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Ian Hacking – Special Issue

Making Sense of Hacking: Styles, Metaphilosophy and Naturalism

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Abstract:

I argue a useful way to conceptualise all of Hacking's work is through his styles project. This provides us with a simple structure to organise many of Hacking's main texts and brings into sharp relief two of his major philosophical projects. The first is to explain the stability of science. The second is metaphilosophical: to understand why scientific activity gives rise to certain philosophical difficulties, for example realism disputes. In its most ambitious form, Hacking called his project Philosophical Anthropology, and his aim was to explain how creatures like us, in a world like this have happened to alight on methods of finding out that work so well. I end with a brief discussion of how successfully he realised his goals and an even briefer comparison with two naturalist philosophers, Mark Wilson and Penelope Maddy, who share some of his interests and ambitions.

Keywords: Ian Hacking; Styles of Thinking; Philosophical Anthropology; Metaphilosophy; Naturalism

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> I have often, rightly, been accused of laying out a set of options quite well but concealing my own hand. What on earth do *I* think? (Hacking 2014, 93)

Introduction: Philosophical Anthropology and Styles of Thought

Ian Hacking was a singular philosopher of science. His work is unusually enjoyable to read for one thing: full of fascinating details and even the occasional ripping yarn.[2] It covers a staggering variety of topics from formal aspects of the philosophy of statistics to mental illness to experimentation to child abuse to mathematical discovery and almost everything else in between. But it can be frustrating in other ways, as he himself understood. One can't help thinking every now again why won't he just get to the point. Why does he always seem on the verge of saying something truly radical, only to back away, qualify or retract?[3] Why do

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[2] Hacking (1998) is a brilliantly told story.

[3] See for example his discussion of an indeterminacy in the past in Hacking (1995) and his clarifications in Hacking (2003) or his backtracking on astronomical anti-realism in Hacking (2009)

we get so often in his writings admissions that what he is doing is frustrating or annoying[4] or that his opinion on a particular philosophical dispute doesn't matter?[5] What, in short, is he up to?

It is possible the answer is nothing, or lots of different unrelated things. There is no overarching philosophical structure to his output, and we should read his work as a series of sometimes fascinating, sometimes irritating interventions on a range of topics. I think, perhaps, as an arch disunifier[6] he might be quite happy for his work to be taken up in this way. The only detailed and sustained attempt to give a more informative answer I know of can be found in Maria Laura Martinez's (2021) excellent book. She suggests we can make sense of Hacking's output by seeing "Foucault's influence as the thread that runs across Hacking's work". While I agree with many of the particular things Martinez[7] says and find her way of ordering Hacking's work illuminating, I think to focus on Foucault is a mistake. Hacking is influenced by many philosophers, Kuhn, Feyerabend, Austin, and especially Wittgenstein to name only those who feature most prominently, picking up ideas here and there as he finds them useful before moving on to other things. I think the best way to make sense of Hacking's work is to think of him as pursuing a particularly ambitious philosophical programme, something he calls, perhaps somewhat tongue-in-cheek, Philosophical Anthropology, the project of understanding "Man and his place in nature" (Hacking 2012, 607) or more informatively "some aspects of human *nature* as they have been discovered and *nurtured* by groups of people and encoded in societies, even in civilizations." (Hacking 2009, 50) This project involves history, and here the influence of Foucault (and Kuhn) is important but it equally: "include[s] evolutionary biology, cognitive sciences, developmental psychology, and neuroscience, but also archaeology (especially the archaeology of mind or cognitive archaeology[8]), prehistory, anthropology, ecology, linguistics, sociology, science studies, [and] mathematics" (Hacking 2014, p.94).[9] A project like this sounds impossibly grand but, in Hacking's hands at least, it has a narrower, more distinctively Wittgensteinian metaphilosophical flavour. He is interested in using these multiple disciplines to teach us something about the origin of our philosophical perplexities, and, perhaps, thereby help us escape some flybottles.

Below, I offer a way of ordering Hacking's thinking to show how we can understand much of it, especially as it took shape in his later work, as organised around this metaphilosophical project. Key, I think, to understanding the broad structure of Hacking's work is his notion of a style of thinking. This provides us with a tool to organise his work. Hacking's writings can be broadly thought to divide into work that explicates the notion of styles of thought; particular analyses and elaborations of one style or another; and accounts of thinking and reasoning to which the six styles do not seem to stably apply. The styles project understood as a kind of Philosophical Anthropology in Hacking's last writings is

[4] See, for example, Hacking (1992b) in reference to his discussion of metaphysics or the introduction to the second edition of Hacking (2006) in which he describes his model as "preposterous".

[5] See Hacking (2014) in relation to questions of Platonism and nominalism and Lecture 4 of Hacking (2009) in which realism debates are described as "mickey mouse".

[6] Hacking (1996)

[7] In particular, the role she gives to styles of thinking in organising Hacking's thought.

[8] Here of course Foucault is important again.

