**EPISTEMIC HUMILITY IN THE SCIENCES**

*Routledge Handbook to the Philosophy of Humility*

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**1. Introduction**

Humility is a complex concept, with a variety of meanings, and the term ‘science’ is a complex umbrella term for a deeply pluralistic array of activities, institutions, and project. This means that any discussion of humility in relation to science must be appropriately sensitive to those pluralities of meaning and reference.

In this Chapter, my focus are two broad ways that they can be related: first, *humility as a component of science*, then, *science as a source of humility*. In the first case, certain forms of practical and epistemic humility are integral to the proper design and performance of scientific activities and projects—as a virtue of scientific practice, perhaps. In the second case, certain kinds of reflection on the limitations and deliverances of scientific enquiry can be a source of epistemic and existential humility. Stephen Jay Gould, for instance, argued that appreciation of our evolutionary history feeds a ‘deep humility for our status as a tiny and accidental twig on [the] luxuriating branching tree of life’ (2011: 267).

 These two sorts of humility are not sharply separated from one another, since one key feature of much scientific enquiry has been a sort of isomorphism between the humility of an enquirer and a proper sense of our place within the wider order of things. Within the scientific tradition that emerged in Europe, one sees this in the project of ‘natural theology’. Christian theological ideas informed early modern scientific projects in all sorts of ways—guiding the selection of problems, conferring salience on certain hypotheses, and so on (Brooke 1991). Despite the excesses of some modern secularists, the historical record is clear that ‘a good part of the distinctive success … of the scientific enterprise in the early modern West derives … from the fact that natural philosophy could be accommodated to projects in natural theology’ (Gaukroger 2006: 23).

Humility ran through many of those projects. Enquiries into nature, conducted with the right spirit, could, *inter alia*, promote a sense of awe and humility towards its Creator, or underscore our fallen, ‘corrupted’ nature by making clear our need for cooperative enquiry, or disclose the purposes of God’s design as manifested within His creation. Early modern Christian natural theologians explained their aims by quoting Romans 1:20, not to ‘entertain an idle barren curiosity, but to display the invisible things of God, his Power, Wisdom, and Goodness’ (Brooke 1991: 260).

A properly humble stance towards nature could therefore help to disclose the power and glory of its divine creator, while simultaneously contributing to the articulation of a deep picture of the world – a conception of the origins and nature of reality and human beings – of a sort that provided a metaphysical basis for a profound humility. Granted, later historical and cultural developments saw the displacement of such theologically charged conceptions of the relation of science and humility. But their influence persists, albeit in subtler forms.

**2. Some Initial Characterisations.**

Within the Western philosophical tradition of the last five hundred years, thinking about the nature of humility has been consistently shaped by the reflection on the scientific enterprise, which came to be the most epistemically authoritative institution of late modernity. Granted, the specific character of those reflections often changed, often due to internal developments within the sciences. A new sense of temporal humility was made possible in the latter half of the 17th century by radical developments in geology, which established the idea of ‘deep time’ (Rudwick 2007). Nowadays, different scientific disciplines can illustrate different kinds of limitation to our efforts to expand our knowledge, certainty, and capacity along spatial and temporal scales. An interesting case are the historical sciences, like palaeontology, where we cannot (currently) employ experimentation, one of our main types of epistemic practices. The philosopher of the historical sciences, Derek Turner, uses this as to motivate a humble sense that ‘our inability to intervene in the past …limits our knowledge of the past’ (2007:24). When we reflect carefully on specific sciences, many forms of humility emerge.

 The sciences have contributed many images and metaphors of humility to our ways of conceiving of the nature of humility. Among the most popular are the exploratory metaphors of ‘discovery’, ‘ongoing quest for knowledge’, ‘pushing the frontiers of human understanding’ and other slogans that affirm our current epistemic limitations and a related commitment to overcome them. Consider two famous images:

1. Sir Isaac Newton offered the famous image of the humble scientist, ‘standing on the shoulders of giants’ (in Turnbull 1959: 416). Although insincere in Newton’s own case, the image nicely expresses an *intergenerational conception of humility*, the ways that each successive generation of enquirers builds upon the contributions of the former. The image informed the sociologist of science, Robert K. Merton, when developing his famous ‘norms of scientific enquiry’, even to the point that he devoted an entire book to tracing the history of the ‘shoulders of giants’ phrase (Merton 1942, 1965).[[1]](#footnote-1)
2. Joseph Priestley offered a rather beautiful image of epistemic humility when reflecting on the generative character of new discoveries: ‘[t]he greater is the circle of light, the greater is the boundary of the darkness by which it is confined’, such that ‘the more light we get, the more thankful we ought to be’ (Priestley 1790, 1: xviii–xix).[[2]](#footnote-2) This is an expression of a *dynamic conception of humility* as a disposition that incorporates this sense of the transitory and potentially correctible character of our current ignorance.[[3]](#footnote-3)

The ‘shoulders of giants’ and ‘circle of light’ images are powerful ways of conveying and even inspiring humility. They also point to some general points of contact between humility and science.

