Willard Van Orman Quine, From Stimulus to Science (Harvard University Press, 1995) vi, 114p.

By Catherine Legg

From Stimulus to Science crystallises one of America's most celebrated philosophers' thinking of a lifetime on naturalised epistemology. This slim volume grew out of Quine's Ferrarer Mora Lectures of 1990 at the Universitat de Girona in Catalonia. Its overarching theme can fairly be described as *rational reconstruction* of the passage to mature, predictive scientific theory from "...the mere impacts of rays and particles on our surfaces and a few odds and ends such as the strain of walking uphill" (p. 16).

The first chapter, "Days of Yore", is an idiosyncratic and occasionally charming survey of philosophy from Thales to Carnap. The tale begins with the problem of error:

> We and other animals notice what goes on around us. This helps us by suggesting what we might expect and even how to prevent it, and thus fosters survival. But the expedient works only imperfectly...(p. 1).

Quine suggests that Plato's "ideas" were an early attempt to counter the scepticism that was already plaguing the ancient Greeks. He mentions Aristotle's syllogistic achievements, but suggests that in this period "[k]nowledge itself outpaced knowledge about knowledge (p. 2)". He skips lightly over the medieval period to discuss the early modern scientists and philosophers. He claims that Hobbes' view of knowledge was "strikingly modern", but that Descartes had a "theological epistemology". Locke meets with more approval, though his empiricist account of the association of ideas is "the barest beginning". Berkeley's disavowal of matter was, Quine writes, "a matter of words". Hume took British empiricism to the conclusion that "there simply is no evidence for the continued existence of an object between one occasion and another of our perceiving it."(p. 5). Such a heavy reliance on privately received sense-impressions in epistemology leaves one very little with which to build a theory of the world in all its structural complexity.

The reader then encounters Jeremy Bentham, and his innovation, *contextual definition*, whereby terms are defined purely by explaining all sentences in which we wish to use them, and objects whose ontological status is dubious may be treated as "innocent fictions". This leads on to a discussion of Principia Mathematica, its ambitious project of deriving classical mathematics from logic, thereby clarifying

mathematics' "whole intricate structure", and the death-knell delivered to this hope by Goedel in 1931. This quest for translation as an aid to understanding is claimed to apply to empiricist epistemologists generally. Quine claims that Russell and also (notably) Rudolf Carnap sought "the explicit construction of the external world, or a reasonable facsimile, from sense impressions..."(p. 10).

In chapter two ("Naturalism") Quine turns to issues on which he and Carnap part ways, such as Carnap's methodological phenomenalism. Carnap, of course, wished to claim that this was without "metaphysical" implications. However to Quine it is an embrace of Cartesian dualism, and he suggests that a better alternative is monism of the physicalist variety. How might this be expressed? One might just do physics. Or if one wants to flex philosophical muscles, one might be a naturalist. Quine defines naturalism as, "rational reconstruction of the individual's and/or the race's actual acquisition of a responsible theory of the external world".

Famously, Quine claims that this exercise is itself "part and parcel of empirical science". There seems to be some tension between such pragmatic holism and the project of rational reconstruction, on at least two counts (though the two are connected). The first is a tension between pragmatic holism and the *critical distance* implied by the very term "reconstruction", and Quine's enthusiasm for Principia Mathematica-style mapping of a theory's entire structure in order to make it clear. While one is afloat on Von Neurath's raft, one can only add or remove individual planks -- surely to "reconstruct" one must get it on dry land?

The second source of tension is between the pragmatic naturalist desire to engage in pure *description* of the progress from stimulus to science in the human being *qua* physical organism, and the *normative* function Quine sees rational reconstruction playing, which can already be seen in the appellation "rational" in "rational reconstruction". These issues return at certain key points in the book.