[9] Hacking does not use the term philosophical anthropology here, but it seems clear that he is describing precisely what he calls elsewhere a philosophical anthropology of mathematics. Compare Hacking's discussion in Hacking (2009) in the opening section of ch.2 and Hacking (2012) sec. 20. More and more disciplines seem to become relevant to the project of philosophical anthropology in Hacking's later work. By way of contrast see Hacking (2002, 196) where we are offered: "These conditions [the emergence of styles of thought] are not topics of the sciences, to be investigated by one or more styles, but conditions for the possibility of styles. An account of them has to be brief and banal", I am assuming the later versions are a more fully worked out account of the idea.

incredibly ambitious but I claim it achieves for Hacking two main things: 1. A way of distinguishing science from non-science, here the key ideas are stability and what he calls self-authentication; 2. A structure that helps us understand why certain philosophical questions emerge, and, sometimes, a diagnosis of why in contemporary philosophy those questions are misguided. This has in part again to do with self-authentication but also something more straightforwardly empirical: a closer look at what actually happens in science can highlight misguided presuppositions.

My structuring of Hacking's work, like any such interpretation, involves bringing certain elements of his writing into sharp relief and downplaying others. I do not suggest it is the only or even the most fruitful way to think about Hacking. (Martinez's work clearly offers an excellent, much more detailed alternative vision.) But I do think it can help us make sense of why he was often unconcerned about questions that other philosophers found pressing, of the scale of his ambition and how his work connects to contemporary anglophone philosophy.

The Styles Project

Hacking tells us that he first heard A. C. Crombie talk about styles of thinking in 1978 (Hacking 2012, 599). Since much of Hacking's most significant work was written well before this, it would be absurd, of course, to say that we should understand his philosophy from beginning to end as a working through of the idea of styles of thinking. But Hacking, I think, was particularly drawn to Crombie's idea of styles of thought because it provided a structure which helped him make sense of many of his own historical and philosophical projects[10] and it is in that spirit that I wish to elaborate the idea. I'll first give a very brief sketch of the notion of styles of thought, especially as it was developed in Hacking's later work. Then, I will show how we can organise much of Hacking's output in terms of styles. Before finally turning in subsequent sections to try in a critical way to make sense of the philosophical work it is supposed to do.

Crombie distinguished six styles of thought in the European tradition. They are in a simplified form favoured by Hacking:

1. The mathematical style

2. The experimental style

3. The hypothetical modelling style

4. The statistical style

5. The classificatory style

6. The historico-genetic style[11]

Hacking in his own presentations has fiddled with the both the terminology and the list itself. Sometimes instead of 'styles of thinking' he speaks of 'styles of reasoning' or 'styles of thinking and doing in the European tradition' or more concisely 'genres of thought'. Sometimes Hacking entertains the thought that there are more styles than Crombie's six; there might have been a the Paracelsian style and there might be emerging a new style associated with computer simulations; and sometimes he has merged the styles on

[10] Note the second edition of Hacking (2006) refers to styles of thinking, even though of course the first edition (Hacking (1975) predates his discovery of Crombie.
[11] Crombie's (1994) names are bit more elaborate and a little different. None of that will concern us here.

Crombie's list. The marriage of styles 2 and 3 becomes what Hacking calls in many writings the laboratory style. This fiddling, especially with the members of the list, is indicative of some dissatisfaction with Crombie's structure. Hacking sometimes found it hard to get Crombie's styles to perform the philosophy work he wanted, especially as we move further down the list. We will come to discuss some of this later, but the main draw of Crombie's list is its familiarity. As Hacking puts it "This list of six was wholly unoriginal, and that is one of its merits. It is a conventional organization of popular history of science." (Hacking, 2012, 600) It strikes Hacking, and he thinks it should strike the average reader too, as forming a decent attempt to capture in broad outline what we already think are key parts of the methodology of past and contemporary science.

According to Crombie (and Hacking concurs) each style is not just a new method of reasoning but also brings with it new objects and new sentences. For example, with the mathematical style comes a new method of proof, new abstract mathematical objects, and new sentences expressing claims proved about these objects. With the combination of styles 2 and 3 comes new unobservable objects and new sentences expressing claims about and evidence for those unobservable entities. For Hacking these objects and sentences are not just by-products of the style. He denies that first we have the style, the way of finding out, then later objects and sentences. All three come together and all three in part constitute the style.

One important way that Hacking deviates from Crombie is that whereas Crombie sees elements of all of these styles in premodern investigation, Hacking thinks there are sharp discontinuities in the histories of all six styles. Each of the styles on the list has a moment when it *crystallizes* when there is "a fixing of how to go on in the future, usually after centuries, perhaps millennia, of inchoate precursors" (Hacking, 2009, 14).

In his Taiwan lectures, inspired by Bernhard Williams idea that truth is timeless but there is a history to our concept of truthfulness, Hacking condenses these ideas into a neat schema, each style involves:

(∗) A shift in conceptions of what it is to tell the truth about X.

(∗∗) This significant change took place in the Y century, and its emblem is Z.

Fleshing this out for the mathematical style for example we get this:

(∗) A shift in conceptions of what it is to tell the truth about geometrical objects.

(∗∗) This significant change took place early in the sixth century [B.C.E], and its emblem is Thales. (Hacking, 2009, 104).

Two further and more controversial ideas are important. Styles, according to Hacking, are both autonomous and self-authenticating. They are autonomous in the sense that although for example the mathematical style arises in ancient Greece and there may be a detailed story to tell about the conditions under which it came to crystallize, once it becomes fixed, it is not hostage to those origins. The method of proof can and does flourish in social and environmental contexts very different from Ancient Greece. Styles are self-authenticating according to Hacking in that "sentences of the relevant [style-dependent] kinds are candidates for truth or for falsehood only when a style of [thinking] makes them so." (Hacking, 2002, 191). So, there is no style-independent justification to be offered for styles as methods or as sentences emerging from that method.