1. *The epistemic imperatives of scientific enquiry*: a guiding desire to gain knowledge and understanding of the empirical world, at the micro and macro spatial and temporal scales. This reflects an acquisitionist value theory, according to which the primary aim of science is the acquisition of epistemic goods, which in turn lends salience to virtues or traits believed to contribute to that aim (Manson 2012). Since an explicit aspiration to acquire epistemic goods incorporates awareness of current deficiencies in our stock of epistemic goods, one can interpret an acquisitionist epistemic imperative of science as expressive of a fundamental *humility*.
2. *The epistemic discipline of scientific enquiry*: participation in scientific enquiry includes an acceptance of the need for scientific practitioners to submit themselves to various forms of epistemic, practical, and even moral self-discipline. Celebrants of science are prone to associate such voluntary self-disciplining with humility owing to the influence of postlapsarian Christian doctrines of the Fall on early modern natural philosophy. To submit oneself to the methodological strictures of science, such as Newton’s ‘Rules of Reasoning’, expresses an acceptance of the default epistemic corruption of humanity. Consider the ‘Idols of the Mind’, described by Sir Francis Bacon, the array of intrinsic and acquired epistemic vices and failings that, on his analysis, systematically impeded earlier projects of enquiry into nature. As he argues in *Novum Organum*, the willing submission to the external normative constraints of scientific method enables proper self-rectification of the epistemically disruptive impulses, desires, and temptations of our Idolic Mind—a complex story told by Sorana Corneanu in *Regimens of the Mind* (Corneanu 2011). Although modern celebrants of science drop the theology, they still retain the association of humility and scientific discipline, as when Merton praises the sciences as ‘institutionalised humility’.
3. *Reflective humility*: systematic reflection on the practice of science and their fruits are a useful focus and aid to wider philosophical reflection on the nature and limitations of our epistemic capacities and situation. This is partly due to the sheer practical and theoretical complexity of the sciences, of course, and partly due to the special roles in the epistemology of science of concepts themes adjacent to humility – of certainty, dependence, fallibility, and so on. Think of Karl Popper’s conception of science as the fallible, self-correcting process of ‘problem-solving’, proceeding by ‘conjectures and refutations’ aimed at ‘falsification’ of tentatively-advanced hypotheses (Popper 1959, 1963).[[4]](#footnote-4) Among contemporary philosophers of science, Hasok Chang argues that ‘[t]rue realism ought to consist in a humble admission of the existence of beings that do not obey us. It is hubris to grant the existence of objective reality and then presume to predict and control it perfectly’ (2012:239).

**3. Some Broad Claims.**

Based on these remarks, we can make some broad claims about science and humility.

1. Humility takes many *forms* in the sciences. Typically, the focus is on forms of *epistemic humility*. Historically, however, the sciences necessarily invoked concerns about other forms of ethical, existential, and spiritual humility (which is one reason that thinking about humility and science requires careful engagement with history of science).
2. Humility operates at many different *levels* in the sciences, from the individual stances and psychologies of scientific practitioners through to multigenerational collectives to the wider scientific enterprise. The levels interact with one another in complex ways, often mediated by the social and material structures of enquiry and informed by wider philosophical conceptions of the nature of science and its wider to wider forms of life.
3. Humility in the sciences is typically *dynamic*, in a double sense. First, the forms and means of scientific enquiry are constantly refined, for instance as new theoretical and technological developments offer new ways of extending, enhancing, or augmenting our individual and collective epistemic capacities—what Paul Humphreys (2004) calls *Extending Ourselves*. Second, the deliverances of the sciences are constantly changing, as researchers generate new theories, discoveries, models, data sets, and so on. All of these can transform estimates of the scope and stability of our current epistemic achievements and alter our sense of what count as tenable ambitions of enquiry.
4. The relationship between science and humility is *problematic* and *contested*. There is always scope for epistemological and metaphysical debate about the sciences as they relate to the theme of humility. The existence of the discipline of philosophy of science is partly premised on the persistence and significance of those debates, most clearly when it comes to debates about scientific realism. We can distinguish two main sorts of challenge. First, *internal challenges*, inspired by reflections on the history, practice, and social organisation of the sciences as they have developed, which provide grounds for critically rethinking our epistemic attitudes towards scientific practice and theory. A very short list of internal challenges would include the pessimistic meta-induction,[[5]](#footnote-5) the problem of unobservable entities, the underdetermination of theory by data, and scepticism about inference to the best explanation (see Chakravartty 2017: §§3-4).
5. A second class of *fundamental challenges* come from those who question the general epistemic ambition to provide what Bernard Williams called an ‘absolute conception’, an account of *‘*what there is *anyway*’. An absolute conception affords knowledge and explanation of the world independently of other, more ‘local’ conceptions, and insofar as it does, earns a privileged status (1978: 245). Such fundamental challenges come in a variety of flavours, ranging from Kantian arguments about our inability to transcend the structures of sensibility and experience conditioning our knowledge to forms of phenomenological argument that see scientific accounts of the world as prescinding from, and hence parasitic on, a more fundamental orientation within the world which they necessarily presuppose and thus cannot explain (Cooper 2002: chs. 8 – 10, Ratcliffe 2013).

