

Objectivity and Relativism in Science*

1. The Cognitive Authority of Science

Our culture accords science a great deal of prestige and respect. We treat science as if it were something special. We grant science and scientists what one might call *cognitive authority*. Because of this, claims made by scientists are more readily accepted than are claims made by most other members of the community.

I suggest that the reason we grant science special cognitive authority is that we tend to operate with a kind of divide with respect to knowledge. On the one side of the divide there is science. On the other side of the divide there is everything else. We think of science as the enterprise that makes contact with reality. Scientists have rigorous techniques for finding out how the world really is. Scientists have objective procedures for deciding what claims about the world are true, and which are false.

On the other side of the divide, everything else is simply a matter of taste, prejudice, subjective opinion, habit, custom and myth. When was the last time that film critics agreed about a film? Are there objective grounds for thinking that *Crocodile Dundee* is a better or worse film than *Muriel's*

* Text of a lecture presented to various audiences in Melbourne in the late 1990's.

Wedding? Or think about moral issues like euthanasia, capital punishment, abortion. Surely disagreement on such things is just a matter of difference of personal opinion? Such questions cannot be decided by collecting data, making tests, or presenting proofs.

Whatever else goes on in the rest of culture, science gives us the facts. Science, on this way of thinking, is a successful and effective knowledge-producing activity that is concerned with the way the world really is. Science has the ability to tell us the truth about reality. It tells us how species evolve, what chemicals are made up of, and what electrons and neutrons are like. It can explain how the oceans and the continents were formed. And science can say how hot it is in the interior of the sun.

But science does not just give us abstract, theoretical knowledge about things that are only of interest to scientists. Science is also of great practical use. It provides beneficial knowledge. Scientific research helps to cure fatal diseases, tells us how to keep our teeth clean, what to eat if we don't want to clog up our arteries, and warns us that smoking causes cancer. Science also gives us technology. And technology helps us grow better crops, communicate with folks far away, and travel overseas. In short, science improves the quality of life.

2. Why Is Science a Cognitive Authority?

We treat science as a cognitive authority because we think it is a reliable source of knowledge. If we want to know whether the dingo did it, we call in the scientists. If we want to know why the dinosaurs died out, science will tell us. If we want to know what is happening to the ozone layer, again we ask

the scientists. So if what we want is to know something about the world, then we turn to science. We accord science a special status as a cognitive authority, because we think science has the ability to provide us with true, objective knowledge about the world.

But why do we grant such authority to science? There are, I think, a number of reasons.

The main reason is that science is considered to be an institution which has developed effective and reliable techniques for finding out the way the world is. As a result, we see science as our best example of how a rigorous, systematic, *rational inquiry* should proceed.

As evidence that science does possess such means of inquiry, it may be pointed out that science is seen to make actual *progress*. We are constantly aware of new advances, breakthroughs and findings in science. When there are changes of scientific theory, these are not just changes in fashion but actually advances of knowledge.

Apart from being a prime example of rational inquiry and demonstrating progress, there is another feature of science which makes it seem special. Unlike disputes in politics, religion and humanities disciplines such as literary criticism, science is typified by widespread *consensus*. The sciences tend to be characterized by fundamental agreement on basic principles. Usually agreement is reached quickly on new claims or ideas. Moreover, when there is disagreement among scientists, it rarely lasts for long. Usually disagreement is brought very rapidly to a close.

To sum up, science is very widely thought of as: a prime instance of rational inquiry; progressive with respect to scientific knowledge; by and large a consensus-based practice. These are some of the reasons why I think we accord to science a special status as a cognitive authority.

But there is a further reason that I wish to discuss in a little more detail: *science is frequently thought to be objective*. And the *objectivity* of science is part of why science is taken to be a rational enterprise that makes progress and is characterized by widespread consensus.

3. Objectivity

What does it mean to say that science is objective? In fact, this is ambiguous. There are at least two senses in which we tend to use the word ‘objective’, and two things we have in mind when we say that science is objective.

In the first sense, we contrast objectivity with subjectivity or with the merely personal. Suppose someone allows their thinking about some subject-matter to be coloured or distorted by personal ambition or prejudice, or by idiosyncratic likes or dislikes. When they form an opinion on the subject, this may lead them to overlook relevant facts, or to misinterpret facts, and to arrive at an incorrect view of the subject-matter. In extreme cases someone might be so in the grips of their prejudices and preconceptions that, even though the facts are staring them in the face, they arrive at a false belief. In such cases we may want to say that they have failed to be objective in forming their opinion.