Styles as a Way of Organising Hacking's Work

This brief sketch of the styles project so far misses almost everything which is philosophically interesting, but we have enough here to see how the notion of a style of thought can be used to organise Hacking's writings. I claim that much of Hacking's writing can usefully be thought of falling into three categories: 1. An attempt to explain the general idea of styles of thinking; 2. Work which investigates aspects of a particular style (or sometimes combinations of styles) including its history; 3. Work on subjects in which the six styles of thinking do not stably apply. As a classification this might sound trivial. My third grouping seem to include[12] by definition everything that is not included in group 1 and 2. But, I maintain, this is a useful distinction since in part what styles of thinking are supposed to capture for Hacking is a demarcation between science and non-science. The six styles of thinking listed by Crombie have crystallized and become autonomous. They have a certain kind of stability and so the disciplines which employ those styles, the natural sciences, have a kind of stability that other disciplines, like those in the humanities, do not. One task of Hacking's writing that I would group in category 1 and category 2 is to explain that stability. One task of the writings I would group in category 3 is to explain the instability of these other disciplines. Below, I explain how some of that is meant to go but before we get to these more substantive philosophical issues, let me quickly outline my three-category ordering of Hacking's work.

The *general* idea of styles of thinking has been articulated by Hacking in several papers and talks (2002, 2009) but most elaborately in Hacking (2012) where the full scale of the ambition of the project becomes clear. Nevertheless, this represents a tiny fraction of Hacking's work. The really important work for Hacking has been in developing accounts of each individual style, what I call above category 2. Hacking's last book *Why is there a philosophy of mathematics at all?* is an account of the mathematical style of reasoning but also touches on style 3, the use of hypothetical, mathematical models in describing the world. *Representing and Intervening* is an account of both style 2 and 3, what in combination Hacking has sometimes called the laboratory style. *The emergence of probability, The taming of chance*, and also in an important way *The logic of statistical inference* concern the statistical style of reasoning. This I think is all straightforward. It is tempting to think that Hacking's works on mental illness, *Re-writing the soul* and *Mad travellers*, are instances of work on the classificatory style. I think they fit into category 3. Both books are studies of instability and transience. They are stories of how classifications come and go. Hacking's many and evolving writings on natural kinds are part of an attempt to say something about the classificatory style, along with his unpublished lectures at UNAM, which I think represent his only attempt to seriously engage with the historico-genetic style. These writings also point to a fissure in his understanding of the six styles. The final two are not as stable as the first four. It is significant I think that Hacking became more sceptical of the idea of natural kinds and did not publish on the historico-genetic style. As I shall suggest below, given the work the styles project is meant to do, there may be grounds for excluding the final two styles from Hacking's considered taxonomy.

We can summarise this ordering of Hacking's work in the following table:

[12] In fact, certain books like *Why does language matter to philosophy?* and other work more straightforwardly in the history of philosophy don't fit these categories at all. This is some of the material which is occluded in my favoured rational reconstruction of the main themes of Hacking's work.

Work on styles project in general	Work on particular styles: studies in stability	Work on disciplines to which styles do not stably apply
Parts of *Historical Ontology* Lecture 1 of *Scientific Reason* Styles of thinking thirty years later	**The straightforward four** 1. The mathematical style: *Why is there a philosophy of mathematics at all?* 2. The experimental style: *Representing and Intervening* 3. The hypothetical modelling style: *Why is there a philosophy of mathematics at all; Representing and intervening* 4. The statistical style: *The emergence of probability; The taming of chance; The logic of statistical inference* **The troubled two** 5. The classificatory style: UNAM lectures; Natural kinds: rosy dawn, scholastic twilight; Kinds of people: moving targets 6. The historic-genetic style: UNAM lectures	*Re-writing the Soul* *Mad Travellers*

There is a case that what I call the troubled two should really be in the third column (or perhaps that what I have in the third column should really be instances of the troubled two or that both should hovering between the second and third columns). The reason to classify them this way, as I have already suggested, is to highlight something that thinking about styles is *supposed* to do for Hacking, namely to explain stability. It is to that issue which I turn next.

Stability: Styles 1-3 Demarcating Science

One aspect of the styles project, which is in a way very old-fashioned, is that it is meant to demarcate science from non-science. Although 20th Century philosophy of science tended to view the history of science in discontinuous or revolutionary terms, Hacking thinks that what is distinctive of the natural sciences is in fact a certain kind of stability which can be understood best by thinking in terms of styles of thinking. To put it in crude terms, although there might have been revolutions in theories or radical changes in instruments used to probe nature, some basic techniques of investigation, the styles, have remained stable and gradually accumulated over time. The key to understanding the stability of styles of thinking is that are self-authenticating and contain self-stabilising techniques; and it is the existence of these self-stabilising techniques which distinguish scientific styles of thought from others and distinguish within the styles those which are highly stable (the straightforward four in my classification) from those which are not (the troubled two).

