

11 The Role of Presuppositions and Metaphysics

This Chapter concludes section 3 of the subject, our philosophical interlude. We've looked at traditional and modern notions of scientific method. Now we are going to sift out one final bit of conceptual machinery that is going to be useful to us. We will bring out into the open something that was implicit in what I have done so far, but which now needs a slightly philosophical or abstract discussion. It is very important for the working historian or sociologist of science to use the ideas I am going to talk about in this Chapter: The idea of theories having deep presuppositions built into them, which shape or condition them--the idea of what historians of science call 'metaphysics', or the metaphysical background to theories.

We have already destabilised the old idea of given objective facts because we have seen that facts are actually theory-loaded. Now we are going to see is that theories are presupposition-loaded; theories are shaped and conditioned by cultural presuppositions, beliefs, commitments, aims, that exist in a given society or culture; pre-suppositions that shape the origin and the use of the given theory. So, as theories are to facts, cultural presuppositions (or the metaphysical background to theories) are to theories. Figure 1 illustrates (a) the naive view of facts given and generalised into theories; (b) the theory-loading of human facts; and (c) the new idea of the metaphysics-loading of theories.

Let's go back to the metaphor of the 'conceptual grid' (Chapter 4). Everyone has a conceptual grid. It might differ a little by language, class, profession, or biography, but everyone has a conceptual grid. Using this idea, let's explore what we mean by scientific theory or scientific law. What we have in figure 2a are some different regions of a person's conceptual grid, someone who has concepts about types of 'birds'. This person seems to have grouped these concepts into some larger concept of 'types of things that are birds'. Additionally, this person also has a set of concepts about colours and a general grouping concept of 'colour'.

(Notice, if this were taken to be the full content of the person's conceptual grid there is no concept of antelope there. So I guess that person would not perceive any antelopes in the gestalt diagrams - not having a concept to form that perception.)

Now, by a 'scientific law' we mean, 'an association made between two or more concepts', and I further I suppose that if you have a bunch of interrelated laws, then you have a theory. But basically, a scientific law asserts a connection or relationship between two or more of these kinds of general concepts.

Throughout this Chapter I am going to use an example of a scientific law which philosophers like to use, when they build their abstract, non-historical pictures of what scientists should do, as opposed to what they actually do. For some reason, over the last century or so, many philosophers have looked at scientific laws and theories and used the following example of a scientific law: 'All swans are white'. Anyone who believes that law has made a connection in his or her conceptual grid, and has thereby subtly altered his or her conceptual grid. Figure 2b shows how we have made a connection between swans and whiteness. In a sense, the total content of this person's conceptual grid is now slightly different, because he now entertains this law, this relation between the two generalised concepts, swans and white.

Obviously, in a situation like this, prior to saying ‘all swans are white’, this person was not walking around with atomic independent concepts jostling around in his or her conceptual grid. There were already connections and relations amongst the concepts. For example, this person’s notion of swans or this person’s notion of birds in general, and this person’s notion of white and this person’s notion of colours in general, were already involved in conceptual relations and linkages, before he ever said ‘swans’ are ‘white’. It stands to reason that birds and colours were not just sitting there, independent of all prior sets of conceptual relations. The connections and relations of those concepts, before they are connected as ‘swans or white’, are part of what I would want to term the cultural presuppositions or the metaphysical background (conceptual/belief background) to this law.

So, laws are stated in terms of general concepts that are in your conceptual grid: you cannot assert a law about a concept that is not in your conceptual grid. But, the concepts in your conceptual grid are already tied up and connected with each other before you assert a connection. Those pre-existing relations and connections I suggest, shape and colour the type and kind of newer relations that you draw as laws. To put it another way, a theory and the concepts used in a theory always have a context, a surrounding atmosphere of other beliefs and theories that have shaped how those concepts are used in the new law or how a new theory is put together. What historians of science have found is that these background beliefs that shape a new theory, a new law, can be beliefs of any kind ie: religious, political, philosophical beliefs; they could also be beliefs based on some other science which is already established. Any bits of prior belief can provide the presuppositions or the metaphysical background for a new law or a new theory. And obviously it goes along with what we are saying that there are never new laws or theories that do not have presuppositions behind them or some metaphysical background.

Why is this important? It is important because we think that in the history of science and in science generally, the metaphysical background of a theory or law affects the meaning of the theory. Secondly, it affects the facts that are relevant to that theory, and thirdly, the metaphysical background of a theory affects the goals and the tactics of research within that theory.

