characterization of the nature of science described by Irzik and Nola (2011; see also Dagher & Erduran, 2016). On this view, there is no single aim that applies to all of science, but all the sciences are bound together by a set of aims, such that every area of science pursues one or more of those aims. This view seems plausible, but it is doubtful that it could generate universal constraints on local aims across all of scientific practice unless there were some universal, overarching aim (which we have shown to be elusive). Without such an overarching aim, it is difficult to see how a family of overlapping aims could generate truly *global* constraints. That is, if there were a set of aims that applied to all of science, but only specific aims operated in specific contexts, it would seemingly be the case that the aims of science were actually *local* and determined by context. Such a situation seems to be better modeled by considering local aims, which we will examine in the next section.

4 Local aims

Our analysis in Sect. 3 places the burden of proof on those who claim that science has one or more global aims that constrain local aims across all of scientific practice. Unless the proponents of global aims can develop a convincing way to conceptualize and justify them, it seems reasonable for proponents of the equal aims account of values and science to maintain their position that science has only local aims that apply to specific research projects, disciplines, or fields. These local aims could take different forms; for example, they could be based on essential characteristics, functions, criteria for success, shared goals, designed goals, or one of the other approaches discussed in Sect. 3. However, whereas we have seen that it is unlikely that one could arrive at *global* aims conceptualized in any of these ways, it is less difficult to arrive at local aims in one or more of these ways if one narrows the scope of one's analysis appropriately.

For example, if one were to focus on a single research project, one could identify an aim for the project by looking at what the principal investigator designed it to achieve. Then, if it turned out that all the investigators working on research projects in a particular research area shared an overarching goal or normative commitments, one could broaden one's analysis and identify one or more aims for that research area. In some cases, it might even be possible to identify an aim for an entire field or discipline if its founders designed it for particular purposes. For example, the first editor of the journal *Conservation Biology* claimed that the founders of the Society of Conservation Biology viewed themselves as developing a mission-oriented discipline with the aim "to save as much as possible of the earth's biodiversity" (Ehrenfeld, 2000, p. 106; see also Gerber, 2010; Soule, 1986; Wilson, 1999). Admittedly, the fact that the founders of the field of conservation biology intended it to have that aim does not guarantee that everyone in the field will continue to share that aim indefinitely, but it illustrates the potential for scientists to coalesce around specific aims for a limited period of time.

It is worth reiterating that such local aims do not fall prey to the objections raised above for global aims, primarily because their scope is limited. Whereas it is difficult to identify criteria of success for science as a whole because of the highly varied nature of scientific practice, it is often feasible to identify criteria of success for a single project or perhaps even for a field. In such cases, the existence of other projects with other criteria for success does not threaten or undermine a project's individual aims; in fact, many think that having multiple projects or research programs striving towards different ends in the same area of science may have epistemic benefits (see e.g., Longino, 1990, 2002). Similarly, some scientific projects (for example, those performed by industry) might be grounded in well-defined corporate goals, and they might be performed within established hierarchies that ensure research teams focus on those goals.

However, if one adopts a view like this one, according to which science has only local aims, one is left with the question of how these aims relate to each other. After all, scientific projects rarely have a singular goal associated with them. It is much more often the case that projects have multiple goals at once. For example, some scholars view protecting endangered species *and* understanding human impacts on species as the aims of conservation biology (Gerber, 2010). Similarly, Kristen Intemann claims that climate science generally aims to generate projections for "protecting a variety of social, economic and environmental goods that we care about" (2015, p. 219), but this general aim can be conjoined with a variety of other aims. For example, climate modelers might generally want to protect human lives and well-being, but different modelers might have additional goals associated with protecting people from particular kinds of harm (e.g., wildfires or droughts), in particular regions (e.g., the western United States), with a particular degree of accuracy, using particular sets of limited resources, and ensuring that their results can be used by particular relevant groups (e.g., forest-fire fighters or policy makers). To take another example, drug companies might want to obtain regulatory approval for their drugs, but they might also aim to stay within budget, appease regulators, ensure safety, and avoid future lawsuits from users. In these examples, the aims are local but also multiple. It is reasonable that one desires to fulfill each of them, at least to some degree or another, but more needs to be said about how all these aims can be knitted together to form coherent guidance for scientific practice.