The upshot of these challenges are genuine, substantive disagreements over the historical epistemic successes, and future epistemic ambitions, of the sciences. Arguably, the mood that prevails in contemporary analytic philosophy of science is one of relative humility or modest, as evident in the titles of modern forms of scientific realism – such as ‘modest realism’, ‘partial realism’, and ‘perspectival realism’ (see, e.g., Kitcher 2001: chs. 1 – 5, Massimi 2012). These debates are not exhausted by the theme of humility, of course, nor is it always appropriate to conceive of them in those terms. It should be clear, though, that the philosophical connections between humility and science are sufficiently deep and substantive to warrant attention.

**3. Levels of Humility in Science.**

We can think about epistemic humility within the sciences as fundamentally involving efforts to respond appropriately to the multiply *conditioned* character of epistemic confidence, that which affects our epistemic attitudes, activities, and ambitions. To be epistemically confident is to stand in a certain relation to the attitude, activities, and ambitions one has adopted or is considering adopting – a relation characterised by the expectation of the stability and efficacy of one’s capacities, of the rightness of one’s epistemic goals, the *tenability* of one’s ambitions (where their successful realisation is anticipated) or their *worthwhileness* (where failure is a tangible possibility), coupled to anticipation of success or trust in one’s ability to respond well to possible disruptions and contingencies (Kidd 2016a, 2018).

 This conception of epistemic humility has a pragmatist character. To be epistemically confident is to be free of what Charles Sanders Peirce (1992: §4) famously called the ‘irritation of doubt’, which motivates *enquiry*: the active ‘struggle’ for ‘settlement’, a state marked by a felt sense of the relative stability of our commitments and the likely efficacy of our activities. Such settlement is a precondition for the styles of smooth, unanxious epistemic comportment which make for the most effective sorts of enquiry Such pragmatist confidence also flows into Hasok Chang’s conception of epistemic humility in science as ‘an active pursuit of knowledge while accepting one’s own limitations’ (2012: 148).

 I want to suggest that epistemic humility within the sciences ought to be conceived as an active, reflective responsiveness to the contingent, conditioned character of our epistemic capacities and therefore of our wider epistemic activities, projects, and ambitions. (Note my preference for the term *conditioned*, over the term *limited*.) There are a variety of things that can condition the forms, scope, stability, and strength of our epistemic confidence, which can include *material conditions* (eg the availability of essential investigative technologies) to *social* *conditions* (eg the existence of a supportive community of peers) to *intellectual* *conditions* (eg the availability of suitably complex conceptual resources). Call these *confidence conditions*.

An advantage of this account of humility as reflective appreciation of the conditioned status of our individual and collective epistemic life is that exposes certain attractive features of the scientific enterprise. We can think about the sciences as systematic efforts to develop and implement receptive material, social, and intellectual conditions for increasingly complex forms of enquiry. Within the Western tradition, this conception of science goes back to Bacon, whose proposals for the methodological disciplining of science and the collective direction of enquiry was intended to provide systematic means for nullifying our individual failings and to maximise the effectiveness of our pooled epistemic capacities and resources. Of course, there are legitimate worries about the extent to which the sciences, historically and in their current forms, actually deliver on this ideal: our scientific practices, communities, and institutions are shot through with gendered biases, structural incentives to epistemic conservativism, dodgy political and ideological influences, and other deliberate and contingent suboptimalities. Crucially, then, a proper sense of humility needs active acknowledgement of suboptimalities and appropriate ameliorative responses.