To illustrate this, we are going to work with the very simple example which I introduced above, but be assured that more complex real cases can be used. I am going to take our law “All swans are white”, and I’m going to imagine that that is the total content of a very powerful science called “Swan Science”. Obviously, real sciences are much more complex than this, but here is the total content of a textbook of swan science: “all swans are white”.

Now I am going to insert that science into two different and contrasting metaphysical backgrounds, two different sets of cultural presuppositions. And I am going to try to show that the swan science (or theory or law) is different in the two cases, that the relevant facts are differently construed and that the goals and tactics of research are different when the metaphysical presuppositions are different.

This is easy to do because it is a baby example of some things that really did happen in the history of biology (in the history of evolution theory in the nineteenth century). Lets take a pre-1859 (pre-Darwin) view of things and lets take a post-1859 (Darwinian) view of things. Allowing of course for the fact that Darwin thought what he did before 1859 but he only published in that year, and even after 1859 a lot of people still thought in the pre-1859 way.

Pre-1859:

Assume you are enrolled a subject called 'Swan Science 336', a third year subject, and the lecturer gets up and says "All Swans Are White". Upon hearing this you think, and he thinks, the following:

"Swans are a species of organism."

That is we are unpacking the conceptual presuppositions, the metaphysical background to this science. The lecturer did not say, 'Swans are a species of organism'. He just said "All Swans are White", but what, as pre-1859 listeners do you associate with this? You think, and he thinks...

"Swan are a species of organism; God made the species as the Bible teaches us, and, therefore, as the Bible teaches, God made the species unchangeable and fixed."

When the lecturer said all swans are white, he did not literally say all those things, but in the background of what he is saying is this set of conceptual presuppositions, this background of belief (fig 3).

Now what if you were taking Darwinian evolutionary biology after 1859, . In many ways Darwin's theory of evolution becomes the relevant background metaphysics. There indeed is nothing to prevent one theory from supplying the metaphysical background to another! Historians find that any bit of culture/belief can provide the conceptual background to another assertion, or theory, or law. So, now you are learning biology after Darwin and his theory of evolution becomes the relevant bit of cultural presupposition and when I say "All Swans are White" there is a different metaphysical background here for, when I say "All Swans are White" you think,

"Species are changeable, they can evolve according to the mechanisms of natural selection".

That is really quite a different set of presuppositions than we had pre-Darwin (fig 4).

Now let us look at the issue of whether different metaphysical backgrounds tend to shape and foster different relevant facts and tactics of research. Somebody digs up a fossil. Our theory-loaded perceptual apparatus tells us that it is a bird-like thing and that further tells us it is partly like a swan and partly like a duck. (Of course, if we had just arrived from Mars and didn't have any of these concepts (bird, duck, swan) we would say "what a peculiar example of a gobbledegook - related to the gobbledegooks we have on Mars.")

In the pre-Darwinian theory of swans, with its religious metaphysics, what we say is "species do not change or evolve, this must be a one-off freak of nature" They do happen - six legged sheep. Six-legged sheep do not reproduce, for there isn't a species of six-legged sheep. This is a freak of nature, a ducky-swan or a swanny-duck. Perhaps, if we read the Bible with more care, we might learn why God licences this to happen occasionally. Maybe he's sending us some message by presenting freaks of nature. Maybe He is reminding us of His overall benevolent proprietorship of the universe. And what should we do? Well, I guess we should apply for a research grant (this is the tactics of research) explaining the existence of freaks of nature and the necessity of finding some more so that we can explore this question of their meaning--

where the meaning would obviously be in a theological context. This is a perfectly reasonable thing to go and research.

Now, for a Darwinian view of this fossil, with different facts and research tactics emerging. At some basic level, both sides agree on the basic fact that here is a fossil (an object in front of us)--it is a swanny-duck or a ducky-swan, but one wants to go a bit further and a 'bit further' in the light of one's theories and ones metaphysics. The Darwinian view: this is an example of a species of bird, now extinct, which may have been the common ancestor of present ducks and swans and more research is needed. As for research policy, we must apply for a research grant and our application will say "According to the theory of evolution there should be extinct species that bear ancestral relations to present species - let us go and do some field work and find some more".

The two sides might then go to the same place and dig up a second curious fossil. Each side would very happily report a different sort of fact with a different sort of plan for further work. Each would continue to claim success in further the frontiers of their own versions of "Swan Science".

Let's say of a new theory that is being put together. Its metaphysical background (the conceptual presuppositions of a theory) does not have to be some set of beliefs that is dominant or even terribly well-known in that society. When a new theory is put together it does not always have a metaphysical background consisting of commonly accepted ideas or majority favoured ideas from that society. What is necessary is that the beliefs that serve as the metaphysical background to the new theory have to be available in some way to the inventor/s of the new law or theory.