We think that the adequacy for purpose framework proposed by Parker (2009, 2020) and developed to address values in science in our previous work (Lusk & Elliott, 2022) and the work of others (e.g. Harvard & Winsberg, 2022; Winsberg & Harvard, 2022) provides a good starting point for clarifying how multiple local aims can work together to provide normative constraints on scientific work. We previously suggested that scientific practice can be characterized as an exercise in evaluating adequacy-for-purpose (AFP) hypotheses (Lusk & Elliott, 2022).[5] It is generally understood that models are evaluated in terms of their adequacy for purpose, not their truth, and we have argued that other scientific phenomena like hypotheses or methodologies can also be assessed in terms of their adequacy for purpose, not their truth. Based on an empirical description of what it would take for a scientific object (e.g., a model, hypothesis, methodology) to be adequate with regards to a particular "purpose," an AFP hypothesis proposes that the object is in fact adequate for the purpose. For example, a hypothesis about the safety of a toxic chemical could be evaluated for its adequacy to ground further scientific inquiry in a particular field, or it could be evaluated for its adequacy to guide decision-making for a chemical company, or it could be evaluated for its adequacy to facilitate regulatory decision-making. When inquirers decide on a purpose, they take the multiplicity of local aims at play and specify that they should be prioritized in such a way as to achieve the purpose. More formally, a purpose can be conceptualized as a problem space that is composed of both epistemic dimensions (i.e., aims) like accuracy and precision and non-epistemic dimensions like ease of use or completion time (Parker, 2020). Different adequate objects (e.g., hypotheses or models) represent "solutions" whose properties address a location within the problem space.

We acknowledge that our approach is not entirely uncontroversial.[6] For example, even if one thought that it made good sense to evaluate some scientific phenomena (e.g., models and methodologies) in terms of their adequacy for purpose, one might resist the notion that hypotheses should be evaluated in terms of their adequacy for purpose. (After all, models and methodologies are not truth-apt, whereas hypotheses are.) Nevertheless, we are proposing a pragmatic view about the nature of scientific reasoning, according to which it is better to think of scientists as evaluating the truth or falsity of claims about the suitability of scientific models, methods, and hypotheses for particular purposes than to think of scientists as directly evaluating the truth or falsity of claims about the world. Consider an example from our previous work (Lusk & Elliott, 2022), where we examine the process of selecting between two approaches

[5] One might wonder whether, on our view (Lusk & Elliott, 2022), the evaluation of AFP hypotheses could be regarded as a global aim of science, thereby challenging the central argument of this paper. We would respond in two ways. First, we think it would be a stretch to regard this as a global aim because it really focuses on pursuing the purposes that are local to particular contexts of inquiry. This supposedly "global" aim of science would therefore boil down to achieving local aims. Second, even if one did insist that this were a global aim, it would not be the kind of global aim that would place constraints on the achievement of local aims, and thus it would not threaten the equal aims approach to values in science.

[6] We thank an anonymous reviewer for helping us think through this point.

to risk assessment of toxic chemicals (namely, standard risk assessment and expedited risk assessment). We describe this selection process using an adequacy for purpose hypothesis:

> Standard Risk Assessment (SRA) [or Expedited Risk Assessment (ERA)] is ADEQUATE-FOR-Chemical Risk Assessment (where a method is ADEQUATE-FOR-Chemical Risk Assessment iff in instances where the government employs it to assess toxic chemicals, effective regulation is very likely to be achieved). (Lusk & Elliott, 2022, p. 17)

The adequacy-for-purpose hypothesis is that SRA (or ERA) is adequate for chemical risk assessment, and it further specifies what it takes for a risk assessment method to be adequate for this purpose (namely, it must make effective regulation very likely to be achieved). We go on to clarify that "effective regulation," like many scientific goals, is a multi-dimensional notion: "it is not as if effective regulation can be clearly determined simply by assessing, for example, the accuracy of the two methods" (Lusk & Elliott, 2022, p. 17) or by assessing any other individual goal. For us, "effective regulation might require a number of usage constraints: assessment methods might need to be reasonably standardized so that chemical companies can predict how their products will be handled by regulators, they might need to be conducted in a timely fashion, the results would need to be interpretable by regulators, etc." (Lusk & Elliott, 2022, p. 17). When defining adequacy-for-purpose, then, it may be the case that adequate scientific objects may differ in their properties, with one object being more fit along some dimensions, and others along a different set of dimensions. If any of the necessary dimensions are entirely absent, however, then the adequacy for purpose hypothesis can be rejected, that is, the object it references would be inadequate for purpose. The adequacy-for-purpose approach therefore provides a way in which multiple local aims, and even local aims of different kinds, can provide normative guidance for scientists by helping to ensure alignment between scientific means and ends.

