BAYES & NEWMAN (part 2)

Introduction to a talk by Tim Hodgetts to the South London Philosophy Circle

"The actual science of logic is conversant at present only with things either certain, impossible, or entirely doubtful, none of which (fortunately) we have to reason on. Therefore, the true logic of this world is the calculus of probabilities, which takes account of the probability which is, or ought to be, in a reasonable man's mind."

This quotation is taken from the letters of the celebrated mathematical physicist James Clerk Maxwell, one of only two predecessors openly admired by the even more celebrated Einstein (the other was Newton). It neatly sums up the two systems of reasoning in the sciences: one, the classical logic described by Aristotle, in which we proceed by syllogism and reach conclusions classified as "true", "false" or "doubtful/undecidable"; the other, the "calculus of probabilities", in which we proceed by assigning probabilities or weightings to our measurements or previous provisional conclusions and combining them, so that firm conclusions are reached by the "accumulation of converging probabilities" – a phrase first used by the empiricist philosopher Locke and adopted by Cardinal Newman.

A few months ago, I gave a talk to this philosophy Circle on the ideas of Bayesian reasoning, which is the modern formulation of the "calculus of probabilities" (an idea traceable back in time to the law-courts of ancient Rome); and I illustrated that talk with references to Cardinal Newman's book on epistemology and fundamental theism *Essay in Aid of a Grammar of Assent*. At that time, I was only really familiar with Bayesian ideas through the work of Sir Harold Jeffreys in the 1930s, expressed best in his book *The Theory of Probability.* That book was intended more as a practical scientist's guide to the right use of measurement statistics than as an analysis of the philosophy of reasoning; but Jeffreys found himself drawn into the philosophical arguments of his time, notably with Karl Popper, who took a sceptical position akin to that of Hume, in which no scientific theory can ever be proved but any theory may be falsified by the establishment of a single contrary fact.

These arguments have never gone away; and since my previous talk, I have come across an extraordinary variety of writers and viewpoints on them. Newman reasoned using the "accumulation of converging probabilities", as did Charles Darwin (although he was not a mathematician and felt that as a handicap – one edition of *The Origin of Species* contains a preface with the wistful words "I have often wished that I had some appreciation of the great principles of mathematics, for those so gifted seem to me to be endowed with an extra sense"). John Maynard Keynes sat on both sides of the fence; he was a practical mathematician of the first rank, a Cambridge Wrangler in his student days and the author of a book on (essentially Bayesian) probability theory when he was still only of PhD age, but his great work *The General Theory of Employment, Interest and Money* contains hardly any formal mathematical reasoning. Meanwhile, the modern theologian Richard Swinburne has written his book *The Existence of God* using explicit Bayesian mathematics (although mostly comparative rather than computational), while Sarah Coakley (another modern theologian) has collaborated with the mathematical biologist and evolutionary theorist Martin Nowak to produce the text *Evolution, Games and God: The Principle of Cooperation.* And the American mathematician Edwin Thompson Jaynes, following directly in the footsteps of Jeffreys, devoted much of his life to producing his *Probability Theory: The Logic of Science*.

I shall attempt to survey this wide field on the day, and I intend to make it easier to debate by attending the "home" of the Circle in "real life", so that I can try to lead a symposium of ideas rather

than just presenting a thesis of my own. I encourage all attenders to pick at least one of the texts listed below, mostly available online, to create their own debating point!

Bayes' original: *An Essay towards solving a Problem in the Doctrine of Chances*; see https://en.wikipedia.org/wiki/An_Essay_towards_solving_a_Problem_in_the_Doctrine_of_Chances and the references therein;

Newman's original: *Essay in Aid of a Grammar of Assent* ; see https://en.wikipedia.org/wiki/Grammar_of_Assent and the references therein;

Jeffreys: *The Theory of Probability* ; there are several editions, but the more recent ones take more account of the "philosophical arguments" provoked by Bayesianism (e.g. https://archive.org/details/in.ernet.dli.2015.2608/page/n1/mode/2up);

Swinburne: *The Existence of God* ; see https://fhuiguide.files.wordpress.com/2015/02/napi-the-existence-of-god.pdf ;

Jaynes: *Probability Theory: The Logic of Science* ; http://www.med.mcgill.ca/epidemiology/hanley/bios601/GaussianModel/JaynesProbabilityTheory.pdf ;

Nowak & Coakley (eds.): *Evolution, Games and God: The Principle of Cooperation* ; (looks as if this one has to be bought); https://www.hup.harvard.edu/books/9780674047976 .