

University of Oxford
Department of Politics and International Relations

Philosophy of the Social Sciences: Lectures
Elizabeth Frazer, New College
Michaelmas Term 2002

Lecture 2: **SCIENTIFIC THEORY II**

The Problem

Influential philosophers and scientists take it that science's rationality is based, first, on the rigorous use of logic in argument, and, second, on the testing of hypotheses or theories against our observations of the empirical (experientiable) world. This method of observation relies on the independence of theory and observation. The philosophical project of establishing the independence of theory and observation runs into numerous difficulties. Philosophers even have trouble establishing any clear distinction between the two. But if 'theory' and 'observation' are interdependent or conceptually connected, how can the one be the test of the other?

Key Concepts

1. **Theory**

contrast terms:

- theory/observation – observation has what we might call a *sensory subjective infrastructure* – human mind, eye, sense experience; theory has what we might call an *intellectual* (imaginative, rational etc) *subjective infrastructure*.
- theory / reality; theory / fact – theory is subjective, mental; reality or fact is objective, external

theory as set of statements (but a nursery rhyme is a set of statements too)

- coherence: a theory must be understood in relation with other relevant sets of statements; the relationship between theories must be judged by the criteria of consistency, or coherence
- informative – increased understanding, technical progress, ...
- testable – this does not only apply to scientific theory – literary theory, philosophical theories etc

2. **Observation**

- *distinguish from perception* – concept of observation adds intentionality, concentration, systematicity, orderliness, to perception
- to observe is to bring language, concepts, categories, analysis to bear on perception

Ex bird spotting,

sociological observation of encounters,
counting traffic flows

- consistent with use of aids such as microscopes, XRays, telescopes, Magnetic Resonance Imaging (???)
- *distinguish observation from measurement*: measurement is quantitative

Observability

- A flying horse is observable (otherwise we would have to call it an invisible flying horse); (van Fraassen)
- abstract categories like pi are not (although they are quantifiable);
- universals (like 'man', or 'all swans') are not observable
- some entities that are central to modern science, like 'electrons', once were not observable (and were cases of purely theoretical entities for a long time), but now with advances in technology are observable

- abstract sociological categories like ‘race’, ‘class’, ‘gender’ are not observable.
- individual and group characteristics like skin tone, language, dress, propensity to depression, are observable.

3. **Empirical**

- Based on (sense) experience.
- A statement, proposition or judgement is empirical if we can know its truth value by appealing to experience.

Ex ‘This is red’ is an empirical proposition.

‘Red is a colour’ – not empirical.

‘Social class is a good predictor of educational attainment...’ ???

Who has said what about all this?

J S Mill

Mill is an exemplary representative of the view that we construct ‘theories’ by a process of induction or speculation out of our observations and reasoning about the world; then deduce from these theories empirical observable consequences

Ex if all swans are white, the next swan I see will be white;

if social class predicts education, then in this survey we shall find that social class is correlated with education, even when we hold all other variables constant;

and we compare what we actually observe with what the theory predicts we should observe. Mill’s verificationism relies on this method.

The Vienna Circle

I am trying in these lectures to avoid getting bogged down in ‘isms’. This is because ‘isms’ are constructs out of complex strands, tendencies and traditions of thought and philosophical analysis and invariably misrepresent the actual ingredients that go in to them. Nowhere is this more the case than with ‘positivism’ which is a complex tradition of thought about science, reality, knowledge and logic, and seems to me invariably to be misrepresented both by its defenders and its critics. That’s why in these lectures I am taking pains to look at the actual writings of important philosophers. However, you had better know that the ‘Vienna Circle’ are associated with the philosophical tradition called ‘Logical Positivism’. Here are some of the elements of that position:

Verificationism The significance of non-analytic sentences depends upon whether they can be tested. When we talk about the ‘meaning’ of a proposition or term we are talking about how we would verify the proposition, or empirically verify the validity of a term. Utterances which are neither analytic, nor empirically testable, are meaningless.

Ex: A brother is a male sibling – *analytic*.

Jack and Jill went up the hill to fetch a pail of water – *synthetic; empirically testable*.

All history is the history of class struggle???

Rudolf Carnap (1891-1970) Carnap analysed ‘science’ as follows:

- The logic of science is no less and no more than the logic that governs the language of science;
- A crucial part of the language of science is a ‘pure’ observation language which is devoid of theory, and consists of what he called ‘protocol sentences’.
- In answer to the question what this ‘pure observation language’ can ‘inhere in’ or be founded in, Carnap says: ‘sense data’
- But, as other Vienna Circle philosophers concede (eg **Otto Neurath** 1882-1945) protocol sentences must be refutable; if they do not ‘fit’ into a theoretical system they can be ‘deleted’.