5 Local aims and the equal aims approach to values in science

Our analysis in Sects. 3 and 4 places the burden of proof on those who claim that there are global aims that constrain local aims. By challenging the existence of global aims, our analysis leaves the equal aims approach to values in science in good standing. Such an approach would be problematic if there were global aims that had to be satisfied, but we have considered several different ways of conceptualizing and justifying such aims and have not identified convincing arguments for them. Thus, proponents of the equal aims approach can continue to prioritize local aims without worrying that there are global aims to constrain them.

However, one might still be inclined to object to the equal aims approach based on the intuition that there must be some source of global constraints to limit scientists from engaging in epistemically corrupt practices. If priority can be given to local non-epistemic aims in some circumstances, and if there are no global epistemic aims to limit them, will scientists not be tempted to falsify their data, fabricate their results, cherry pick data, or otherwise manipulate their methods to ensure their local aims are achieved? Given the evidence that powerful groups have in fact engaged in corrupt practices to serve their interests (see e.g., Holman & Elliott, 2018; McGarity & Wagner, 2010; Oreskes & Conway, 2011), this is a significant concern. The consequences of this have become even more apparent given the ease with which corrupt scientific claims generated by these "merchants of doubt" are able to spread widely in contemporary society through social media networks (O'Connor & Weatherall, 2019).

Steel (2017) has raised precisely this objection against the equal aims approach, and he offers what he calls an Ibsen predicament as a stylized example of the problems that worry him. Ibsen predicaments are named after Henrik Ibsen, playwright of *An Enemy of The People*. In the play, a town that is dependent on local baths for economic subsistence silences and exiles a local scientist because the scientist has discovered that the baths are in fact harmful. According to Steel, the equal aims approach is unfit to condemn the activities of the townspeople: since non-epistemic values are permitted in science insofar as they further the aims of inquiry, then the townsfolk can justifiably silence the scientist. After all, the scientist's investigations go against the democratically selected aims of the majority of the town. However, such activities appear to corrupt science in the sense that non-epistemic values have trumped legitimate epistemic aims of identifying public health threats.

Steel generalizes and suggests that when the epistemic integrity of science is at odds with other non-epistemic aims, there is a strong incentive for the corruption of science. He points to the example of Vioxx, a drug marketed by the pharmaceutical company Merck despite evidence that it could cause cardiovascular problems. Because Merck's primary aim appeared to be getting their drug approved by the U.S. Food and Drug Administration, they designed and interpreted studies about the drug in questionable ways that appeared to involve "gross violations of the value of empirical accuracy" (2017, p. 51). From Steel's perspective, since the equal aims approach permits non-epistemic aims to have equal weight with epistemic ones, the equal aims approach does not provide adequate resources for challenging such corruption. If there are no global epistemic aims to constrain science, and if science often incorporates non-epistemic aims, then science appears to be rudderless in the face of corrupting pressures.

Nevertheless, the equal aims approach is not as susceptible to Ibsen predicaments or other forms of epistemic corruption as one might think. While equal aims approaches are often referenced in the literature, detailed explanations of precisely how multiple aims can operate together have been lacking.[7] This lack of clarity about equal aims approaches could lead to the assumption that the choice of a single aim (either epistemic or nonepistemic) is all that is required to guide a particular investigation. For example, Kristen Intemann—when defending an equal aims view—often discusses the protection of human lives and well-being as the goal of climate science, whereas Steel—when objecting to the equal aims approach—often asserts that the goal of a drug company is to get their drug approved or that the goal of a fictional town is to prevent their baths from being shut down. One might assume, then, that so long as an investigation somehow promotes this singular aim, then it would be normatively justified on the equal aims account.