So, we contrast arriving at a view of things which is distorted or unduly influenced by one’s personal prejudices, ambitions or emotional make-up with arriving at a view of things without such distortion or influence. To be objective in the first sense is to avoid being led astray in arriving at an

opinion on some matter by means of merely personal, subjective considerations. Typically, it is to avoid such distorting influences and to pay attention to the relevant facts and other considerations.

In the second sense of the word ‘objective’, we talk about such things as *objective reality*, the *objective facts*, or just *objects*. In this sense, objectivity has to do with the way reality is independently of our subjective reactions to it, independently of observers. Objective reality is the way the world is, in itself, whatever we think or believe about it. The objective facts are the facts that really exist, even if we do not know about them. It is the way things are in reality.

Thus, in the first sense of ‘objective’, objectivity has to do with us, and with the way we go about forming opinions about factual matters. In the second sense of ‘objective’, objectivity relates to the world. It is the way the world is independently of us which is objective.

These two senses of ‘objectivity’ fit together in connection with science. It is because science is objective in the first sense, because it removes subjective bias and pays attention to the facts, that science manages to give us an accurate picture of objective reality, in the second sense of ‘objective’. So, it is a good thing that science is objective in the first sense, if we want objectivity in the second sense.

4. Method and Objectivity

How does science succeed in being objective? The traditional answer has been that science possesses something special which guarantees objectivity, and it is because of this that science is set apart from

non-scientific disciplines and other areas of culture. Science possesses a special set of procedures or techniques for finding the truth, or anyway for finding and proving good theories. What it is that science possesses is *the scientific method*.

It is the scientific method that insures that science is rational, that it makes progress, and leads to consensus. It is the scientific method that makes science objective.

There are two main reasons for this. First, use of the scientific method insures that science is objective for the simple reason that scientists all use *the same method*. If scientists all use exactly the same procedures, then, it is thought, they will all come up with the same results. If scientists fail to use the same method, then other scientists can easily see if their work has been influenced by subjective factors, such as bias or emotion, rather than by use of the scientific method. Moreover, because the method is something that is *shared or common* between scientists, they are able to make use of a procedure which does not depend on or make use of subjective taste or bias.

Second, the scientific method is based on logic and observation. Both logic and observation are thought to be objective techniques of inquiry. Logic is grounded in objective principles of reasoning, and does not depend upon our merely idiosyncratic thought processes. Observation involves use of our built-in perceptual apparatus to detect the way things are in the world, and this perceptual apparatus is something all people have in common, which works the same way in all people. Moreover, observation using our perceptual apparatus provides a reliable and accurate means of establishing the facts.

Now that I have said something about how scientific method insures the objectivity of science, I want to mention a couple of different views about the nature of scientific method.

5. Inductivism and Falsificationism

I will give two examples of *objectivist accounts of scientific method*. The first account is called *inductivism* and the second is called *falsificationism*.¹

Inductivism takes the main characteristic of science to be that it is based on an inductive inference from observed facts to general scientific laws or theories. An inductive inference is a chain of reasoning which runs from a limited set of data to an unlimited general claim, or from a set of past observations to a claim about what will happen in the future. For example, if one reasons that because all past observed ravens were black, therefore the next raven will be black or all ravens will be black, then one reasons inductively.

Inductivists hold that scientific theories are arrived at by an inductive inference on the basis of observational data, where this observational data is treated as being perfectly objective. It is treated

¹ For a useful overview of the distinction between inductivist and falsificationist views in the philosophy of science, as well as the positions of Kuhn and Feyerabend to be mentioned below, see Alan Chalmers, *What is this thing called science?* (University of Queensland Press, St. Lucia, 3rd ed., 1999).

as objective because observation is thought able to free itself from personal bias, and to tell us the way the observable portions of the world really are.

My second example of a theory of method is the falsificationist philosophy of science proposed by Sir Karl Popper.² Falsificationism differs from inductivism in denying a role to inductive inference. Theories are arrived at by means of a process of conjecture, of educated guesswork. Once theories are formulated they are put to test. Science does not attempt to arrive at theories by induction, nor does it attempt to prove theories right inductively. It attempts to refute theories by testing their predictions. In the end what science does is give us theories that have been rigorously tested without yet being falsified. In science we never prove that theories are true. We only get rid of false ones. This leaves us with theories that have not so far been falsified, that may be tentatively accepted, while scientists attempt to falsify even these.

Both of these theories of method are objectivist accounts of science in roughly the sense that I have described above. For both assume that there is one scientific method shared by all scientists. Both assume that observation involves a high degree of objectivity. And both assume that the method of reasoning involved in establishing theories – induction or deriving predictions to be tested – is also an objective process.

² See, for example, Karl Popper, *Conjectures and Refutations* (Routledge, London, 1963), Chapter 1.

