

# *On the Relations Between Philosophy and Science*

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## *1. Introduction*

This talk will discuss the role of philosophy in intellectual life as I see it today, especially the relation between philosophy and science. I'll do this by sketching first a simple story, then a more complicated story, though the more complicated story is not very complicated. I'm doing it this way because I want to first sketch basics and contrasts, and then look at subtleties.

## *2. Three Roles*

Here is the simple story. The best one-sentence summary of what philosophy is up to was given by Wilfrid Sellars in 1962. It's a famous summary though I think people who endorse it are not always true to its spirit. Sellars said philosophy is concerned with "how things in the broadest possible sense of the term hang together in the broadest possible sense of the term." Philosophy aims at an overall picture of what the world is like and how we fit into it.

There can be a cheerleading feel to the Sellars formulation. And it might seem like something that no one would or should deny. But I interpret the Sellars view in a very substantive way. To get to this interpretation, here is a way of coherently denying the Sellars view as I read it. You might say: it's not that *philosophy* tries to work out how things hang together in the broadest sense of the term. Rather: *inquiry as a whole* does this. Philosophy is part of inquiry as a whole, and it makes some useful contribution. But no single field does what Sellars said, not philosophy and not physics either; instead all the fields working together do. Perhaps there might be said to be a fallacy involving parts

and wholes in saying that in order to endorse the Sellarsian goal of working out how things hang together, some particular discipline has to take this as its job.

That view makes it possible to assert the Sellars view as a goal for everyone, in a sense, while seeing philosophy as having either an ancillary role, such as criticism of pseudo-inquiry and ground-clearing, or else having a subject-matter that shrinks down more expansive visions of philosophy. Maybe philosophy is about *concepts*, for example. 'Getting clear on concepts' is, after all, a part of seeing how things hang together.

However, I think it's true that *philosophy* does what Sellars said. In fact, I think if there is a error that could be made in the area here, it's not the part-whole fallacy accusation that might be directed at the person who says it's philosophy's job to see how it all hangs together, but the error of thinking that if there are no particular people who are doing the how-it-hangs-together work, and it's left to the "community," that the job is being done at all. I think you have to have some people who explicitly *ask* how it all, or much of it, hangs together, and if they ask about just part of it, they ask it in a way that lends itself to integration with what someone else is asking in the same integrative style. This is what a lot of very familiar philosophical work does – work that tries to get a sense of how a commonsense view of humans, especially human thought and choice, relates to the picture of us we get from physics and biology, work on how facts – in general – relate to values, both moral and other kinds. These are not only questions about 'concepts,' and they're not pseudo-questions to be deflated. To answer these questions, philosophy has to make a lot of contact with other fields, but it can make contact with these fields without being swallowed up by them. So, in the light of all this, one role for philosophy is an *integrative* role.

I think of the integrative role as a central and relatively permanent one for philosophy, but it's especially relevant now, because of specialization in intellectual life. Maybe as late as the mid 19th century, a person could know a large fraction of what there was to know without greatly sacrificing their pursuit of detailed work in one field. This is probably no longer possible; now it is necessary to specialize in generalism, at least to some extent.

This identification of philosophy's concerns is broad, but it doesn't cover everything. Another role consistently played by philosophy is what I will call an

*incubator* role. Philosophy is a place where ideas are developed in speculative and broad form, in theory-sketches and schemata, that often then make their way into an empirical form within some science, or into a mathematical form, or some other more focused form.

A version of this view was defended by Karl Popper (in *LSD*, 1959). Michael Friedman argues (in *Dynamics of Reason*) that 19th century debates about space and the interpretation of geometry influenced Einstein's theory of relativity.<sup>1</sup> There are many examples in psychology, both from the transition that gave birth to psychology as a science and also later. *Associationism* made its way from a philosophical to a recognizably scientific form through the mid 19th to early 20th century (Bain, Mill, Thorndike, Pavlov). Much of the theoretical framework used in current cognitive psychology and linguistics originates in philosophy: Wittgenstein, Grice, Fodor. Michael Tomasello's recent scientific work emphasizes as precursors Grice, Searle, and Bratman. The "embodied" approach to cognition is presently making its way from a very philosophical side of cognitive science into more scientific form (compare Andy Clark and Rolf Pfeifer). Another recent case, though one where there has been more to and fro between fields, is the "Bayes net" framework for understanding causal relations (Reichenbach, the CMU group with Scheines, Glymour, and Spirtes, also Pearl, Gopnik, and Woodward). A more tendentious example is the way Hegel paved the way for Marx, or for the scientific side of Marxism. Logic is a special case because the work was not so inchoate, and it shaded quickly into mathematics. But by any standard philosophy had a great deal of impact, through Boole, Frege, and Russell, on the development of computers.