When applying this model of humility to the sciences, focus on *confidence conditions*. We can think about these as operating at three main *levels* – the *agential*, *collective*, and *deep* – with the provisos that these levels are interpenetrating, such that changes at one level can effect consequent changes at the others. Some of these conditions can be overcome, quickly and easily—for instance, uncertainty about the chemical composition of a substance will act to condition the confidence of a chemist tasked with its identification, but that can be solved by performing a straightforward laboratory test. In other cases, the confidence conditions will be harder to fulfil, due to practical, financial, epistemic, or other reasons The absence of a certain fossil conditions an archaeologist’s confidence in a palaeontological hypothesis, which could only be fulfilled by the discovery of that fossil – something that cannot be guaranteed, given the practical expense of excavation and the enormous gaps in the fossil record. In some cases, fulfilment of the relevant conditions could be practically impossible, in ways that act as a perpetual constraint on one’s epistemic confidence.

Consider the following examples of epistemic confidence at the three levels:

1. *Agential humility* is that that exercised by individual scientists, as they adopt, amend, or reject certain *epistemic attitudes*, or perform and reject certain *epistemic actions*, or accept, amend, or reject certain *epistemic ambitions*. Such agential confidence can be conditioned by, *inter alia*, the subject’s cognitive, bodily, and perceptual capacities; the education and training available to them; the variety and degree of their practical skills and competences; the self-esteem and epistemic self-trust they have developed; and so on.
2. *Collective humility* is that exercised by scientific collectives, such as research teams or, at a larger level, the disciplinary communities characteristic of modern ‘Big Science’ (Galison and Hevly 1992). It includes confidence in shared values and norms; systems such as peer review and data-sharing; the integrity of the disciplinary community; and so on. Such collective condition is conditioned by the quality, stability and complexity of the structures of local and transnational scientific communities. As those conditions change, the confidence one can reasonably invest in the collective changes, too—the replication crises in psychology and biomedicine, for instance, are often described as ‘crisis of confidence’ (e.g. Pashler and Wagenmakers 2012).
3. *Deep humility* is motivated by the recognition that individual and collective epistemic activities depend for the intelligibility and salience on something beyond themselves. Objects of deep confidence can a certain project of enquiry, an intellectual inheritance that provides shape and direction to a research agenda, or a metaphysical vision that provides what Heidegger (1977: 118f) called a ‘ground-plan’ for enquiry, stipulating in advance the sorts of entities allowable for investigation. Such deep confidence is often sustained by wider cultural projects, too, hence Edmund Husserl’s (1970: 48) remark that ‘science is [an] accomplishment which presupposes’ a *Lebenswelt*, a ‘surrounding world of life.’ In thse cases, what *counts* as humility is determined relative to a certain metaphysical vision or worldview (Kidd 2018a: §§ IV – VI).

Proper humility about science ought to attend to all of these levels, though not necessarily at each level at all times. The dynamics of agential confidence might be highly complex, while changes in the objects of deep confidence in science change very slowly, for instance, due to the influence of radical philosophical developments. Consider the ways that deep confidence in the capacity of human beings to describe the nature of reality was profoundly challenged by Kant’s ‘Copernican Revolution’ (on this example, and others, see Kidd 2017a). Moreover, an estimation of the degree of confidence one can invest, at whatever level, is often subject to uncertainty and contestation. Kant’s transcendental idealism, Nietzsche’s genealogy, and the ‘historical’ and ‘sociological’ turns of the middle-third of the 20th century each challenged the prevailing forms of deep confidence in science, even if their pertinence and force was subject to vigorous counter-challenges.

Humility, then, depends on current conceptions of science, the nature and grounds of the confidence invested in science, and the types of critical challenge considered salient within a given cultural period.

**4. Epistemic Humility within the Philosophy of Science**

The theme of epistemic humility will look differently when considered in relation to different debates or topics. Contemporary philosophy of science offers a variety of candidates, of which I want to survey two – *contingency* and *pluralism* – each of which can inflect our conceptions of epistemic humility.

**4a. Contingency and science.**

Acceptance of the importance of engagement with the methods and results of the history of science is an established feature of the philosophy of science. Studying the ways that sciences have developed over time matters for all sorts of reasons, of course, although one of the more neglected reasons is that an historical sensibility discloses a deeper feature of the sciences –their *contingency.*

Taken broadly, contingency refers to the fact that the emergence, development, and entrenchment of the sciences was and continues to be shaped by various contingent events and processes – material, social, intellectual, cultural, and technological. These are contingent in the sense that they might not have occurred or might have occurred differently to the way that they did. Put that way, talk of contingency seems a historical banality, but during the last century, a variety of philosophers began to argue that reflection on contingencies motivates important changes in our epistemic attitudes towards the science. Crucially, contingency can reveal that our scientific inheritance is a product of social and historical accidents, rather than deliberations and decisions that vindicate *that* inheritance over its alternatives.