But in fact, within the philosophy of science, objectivist accounts of scientific methodology are nowadays in a great deal of trouble. Anti-objectivist and relativist views of science have become popular.

6. Anti-Objectivism

I want to mention two theories of science that have been proposed in recent years, which reject the assumption that science is based on a single objective methodology. These are the accounts of science proposed by Thomas Kuhn and Paul Feyerabend.

In his book, *The Structure of Scientific Revolutions*, Kuhn argued that, rather than being a process based on a single uniform methodology used throughout all areas of science, science is a historically changing process that is practiced in changing historical, social and intellectual circumstances.³ He introduced the idea of a *paradigm*.⁴ A paradigm may be thought of as a great embracing theoretical framework, which dominates work in a field of science for a given period of time (e.g. Darwinian evolution, plate tectonics, Newtonian physics). The paradigm provides scientists with their fundamental theoretical view of the world, with the set of problems to work on, and even with a set of methods for solving problems. While the paradigm is accepted scientists

³ Thomas S. Kuhn, *The Structure of Scientific Revolutions* (University of Chicago Press, Chicago, 3rd Revised Edition, 1996).

⁴ Kuhn, *op. cit.*, p. 10.

work a way on routine scientific problems with complete agreement on fundamental assumptions, and as more and more problems are solved science makes progress.

But from time to time, paradigms are undermined by recalcitrant facts. Scientists face *anomalous* problems which cannot be solved by the paradigm. They lose confidence in their paradigm. When this happens there is a *crisis*, a new paradigm is put forward and accepted, and a *scientific revolution* occurs. Kuhn describes the transition between paradigms as being like a religious conversion, and as involving a non-rational leap of faith.

A related view is that of Paul Feyerabend, who wrote books with titles such as *Against Method* and *Farewell to Reason*.⁵ Feyerabend argues that every single rule of scientific method that has ever been put forward has been, and should have been, broken by scientists. Feyerabend claims that there is no uniform methodology of science. But, if one insists on having a general method, then the only general method there can be is: “Anything goes”.⁶ He calls his view *epistemological anarchism*, because it has no rules of scientific method.

Both Kuhn and Feyerabend, moreover, reject something that had been common to inductivists and falsificationists. They reject the idea that observation provides neutral ground between theories. Instead, they hold that our perceptions, our choices of what observations to make, and the language we

⁵ Paul K. Feyerabend, *Against Method* (New Left Books, London, 1975) and *Farewell to Reason* (New Left Books, London, 1987).

⁶ Feyerabend, *Against Method*, p. 28.

use to report what we observe are all influenced by the theories that we accept, and by the particular scientific training that we have received.⁷ But, without neutral observation, how could science be objective?

7. Relativism

The rejection by Kuhn and Feyerabend of the traditional methodological basis for scientific objectivity has been branded ‘relativism’ by many authors.⁸ But what is relativism?

The most basic claim of the relativist has to do with a certain kind of claim of equality. It is an attempt to reject chauvinistic or supremacist claims that one society, or culture, or way of life, or scientific theory, is better than, or closer to the truth than, or superior to, any other. Relativism reflects a “live and let live” attitude. It promotes an attitude of tolerance.

But in connection with science, and with knowledge more generally, it reflects a certain *cognitive egalitarianism*. It says that one belief, or theory, or view of the world is just as good, or

⁷ See Feyerabend, *ibid.*, Chapters 6 and 7; Kuhn, *ibid.*, Chapter 10. The classic reference for the thesis that scientific observation is ‘theory-laden’ is Norwood Russell Hanson, *Patterns of Discovery* (Cambridge University Press, Cambridge, 1958). For an overview of the issue, see Chalmers, *op. cit.*, Chapters 1 and 2.

⁸ See, for example, the discussion of Kuhn and Feyerabend by the contributors to Michael Krausz and Jack W. Meiland (eds.), *Relativism: Cognitive and Moral* (University of Notre Dame Press, Notre Dame, 1982).

rational, or true as any other. So it says that Aristotle's earth-centred astronomy is just as true, in its time and place, as was Copernicus's sun-centred astronomy. Stahl's phlogistic theory of chemistry was just as good as Lavoisier's oxygen theory.

Taken to an extreme, relativism says not only that one scientific theory is just as belief-worthy as any other, but that science itself has no particular claim on our credence. Given that one view is as good as any other, if astrologers tell us that the planets influence our lives, and science tells us that there are no such influences, that's no bad mark against astrology. It just means that scientists disagree with astrologers. Since one set of beliefs is as good as any other, you might as well believe in astrology as in the scientific views which conflict with it.

Such things are indicative of the general relativist attitude. But, to be more precise, there are at least two different forms of relativism that have to be distinguished: *relativism about truth* versus *relativism about reason*.

