

Alan Turing Lecture on Computing and Philosophy

Epistemology as Information Theory: From Leibniz to the Omega Number

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In 1686 in his "Discours de metaphysique", Leibniz points out that if an arbitrarily complex theory is permitted then the notion of "theory" becomes vacuous because there is always a theory. This idea is developed in the modern theory of algorithmic information, which deals with the size of computer programs and provides a new view of Gödel's work on incompleteness and Turing's work on uncomputability. Of particular interest is the halting probability Omega, whose bits are irreducible, i.e. maximally unknowable, mathematical facts. More generally, these ideas constitute a kind of "digital philosophy" related to recent attempts of Edward Fredkin, Stephen Wolfram and others to view the world as a giant computer. There are also connections with recent "digital physics" speculations that the universe might actually be discrete, not continuous. This "systeme du monde" is presented as a coherent whole in my book "Meta Math!", which will be published this fall.