For example, the mathematical style is distinguished by methods of proof. This is self-*authenticating* in part (but only in part) in the sense that when the methods of mathematics come into question, it is only to further mathematical proofs or work in the foundations of mathematics that we appeal. Work in metamathematics is just more work in mathematics which generates more proofs, even if these proofs like Goedel's incompleteness theorem

demonstrate for us the limits of mathematical methods. This is in a way, I think, in part simply a descriptive claim but one meant to put philosophy in its place:[13] mathematics does not have or need philosophical foundations to justify its practice. There are no higher standards than the style itself. More interesting and more controversial is the account of self-*stabilizing* techniques which I think are meant to provide another aspect of the idea of self-authentication. Here Hacking is less clear and probably less certain. In Hacking (2002, ch.12) he seems tempted by an idea he claims to find in Lakatos (1976) and Wittgenstein (1956) and that he labels *analytification*. As proof-ideas develop the concepts used in the proof, for example the concept of a polyhedron discussed in Lakatos's *Proofs and Refutations* become altered; eventually turning synthetic claims into analytic ones. Hacking (2014, 31-2) is on the other hand completely non-committal. Attributing the idea of analytification to Lakatos in conversation, but not print and simply noting some similarities with Wittgenstein's philosophy of mathematics.

In the case of styles 2 and 3, Hacking understands both self-authentication[14] and the self-stabilizing techniques to emerge through interaction between the two styles. Experimental work is validated when it agrees with an appropriate model, but equally models are taken to be sufficiently good when they agree with experiment. Hacking (2009, lecture 4) finds this kind of self-authentication neatly summed up by a research team interested in cold atoms:

> […] our results point to the fact that the [Bose-Hubbard model] is sufficient to explain all the features discovered in the experiment and that the experiment was a clean realization of the model as expected. (Clark and Jaksch 2006, 177)

As in the maths case, the self-stabilizing techniques which lead to this self-authentication are to be understood as dynamic. Hacking (1992a) drawing on the work of Duhem and Pickering describes three different kinds of plastic resources: ideas, things, and marks and manipulations of marks. The first of these includes questions, hypotheses and representations of experiments and apparatus; the second the material things which are investigated or used to investigate our target, including the tools used to manipulate the target, detectors and data generators; the third includes the raw data itself and the methods by which that data is manipulated and smoothed out to become the result of some experimental procedure, a data model. All of these elements can be and are shaped until they come into some sort of stable harmony. Hacking describes in detail the case of the discovery of pulsars as an example of one sort of interaction of some of these elements. van Fraassen's (2008) discussion of the interplay between theory and apparatus in the development of our account of temperature is a simpler example of the same phenomenon. In that case, we begin with very simple devices which seem to be able to detect changes in what we think of as intuitively differences in temperature, like Galileo's air thermometer. Eventually theoretical ideas are introduced which improve our apparatus (allowing us for example to see that Galileo's thermometer is actually a kind or barometer too) which lead to better apparatus and then which in turn lead to better theories. This evolving of apparatus and theory together, van Fraassen calls the view from within. It is here that we fix the very meaning of the terms we use in our theory, like temperature until we reach a stage where we have a stable theoretical representation of the property in question and how our apparatus interacts with and thus measures this property. This end point van Fraassen calls

[13] More on this below when we turn to realism and anti-realism disputes.
[14] The term "self-vindication" is often used in discussion of the laboratory style rather than self-authentication.

the view from above and marks exactly the kind of self-authenticating stability Hacking finds in the work of the cold atom scientists quoted above.

What we can see in both the maths and laboratory case is how self-stabilizing techniques are in part shaping the very concepts employed. If all goes well, and a stable result is achieved, we have moulded our concept so it is amenable to our methods, making it just the kind of thing which might be proved or measured in an experiment. This is, I believe, in part what Hacking means when he says certain statements are only up for grabs as true-or-false when a style makes them so or, perhaps more contentiously, that a style brings with it certain new objects. Understood in a flat-footed literal way, the claim that the mathematical style brings into being various objects, like say triangles or other geometrical shapes or that the laboratory style introduces unobservable objects like atoms, seems obviously false. Many cultures haven spoken about numbers and geometrical objects before the discovery of proof. Many philosophers and other thinkers from the ancient atomists onwards postulated the existence of unobservable objects. I take it Hacking would want to say that the terms "geometrical object" and "atom" take on a new meaning when placed in the context of proof or laboratory work. Geometrical objects become the kind of thing defined in Euclid, atoms become eventually the kind of thing measured and counted by Perrin at the beginning of the twentieth century. Earlier speculation about unobservables is just like contemporary speculation about universals or tropes, a kind of metaphysics, not science. (And indeed, this is why it of no concern to the working scientist that the things they call atoms have parts, since their hypothesis is empirical not metaphysical.)

The mathematical style makes few, if any, demands on reality since its new objects seem to be abstract. By contrast the laboratory style can only succeed because the world cooperates with us in a certain way; it must be open to the kinds of interventions and manipulations upon which successful experiment depends. Hacking does not say a great deal about this, but it seems reasonable to think as Cartwright (1999, 102-3) has argued and seems implicit in Hacking (1983) that we assume the world consists of objects or other structures that have natures or causal dispositions. These are often hidden or obscured in the wild but can be purified or revealed in the artificial settings of experiments where interfering factors are weeded out. In so doing we often create, as Hacking says, new phenomena, like the Hall effect or lasing.[15]

Hacking seems in addition committed to the idea that there are facts about us and our cognitive architecture which explain the possibility and the stability of both styles. Articulating these facts would be a substantive part of doing Philosophical Anthropology. But Hacking's remarks here are sketchy, mostly making allusion to the work of others like Netz (1999) or Carey (2009) and saying, as far as I can see, almost nothing about what underlies our experimental capacities. In the final section, I will suggest that some philosophers without thinking in terms of Hacking's grand Philosophical Anthropology have made more substantive progress here.