There are two broad styles of ‘contingentist’ argument, popular among some groups of philosophers, that are worth noting because they are popular, but ineffective. First, there are what we might call *constructionist* arguments, popular among sociologists of science from the 1980s onwards. These stress the socially ‘constructed’ character of scientific theories, the products of personal ambitions, institutional politics, and much else (classic examples of such work are Pickering 1984 and Latour 1987). Second, a ‘*Baconian’* style of argument, according to which the modern sciences are fundamentally animated by the goals of mastery of nature—to dominate nature, women, and aboriginal peoples—rather than genuine cognitive interests. Of course, neither style of argument succeeds: each are guilty of *non sequiturs* (see Hacking (1999) and, more polemically, Koertge (1998)).

A better style of argument uses reflection on contingencies to motivate epistemically humble attitude towards the inevitability and efficacy of the sciences we inherited. There are various ways to do this, depending on the philosophers one consults. Generally, anglophone philosophers of science have been slower to admit the significance of contingencies, whereas a deep sense of contingency flows through the accounts of science of, say, Husserl (1970) and Heidegger (1977). Ultimately, though, all participants in the debate agree that contingency can motivate a deep sense of epistemic humility about science.

**4b. The modern contingency debate.**

The most comprehensive treatment of the modern contingency debate is provided by Léna Soler (2008a, 2015). She distinguishes two main positions, each best construed as a pole bordering a range of subtly distinct positions, named *inevitabilism* and *contingentism*. There are three main points of contestation, phrasable as questions: could the history of a particular scientific discipline could (*first*) have developed differently than it actually did, and (*second*), if so, would it still have been as non-trivially successful as what came to be actual science, and (*third*) how could these claims be properly decided? Put crudely, the inevitabilist denies these claims and thinks they cannot be decided, while they are affirmed by a contingentist, who thinks we can be confident enough in our claims about unrealised ways that history could have gone. Obviously, the most direct point of contact with epistemic humility is the third issue, which Katharina Kinzel (2015: §4) has labelled *the challenge of decidability*.

When making contingentist claims, the two crucial things that need specifying are the *objects* of the contingency claims and the *degree* of contingency attributed to them. Soler (2015) calls these the *what* and *how (much)* questions. Some of the main points are these:

1. *Objects of contingency* are highly plural and, in principle, coequal with the whole range of components of scientific enquiry. Candidates include concepts, theories, results, methods and practices, experimental techniques, ontologies, disciplinary norms and structures, and aims of enquiry (Soler, Trizio, and Pickering 2015, Parts II, III, and V).
2. *Arguments and objects*: one needs different sorts of arguments when arguing for the contingency of different kinds of object. A different social organisation for a scientific discipline is one thing, whereas a different metaphysical framework is quite another. Claims about the contingency of different objects will be more compelling when they can specify those objects, although also, for that reason, more difficult to make.
3. *Selective contingencies*: one can be contingentist about some objects, but also quite inevitabilist about other objects. A contingentist might think that the end *results* of scientific enquiry are inevitable, but the particular *paths* by which one reaches them are highly contingent. A contingentist could subscribe to some form of convergentist conception of enquiry of the sort popular among some pragmatists (Hookway 2002: chs. 1 – 2).
4. *Diachronic variability*: the degree of contingency one assigns to a given object can be *diachronically* *variable* in the sense of their varying over time in response to changes in the content and context of enquiry. In an important early study of contingency, James T. Cushing (1994) argued the entrenchment of Copenhagen interpretation of quantum mechanics was not initially inevitable, since it had to contend with David Bohm’s alternative hidden variables interpretation. Luckily for the Copenhagen interpretation, however, various contingent developments led to Bohm’s self-exile to Brazil, which scuppered his chances of effectively advocating for his rival interpretation. As a result, the entrenchment of Copenhagen interpretation came to be all but inevitable (Pessoa 2001).
5. *Counterfactual history*: contingentists often use counterfactual claims in support of their claims, with the best available examples based on the recent history of biology. Greg Radick (2005, 2005) has argued for the contingency of genic biology by showing the availability of an alternative non-genic biology. A more ambitious counterfactual social and intellectual history is Peter Bowler’s (2013) *Darwin Deleted.* An example from the history of chemistry is Hasok Chang’s (2009) argument that establishment of oxygen theory in 18th century Europe was not inevitable with respect to its much-maligned rival, phlogiston theory.