A third role for philosophy is tied more to its immediate context. Especially in English-speaking countries, when asked about the point of philosophy people quite often say that what is distinctive is a set of skills – clarity, analysis, critical thinking. Philosophers, they say, do not know any special facts or theories, and have no permanent

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<sup>1</sup> Friedman: "[I]n creating the general theory of relativity... Einstein explicitly appealed to a preceding tradition of reflection on the nature and character of geometry within nineteenth century scientific philosophy. This was the famous debate between Helmholtz and Poincaré, in which empiricist and conventionalist interpretations of the new non-Euclidean geometries opposed one another against the ever present backdrop of Kant's original theory."

subject-matter, but they have a skill-set that can be usefully brought to bear on any problem. When this is presented as a general view of philosophy as an activity or profession, I am against it; philosophy is not an uninvited management consultant to more substantive intellectual life. There is, though, an important part of a role of a philosophy *department* in a modern university that is along these lines. It is part of what philosophy contributes to education, especially undergraduate education.<sup>2</sup> Philosophy also has a further educational role. Richard Rorty once made a comment (which I have not been able to track down in print) that I like here. Rorty said that philosophy is the place in the university where a student can bring any two books from the library and ask what, if anything, they have to do with each other.

So as a first simple picture, I think that philosophy has three roles: integrative, incubator, educational. Two of these give philosophy a special relation to science. On the integrative side, philosophy draws on the sciences. In its incubator role, it contributes to them.<sup>3</sup>

I'll head towards the end of this section of the talk by looking at a couple of quotes from other recent discussions of the nature of philosophy. The first is from Scott Soames.<sup>4</sup>

Near the beginning of the final lecture of *The Philosophy of Logical Atomism*, in 1918, Bertrand Russell articulates a view of the relationship between philosophy and science for which there is much to be said. He says:

I believe the only difference between science and philosophy is that science is what you more or less know and philosophy is what you do not know. Philosophy is that part of science which at present people choose to have opinions about, but which they have no knowledge about. Therefore every advance in knowledge robs philosophy of some problems which formerly it had... [and] a number of problems which had belonged to philosophy will have ceased to belong to philosophy and will belong to science.

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<sup>2</sup> The value of this role depends on what is going on in other fields, and on the structure of the undergraduate curriculum. It is diminished where undergraduates specialize very early. That is bad for all sides – for undergraduates who choose philosophy and do not get exposed to enough other material, for undergraduates who miss out on exposure to philosophy while learning other fields, and for professors too.

<sup>3</sup> What about the 'criticism of methods' role for philosophy in relation to science? I am not much in favor of this.

<sup>4</sup> From *Analytic Philosophy in America and Other Historical and Contemporary Essays*, Princeton University Press, forthcoming.

In short philosophy is the way we approach problems that are presently too elusive to be investigated scientifically. The goal is to frame questions, explore possible solutions, and forge conceptual tools needed to advance to a more definitive stage of investigation.

This is a statement of something like the incubator role, but it seems to rule out the integrative role. Russell certainly means to do this; I am not sure about Soames, as his comment is made at the beginning of a treatment of a specific case. For Russell, though, philosophy is only a place for the immature, never the highly general and mature. I think that's wrong.

Here is a quote from Dick Moran, in an interview on the "3AM" website:

[P]hilosophy has always been a place for questions that have no other home among the disciplines, and yet which we remain convinced are real questions even if we don't yet even know what it would mean to answer them. Sometimes, of course, we discover that our sense of the question we were asking was confused, or there wasn't really the question we thought there was. But it is very important to the health of philosophy that we resist the idea that there is a way of knowing in advance whether our questions are real ones or not.

That is a perennial temptation in philosophy, to think that we could arrive or have arrived at a method or general principle (e.g., verificationism, certain forms of pragmatism) for knowing in advance which questions are "real" and which are not, the dream of a formal method for banishing "metaphysics" in the pejorative sense.

I agree with this and I see the critical point being made – the point made about attempts within philosophy to rule styles of work out.