An example: Darwin had to step outside the majority religious view of his time. The religious view that I put forward was not the metaphysical background to the theory of evolution. But Darwin did not step completely outside the range of available beliefs in his Victorian society. He instead reached for, or was pushed towards, (we would have to do some biography to figure out which) a different cluster of beliefs which was also circulating and available in his society, especially among men of his class and background: These were ideas about economics and political economy and not about animals and evolution: ideas about people and how people love to reproduce; and usually reproduce faster than the food resources can be increased; and therefore, have to struggle with each other for survival and economic success; and how the people who succeeded economically are therefore the most competent and the 'best' people. These are ideas, then, from a certain strand of the Victorian political economy which Darwin puts into biological terms and which become the background to his thinking. We can almost map this situation (See figure 4 where we can link ideas of political economy to the idea of population pressure, which linked to random variation constituted the core of natural selection and which now in a Darwinian's mind is the background to any thinking about 'swan science')

To reiterate. In figure 3 we have 'swan', and 'white', and a dazzling connection between them. Elsewhere in the grid we have God, Bible, Creation (obviously it is a lot more complex than this). What is happening pre-Darwin is that this cluster (ie religion) is shaping and controlling that swan-science linkage set-up. It is the set of conceptual presuppositions or the metaphysical background to swan-science.

In the case of Darwin in figure 4 we have again swan, white, and a connection. But, for Darwin we have population pressure in nature, random variation, animals and plants like to have off-spring but every little off-spring is a little bit different to each other and

because there is population pressure against the environment the off-spring with a bit of advantageous difference survives and reproduces. This is all linked up; in fact this link is Natural Selection, which we further linked back to its own metaphysical background in political economy. So, when Darwin thinks about swans he thinks against *this* metaphysical background. But it must be admitted that God, Bible and Creation were still there. What Darwin did was cut the link that everyone else thought was 'natural' between thinking about swans and this religious cluster of ideas. He still had those ideas, perhaps toned down and moderated a bit compared to the real fundamentalists of the day, but he certainly still had those ideas. I suppose clusters of ideas that don't get plugged into other new clusters, that don't provide the conceptual presuppositions for new clusterings tend to fall by the wayside by disuse, unless other groups and institutions in the society keep them alive.

Obviously, given what we have seen it is very difficult to argue that there is one true good proper metaphysical framework for the sciences and that all the other ones that we find are silly, wrong or biased. We have sometimes encountered this in some first year student essays which say "Copernicus' facts were loaded by his theory, but fortunately he had the right metaphysics"! This is 'progress' in metaphysics, or Whig history of metaphysics! Get your metaphysics right and your science comes out right! But, we have moved so far from hard facts that it is very difficult to think that hard facts of nature determine what is a good metaphysics and what isn't. We have moved away from nature and into culture and history. These metaphysical backgrounds are collections of cultural beliefs and commitments.

We have met metaphysical backgrounds already. We have been doing this but we didn't have a name for it. Remember we said that astronomy was the attempt to solve the difficult problem of the motion of the planets and for the Greeks this science had to be done, as far as possible, within the constraints and the dictates of Aristotle's Natural Philosophy. So you might now say that Aristotle's Natural Philosophy was the metaphysical background to Ptolemaic astronomy. It is an interesting case because what they wanted and what they got were two different things. Ptolemy's astronomy was broadly shaped by Aristotle's cosmos: there is one universe, there is the sphere of the fixed stars, the earth was at rest, the other things go around the earth etc. Unfortunately, the demand for accuracy meant that Ptolemy's astronomy had some bits and pieces in it that were not physically plausible, and did not fit the background metaphysics. Epicycles on epicycles or the earth off-centre etc. This is interesting. Maybe a metaphysical background isn't totally constraining, maybe it just *tends* to constrain. In that case, accuracy got the better of them. They didn't like that because accuracy ran counter to metaphysics and after all we all think our own metaphysics is true. So accuracy ran against the 'truth', as metaphysically defined via belief in the truth of Aristotle's cosmology.

Copernicus is another example. Copernicus is bringing in an extra criterion for judging theories: "Is the theory a pretty blue-print, mathematically speaking". Not only does he bring this criterion in, but makes it the most important one. As I said, this has something to do with the fact that he was partially committed to the philosophy of Plato and not entirely committed to the philosophy of Aristotle. Part of the philosophy of Plato involved just that idea, that there was some really elegant mathematical blue-print under the surface appearances of nature. Now this suggests (and this insight was one of the founding insights into the modern history of science) that we can say that Copernican astronomy has a slightly less Aristotelian metaphysical background than Ptolemaic astronomy does, and that his commitment to Platonic philosophy plays a role here in constraining or dictating how Copernicus does astronomy. This commitment to

Plato is dictating or constraining what he does precisely by making him respond to a new and different criterion of what is goodness of theory. This difference of metaphysical presuppositions is perhaps why Copernicus and his opponents tend to speak past each other. Not only are their theories different and their facts slightly different, and their criteria slightly different, but their deep presuppositions are also rather different.