Quine then begins setting out the details of his rational reconstruction. The path begins with what he calls the *global stimulus*, (a subject's total sensory experience of a moment, which in a disarmingly frank show of behaviourism he also refers to as "an ordered set of receptors"). He then moves through*observation sentences*, which are the human counterparts of bird calls and apes' cries, pointing out intersubjectively observable situations which are directly present to speaker and receiver, to *observational predication* (for example, "That dog is black"), and *observation categoricals* (for example, "When it snows, it's cold"). With the latter, one has

reached one's "first, faltering scientific laws", and opened a rudimentary theory of the world to empirical testing.

Chapter 3 ("Reification") deals with the next great leap forward for a budding epistemology. This chapter may be seen as a rational reconstruction of the emergence of existential quantification. Quine claims that reification amounts to "the transcending of the specious present"(p. 36). By this he means that one is committed to the existence *qua* object of, for example, a raven, when one is willing to claim that it is *the same raven* one saw yesterday. Quine imagines the human race "discovering" reification in a quantum leap whereby caveman Og presents to his colleague Ug the possibility that the cave-bear he is about to pursue into the cave is *the bear last year* which, pursued into a cave, killed their friend Ig.

Of course there are other reifications in the human world-view besides bear-sized concrete objects. Quine discusses abstract objects, notably properties, where he stands firm, ("There is no entity without identity, and the identity of properties is ill-defined." p. 40). Classes, however, are acceptable to a physicalist ontology which, "consists of just the physical objects, plus all classes of them, plus all classes of any of the foregoing...and so on up" (p. 40). Numbers enter our ontology by this route. Numbers must enter somehow if one is to be a good physicalist, for though even "soft science" requires classes, "hard science is waist deep in classical mathematics".

In Chapter 4, "Checkpoints and Empirical Content", the question arises, what makes a sentence an *observation* sentence? Quine's so-called observational categoricals are the checkpoints of science, where theory meets world through experimental testing. The relative frequency of such checkpoints is what distinguishes the "hard" from the "softer" sciences (such as economics and history). The observation categoricals implied by a set of sentences may be said to be its *empirical content*..

At this point the normative side to the naturalist's rational reconstruction of epistemology emerges. Quine suggests that actually sitting down and evaluating the empirical checkpoints of "some substantial fragment of science, say Newtonian mechanics" could well "contribute to the advancement of natural science by uncovering unexpected logical interconnections and suggesting a fruitful new hypothesis for testing." (p. 47) The art of framing hypotheses is an area of epistemology in which the normative is ineliminable, and the norms include conservatism and simplicity. Normative epistemology also recognises and corrects for errors in our theorising about the world which are unfortunate side-effects of natural

selection, thus doing for human science what surgical correction of hernias does for the human body.

Having pointed out that a theory stands or falls by the observational categoricals it implies, Quine asks in Chapter 5 ("Logic and Mathematics") what defines *implication*? He answers, "elementary predicate logic is enough". To prove that a set of premises implies a conclusion, one may merely prove that they are inconsistent with its negation. If one restricts logic thus austerely to elementary predicate logic one excludes set theory. Quine is happy with this, preferring to see set theory as "another, higher branch of mathematics".

What distinguishes mathematics from natural science? First of all it lacks any empirical content. That characteristic, however, is by no means definitive of mathematics. Neither is the essence of mathematics captured by noting that it is what Tarski termed a *formalised language* . Quine concedes that he "has no demarcation to propose", but that "Mathematicity is perhaps a matter of degree". But what about statements such as the continuum hypothesis, which are seemingly entirely unconnected to any observation categorical? Are they true or false? Quine has some sober words for the "starry eyed set theorist". We may concede that every statement in our language is true or false, while recognising that this makes no difference either to our theories or to the observable world. "It is like Kant's thing in itself, but seen as a matter of human usage rather than cosmic mystery" (p. 57).