An old paper by Rorty is called "Keeping Philosophy Pure." The instinct to preserve purity is seen in attempts to mark out a special domain for philosophy such as "the analysis of concepts," or of the *a priori* preconditions for living and thinking as we do. I am opposed to moves like that. The natural role for philosophy involves impurity. Good philosophy is impure philosophy. I say that as something as a slogan and I mean it. There might then seem to be a tension between that slogan and the openness of the discipline that I endorse, seen in the Moran quote: do not close off avenues with a theory of what cannot be done. (Suppose someone wants to do metaphysics while ignoring all of

science; do I want to *stop* them? No.) I agree with Moran and qualify my sloganeering. We can distinguish between purity of first-order work and purity in metaphilosophical attitude. I am certainly against purity in metaphilosophical attitude. I also tend to bet on impurity in first-order work.

### 3. Critics

As an interlude I will look at a series of hostile comments made about philosophy by physicists during recent years.

The first is by Stephen Weinberg, who wrote a chapter in his 1992 book *Dreams of a Final Theory* called "Against Philosophy." Weinberg's remarks are mild and thoughtful by the standards of what came later.

I know of no one who has participated actively in the advance of physics in the postwar period whose research has been significantly helped by the work of philosophers. I raised in the previous chapter the problem of what Wigner calls the "unreasonable effectiveness" of mathematics; here I want to take up another equally puzzling phenomenon, the unreasonable ineffectiveness of philosophy.

Weinberg argued that the usual role of philosophy is to impede progress, because it is a place where old ideas stay around and function as dogma.

We can certainly see how that *could* happen; there is a plausible sequence here. A scientific idea develops and comes to influence general ideas about how the world is. It makes its way into philosophy, and there it hardens, and in the hardened form it is treated as how things *must* be. In the science itself, eventually ideas start to move on, as the old view has run out of resources, but to the extent that scientists attend to philosophy, they will be held back by the more dogmatic version of the older view that has taken hold there. For Weinberg, philosophy is not an incubator but a dim place where once-vigorous ideas live on in suspended animation, and do so in a way that blocks new inquiry.

Is this true, or partly true? Weinberg gave two examples, mechanism as a view about the physical world and positivism as a view about theoretical language. The former case I think is weak. Weinberg thinks that it was imperative that the once-vigorous mechanistic view of nature be overcome, especially round the turn of the 20th century,

but some people resisted. He does not give evidence that it was resisted because of the influence of philosophy, though, and this seems unlikely to me. Weinberg's other case is better. He thinks that the positivistic insistence that theoretical language be tied closely to known observable tests is occasionally progressive in specific contexts, such as Einstein's, but is harmful as a general constraint on theorizing. Here I agree more with the case, with qualifications that we could discuss. So there is a kind of accounting that can be done here, balancing the creative role of philosophy with the constraining role. It would be fortunate if scientists paid attention to the creative work and ignored the constraining work. In fact, I think things might be a bit like that, something that reflects better on the scientists than the philosophers.

Other anti-philosophy remarks have been less well-informed and considered, and there is less to say about them individually.<sup>56</sup> This includes comments by Stephen Hawking in his recent book with Mlodinow, and Krauss. The denunciation with the most panache, though, comes from Freeman Dyson, writing in 2012 in the *NYRB*.<sup>7</sup> Trimming it down to the basics:

For most of the twenty-five centuries since written history began, philosophers were important.... Through all the vicissitudes of history, from classical Greece

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<sup>5</sup> Stephen Hawking and Leonard Mlodinow's book *The Grand Design* (2010) starts out by saying that there are good general questions about reality, the creation of the universe, and so on that are traditionally philosophical questions, but "philosophy is dead," because it has "not kept up with modern developments in science, particularly physics." As James Ladyman and Don Ross argue in *Every Thing Must Go* (2007) there is a high-profile part of philosophy, analytic metaphysics, where the messages of recent physics should guide the work much more than it presently does, but as a general claim what Hawking and Mlodinow say is simply erroneous.

<sup>6</sup> Lawrence Krauss wrote a book called *A Universe From Nothing* (2012) with some mildly negative comments about philosophy, one of which has real content: the universe is stranger than our imaginations can anticipate, and philosophers trust their imaginations too much. David Albert wrote a negative review of the book in the *New York Times*, and Krauss subsequently became very aggressive, calling Albert "moronic" in a speech, and said in an interview in the *Atlantic*:

Philosophy is a field that, unfortunately, reminds me of that old Woody Allen joke, "those that can't do, teach, and those that can't teach, teach gym." And the worst part of philosophy is the philosophy of science; the only people, as far as I can tell, that read work by philosophers of science are other philosophers of science. It has no impact on physics what so ever, and I doubt that other philosophers read it because it's fairly technical. And so it's really hard to understand what justifies it.