We are going to meet more Platonists, such as Kepler and Galileo. They seem to be the ones who seem to respond to Copernican theory. Now, that is all fine, for that is about as far as the historians of science got by the 1930s and 40s leading up to the writings of Thomas Kuhn in the 60s; but, there is something more that you have to add to this picture of metaphysical backgrounds and it's this: Obviously metaphysical backgrounds are pieces of culture and social belief and so we need social, and political, and historical explanations of them. We cannot explain the presence of Platonism in the Renaissance by just saying that the good guys are getting in touch with the facts of nature. So, metaphysical commitments invite us to social and political and historical and economic explanations. They do not invite us to discover what real facts motivated the wonderful metaphysical postures of the winning team. In other words, if the Copernicans were Platonists, as you will find many were, that doesn't mean that Platonism is the key to the universe.

Finally, metaphysics is a bit of a dirty word amongst some philosophers and some hard-headed scientists. There have been, during the last two hundred years, schools of philosophy, devoted to the cult of facts, termed empiricists [who think all knowledge comes from nuggety facts] or Positivists [who think only such scientific knowledge of facts is real knowledge] (a lot of Whig historians of science were Positivists). Many philosophers have taken the view that we don't want any metaphysics in science. This type of philosophy states that directly observed facts are real; laws and theories induced directly from observed facts are real, and ideas that do not have a basis in real facts are nonsensical, they are 'metaphysics'. So, in other words the word 'metaphysics' has been used to label beliefs that have no factual basis, whereas I seem to have been arguing that metaphysics conditions theories, and theories condition facts, so that, at a remove, metaphysics conditions facts.

The modern use of the term metaphysics, since about the 18th century, makes metaphysics into a dirty word in just that way, that metaphysics consists of beliefs or concepts that are not really based on facts. So to a lot of people, of say, this Positivist persuasion, religious ideas are meaningless, they are nonsensical because they have no basis in fact. Now, I think we would want to put it another way -- that if you have got a bunch of people who believe in a religion, then they will see and understand things in relation to it and there will indeed be 'facts' to support their religion.

The key thing here is that people who use metaphysics in this derogatory way, obviously assume that we do have access to hard objective unshaped facts. That is the core of their position for if we have access to hard unbiased, unshaped facts then those people who make the mistake and believe things that are not based on hard, unbiased, objective facts are obviously stupid, or mistaken or believing nonsense and they are indulging in metaphysics. So that is the derogatory sense of metaphysics that you get in some schools of philosophy. That is not how historians of science generally use the term. Historians of science, both before and after Kuhn, use the term in precisely the way I defined it at the beginning of this Chapter. The historically and socially available presuppositions, beliefs, background assumptions that shape the making and use of a

new theory. Obviously, this is going to be a rich tool for us to use in reconstructing the history of science.

We now turn in the next three Chapters, section 4, to the Copernican debate in the two generations following the death of Copernicus. We shall discuss aspects of the work of three key participants -- Tycho Brahe, Kepler and Galileo -- and we shall be applying to our historical analyses, the new critical concepts about facts, theories, pre-suppositions and the social shaping of knowledge that have begun to emerge thus far.