Based on this quick sketch of the contingency debate, we can pick out two main ways in which humility plays a role. One concerns the standard objection to the contingentist which Ian Hacking (2000) memorably labelled the ‘put-up-or-shut-up’, the other concerns what I’ll call *deep humility*.

**4c. Contingency and humility.**

Let’s start with the ‘put-up-or-shut-up’ objection - PUSU. This expresses a challenge to those who make contingentist claims about alternative ways that the sciences, at whatever level, could have developed. Bluntly put, the challenge is to ‘put up or shut up. Show us an alternative development’ (Hacking 2000: 67; cf. Soler 2015b: 55). PUSU exploits a sense that those who want to talk about radical alternatives to extant, successful scientific theories should upgrade their suggestions by providing them for critical scrutiny. Otherwise, a contingentist is granted the luxury of unchallenged speculation, which might be exciting but lacks serious content (Radick 2005:22). Those who deploy PUSU often present themselves as upholding the norms of responsible debate. After all, one modes of humility is submission to forms of epistemic discipline, such as resisting the urge to make extravagant claims about ‘other sciences’.

Contingentists have challenged the legitimacy of the PUSU objection, and many of their arguments explicitly appeal to the concept of epistemic humility (see Soler 2015b: 83ff). My focus is those that explicitly employ a concept of epistemic humility. I will combine two such arguments, one owing to Emiliano Trizio (2008) and the other to myself (Kidd 2016b). Taken together, the conclusion is that PUSU cannot be satisfied: it presupposes an exaggerated, hubristic conception of our epistemic capacities. For that reason, it ought to be rejected.

In general form, the argument is that to demand that the contingent ‘put up’ is, in practice, to demand that they conceive and develop an alternative historical development of some science. Unfortunately, that ignores what Trizio calls the ‘collective and highly specialised character of enquiry’ – the dependence of scientific enquiry on a complexly organised community of scientists. Such collective epistemic agency cannot be simulated by a lone theorist, given the scale and complexity of the required epistemic work, which forbids ‘any private reconstruction of the entire edifice of knowledge’ (2008: 258). By issuing PUSU, the inevitabilist is either (a) ignorant of those facts about scientific enquiry or (b) holding the contingentist to an impossibly high epistemic standard. If so, then PUSU looks like a choice – to *put-up* or to *shut-up* – but, in practice, only allows the contingentist to ‘shut up’.

The connection to humility comes when one restates the response to the inevitabilist in the language of *hubris*, my technical term for a radical deficiency of humility, which involves asserting or presupposing possession of epistemic capacities of a type, scope, or strength of a sort unavailable to human beings (Kidd 2016a). In the case of the PUSU demand, these are the capacities needed to imagine and animate, in detail, an entire alternative development to the sciences – to achieve what Trizio nicely called a ‘private reconstruction of the edifice of knowledge’. Since no-one possesses such magisterial epistemic capacities, PUSU relies on a *hubristic* estimation of our epistemic capacities and should be rejected for that reason. An acceptance of the challenge would entail at least implicit acceptance of a hubristic estimate of one’s epistemic capacities—a radical failure of humility and also of self-knowledge.

**4d. Deep contingency.**

A second way that contingency connects to humility concerns epistemic attitudes to the wider scientific conceptions of reality that have come to provide the authoritative accounts of what the world—the scientific worldview or scientific ‘picture of the world’. A certain sort of *deep humility* is expressed by a reflective acceptance that, had history gone another way, an entirely different picture of the world could have become entrenched. Historically, such sensitivity to the deep contingency of science has been largely confined to certain Austrian and German philosophers, specifically Heidegger’s (1977) remarks on the contingent ‘ways of revealing’ that came to shape our scientific ‘world-picture’, or Husserl’s (1970) reflections on the ‘crisis of the European sciences’, to interesting remarks scattered through the later writings of Ludwig Wittgenstein (1980) and Paul Feyerabend (1999), as reconstructed by Cooper (2017) and Kidd (2017c), respectively.