He partly recanted these remarks later: <http://www.scientificamerican.com/article.cfm?id=the-consolation-of-philos>.

<sup>7</sup> Freeman Dyson, "What Can You Really Know?" *NYRB*, November 8, 2012.

and China until the end of the nineteenth century, philosophers were giants playing a dominant role in the kingdom of the mind.

Holt's philosophers [those discussed in Dyson's review] belong to the twentieth and twenty-first centuries. Compared with the giants of the past, they are a sorry bunch of dwarfs. They are thinking deep thoughts and giving scholarly lectures to academic audiences, but hardly anybody in the world outside is listening.

When and why did philosophy lose its bite? How did it become a toothless relic of past glories? ... Philosophers became insignificant when philosophy became a separate academic discipline, distinct from science and history and literature and religion.

A first thought in response to Dyson is to wonder if he has never heard of John Rawls and Peter Singer. Singer is someone whose philosophical work has had more effect on the world – more "bite," to use Dyson's term – than perhaps any other living academic. Dyson's final comment is a nudge in the right direction, though; philosophy risks becoming insignificant when it becomes more self-contained, and some parts of it do risk that outcome. If we look at epistemology in American philosophy, for example, and think of a sequence from James to Dewey to Quine and then the current generation, it is reasonable to wonder. Thomas Kuhn, someone who had immense impact as an epistemologist, was only marginally a philosopher.

Several physicist critics, including Weinberg (also Krauss and Perakh, but not Dyson) complain that philosophy is no good because it does not help scientists.<sup>8</sup> Bracketing whether or not this is true, the view I defended earlier is one in which the point of philosophy is not to help other fields, but to answer questions within its own. Philosophy's "field" is a somewhat unusual thing, given its synoptic quality and its openness, but its goal is not to help some *other* field – just as the goal of history or

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<sup>8</sup> Similar comments were made by the physicist Mark Perakh on a website round the same time:

I dare to claim that the sole value of philosophy of science is its entertaining ability. I doubt that all the multiple opuses debating various aspects of the philosophy of science have ever produced even a minute amount of anything that could be helpful for a scientist, be he/she physicist, biologist, geologist, you name it.

(<http://www.pandasthumb.org/archives/2010/12/philosopher-rus.html>)



theoretical physics is not to help some other field.<sup>910</sup> In doing the accounting in this area, there are also risks of philosophy not getting credit for its successes. Via the Russell and Soames comments, we are reminded that once an investigation starts to show obvious progress, it often passes from philosophy into something else. It would make no sense to criticize an incubator for failing to produce well-rounded adults - its role is to produce promising infants. If a person thought the incubator role was central, this might be their main reply to the physicists.<sup>11</sup> I see the incubator role as secondary, though, so philosophy is to be judged more for its producing real understanding of the integrative kind.

#### *4. Philosophy as Style and as Tradition*

That's my simple story about philosophy, and philosophy's relation to science. Now I want to partly replace it with a more complicated one, adding detail and perhaps overwriting some things. The second pass will involve paying more attention to the entities involved – in a sense, to the metaphysics of philosophy – and also to the history.

First I'll note an ambiguity in the discussion so far. When asking about what the role of "philosophy", one can, roughly speaking, be asking about two things: a *style* of work, or a *cultural tradition*, an institution, or a lineage of work. In thinking about this distinction we can draw on some philosophy of biology. Here are two ways of thinking about species and some other biological categories:

(i) A species can be seen as a kind, a collection of objects whose members are unified by intrinsic similarity.

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<sup>9</sup> Massimo Pigliucci made this point in reply to Krauss:

To see how absurd Krauss' complaint is just think of what it would sound like if he had said that historians of science haven't solved a single puzzle in theoretical physics. That's because historians do history, not science. When was the last time a theoretical physicist solved a problem in history?

(<http://rationallyspeaking.blogspot.de/2012/04/lawrence-krauss-another-physicist-with.html>)

<sup>10</sup> Dyson: "I put narrow limits on science, but I recognize other sources of human wisdom going beyond science. Other sources of wisdom are literature, art, history, religion, and philosophy."

<sup>11</sup> In the *Atlantic* interview Krauss was asked about Bertrand Russell and his role in the origin of computers. Krauss said that Russell was doing mathematics, not philosophy. In fact Russell was doing a mix of the two – doing what by both current standards, and the standards of his time, was a mix of both. He was doing new kinds of things in mathematics as a response to partly philosophical motivations.