Stability, then, of styles 1-3 is a matter of the discovery of self-stabilising techniques which have led to the claims of mathematics and the laboratory sciences becoming self-authenticating as the concepts employed and so objects or properties picked out become refined to fit the style. That this work[16] can succeed depends on facts about us and our cognitive architecture about which Hacking has some conjectures but not much detail. In the case of the laboratory style, facts about the world come into play too: generally, the idea that

[15] This idea is discussed in much more detail in Ritchie (2012) where it is related to Hacking's discussion of Hobbes as a hold-out against the new laboratory style being pursued by Boyle. We might speculate that just as Goedel's work shows the limits of proof, the development of quantum theory, the discovery of non-local correlations in the famous EPR experiment shows the limits of the experimental method and its underlying causal commitments. Glymour (2006) might be read that way.

[16] Of course, it does not always work.

the world has hidden natures which can be revealed through manipulation; and specifically, that the world cooperates to produce some stable end result in the interplay between apparatus and theory.

More Stability: Style 4

The story for the statistical style is more complicated. Aspects of it have already crept into our discussion. The third part of self-stabilising techniques of the laboratory style, marks and the manipulation of marks, involves various statistical techniques to smooth out raw data and account for errors in measurement. In Hacking (1992b) this (and so the material covered in *The Emergence of Probability*) is part of the pre-history of the style. Crystallization on this story occurs only when new objects, the mean and the standard distribution, are introduced by Quetelet to describe something else new, a statistical population (Hacking 1992b, 141-8). In other works, for example Hacking (2009, 45; 2012, 603), Pascal is picked out as the emblem of the statistical style. This would suggest crystallization occurs much earlier.

In some ways this inconsistency doesn't matter much. Talk of crystallization is not serious history. It is gesturing at our pop history of which the idea of distinct styles with distinct beginnings is already a part, according to Hacking. But in other ways it highlights certain strains in how Hacking talks of styles: they both crystallize "but also continue to evolve in an endless cycle of contingencies." (Hacking 2012, 600). These metaphors of crystallization and evolution are obviously in tension.[17] If we try to understand styles apart from Hacking's broader philosophical goals, then I think such tensions are irresolvable. But recall styles are supposed to be marked by their stability, something which in turn explains a certain kind of stability in the sciences. To make sense of this aspect of styles, we need the idea of self-stabilising techniques and self-authentication. In the case of the statistical style, then, the earlier Hacking seems right. These emerge in the 19th century. Earlier probability ideas are plausibly thought of as important parts of developing mathematics or the laboratory style but lack key ingredients of a style of thinking. A statistical style of reasoning only crystallizes when: 1. these ideas are applied to populations and models of those of populations[18] and 2. statistical theories are developed to test these claims. The second stage begins to take off with the development of significance tests, confidence intervals and the paraphernalia of modern statistical testing and it offers a vivid example of self-authentication. As Hacking puts it: "the conditions of assertibility of statistical hypotheses are themselves to be determined by using the statistical style of reasoning, and in terms of yet a new layer of sentences that themselves are statistical." (Hacking 1992b, 151)

The full anthropology of the statistical style ought to say something about how facts about us and the world make such reasoning possible. Again, I can't find much in Hacking, and it is difficult to know what to say here beyond platitudes like the world must cooperate in the sense of having populations that broadly conform to statistical modelling assumptions.

Instability? Styles 5 and 6

Hacking published nothing directly on styles 5 and 6 and it is more difficult to see how they fit his styles template. Consider first style 5. Sometimes this is referred to as the classificatory style, sometimes the taxonomic style. Either way it does fit his Williams inspired schema. Classifying is not a way a tell the truth. Classifications may be accurate or apt or useful, but

[17] See Ritchie (2012) for one way very narrow understanding of how this evolution is possible.
[18] The objects which emerge, populations with distributions say, are made for the style in the same way as mathematical concepts and physical properties are made through the self-stabilising techniques of other styles. For constructed measures like IQ, this, I would think, is not even controversial.

they are not usually described as true. The emblem of the style is supposedly Linnaeus (Hacking 2012, p.607) which would suggest that what Hacking has in mind is biological taxonomy but then, contrary to the idea of styles as something meant to capture methods used throughout the sciences, this would be a very science specific style. If we set Linnaeus aside and focus instead just on the idea of classification, then the concept seems too general. Classification of some kind is ubiquitous at all times and places both within and outside the sciences; and the classifications offered throughout science seem very different. Linnaeus's classification is hierarchical, but the equally (maybe more) important classification of Mendeleev's periodic table is not. It is difficult to see any interesting commonalities here which might lead us to say they are aspects of one style.[19]

It's tempting to think that the new style Hacking might have in mind is a combination of 5 and 6 (just as the laboratory style is a combination of styles 2 and 3). The hierarchical classification of Linnaeus really takes off when combined with Darwin's theory of evolution, so that tracing higher up the hierarchy of biological taxa is travelling further down a branch of the tree of life until we find a common ancestor. But again, this seems very biology[20] specific and while it might make sense of the idea of new objects coming into being, like higher biological taxa, it is difficult to see how we might say this is self-authenticating or where we can find something like self-stabilising techniques which are supposedly crucial to each style.