The fullest account of this argument, which draws on the aforementioned philosophers, has been developed by David E. Cooper in his 2002 book, *The Measure of Things*, which has complex reflections on hubris and humility:

[T]he failure of any rival to the scientific image to become our entrenched view was not due to the recognition, after patient and prolonged investigation, that the entities and processes postulated by the rivals did not pass muster in comparison with those proposed by physics [.] The fact is that no one has ever tried, in detail, to develop the ‘research programmes’ indicated by such rival images of reality, or to compare them, in terms of explanatory scope, with those of the natural sciences. (Cooper 2002: 194)

Against the inevitabilist insistence that any rivals were doomed to fail, Cooper responds that the confidence expressed in their judgments could only be legitimate if the inevitabilist had epistemic capacities which they patently lack:

Only a creature able to survey such rivals, to work out their implications, to compare them with one another and with our entrenched scientific account, could have good reason to conclude that the last of these has the edge. None of us could even approximate to such a creature, and to pretend that we not only could, but actually do, is to be lacking in humility. (Cooper 2002:195)

Such deep humility is intended to undercut the inevitabilists’ confidence in the inevitability of the conceptions of the world that have come to be part of our cultural and intellectual inheritance.

The really interesting questions concern the wider implications of this deep contingency. Soler thinks that helps to ‘foster a profound change of spirit regarding science’, not least by motivating deeper, more critical reflection on ‘our scientifically based form of life’ (2015a: 42). I have argued that acceptance of deep contingency is necessary if one wants to take up a radically critical stance on the sciences, since it compels us to consider extremely different ways that science could have been (Kidd 2013a, 2017c). At its most radical, deep humility can involve acceptance of the possibility that our form of life might never have developed into anything we could recognise as a scientific picture of the world. But this brings us to a second theme – *pluralism*.

**5. Pluralism.**

Contemporary philosophy of science is currently experiencing a ‘pluralist turn’, the turn to a descriptive and normative vision of the sciences as plural – theoretically, methodologically, axiologically. Starting from a rejection of the monism promoted by Thomas Kuhn (1962) and other early-to-mid 20th century philosophers of science, several major developments within the discipline contributed to a revitalising perception of the pluralistic character of sciences. Some standout examples were the ‘historical’ and ‘sociological’ turns, which made clear the plurality to be found within actual scientific practice, and the array of normative arguments for pluralism developed by feminist philosophers of science. By the 1990s, the ‘disunity’ and ‘plurality’ of science was increasingly accepted, to the point of being mainstream today (see Galison and Stump 1996 and Kellert, Longino, and Waters 2006).

Since pluralists are self-reflective about their pluralism, there are many conceptions of pluralism available. Here are some of the crucial points:

1. Essential to pluralism is a rejection of *monism*, the normative claim that a single account of the world, a single set of aims, or a single unified set of methods (and so on) is either *possible* (*strong form*) or desirable (*weak form*).
2. Distinguish *plurality* (a descriptive thesis) and *pluralism* (a normative thesis). One can endorse claims about science’s plurality without endorsing the normative thesis that such plurality ought to be protected or promoted.
3. Distinguish *objects of pluralism*: one can be a global pluralist and think that every aspect of science could be plural – aims, values, methods, theories, evidentiary standards, ontological commitments, and so on (like Feyerabend 1975, at laest as interpreted by Oberheim 2006). Other pluralists are more circumspect, confining their pluralism to only certain aspects of science, such as its methods or axiology.
4. Distinguish *epistemic* and *metaphysical* pluralism: scientific pluralists disagree on the question of whether epistemic pluralism about science either needs or would be strengthened by an associated metaphysical thesis, either about the nature of reality (*broad metaphysical pluralism*) or about a specific domain of phenomena (*narrow metaphysical pluralism*). John Dupré (1993) and Sandra Mitchell (2003) develop metaphysical theses to support doctrines of epistemic pluralism, while Chang (2012: §5.3.2) does not, instead opting for agnosticism about the nature of reality.

**5a. Pluralism and humility.**

There are several ways that pluralism connects with the theme of humility. I focus on those identified by Hasok Chang (2012: ch.6), who invokes humility when making the case for what he calls *active normative epistemic pluralism*:

1. *Tolerant pluralism*: an attitude of tolerance for multiple systems of practice, each of them making its own distinct contributions, without any need for the systems to ever interact with one another—indeed, the relevant communities could be populated by strong monists. A state of tolerance could be achieved by spontaneous toleration, or a centralised structure that facilitates diversity, or both. Advantages of toleration can include hedging one’s bets, divisions of epistemic labour, satisfaction of different aims (as part of ‘pluri-axial regimes’), and the multiple satisfaction of aims (see Chang 2012: § 5.2.2).
2. *Interactive pluralism*: an active stance of facilitating interaction between the different systems of practice, which requires at least some scientists to be committed pluralists and social structures that encourage and enable their interactions, while also working to monitor for and correct emerging monistic tendencies. Advantages of interaction can include productive integration across different systems, co-optation of resources, and productive epistemic competition (see Chang 2012: § 5.2.3).