(ii) A species can be seen as a lineage, a collection of things unified by causal relations of a special kind, where earlier members produce later ones, rather than similarity.

In the 1970s Michael Ghiselin and David Hull argued that it was important to think about species in the second way. As units in which there can be open-ended change in intrinsic properties, unified by how the parts are causally connected. Later members can be very different from earlier members, but later ones came from earlier members and the totality has a particular role that marks it out as a real thing.

That was all meant for the case of species, but let's apply the same sort of distinction broadly, to all sorts of collections with temporal structure. The two approaches might coincide: suppose that objects with certain intrinsic properties are always and only produced by reproduction, transmission, or some similar process, within a lineage. Then the two ways of categorizing things will be extensionally equivalent.

Depending on empirical factors, they can also diverge. Biological species have a mix. It is very hard to get a chimp-like object to arise outside the chimp lineage, though chimps inside the lineage gradually evolve, too. Contrast CO<sub>2</sub> molecules – they come into existence all the time without being born of other CO<sub>2</sub> molecules. Whenever the raw materials are there and the conditions are right, you get CO<sub>2</sub>, and it is intrinsically the same as CO<sub>2</sub> made elsewhere. All the CO<sub>2</sub> in the universe can be thought of as a big "historical individual," but this is not the sort of cases where this mode of thinking comes naturally; there is too much "spontaneous generation" of intrinsic-CO<sub>2</sub>.

Another contrasting case, different from both the species and CO<sub>2</sub> cases, is where you get work within a lineage that is *reactive*, a response to earlier work but different from it or opposed to it, perhaps self-consciously so. The evolution of the chimps is not like that; you do not get later members who are intrinsically unlike earlier members *because* earlier members were the way they are. Biological reproduction is more conservative, though change does happen. An example of a tradition that is can work a bit like this is *art*. I think that one kind of debate about "what is art?" can be fruitless because of the kind of lineage-based practice art is, at least in the West and in historic as opposed to prehistoric times. Work that looks art-like can arise outside the lineage, of course, but what I have in mind here is the fact that a lot of work within the lineage arises as a *response* to what was done before, but not in a way that gives rise to a *similar*

outcome. Work arises that is a *rejection* or abandoning of what went before (readymades, anti-art, conceptual art). When this is going on, ambiguities between a lineage-based and typological view of art will be acute. It will be a mistake to try to find some intrinsic property that more-or-less captures everything within the lineage, or a property involving the interpreter's psychological response, such as aesthetic response. The lineage is being regenerated in a way that is at odds with there being any such property. Perhaps the word "tradition" is not appropriate in cases like this; that word is appropriate when a lineage tends to generate similar products.

Now back to philosophy, and science. To some extent, philosophy now is a style of work housed within a lineage. There is work in the style outside the lineage, and also work in the lineage – in philosophy departments, for example – that is outside the style even in a broad sense. But the institutions and habits seen in philosophy, the lineage, tend to encourage work that has a particular style, though that style evolves too, over time. Separate questions, both descriptive and evaluative, can be asked about the tradition and the style, and about the relations between them. To what extent, as a matter of fact, is sophisticated work in the philosophical style mostly done by people inside the lineage – inside philosophy departments or at least in touch with other philosophers? Would we like there to be less of this "housing," or more? Within the philosophical style of thinking, specific components discussed earlier can also have these questions asked about them. For example, it's a contingent feature of philosophy that the incubator role has been housed together with the integrative work. This is not entirely an accident, as the integrative perspective will encourage speculative theorizing. But it's a contingent historical matter that the incubator role is recognized and encouraged within philosophy *departments*, within the present-day social bodies most closely associated with the lineage as far as causal relations go.

You might wonder if this is a good thing – whether universities should encourage incubation to take place in different contexts instead, and discourage the quasi-scientific speculators in philosophy departments. Someone might want to set up a *department of theoretical incubation* in a pure form. But I think this would not work. How would the field have internal standards of its own? Any attempt to lay down the proper form of a good nascent theory, a good egg, would defeat the purpose of the enterprise. Part of the

point is that it is not possible to have a sense in advance of what a good new direction will be like, in and around a more established field, or in some area that does not yet comprise a field. So you would not want to lay down much in the way of field-independent standards, unless the incubation department was going to be pretty narrowly based on existing practices. The proof of a new idea of this large-scale kind is seen in how it contributes to the fields that spawned it, or in the evolution of a new field altogether. So I think it's probably appropriate for the incubator role to be encouraged in philosophy, the integrative discipline, even though it may be held back sometimes by philosophy's obsession with its history, an obsession that has a very valuable educational role, and some value on the integrative side too, but perhaps not in the incubator role.<sup>12</sup>

