Epistemology is concerned with a number of interrelated problems, one of which is the investigation of epistemic justification. The term ‘epistemic justification’, however, is used in more than one way in epistemology. We must distinguish between epistemic justification as a regulatory notion governing reasoning, and epistemic justification as the “principal constituent” in an analysis of knowing. These need not be the same thing.¹ My interest here is in that sense of ‘epistemic justification’ according to which it results from arriving at beliefs in accordance with our rules for rational belief formation. These rules comprise what, in AI, is called a “production system” – they are rules telling us “what to do when”. One of the central tasks of epistemology is to describe these rules, and the main purpose of this paper is to say something about their content, but I will begin with a lengthy digression on methodology.

1. Epistemology and Cognitive Science

Epistemology is not alone in investigating reasoning. Reasoning is also a subject of investigation in other subdisciplines of cognitive science, including in particular AI and cognitive psychology. To what extent are researchers in these diverse disciplines exploring the same questions? What are the connections between epistemology, AI, and cognitive psychology?

First we examine AI. A major disideratum that I would impose upon an investigation of epistemic rules is that they be stated with enough precision that they can be implemented on a computer. This implemmentation can be regarded as either a computer model of rational reasoning, or in the spirit of so-called “strong AI”, as an attempt to build a computer that actually reasons. I favor the latter construal,² but even on the former the connection to AI is an intimate one. Epistemological theories of reasoning, when implemmented on a computer, become AI programs. The theories and the programs are, quite literally, two different ways of expressing the same things. After all,
theories of reasoning are about *rules* for reasoning, and these are rules telling us to do certain things in specific circumstances. To state such rules precisely *just is* to write a program. Using a programming language like LISP for the formulation of the theory is just a terminological matter. You could carry out exactly the same task in English, except that the formulations would be much longer and subject to more ambiguity. The reason, then, for using a programming language is precisely the same as the reason philosophers use logical notation. In fact, the connection between LISP notation and logical notation is quite intimate.

Investigations in AI tend to have multiple objectives. Sometimes, perhaps even most of the time, the concern is simply to design a system that will carry out a specific data processing task, with no initial constraints on how that might be done. But at least some of the time the concern is to build a system that reasons the way people do, and when they are pursuing this latter concern, AI theorists are doing epistemology. They are pursuing the same goals as philosophers, but approaching them from within a different conceptual framework and using different tools of analysis.

The sentiment of some philosophers may be that bringing computers into the investigation is just introducing excess baggage, and the pure philosophical task is to discover the correct rules for rational thought and state them in an abstract way. In some ideal sense, that is correct, but I have found the use of computer modeling to be an invaluable tool in this investigation for three reasons. First, philosophers have an alarming propensity to wave their hands when the going gets difficult. This results in theories that are so vaguely stated that there is no way to test their correctness. Such "theories" are, at best, initial proposals for what kind of theory to look for. They should not be regarded as the end product of an investigation. This problem is avoided by insisting that theories be sufficiently precise to be modeled on a computer. You cannot run a computer by waving your hands at it.

The second way in which I have found the use of computers invaluable is as a kind of mechanical aid in the discovery of counterexamples. Just sitting in your armchair and reflecting upon a complicated theory of reasoning will rarely lead you to see its more complicated ramifications. You can discover simple and obvious difficulties in this way, but subtle difficulties will often go overlooked.