In Chapter 6. ("Denotation and Truth"), Quine discusses "the ontology of denotation", and the set-theoretic paradox with which Russell devastated Frege in 1902. For a consistent account of denotation, he argues, one must look to a Tarskian formalised language. What of truth? Quine notes that this notion is something of a placeholder for the sublime and noble in the pursuit of inquiry. This may be seen in the determined way in which, when one of our scientific conclusions is falsified (or "dislodged by further research"), we say that it was actually never true:

> Such is the idiom of realism, and it is integral to the semantics of the predicate 'true'. It fittingly vivifies scientific method, the method of interrogating nature by conjecture and experiment and abiding by the consequences. (p. 67)

By Chapter 7. ("Semantic Agreement"), the pieces of Quine's rational reconstruction are almost all in place. Sameness of reference is now defined for bodies (in terms of "intersubjective agreement" established either directly, through ostension, or indirectly *via* scientific inference), but not for abstract objects. ("Who is to say

whether what you refer to as the number nine is the same thing as what I refer to by that phrase"? p. 69). Quine waxes pragmatic at this point. He claims that the question makes no sense beyond "what is reflected in successful dialogue. If two scientists both propose that neutrinos exist, but differ over whether they have rest mass or not, then whether the scientists are proposing *different particles* or just differing over the properties possessed by *the* neutrino is an empty question.

At last we are equipped to turn to the vexed question of how define *sameness of meaning*. Quine claims that two sentences' having the same meaning, "...is reflected in sameness of truth value, occasion by occasion." (p. 76). However the sameness actually consists in a disposition, possessed by a speaker, to assent to the two sentences occasion by occasion, and this disposition is a "present passive physical state of the subject's nervous system". Quine sees his distrust of meanings as the final nail in the coffin of *ideas*, considered as an Early Modern unconscionable ontological excess. "Meaning is the idea wedded to the word, and as such it is up again for exorcising." (p. 81).

In Chapter 8, "Things of the Mind", Quine notes that since the astute philosopher has rejected Cartesian dualism for monism, each "state of mind" corresponds to a distinct "state of the body". Now all that is required is a translation manual. Physiology looks like a promising start, having already provided much relevant information on mentalistic predicates such as "pain". In fact, the physicalist is dedicated to the belief that all sensations and emotions have "a distinctive mechanism or set of alternative mechanisms". Connectionism is mentioned as a promising research project. (p. 88)

Modal logic receives an eleventh hour mention three paragraphs from the end of this last chapter, as an "intensional slough" that may be cleared up by noting that, "[t]he modal adverb 'necessarily', governing a subordinate sentence, gives way to the predicate 'necessary', governing a quotation of that sentence" (p. 99). Quine's cavalier treatment of necessity and possibility contrasts in an interesting manner with much of the analytic philosophy tradition that he was so enormously influential in forming. (Though he is careful to note that such studied insouciance does not carry over into *probability*, a vital notion for a naturalised epistemology). Throughout his career, it is the holy grail of extensionalism which has led Quine to wander in desert landscapes, eschewing teeming, disorderly "worlds" such as those over which modal logic quantifies.

In only one hundred pages, this book provides an summary of Quine's philosophical contributions and his distinctive world-view, over a career spanning more than six decades. The key issue it raises for the philosopher of science and indeed for the scientist is the issue of rational reconstruction which is the book's theme. What does such a project have to offer science? Does the tension between descriptive and normative approaches to epistemology evident here reflect an inability to choose between a new vision of philosophy as part of science and the old high Kantian critical distance? Or alternatively does it reflect Quine's location as a bridge between monistic open-ended pragmatism (the previously dominant paradigm in American philosophy which he was so influential in replacing), and the newly burgeoning logical positivism with its complex strictures on which questions may be regarded as meaningful?

Such questions are crucial for those situated now, late in the analytic philosophy tradition, who wish to know what was happening at its birth. They will also play a key role in years to come in evaluating the true place in the philosophical tradition of this most logical, erudite and austerely inclined of philosophers.