Now I'm going to take a more historical perspective on some of these relationships, putting the ideas above into a different frame. It is a familiar fact that what we think of now as "philosophy" and "science" were once part of a single broader enterprise, and a lot of central figures in philosophy did both kinds of work – Descartes is an example, Aristotle further back. Then the two diverged. The "divergence" partly took the form of a series of branching events, with some scientific fields branching off earlier than others. But something I see as a crucial divergence occurred in the 17th century in England, and this divergence had a partly *reactive* character. I have in mind especially the episodes described by Steve Shapin and Simon Schaffer in their book *Leviathan and the Air Pump*, which was about the early days of the Royal Society and a debate between Robert Boyle and Thomas Hobbes.

As Shapin and Schaffer tell the story, a brand of modern science – a lineage and a set of practices – arose from an attempt to *carve off* a style of questioning from a broader collection of practices, in which what we'd call philosophy and what we'd call science

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<sup>12</sup> Work done within the lineage has also been given an educational role, a role in the training of students in various other fields. This also is contingent; there is nothing stopping the culture, or part of it, from housing professional philosophy entirely in research institutions that have no students, and taking in only advanced students or apprentices who will go on to a job in the same sort of institution. I am glad that is not how things are, and I like the American way of handling this in contrast to other ways, including the way I was brought up in, in Australia, where specialization comes earlier for students. I am alarmed at how many of the best philosophers in some countries, like Australia, are now able to avoid teaching and just do research. I want the educational role to be quite tightly fused to the other two roles; that is, I want present-day work within the philosophical lineage to be housed in places in the culture that enable philosophers to serve the educational role.

were mixed in together. Boyle and his colleagues wanted to *narrow* an investigative practice to avoid unempirical wrangling and unresolvable debates. Even though some debates were about intrinsically important things, their intractable nature and their connections to theological issues meant that they tended to cause discord, of a kind that was politically destructive. Boyle and his colleagues were willing to reinterpret old questions, ignoring some parts of them, to focus work on the part that could be investigated in an empirical and public way.<sup>13</sup>

Boyle was not "a vacuist" nor did he undertake his New Experiments to prove a vacuum. Neither was he "a plenist," and he mobilized powerful arguments against the mechanical and nonmechanical principles adduced by those who maintained that a vacuum was impossible. What he was endeavouring to create was a natural philosophical discourse in which such questions were inadmissible. The air-pump could not decide whether or not a "metaphysical" vacuum existed. This was not a failing of the pump; instead, it was one of its strengths. Experimental practices were to rule out of court those problems that bred dispute and divisiveness among philosophers, and they were to substitute those questions that could generate matters of fact upon which philosophers might agree. Thus Boyle allowed himself to use the term "vacuum" in relation to the contents of the evacuated receiver, while giving the term experimental meaning. By "vacuum," Boyle declared, "I understand not a space, wherein there is no body at all, but such as is either altogether, or almost totally devoid of air."

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<sup>13</sup> Shapin and Schaffer:

"Was the Torricellian space a vacuum? Did the exhausted receiver constitute a vacuum? The platform from which Boyle elected to address these questions was experimental: the way of talking appropriate to experimental philosophy was different in kind to existing natural philosophical discourse. Boyle recognized that his experiment would be deemed relevant to the traditional question posed of the Torricellian experiment, "whether or no that noble experiment infer a vacuum?" Was the exhausted receiver a space "devoid of all corporeal substance?" Boyle professed himself reluctant to enter "so nice a question" and he did not "dare" to "take upon me to determine so difficult a controversy." But settling the question of a vacuum was not what this experiment was about, nor were questions like this any part of the experimental programme. They could not be settled experimentally, and, because they could not, they were illegitimate questions. Plenists, those who maintained, either on mechanical or nonmechanical grounds, that there could not be a vacuum, had taken their reasons

not from any experiments, or phaenomena of nature, that clearly and particularly prove their hypothesis, but from their notion of a body, whose nature, according to them, consisting only in extension ... [means that] to say a space devoid of body, is, to speak in the schoolmen's phrase, a contradiction in adjecto.

