

The Ontology of Logic

For philosophers, reason and logic are at the centre of life. They are their key concern when focusing on humanity, and may even be the most important aspect of external reality. Reason appears to be an activity of minds, but logic seems to have a life of its own, so what is it? Is it just an aspect of thinking, or does the inescapable power and authority of simple logic suggest that it has some mode of existence of its own?

We can discern four main answers to this puzzle, two of them focusing on the mind, and two of them focusing on the external world. If logic is a feature of minds (notably those of human beings), then a widely held view is that logic is simply a **conventional** activity which has been constructed by human cultures, with an ontological (or 'existence') status something like the game of chess. On this view, the actual logic used by people in daily life will vary across cultures, in the way that most other activities do. The development of ancient syllogistic logic, and then modern symbolic logic, has led to a standardisation in the way we discuss logic, but this is something like standardising on a computer operating system, and conceals the wide variation in logical reasoning which is actually possible. Powerful thinkers can rise above this conformity, creating their own logical systems, or drifting away from 'logical' reasoning if it doesn't suit them. The best known objection to this view is that while chess can be conventional, logic can't, because it is too basic, and the conventionalist theory needs logic to articulate it.

A particular conventionalist view has been labelled '**if-thenism**'. The idea is that there are no initial truths in logic, and nothing at all can be taken for granted, so that everything has a hypothetical status; in effect, you can write the word 'if' in front of every statement in the early stages of a logical argument. All of the later stages and conclusions then result from the earlier hypotheses. We can, for example, wonder what might be the result 'if' the introduction and elimination rules of classical logic were accepted, without ever wondering whether they have any legitimacy. If you ask whether *and-elimination* ('a-and-b' implies 'a') is a good rule, the reply is 'never mind – just see what consequences it has'. The consequences will result because rules such as *modus ponens* have also been suggested.

An obvious attraction of If-Thenism is that it has no ontological commitments, and so has the purity we hope for in logic. A big reservation, though, is that it offers no way of discriminating between good and bad logical systems, since it seems that we can test all sorts of logical hypotheses, including ridiculous ones, and merely note their results. If we thought some results were 'good' or 'bad', that would give us a different ground for judging the initial hypotheses, and that would undermine pure If-Thenism. The other objection is that all reasoning must be done from clear initial assumptions (the axioms), and no rational steps can be made that don't refer back to what has been assumed. This implies that the logic involved must be 'sound' and 'complete' (so all proofs are true, and all truths are provable), which restricts the possible logic, probably to first-order classical logic. Since much apparently logical reasoning occurs in 'incomplete' systems (such as second-order logic, or arithmetic), this makes If-Thenism seem rather cramped.

The second view focusing on the mind rejects the idea that logic can vary widely across cultures, and proposes a core of logic in all of human thought. Thus logic is a universal **feature of human minds** (and maybe all possible minds), which could be explained either in evolutionary terms, or because of pre-conditions imposed on the production of any successful mind.

Proponents of the view that logic derives its nature and authority from facts external to the mind divide between those who see the authority in the world of pure ideas (the 'platonists'), and those who see it in nature (the 'naturalists'). The **platonist** view comes in strong, medium and weak (or 'restricted') varieties. The **strong** traditional version sees logic and pure reason as part of the most fundamental fabric of reality, prior in time and importance to the physical world, and dictating how things must necessarily be. Hence logic exists eternally, and human minds struggle to grasp its truth. **Restricted** platonism says that logic is thought which has undergone 'idealisation', which separates it from daily thinking, while retaining a link to its origins in the mind. The most popular platonism takes the middle ground, saying that reality contains a mode of existence which is separate from both the mind and physical matter. We know it exists precisely because logic has a stability and authority which could not possibly derive either from varied human psychology, or from the fluctuating physical world. This **third mode** of existence has its own internal laws, which logicians aim to track and clarify.

The final view of the ontology of logic is that it exists as an aspect of the natural **physical** world. You can't directly observe it, of course, because it is highly general in character, but the foundations of logic (as simple logical truths, or permissible steps in reasoning) are generalised reflections of how the world works. Conjunction (*and*) is something like two footpaths uniting, disjunction (*or*) is when they branch, and *if* you go down one *then* you can *not* go down the other. Objectors say that if the world changed its behaviour that would not change our logic, but defenders say the world changing its behaviour in such a general way is inconceivable.

A revealing development in the history of the naturalistic approach was the advent of the weird world of quantum mechanics, which led logicians to develop **Quantum Logic**, in which the uncertainty principles of the subatomic world were reflected in the rejection of some standard basic logical theorems. This type of logic has few supporters, but naturalistic logicians will always feel that they must be sensitive to new discoveries about how nature behaves. A second naturalistic suggestion is that logic is connected to information processing in nature.

One test of how we see the ontology of logic is our account of how we know it. Those with platonist sympathies always assume that logic can be known *a priori*, which bypasses experience and directly sees some of the truths by the exercise of pure reason. A common metaphor for this view is the idea of 'logical space', where the untrammelled facts of pure reason can make meet and resolve themselves. The naturalists, on the other hand, will expect an *posteriori* ingredient in logical understanding, meaning that it must be attentive to our actual experience (even if that is familiar and unvarying).