Figure 1a Naive View

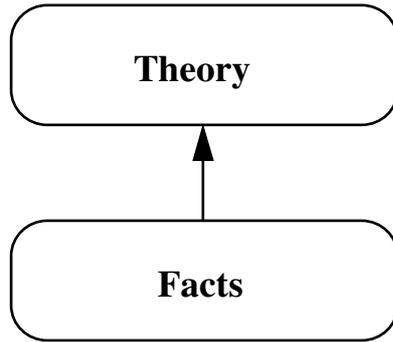


Figure 1b Theory-Loading of Facts

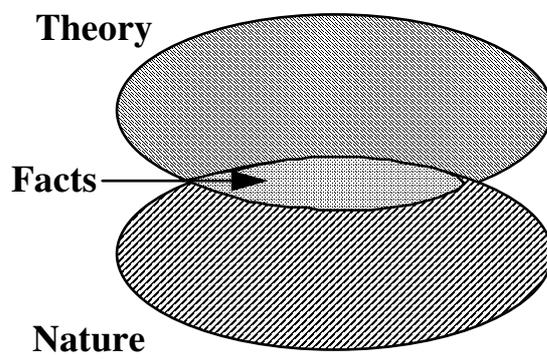


Figure 1c Metaphysics-Loading of Theory

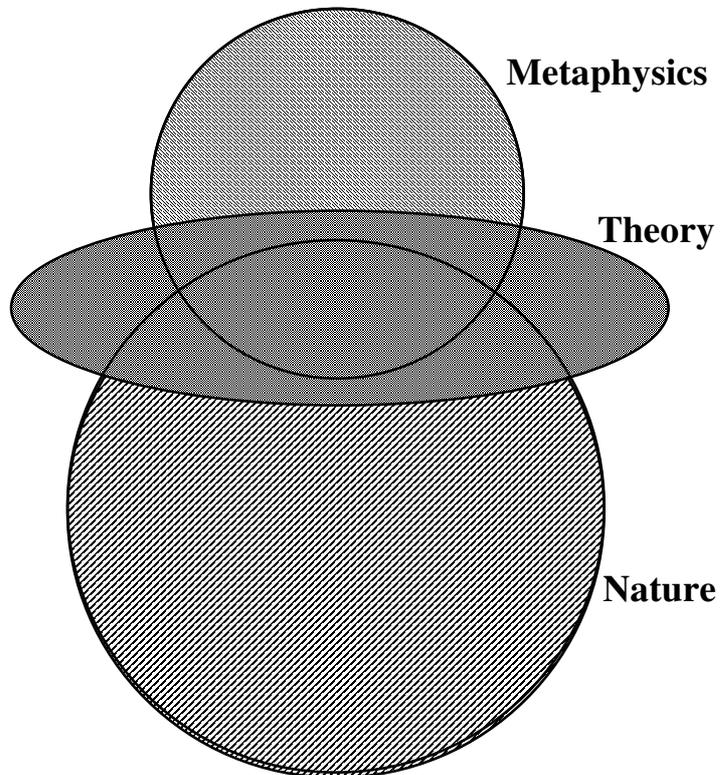
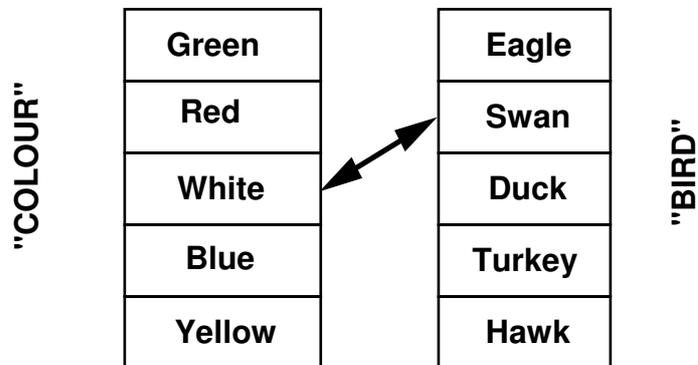


Figure 2a Bits of 'Grid' Categories

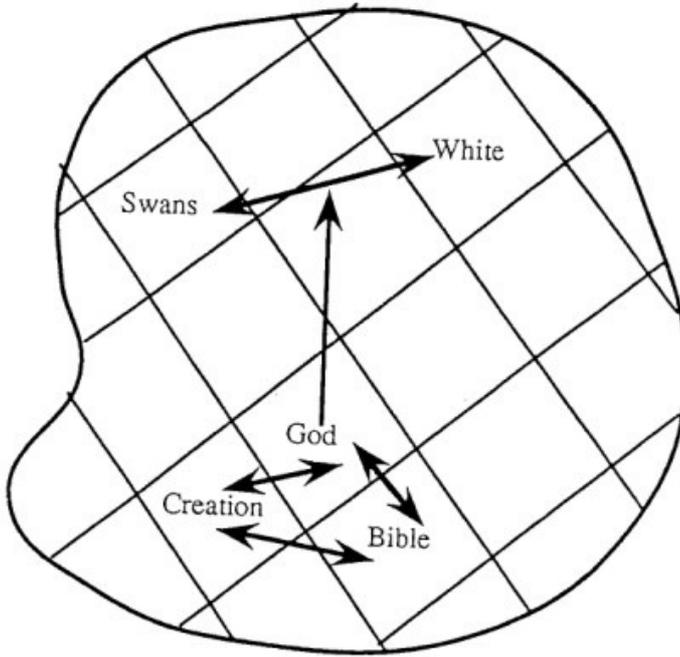


Figure 2b 'Law' in a Grid Structure



1858

Figure 3



1859

Figure 4