But such reasons and such speech had no place in the experimental programme; they served "to make the controversy about a vacuum rather a metaphysical, than a physiological question; which therefore we shall here no longer debate...." (39)

The results were very successful. Philosophy since this time, since the successful development of organized empirical science, has had to wrestle more and more with its role, with questions of method and the meaningfulness of its questions. In response, it has sometimes entertained radically constricted visions of what it can do, as in Logical Positivism, defenses of the analysis of concepts, and other attempts to draw itself in and take on a well-defined ancillary role. At other times it has tried to curtail or reject scientific encroachment on some special subject matter that is more grandiosely understood: perhaps there is *a priori* knowledge that is free-standing, a *priori* knowledge of the structure of human reason or the structure of "our" necessary frameworks for dealing with the world and with others.

A healthier and more realistic conception looks more like this. Thinking for a moment just about inquiry, attempts to understand the world, there is a *natural form of birth* of such practices in which the empirical, the formal, and attempts to say how things just must be, are all mixed in together. Aristotle illustrates the combination. Then somewhat more organized subsets or portions of this mix may "precipitate out," for various reasons. Formal inquiries, mathematics and its relatives, can easily become relatively self-contained. Empirical work, via people like Boyle reinterpreting questions and reorganizing practices, may also precipitate out. This takes more work and time, and not all forms of an empirical orientation will yield science. But there can be a distillation of a socially organized and empirical style of work, as happened in 17th century England, which leaves aside someone like Hobbes, who looks more like Aristotle from this point of view, someone embracing an older mix of methods and questions. Science in this way comes to exist as a lineage by restriction, confinement, and exclusion of some kinds of work.

Does that mean that what is left over is philosophy? Yes in some ways and no in others. Yes, in that detailed empirical work is just about entirely handed over to the sciences. No, in that philosophy is not so much a residue but instead a continuation of the earlier style. When it's healthy, philosophy remains in a mixed and inclusive mode, shaped mostly by questions, by difficult and general questions, and drawing on whatever seems relevant and helpful in getting a grip on them. When it's healthy, philosophy

doesn't retreat to an ancillary role, or a circle-the-wagons *a priori* role, or anything like that. Rather, it remains engaged with empirical material – dealing as best it can with the difficulties that come from the specialization of empirical fields and their technical content – and tries to bring that material to bear whenever it's relevant. The classic mind/body problem, still well and truly alive, is a prime example.

This leads to definite differences in the style and social organization of work between philosophy and science. A feature of philosophy is a willingness to not worry too much about visible progress, tractability, and a cumulative character to the work. The more time I spend around scientists, being involved in small bits and pieces of science, the more struck I am by this imperative within the scientific tradition: to choose questions, reinterpreting them if necessary, in a way that permits work to be cumulative and tractable – also as exact as possible, but I think exactness often functions as a means to a cumulative character. If you have to choose between a more tractable question and a more interesting one, there is often a tendency to choose the tractable one, or the tractable side of the interesting one. Some of this comes from funding constraints and the like, but some also comes from the awareness that each piece of work is part of a larger structure, and the massive and unwieldy problems can be solved by a well-organized accumulation of steps guided in part by tractability.<sup>14</sup> Science is very progressive both because it is good at what it does and also because it avoids projects that don't lend themselves to progress.

What does this mean for progress in philosophy? If we understand progress as more of the people coming to believe truer views, then a larger amount of this would be good, including some narrowing of what are taken to be live options. I am not on the side of those who react to the apparent lack of consensus in philosophy by finding a way for it to be good without seeking consensus and progress in a strong sense. But unlike science, tracking the marks of progress on a social scale, is not a day by day guide, except with respect to tiny moves.

In the view I'm sketching, in one sense the aims of philosophy must be less ambitious than before, because of the profusion of detailed and specialized scientific

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<sup>14</sup> It turns out that scientists are right to think this – that massive and unwieldy problems can be solved by a well-organized accumulation of steps in work guided in part by tractability.

work in particular areas. Where the organized-empirical-tractable machine of science has got some purchase on things, has made progress, that has to be reckoned with. And it can be very hard to reckon with for a nonspecialist in that area. This is one role among several for philosophers of science, to reckon with the output of science in a way that makes contact with philosophical projects.

Some closing thoughts: the view of philosophy I am defending sees philosophy as a continuation of a more amorphous style of inquiry that science distilled itself out from. I think this is a good thing for the culture to contain. In response to what science has done, philosophers should not draw a boundary around a narrow subject matter than can be kept safe from scientific encroachment – the *a priori*, the conceptual, whatever. Philosophers should be opportunistic about sources of information and methods, guided by the questions, not by methods. They should not worry too much about the apparent lack of progress, but should not stop trying to achieve it. I think we will one day sort out fundamental mind-body questions, to use my earlier example, much better than we have, and I think it's reasonable to hope for the same with many other colossal problems.