To take the first, a relativist might say that the truth of some claim about the world, say that the earth is flat, is not something objective that depends on the way the world is independently of what we think about the matter. A relativist might argue that, relative to the cultural and historical context in which people believed the earth to be flat, it was in fact true that the earth was flat. Whereas, relative to our context, since we believe that the earth is round, it is in fact true that the earth is round. Truth, that is to say, is relative to context, and what is true in one context may not be in another.

But what sense can we make of this? If the claim is meant literally, then it would appear to follow that the earth can change shape when our beliefs change. For consider a society which believes

that the earth is flat, and who change their minds and hold instead that the earth is round. If both these things are true, then doesn't this mean that the earth was first flat and then it became round? And doesn't this make the shape of the earth depend on what goes on inside our heads, i.e., on what we believe?

That is hard to accept. But it does not follow that relativism is false. The relativist needs to devise a concept of relative truth which is different from what we ordinarily mean when we say, for example, that it is true that the earth is round, i.e., that the earth is in fact round.

What truth-relativists generally do at this stage is to lapse into talk about different conceptual schemes.⁹ Different theories or cultures employ diverse sets of concepts. Using different conceptual systems, they represent the world in radically different ways. What may be true in one world so represented need not be matched by anything in another way of representing the world. If we go in for this way of talking, then we may say that there are radically different sets of truths about the world which are expressed in terms of different conceptual schemes. But I will not explore that complexity here.

Relativism need not be relativism about truth. A weaker, more plausible, version of relativism is the thesis that what it is rational to believe — not what is true — depends on and is relative to context. According to such a relativism of rational belief, what it is rational to believe depends on the norms or

⁹ For a critique of the idea of alternative conceptual schemes, see Donald Davidson, 'On The Very Idea of A Conceptual Scheme', in M. Krausz and J.W. Meiland, *op. cit.*, pp. 66-80.

criteria of rationality which are accepted within a given culture or sub-culture. In one culture it might be rational to believe claims about the world which are based on sense experience, and which have been submitted to rigorous empirical tests. By contrast, another group might take the evidence derived from dreams to override that of waking experience. Yet another might derive all their beliefs from a spiritual leader whose teachings arise from mystical experiences. What is rational to believe varies between these cultural groups, since what is a criterion of rational belief varies between them.

Furthermore, it is not the case that the criteria of rationality of one culture are superior to those of another. Criteria of rationality are simply conventional criteria accepted in this or that community. And no criteria are any better — have any better purchase on reality — than any other. Given this, it is just as rational to believe the things that are held in the community that follows the dictates of dreams or the teachings of a mystic as it is to believe the findings of sensory experience. Thus, if this is right, rationality is relative to cultural context. More specifically, it is relative to the thoroughly conventional criteria of rationality which are operative in this or that cultural group.

This is a weaker form of relativism than the claim that truth is relative to context. Moreover, it is more plausible than that claim, since it does not face the difficulty of coming up with an intelligible idea of relative truth. However, it still faces the problem that it is quite implausible to say that dreaming or mystical experience is as reliable a method for finding out about the way the world is as

is the systematic use of observation. There really does seem to be a difference between right and wrong ways of finding out about the world.¹⁰

8. The Wrap-Up

Where does this leave us? I have described how philosophy of science sought to explain objectivity in science by appeal to a fixed methodology. I have mentioned two examples of this: Inductivism and Popper's Falsificationism. But that model of objectivity due to uniform methodology is in trouble. It is in trouble, among other reasons, because methodology may not be fixed.

What follows from this? You might think that relativism is what follows. If that is what you think, the problem of the objectivity of science will disappear for you. Science is not objective so there is no need to show how it is objective. The problem of explaining the special cognitive authority of science will also disappear. For if one set of views is as true or as reasonable as any other, then science has no claim to be special in the way of cognitively respectable belief by contrast with any other belief system (though there may be non-cognitive sociological features which distinguish it).

But there is another way to respond, which is the way that I favour. It is to say that a fixed methodology is not required for objectivity. The traditional view was mistaken. For objectivity what is required is that individual bias and self-interest not play an overriding role in science. To avoid that

¹⁰ For further discussion of the distinction between relativism about truth and relativism about reason, as well as a number of other versions of 'cognitive relativism', see my book *Rationality, Relativism and Incommensurability* (Ashgate, Aldershot, 1997), especially Chapter 1.

it is not necessary to have a single, unchanging, ahistorical method. To avoid excessive subjectivity, it is sufficient for there to be intersubjectively applicable methods. Methods may change and depend on context. But, provided there are methods which may be employed by various scientists, that is enough to avoid undue personal bias and prejudice from influencing scientific inquiry.