I think it is because of these difficulties that Hacking did not publish on these styles. The idea of the there being a classificatory style I think is further undermined by Hacking's growing scepticism of natural kinds. If we had grounds for thinking the world contained things called natural kinds, then that might help explain the stability of the classificatory scheme. Good classification in this metaphysical picture is homing in on the natural joints of the world but when we look at the motley of things classified -- not just cabbages and kings but whales, high-temperature superconductors, musical works, nouns, and mud -- there is nothing they have in common and there is no single philosophical theory of kinds that works to explain all these groupings. As Hacking himself puts it: "Some classifications are more natural than others, but *there is no such thing as a natural kind…* there are only relevant kinds." (Hacking 2007a, 203).

More plausible then to say that there are only four self-authenticating styles. Classification is a precondition of all or at least most reasoning but does not itself constitute a style and what Hacking calls the historic-genetic style in evolutionary theory and cosmology is just the application of the first four styles to new subject matter.[21]

Instability: The Human Sciences

The styles project explains what is special about science. In the right conditions, when the world cooperates, styles through their methods of self-authentication and self-stabilising techniques produce a certain kind of stability. What Hacking calls the human sciences -- the social sciences, psychiatry, and psychology -- are characterised (at least in part) by their instability. Hacking's rich work on human categories gives a simple explanation of this: the objects of the human sciences, us, when classified and theorised about can and do resist. The full story involves not just classifications and people but also institutions, theories, and experts. Like the self-stabilising techniques of styles 1-4, the interactions between these elements can bring into being new objects, new kinds like multiple personality disorder, child abusers and autistic children. These people are literally made up, according to Hacking, in

[19] For Hacking's own inconclusive thoughts on this see Hacking (2012, sec.4 & 11)
[20] And one very narrow part of biology at that. As Dupre (1993) has emphasised, classification in ecology and other parts of biology often diverge from those used in cladistics.
[21] Hacking (2012, 603, sec.13) comes close to saying this.

two senses. First the introduction of a new category, creates a new kind of person, a new kind of possibility, which did not exist before. Second, people are moving targets; they are changed as they are talked and theorised about, which in turn changes the categories and theories producing what Hacking calls a looping effect. Here then we can say people are made up since the kinds of behaviour or actions which leads to the classification are made through the looping effect. On this picture of the human sciences, instability has a fundamentally ontological explanation. The things the human sciences investigate, kinds of people, are inherently unstable because of these looping effects.[22]

Styles as a Guide to Metaphilosophy: Why Is There Any Philosophy (Of Science) at All?

So far, we have focused on styles as a way of distinguishing between science and non-science. In his more detailed discussion of each style, Hacking's main interest is metaphilosophical. The title of his final book, *Why is there philosophy of mathematics at all?*, can serve as a template for Hacking's project. The question he wants to address is why certain philosophical questions, especially those which are considered perennial and associated with the sciences, arise in the first place.

Some questions are general. Hacking (2012, sec.17) claims that associated with each style is a realism dispute.[23] Each style as we have laboured above introduces new objects – abstract objects, unobservables, populations and means – and philosophical questions arise about the status of these objects. In one sense this remark seems trivial. If the objects are indeed new, then it is a conceptual truth that prior to the style, questions could not arise about their reality. But it also seems to introduce new tensions into Hacking's discussion. Since styles are in part constituted by their objects, one might think rejecting the objects is to reject the style. But this does not seem right. Anti-realists in science and mathematics do not generally reject those enterprises, they re-interpret them. Rather than try to work through these issues at the level of styles in general, it is more fruitful, I think, to look at what Hacking says about individual styles.

Let's consider first the mathematical style. To summarise a detailed and multi-faceted story, according to Hacking two fundamental facts about mathematics perplex the working mathematician and the philosopher of mathematics. The first is the experience of discovering mathematical truths. Hacking (2014, 28) emphasises what he calls Cartesian proof. In experiencing these, we grasp a truth all at once and see why it *must* be true. The second is the miracle of applied mathematics – that mathematics devised with no practical application in mind, like say imaginary numbers, can often find uses, for example, in quantum theory.[24] The first of these phenomena can lead to the feeling that we are inevitably tripping over things, mathematical objects, out there waiting to be discovered, like the 'monster' in the theory of simple finite groups. The second, that somehow the world was made with us in mind or in a more Quinean vein[25] that whatever reason we have to believe that unobservable objects exist also provides us with reason to believe mathematical objects exist since they are part of our well-confirmed total science. Part of what Hacking wants to do is to emphasise how contingent some of the developments which animates these ideas are. First, as the styles project makes clear, the development of mathematical style of thought was not

[22] Hacking (1992a, p.34) in addition suggests that the laboratory style with its full array of self-stabilizing techniques has not been and perhaps can't be applied to the human sciences. Equally though the classification of people is part of the story of the emergence of the statistical style (Hacking 1998).
[23] 'By-product' is the word he uses.
[24] Hacking (2014, ch.5)
[25] This is much less discussed in Hacking (2014).