Each of these forms of pluralism incorporates a variety of modes of humility, which include at least the following:

* A reasonable humility about human capabilities (2012: xx)
* An acceptance of the limitations inherent to any epistemic practice (2012: 148)
* An appreciation of human epistemic fragility and fallibility (2012: 238)
* An expectation that any successful system of practice will run up against its limitations sooner or later (2012: 258)
* A sense that reality is more abundant and complex than our minds can grasp through simple schemes (2012: 292)

Some of these are more closely aligned to the tolerant forms of pluralism, others perhaps more to the interactive forms. Underlying all of them, however, is a fundamental conviction:

The most fundamental motivation for pluralism is *humility*: we are limited beings trying to under- stand and engage with an external reality that seems vastly complex, apparently inexhaustible, and ultimately unpredictable.2 If we are not likely to find *the* perfect system of science, it makes sense to foster multiple ones, each of which will have its own unique strengths. (Chang 2012: 255)

Other pluralists add other advantages, also expressive of forms of humility. Dupré, for instance, sees pluralism as a ‘therapy’ against the ‘monopoly of epistemic authority sustained by science’ (1993: 262-263) and a check against attitudes, such as ‘the lure of the simplistic’ (2002)—a determined preference for reductive, monocausal responses to complexity—and, worse, insistence on the ‘self-evident superiority’ found among aggressive monists guilty of ‘Imperialist Scientism’ (2003: 112). In such cases, being epistemically humble guards against scientistic tendencies that often express such vices as arrogance and dogmatism (Kidd 2013b, 2018b).

We can connect such humility to the earlier points about contingency, too. Accepting the multiple contingencies of the historical development and current forms of the sciences can lead to at least two broad styles of response:

1. *Active pluralism*: we follow Chang’s (2015: 360) proposal to productively reconceive inevitability as *unavoidability* and try to work out if certain scientific results are unavoidable by trying to avoid them by cultivating alternative projects of enquiry (Aylward forthcoming). By doing so, we actively *test* our epistemic limits as they are contingently developing and try to expand them using a policy of active pluralisation. In this case, contingency gives an argument for pluralism and motivates an *active* *humility*.
2. *Deep humility*: following Cooper, accept the deep contingency of our fundamental convictions about the scientific picture of the world and adopt a humbler attitude towards alternative pictures. This can involve different attitudes: ‘tolerance’ of those different pictures and their associated ‘forms of life’; principled resistance to the temptations to deride or dismiss them as ‘primitive’, ‘crude’, and epistemically unrespectable; reassessment of the default privileging of theoretical descriptions over the richness of lived experience, and so on (Cooper 2002: 342ff, 363ff).

Such possibilities are complex and raise many questions, not least about the variety of ways that philosophical reflection on science can motivate different forms of humility. The active pluralism resonates nicely with contemporary work in philosophy of science in a way that’s not true for the sorts of radical rethinking of our cultural attitudes towards the enterprise of science constitutive of deep humility.

**RELATED TOPICS**

Chapters 0000

**BIOGRAPHICAL NOTE**

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1. Interestingly, the phrase was in standard use from at least the 12th century (Merton 1965: 293. [↑](#footnote-ref-1)
2. ‘For by this means we have the greater range for satisfactory contemplation. In time the bounds of light will be still farther extended; and from the infinity of the divine nature and the divine works, we may promise ourselves an endless progress in our investigation of them: a prospect truly sublime and glorious’ (Priestley 1790, 1: xviii–xix). [↑](#footnote-ref-2)
3. Also, deeper connections between humility and other virtues and qualities – cf. Michael Faraday’s exuberant remarks about the ways that, in science, ‘advancement …, whether in a degree great or small, instead of exhausting the subjects of research, opens the doors to further and more abundant knowledge, overflowing with beauty and utility, to those who will be at the easy personal pains of undertaking its experimental investigation.” (1834, 122, §871). [↑](#footnote-ref-3)
4. A good study of Popper’s critical rationalism is Rowbottom (2010). [↑](#footnote-ref-4)
5. The pessimistic meta-induction is taken to originate with Henri Poincaré’s reflections on the ‘bankruptcy of science’, the awareness of the ‘ephemeral nature’ of scientific theories, which are ‘abandoned one after another’ ([1905] 1952: 160). The classic statement is Laudan (1981) and an overview of the recent stages of the debate is given by Wray (1995). [↑](#footnote-ref-5)