[7] As we noted in an earlier footnote, what we are calling "equal aims" approaches would just be called the "aims" approach in other philosophical literature.

However, the equal aims view is better interpreted as claiming that science can pursue both epistemic and non-epistemic aims and that the non-epistemic aims need not be subordinate to the epistemic ones (see Sect. 2). We clarified in Sect. 4 that scientific research is typically characterized by multiple local aims that researchers need to navigate simultaneously. We argued that an "adequacy-for-purpose" framework can help to clarify how these multiple aims can be handled. According to this framework, the overarching purpose of inquiry in a particular context specifies the extent to which various local aims need to be achieved. The advantages of employing the adequacy-for-purpose framework within the equal aims approach are numerous. First, it demonstrates how several local aims can provide normative guidance for a scientific project. The multiple aims of research define the problem space and constrain the ways that research might successfully proceed. In fact, there are very often tradeoffs between different epistemic and non-epistemic aims that must be negotiated. Second, and more importantly, employing an AFP analysis demonstrates how the equal aims approach can reject epistemic priority without completely dispensing with epistemic constraints altogether: in the AFP approach, the epistemic and non-epistemic aims are satisfied *jointly* as part of achieving the purpose of inquiry. Allowing non-epistemic goals to be on par with epistemic ones does not automatically entail a lack of epistemic constraint, and thus the equal aims approach is not always susceptible to Ibsen-like predicaments.

Nevertheless, an epistemic priority theorist might object that even if the equal aims approach does not *necessarily* fall prey to epistemic corruption, there is nothing to prohibit it. For example, in the cases considered by Steel (discussed above), the "purpose" to be pursued under the AFP framework might put a very high priority on various non-epistemic goals over epistemic ones, and thus it might allow for (or even encourage) forms of fraud, misrepresentation, or disinformation that would violate typical epistemic standards of good scientific practice. In the case of the townspeople, for instance, their overriding purpose might be to keep their baths open, no matter what. But if there are no global epistemic aims of science, then there is no "mandate" to include or prioritize epistemic goals within the set that defines one's scientific purpose, and thus one might worry that the townspeople could not be criticized for ignoring or suppressing evidence about the harmfulness of their baths.

However, there are grounds to criticize decisions like those of the townspeople within the equal aims approach. First, one can question the selection of a particular local aim or an overarching purpose for a particular project. For example, the purpose of keeping baths open at all costs is likely self-defeating; consumers might not want to visit the baths if their safety had not been established. Similarly, suppose a pharmaceutical company designed safety studies of their drugs with the overriding purpose of obtaining results that would protect the sales of their drugs by avoiding any evidence of harmful effects; consumers would be more than warranted in criticizing the purpose of these studies on the grounds that they do not produce results relevant to what the *purpose should be*. In fact, consumers would likely attempt to enact regulations that would limit the extent to which companies could pursue purposes that fail to respect important social priorities, such as ensuring the safety of pharmaceuticals.

Furthermore, one can appeal to other local aims beyond those of an individual research project to curtail epistemically corrupt practices. That is, the purpose adopted in a specific project can still be critiqued from the perspective of the local aims associated with specific areas of science. So, for example, the townspeople could be criticized for adopting a purpose that fails to respect the local aims associated with the toxicological and epidemiological sciences to which they would be appealing in support of their baths' safety. Thus, the townspeople would be forced into either maintaining a purpose that fails to respect the local aims of relevant sciences or shifting to a different purpose (one that incorporates the local aims of sciences like toxicology or epidemiology, which would include considering all available evidence and engaging in sufficient testing rather than focusing solely on keeping their baths open at all costs). If they chose the former, they would lose the authority that society has invested in those sciences.

One might worry, however, that the strictures set by local aims are still not strong enough; ideally one would want more protection against epistemic corruption. For example, those who really wanted to pursue purposes that ran counter to the local scientific aims of toxicology or epidemiology or clinical research could simply bite the bullet and insist that they want to develop different approaches to science based on alternative aims.