inevitable. It arose in the peculiar conditions of the argumentative Greeks. Also, while it is true that we have developed some proof ideas and hit upon some mathematical discoveries where it seems tempting to think and talk in terms of discovery that is only one part of the contingent history of mathematics. We have also developed other concepts, and perhaps these are now our dominate ideas of proof, which Hacking calls Leibnizian:

> proof-is-a-finite-sequence-of-sentences-each-of-which-is-either-an-axiom-or-follows-from-preceding-members-of-the-sequence-by-oneapplication-of-a-rule-of-inference. [sic]. (Hacking 2014, 24)

Proofs can be generated by computers. Here we not tempted to talk of discovering mathematical objects out in the world. Finally, the development of the distinction between pure and applied mathematics upon which the story of the miracle of applications depends, is likewise contingent, gradually emerging from earlier ideas of mixed and pure sciences.

What follows from this recognition of contingency? That is not clear. One thing might be an acknowledgement that what is moving grand philosophical theories like Platonism is not argument but certain contingent and partial features of current and past mathematics. A proper view of the history ought at least to unsettle the dogmatic philosopher.

The styles project also has a more direct bearing on some aspects of the mathematical realism dispute. Since styles are self-authenticating, style dependent claims, proofs in the mathematical case, do not require any further style-independent justifications. But the Platonist picture looks like a version of this: a mathematical claim is true not just because it has been proved but because in addition it corresponds to an abstract reality.

Something similar might be said about the laboratory style. Since styles are self-authenticating, extra-stylistic reasons for any scientific claim are otiose. It is tempting to read the arguments of realists and anti-realists alike as making appeal to such additional reasons. Realists typically appeal to the No Miracles Argument (NMA) (any explanation of the predictive success of science other than its approximate truth makes it a miracle). Anti-realists typically appeal to one or both of the so called Pessimistic Meta-Induction (PMI) (past successful science has turned out to be radically false, so current science is likely radically false too) and the Underdetermination of Theory by Data (UTD) (for every successful theory there is an alternative which posits different unobservable structure, but which is empirically indistinguishable from it). These staples of Philosophy of Science 101 are not the sorts of reason that scientists ever give for example for the existence of the Higgs boson or other unobservable entities. Someone who has absorbed the lesson that styles "settle what it is to be objective" (Hacking, 2002, 181) should regard the philosophers' reasons as irrelevant.[26]

But what about Hacking's own entity realism? First, we might note that he doesn't take it very seriously. As he puts it: "*I used the raging controversy about scientific realism as a peg on which to hang my plea for experiments*".[27] Hacking (2012, lecture 4, italics in the original) What was important to Hacking was to direct philosophers' attention to experiment and away from a theory, towards to style 2 and away from style 3. One thing we notice is that many of the ways of thinking about the standard arguments, including issues about realism, are altered when we do so. Something is obviously wrong with the standard arguments for and against realism when they cannot even get a purchase on experimental practice. Successfully generated experimental effects hang around and so are not susceptible to the PMI; we have no theories in play here, so UTD does not apply; and the NMA misses out an important part of scientific success by focussing only on predictive success. The realism

[26] This is argued in Ritchie (2012). It will not undo all realism anti-realism disputes since many realists like Maddy (2007) and anti-realists like van Fraassen (2008) explicitly reject appeal to such arguments.
[27] See also later in the same lecture: "now I do not want to be realist or antirealist".

dispute is a vehicle to bring philosophers' attention to neglected aspects of actual scientific practice.[28]

Hacking also thinks a realism dispute is a by-product of the statistical style. But more interesting than this is his discussion of the emergence of the problem of induction against the background of the laboratory style and the new ideas of probability. He tells that story more than once and with different details but the crucial ideas are developed in Hacking (1975). First, a new idea of internal evidence, to be contrasted with the external evidence of testimony and authority, needs to develop. People begin in light of the development of the new sciences to think in terms of nature providing natural signs. Facts, or what we might call data, point beyond themselves but like human testimony, imperfectly; they provide reasons for probable opinion, but not certainty. In later tellings, Hacking (2001, 12) is attracted by Poovey's (1998) contention that developments in double entry book-keeping led us to think of this data as particulate. Combined with a re-ordering of the scholastic division of knowledge and opinion so that only mathematical knowledge counts as demonstrative and certain, Hume's problem of how particulate facts, data, capturing what happened now or in the past, can ever provide even probable grounds for knowledge of the future begins to seem inevitable (Hacking 2001, 13). Undoing the problem requires us to reject the idea of particulate facts.[29]

This very brief survey of Hacking's investigation of individual styles points us to an incomplete way of structuring Hacking's philosophical interventions. We can think of them as falling into three levels of analysis. The first we might call *taking a look.* Philosophers often trade in myths about science. Taking a look can correct this. I take Hacking's work in *Representing and Intervening* to offer a clear example of this move. The theory dominated way philosophers have conceived of science has distorted the questions they have asked and the space of answers they have thought possible. By pointing at seemingly mundane things like how microscopists reassure themselves that what they see through their instrument is veridical, Hacking highlights how far philosophical arguments have detached themselves from what is actually done in science. To put it crudely in the *take a look* mode Hacking is just pointing at things overlooked by most philosophers. The second level which we might call the *acknowledgement of contingency* starts with taking a look but looking leads to a recognition that the questions posed by philosophers are contingent. Much of Hacking's discussion of the philosophy of mathematics is in this mode. When we investigate the history of mathematics, we see that the concepts of proof, pure and applied mathematics that we have all have a contingent history. No obvious conclusions are drawn in this work. We simply learn that what might strike us as a perennial problem is in fact contingent. The final level of analysis is the most ambitious; we can call it *undoing*. In some cases when we take a look, not only do we discover that our problems are contingent, but we can see how to overcome them. This is what happens with the problem of induction. The story of the emergence of the particulate fact helps us undo the problem.[30]

[28] And in that we think he might have succeeded. Compare, for example, van Fraassen (1980) with van Fraassen (2008). The latter devotes much more time to measurement and experiment than the former.

