Types of Thinking

Barry Cooper*[1]

[1]School of Mathematics - University of Leeds – Woodhouse Lane - University of Leeds - Leeds LS2 9JT United Kingdom, United Kingdom

Abstract

Early work on artificial intelligence was predicated on the assumption that the digital computer might emulate what had been thought of as distinctively human modes of thinking. Turing himself at Hanslope Park in 1944 was quoted as saying he was "building a brain". On the other hand, there is a long history of recognition of different kinds of thinking, described variously as: head versus heart; logical versus intuitive; scientific versus artistic; left brain versus right brain, etc. Jacques Hadamard's essay on 'Psychology of Invention in the Mathematical Field', drawing extensively on the thinking of Henri Poincare (as outlined in his famous lecture on mathematical invention, in Paris in 1908), came just after Turing's 1939 paper bringing mathematical logic to bear on the relationship between ingenuity and intuition.

The theme running through all this work, and through later work of Turing and others, is that the differences between kinds of thinking emerging from observation, introspection and the mathematics are puzzlingly real. And that these might be the basis for an essentially cooperative conjunction of modes. Related to this were earlier attempts – for instance those of the so-called 'British emergentists' of the 1920s – to place this in a broader scientific context. Work on the relationship between
descriptive and more clearly computational characterisations of phenomena can be traced through such early work as that of Hans Reichenbach and more recent contributions, including that of Reichenbach's one-time student Hilary Putnam.

In the more hermetic recursion theoretic context, we have Stephen Kleene and his successors developing notions of computation over objects of different type. And recently we have Luciano Floridi's book on the "Philosophy of Information", describing an information-based approach to structural realism - a key ingredient of which is the notion of 'Level of Abstraction'.

In this talk we try to draw together these various strands, outlining the formative thinking and historical background, and point the way towards a clarifying mathematics.

*Speaker