We do not see why the constraints on this kind of practice need to come from some global epistemic element of science itself. Rather, the development of alternative aims and approaches to research can and should be subject to ethical, legal, regulatory, and prudential constraints.[8] We contend that these non-epistemic constraints are generally sufficient to address concerns about the development of epistemically questionable approaches to science. We have already seen that legal, regulatory, and prudential considerations can provide significant incentives to avoid these practices. In addition to these constraints (which are typically local in character), we think that basic ethical principles can provide global protection against potential abuses associated with local aims for science that run counter to typical epistemic standards. These ethical principles would require that those developing new or atypical approaches to science clearly broadcast that they are employing an alternative form of science with distinctive rules of inquiry (De Winter, 2016).

In fact, it is basic honesty that is missing from the cases where corrupt industry actors violate the typical epistemic standards of particular fields of science. For example, when the pharmaceutical industry engages in questionable tactics, their goal is to give the *appearance* of following the typical aims and standards of clinical medical practice while *actually* violating those standards and pursuing different aims (Carrier, 2020; Wilholt, 2020). Thus, they are not engaged in a good faith exercise to develop a different form of science with different local aims. If they honestly proposed a new approach to science that prioritized aims other than the truth about their products' safety, others could evaluate the strengths and weaknesses of their approach to science on its merits, and we do not think this would be especially worrisome.

Our solution is, then, much like the call for transparency found in Elliott and McKaughan's (2014) previous defense of what we are calling the "equal aims" approach to science. However, we are clarifying that this transparency must be of a particularly

[8] This suggestion seems to be in the spirit of the emerging field of Political Philosophy of Science (see Lusk, 2020, 2021; Schroeder, 2017, 2022).

striking sort. One must acknowledge that one is forging a new approach to science with distinctive local aims that run counter to those that are standard in one's field. If one cannot make this acknowledgment clear to those who will be making use of one's research (e.g., because people will encounter the results without recognizing the atypical epistemic standards), it would likely be more ethical not to engage in the research at all rather than to mislead people about it. For example, given that the general public expects pharmaceutical companies to follow typical standards for engaging in high-quality clinical trials when evaluating their drugs, it would be very difficult for those companies to abandon typical standards for those studies without misleading the public. Nevertheless, if researchers were willing and able to acknowledge in good faith that they were trying to develop a unique, rare form of science that violated common epistemic constraints like the demand for severe hypothesis testing, we would not rule out those efforts in principle, but we are dubious that such approaches would gain much uptake.

6 Conclusion

We have used debates over the proper roles for values in science as a starting point for examining the justification for claims about the aims of science. We examined a variety of ways of conceptualizing the aims of science and concluded that no matter how one conceptualizes them, there do not appear to be convincing arguments for the view that science has global aims that limit the pursuit of local aims. Instead, we suggested that it is most compelling to appeal to local aims for guiding scientific inquiry. This frees proponents of the equal aims approach from the criticism that they fail to respect global epistemic aims of science, and it places the burden of proof on their critics to show how to justify those global epistemic aims. Although this approach might seem to leave science open to epistemic corruption, we argued that there are still numerous ways to constrain scientific inquiry. Perhaps most importantly, even if there are not global scientific aims, there are still global ethical responsibilities shared by all human beings (e.g., honesty), and these responsibilities require that scientists either follow the local epistemic standards of their fields or make it abundantly clear that they are failing to do so.

But in addition to providing lessons for the literature on values and science, this analysis of the nature and justification of scientific aims has implications for the many other discussions in the philosophy of science that refer to science's aims. Speaking broadly, the conclusions of our paper support a highly naturalized and engaged approach across the philosophy of science (see e.g., Fehr & Plaisance, 2010; Cartieri & Potochnik, 2014; Plaisance & Elliott, 2021). If all aims of science are established locally, then philosophers of science cannot provide methodological guidance from their armchairs; they must engage deeply with scientists to understand their aims and study how they vary across contexts. Indeed, the aims of scientific communities are likely to be implicit and largely unspecified in many contexts, so philosophers could play a valuable role by helping to clarify these inchoate aims. In addition, they could help to clarify how multiple aims are integrated and prioritized to generate the specific purposes that guide inquiry in various research projects (see Lusk & Elliott, 2022;

Parker, 2020). Thus, our analysis of the aims of science has significant ramifications for the philosophy of science, not only in specific debates over issues like values in science but also in conceiving the field's general methodologies.

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