[29] Hacking claims here that modern probabilistic epistemologies whether Bayesian or frequentist "evade" the problem precisely by rejecting this idea, as do non-probabilistic evasions like Norton (2022).

[30] This way of ordering Hacking's work has some similarities with Hacking's (1999, 19 *ff*) own ordering of varieties of social constructionism. Stopping at the level of contingency is to occupy a position similar to the *historical* or *ironic* constructionist. Undoing as described here is more like the *unmasking* constructionist.

Conclusion: A Reluctant Naturalist

Hacking is engaged in an incredibly ambitious project that he called Philosophical Anthropology. It is pursued through his idea of styles of thinking. At the general level, the aim is to help us see what is distinctive about the sciences – they exhibit a certain kind of stability. The idea is to detail the self-stabilizing techniques, facts about us and the world which explain that stability and lead to what Hacking calls the self-authenticating nature of each style. Given the extent of the ambition, it is hardly surprising that Hacking is not fully successful. I have argued here that at best four of the styles are really self-authenticating and Hacking has almost nothing, beyond some speculations and trivialities, to tell us about what aspects of the world and ourselves ground the stability of styles. Hacking's remarks on self-stabilizing techniques are suggestive but underdeveloped and clearly not worked out to his full satisfaction in either the mathematical or laboratory style.[31] He does have the beginnings of a good answer to the demarcation problem: the human sciences are inherently unstable because they pursue moving targets.

At the level of particular styles, there is a story to tell about the nature of each, including its crystallization and subsequent development. Hacking's interest here is resolutely metaphilosophical. He wants to know why certain philosophical questions arise as styles come into being and that explains, I contend, why he can seem so frustratingly unconcerned to simply state what his philosophical position is. His work is not really addressed to first-order philosophical questions like whether numbers or unobservables exist. He wants to know why we ask these questions in the first place. Sometimes the aim is to point to what philosophers overlook, sometimes to show the contingent circumstances which lead to the questions and sometimes to use our historical knowledge to undo the problem.

My reconstruction of Hacking places Philosophical Anthropology at the centre of his work. Philosophical Anthropology is Hacking's label. I think a more familiar and more mundane name fits Hacking's work better. He is a naturalist: someone who is concerned to use the empirical sciences, up to and including history, to address philosophical questions. I doubt he would have liked this suggestion[32] but when we look at the contemporary anglophone philosophical landscape it seems to me that it's the self-professed naturalists who are most plausibly thought of carrying forward Hacking's projects, whether they identify Hacking as an influence or not. Let me end by offering two examples. Penelope Maddy's (2008) naturalism, what she calls second philosophy, can fill in some of the gaps in the styles project. Maddy has a very detailed and empirically well-informed account of how a proto-logic comes to be, what she calls a KF-structure. Part of it involves facts about the macroscopic world. We find ourselves in a world of objects, with properties, and some robust ground-consequent relations. Part of it has to do with our minds. Work in developmental psychology by Spelke and her collaborators arguably shows children's most basic cognitive mechanism represent the world in terms of this KF-structure. If the story is plausible, it fills in some of the physical and psychological grounds for the stability of the mathematical style that Hacking only gestures at.

My second example is Mark Wilson (2021). He is a contemporary naturalist undoer. He argues that there were specific difficulties, apparent inconsistencies in fact, in how the

[31] This is especially so in the mathematical style where there seems to be a retreat as discussed above from the original more daring position. This is also part of the non-committal attitude discussed earlier. Hacking is often trying ideas out rather than offering tightly argued theses.

[32] See Hacking (2014, p.94-5). One reason he offers for resisting the label, "Few philosophers who self-identify as naturalists appear to have much use for the later Wittgenstein" is now refuted by Maddy (2014). Much of Wilson's work is often described as Wittgensteinian. See, e.g., Brandom (2010).

concept force was used in classical physics in the late 19thC. One proposed solution was a more rigorous foundation from which the ideal of axiomatizing mechanics was born. Philosophers like Carnap, forgetting the specific problems from which this demand arose, mistook the programme of axiomatization for actual science and so developed faulty views of scientific theories and concept formation in the axiomatic mode. By returning to the original problem and learning the ways in which scientists in fact responded to the apparent inconsistencies in the use of the term force, by, for example, developing multi-scalar modelling techniques, Wilson thinks we can undo this picture of scientific knowledge and the false problems it generates.

Hacking, as I said in the opening sentence, is a singular philosopher. No philosopher of science is again likely to have his range of interests and influence. But in contemporary naturalists like Maddy and Wilson, especially in their willingness to take a look at history and the details of science, we have something which carries forward some of Hacking's ideas in interesting and new ways.

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