There are some things philosophers should worry about, both as general issues and as problems given particular grip by the present environment. One is the premium placed in philosophy on sheer cleverness. Cleverness comes to function as a *currency*, an accounting device, in situations where a currency or form of assessment is *needed* but the absence of consensus about methods and questions makes it very hard to achieve. Often you can tell that even if someone is working on a problem that looks insane or pointless to you, that person is making moves in a clever way. One might then think: I am not *so* sure that this problem is insane, and my colleagues won't agree in any case, and we can agree that he or she is clever, so we'll give them the job. When this is going on, philosophers start to choose problems and fields based on their potential for displaying cleverness. Good problems of this kind tend to be fairly self-contained, with well-defined resources available, not too liable to seismic disruption from outside. Questions set up in a way that makes them highly resistant to seismic disruption, though, should be distrusted. It worries me that philosophers have become good at marking off areas that have desirable arena-like properties. I think some parts of metaphysics are like this, but I am sure there are other areas. In my main field, philosophy of biology, there is probably



some of this too, but there I think a bigger issue, and a basis for criticism that I'd not exempt myself at all from, is a tendency to follow paths that are intrinsically interesting but get too far away from fundamental questions. A different risk or diversion is found on the "continental" side; here I have in mind people like Deleuze and more recent work by Latour. These are the risks that come from quasi-poetic choices and moves, from the temptation to make poetic gestures. Stylistic choices can pull ideas. The problems here are hard enough that if those things exert significant pull on the development of ideas, there is little chance of progress.

I think this view adds to, and perhaps does some rewriting of, the view expressed in the first half of the talk. It makes contact with what I see as the good parts of some statements by others, too. Moran was right about the healthiness of a perpetual openness in philosophy. Russell and Soames (to the extent that Soames endorses the Russell quote) are right about philosophy's natural place in dealing with the intractable, and continuing to deploy unwieldy mixes of methods. It's *not* a good move in philosophy to find the tractable part of a question and ignore the rest. The intractable part should stay on the table, behaving intractably, and people should be given jobs to work on these intractable questions. They should not, as they now are in some countries, be strongly encouraged by granting agencies to claim, even to pretend, that they will have solved such-and-such a problem by March of 2016 by using method X. If they do solve it, that's great. But this sort of imperative is alien to philosophy – alien to philosophy when operating healthily in the current intellectual environment, with the sciences and other fields alongside. I am very glad to have Boyle, but there also should be Hobbes.

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1.1 The relationship between science and philosophy 1.2 Scientific questions and questions about science 1.3 Modern science as philosophy 1.4 Science and western civilization. Summary Study questions Suggested reading. 2 Explanation, causation and laws Overview. By contrast with Plato, other philosophers have held that mathematical truths are not about abstract entities and relations between them, but are made true by facts about concrete things in the universe, and reflect the uses to which we put mathematical expressions. But 2,500 years after Plato lived, there is as yet no general agreement on the right answer to the question of what numbers are. Relation between Science and Philosophy. The relationship between science and philosophy may be discussed under the following lines: Philosophy critically analyses the results of all sciences and present a synoptic view of the life and world. C.D. Broad says that the object of philosophy is to take over the results of the various sciences, to add to them the results of the religious and ethical experiences of mankind and then to reflect upon the whole. The hope is that, by this means, we may be able to reach some general conclusions as to the nature of the universe and as to our position and prospects in it. Both Science and Philosophy are engaged in the search of truth. Philosophy examines scientific method. Both are critical in nature. Philosophy asks the questions and sets the rules. It questions what is true and tries to find the relationships between these truths. Philosophy mainly focuses on logic. Philosophy is allowed to look at As Durant says in his book, "Every science begins as philosophy and ends as art; it arises in hypothesis and flows into achievement." Design @ TDV. Class blogs for the faculty & students at The Design Science and philosophy have always learned from each other. Philosophy tirelessly draws from scientific discoveries fresh strength, material for broad generalisations, while to the sciences it imparts the world-view and methodological impulses of its universal principles. Many general guiding ideas that lie at the foundation of modern science were first enunciated by the perceptive force of philosophical thought. Philosophical statements are based on sets of facts studied by the sciences and also on the system of propositions, principles, concepts and laws discovered through the generalisation of these facts. The achievements of the specialised sciences are summed up in philosophical statements.