Popper

In *Logic of Scientific Discovery* Popper discusses the problem of ‘the empirical basis’ of science and scientific language. The ‘problem of the empirical basis’ is the ‘problem of the empirical character of singular statements’. Perceptual experiences, in the empiricist and positivist traditions, have most often been regarded as providing the justification for basic statements. That is items of language are justified by items of psychology. However, *logical justification* of a statement can only come from another statement or set of statements. Logical justification is important, otherwise science is either dogmatic, or a matter of ‘our psychology’. In Popper’s view the whole empiricist and verificationist method founders on the problem of induction discussed in Lecture 1. All scientific statements go FAR beyond what can be known with certainty on the basis of sense experience.

Popper argues that the basic statements of science are statements we ‘decide to accept’ *Basic statements are accepted as the result of a decision or agreement; and to that extent they are conventions. The decisions are reached in accordance with a procedure governed by rules. ... Agreement upon the acceptance or rejection of basic statements is reached, as a rule, on the occasion of applying a theory; ... the connections between our various experiences are explicable, and deducible, in terms of the theories which we are engaged in testing.* (*Logic of Scientific Discovery* pp104)

‘If I am ordered: ‘Record what you are now experiencing’ I shall hardly know how to obey this ambiguous order. Am I to report that I am writing; that I hear a bell ringing; a newsboy shouting; a loudspeaker droning; or am I to report perhaps that these noises irritate me? And even if the order could be obeyed: however rich a collection of statements could be assembled in this way, it could never add up to a science. A science needs a point of view, and theoretical problems’’ (*Logic of Scientific Discovery* pp106-7)

Thomas Kuhn

Argues that

- *scientific theory and learning to see are not independent processes.* His point is that physical scientific training is overwhelmingly done by way of textbooks which offer, dogmatically, methods of demonstrating accepted results. Scientific education is education in a disciplinary matrix, consisting of symbolic conventions, symbolic generalisations, models, and exemplars.
- *‘observation’ and ‘sense experience’ are not simply related.* Two people with the same retinal impressions can see different things – think of the example of the ‘duck-rabbit’ and similar visual paradoxes. Two people with different retinal impressions can see the same thing - experiments with ‘inverting lenses’ showed that after a period of a few days wearing inverting lenses (which turn the external world upside down) subjects adapt their perception, ‘see’ the world in exactly the same way as those not wearing inverted lenses and negotiate the external world perfectly well.
- *our observations are determined by our theory.* In both these cases our (learned) expectations and prior knowledge about the world have an effect on our observation; rather than our observation being our guide to how the world is.

Summary

1. Mill’s verificationism, the verificationism of the Logical Positivists and Popper’s falsificationism all rely on the following view of science:

- we observe regularities in the world
- by reason or speculation or induction we construct theories
- we deduce empirical observable consequences from our theories
- we engage in purposive observation to test whether the observable consequences of our theories are actually observed

2. This process is threatened if ‘theory’ and ‘observation’ are not independent of one another

3. The problem of *conceptual construction*: it can be argued that *observations are constructed by the concepts of the observer, and these concepts in turn are theoretically constructed*.
4.
 - ‘Theory change’ does not consist of the discarding of one (less good) theory in favour of another (better) one.
 - It consists rather in shifting from one way of conceptualising the world to another way.
 - To the extent that ‘observation’ is institutionally and intersubjectively produced these shifts are not ‘rational’, nor the straightforward result of testing theory against the world,
5. Kuhn argues that learning a discipline, learning a theory, and learning to see are bound up with one another.
6. The mundane psychology of observation offers further support to Kuhn’s view:
 - two people with the same retinal impression can see different things
 - two people with different retinal impressions can see the same thing
7. Wittgenstein says: ‘seeing as is not part of perception’
8. Popper
 - every statement has the character of a theory
 - descriptive statements cannot be verified by any observational experience
 - our descriptions are conventional and inter-subjective – they are based on agreement
9. Where is ‘reality’ in all of this?
10. There is nothing more to ‘reality’ than what our best theories tell us. ‘Reality’ is a scientific and epistemological construct.
11. We must let go of ‘reality’
12. We must hold on to ‘reality’: the concept of reality entails that ‘it’ is independent of our knowledge of it and theories about it.