C. S. Jenkins
Grounding Concepts: An Empirical Basis for Arithmetical Knowledge.
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One of the central issues of the philosophy of mathematics is the status of mathematical knowledge. Traditionally mathematical knowledge is believed to be *a priori*. The founding fathers of analytic philosophy like Frege claimed it to be analytically true. That we gain knowledge, which was one of the reasons Kant thought mathematical truths to be synthetic (*a priori*), was explained by Carnap as drawing complex consequences of axioms 'true by definition'. *Grounding Concepts* defends the view that mathematical knowledge—more narrowly in this book: arithmetical knowledge—is *a priori* and a result of conceptual analysis, but not just 'true by definition' given explicit definitions/conventions in Carnap's sense. Jenkins endorses those theories of conceptual analysis which allow for conceptual analysis to extend our knowledge (and to be subjectively surprising). Moreover, he claims that mathematical truths are empirical and at the same time *a priori*! This sounds like a *contradiction in adjecto*: at least traditionally rationalistic claims to (non-conventional) *a priori* knowledge are the very opposite of empiricism.

Therefore the key terms have to be (re-)defined before Jenkins' proposal can be understood. The book thus consists of a first part in which Jenkins' understanding of empiricism, realism and knowledge are set out. The main two chapters in the second part put forth the main proposal, and the rest of this part and all of the third part discuss clarifications and try to meet objections to the main proposal. A lot of this may be skipped on first reading.

In summary form, Jenkins' idea is that concepts are acquired by sub-doxastic cognitive information channels, which do not process propositions but establish concepts in the organism's interaction with the environment. A concept resulting from this (successful and adaptive) interaction with the environment is 'grounded'. Thus concepts are acquired—as empiricism demands—but our propositional knowledge analyzing these concepts is not dependent on (present) situations of experience. The ways of acquiring these concepts are 'non-evidential'. Thus, being independent of situational doxastic states of experience, conceptual knowledge can be considered *a priori*. In this usage of '*a priori*' and 'empirical' there is no contradiction in mathematical knowledge being both empirical and *a priori*. One may not like Jenkins' (at least slightly) non-standard usage of these key terms, and Jenkins several times asserts that one might classify his proposal otherwise, as its content is more important than the labeling—he admits, for instance, 'the possibility of a non-empiricist version of [his] concept-grounding epistemology' (234). But certainly the labeling makes for better advertisement.

Jenkins' proposal fits nicely into externalist accounts of knowledge, and he provides his own definition of knowledge in the externalist sense, which supports the view that analysis of our grounded mathematical concepts yields knowledge of real structures (in the world). Examining grounded concepts which represent real structures means examining not just concepts, but reality as well. If some (finitely) grounded concept of sets yields justifiable beliefs about higher cardinalities and they exist, these beliefs count as knowledge, and no causal contact with abstract entities is required.

The proposal also nicely fits into externalist accounts of semantics. Such accounts, as with (e.g.) Fodor or Dretske, often claim that our concepts 'hook up to' properties in reality and thus have objective informational content and reference. Ironically, Jenkins misunderstands Fodor's dialectics against inductive learning theories and ascribes some such theory to Fodor. Fodor's semantics of concepts 'hooked up to' properties, however, is very similar to Jenkins' semantics of 'grounded' concepts, although Jenkins often describes groundedness in epistemological terms. (Fodor allows that after reliably grounding concepts we *can use* stereotypes or inductively learned heuristics to refer to properties, but these heuristics are not meaning constitutive; that is the place where Jenkins quotes Fodor out of context.)

A question not settled by Jenkins, where other externalist theories which stress innateness may fare better, is why we as a species acquire shared concepts fitting structures of reality. A theory claiming that informational input is operative given our natural innate endowment of concepts or our concept generating cognitive structures explains why each of us, having an individual biography of experiences, learns the same concepts in a short period of childhood. Such theories (like Fodor's again, or Chomsky's) could and have been be named 'rationalistic' in contrast to 'empiristic', which once more shows that labels bear not much weight here. As Jenkins rightly says, his 'thesis that arithmetic is known through an examination of grounded concepts is compatible with other well-known accounts of, and approaches to, knowledge' (259). Some may fare better with the details of concept learning. Jenkins claims that the information needed for 'grounding' concepts is perhaps 'less than would be required to acquire them' (231), but this needs further elaboration.

Grounding Concepts thus starts with the case of arithmetical concepts and arithmetical knowledge, but outlines a theory of mathematical knowledge in general, and may well be extended to a general theory of conceptual knowledge and its status. It builds a bridge between, on the one hand, a recently renewed interest in conceptual analysis which extends our knowledge and, on the other hand, externalist semantics according to which concepts have objective content by means of their proper co-variance with real structures to which they thus refer. Anyone with externalist or realist leanings in semantics, but convinced of the special status of (mathematical) conceptual knowledge, will profit from it.

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