Probability

The philosophy of probability has been alive and well for several decades in Australia and New Zealand. Some distinctive lines of thought have emerged, resonating with broader themes that have come to be associated with Australasian philosophers: realist/objectivist accounts of various theoretical entities; an ongoing concern with logic, including the development of non-classical logics; and conceptual analysis, rooted in commonsense but informed by science. In this article I concentrate on work by philosophers on the interpretation of probability, its logical foundations, and its philosophical applications (thus, for example, I will not discuss the pioneering research of R.A. Fisher in statistics at the University of Adelaide).

My nomination for the earliest major Australasian philosopher of probability may surprise some readers: Karl Popper. He counts as *Australasian* by dint of his employment at the University of Canterbury from 1937 until the end of World War II; he counts as a *major* philosopher of probability by any estimation. Two of his contributions have initiated research programs in the foundations of probability that are still thriving: his (1959a) axiomatization of primitive conditional probability functions (so-called 'Popper functions'), and his 'propensity' interpretation of probability (1959b), intended to illuminate single-case attributions of objective probabilities, as are putatively found in quantum mechanics.

David Lewis' place in this article is also beyond dispute, although it too may surprise some readers—while American, and based for most of his career at Princeton University, he paid annual visits to Australasia over a period of almost thirty years, and he embraced and enormously influenced its philosophical culture. During this time he produced such classic papers as "Why Conditionalize?", "Causal Decision Theory", and "Desire as Belief" (and its sequel, "Desire as Belief II"). Arguably, his most seminal contribution was "A Subjectivist's Guide to Objective Chance" (and its sequel, "Humean Supervenience Debugged"), whose *Principal Principle* famously codifies a certain harmony between a rational agent's subjective probabilities (degrees of belief) and her opinions about objective probabilities (chances). See Lewis 1986, 1998, and 1999 for reprintings of these articles.

Hugh Mellor has been another regular visitor to Australasia, and indeed his robustly realist conception of single-case chance and its relationship to rational credence (1971) anticipates some of Lewis' work. By contrast, Mellor's doctoral student at Cambridge, Huw Price, has argued for non-factualism about single-case chance (1983). Price has also contended that conditional probability should be taken as a primitive notion (1986). This view has been further defended by Alan Hájek in a number of papers (especially 2003a).

Perhaps the most important trend in Australasian philosophy of probability has been the rehabilitation and defence of broadly *logical* conceptions of probability. According to this interpretation of probability theory, advocated by Keynes and Carnap, deductive logic and its notion of entailment can be generalized to *inductive logic* and a notion of *partial* entailment; probabilities capture strength of entailment, or degree of confirmation. This interpretation lends itself naturally to an account of *rationally constrained* degrees of belief in propositions that suitably incorporate the bearing of one's evidence on those propositions. For example, in his "Subjective Probability", Douglas Gasking (1996) argues that probability judgments reflect the exercise of skilled judgment, the tenability of any given judgment consisting in a (possibly partial) consensus among independent judges in accord with that judgment.

David Stove's (1986) conception of probability comes closer still to that of

Carnap, and it has proved to be influential on a number of Australian authors. Stove insists, for example, that the premise 'x % of F's are G's' bestows logical probability x% on the conclusion 'a randomly chosen F is a G'. He has also argued that the problem of induction can be solved by a combinatorial argument (inspired by D. C. Williams) that is tacitly probabilistic: most samples from a given population of F's are *representative*—that is, their proportion of G's approximates that of the population—and so it is rational to believe that an inference made on the basis of sampling is reliable. In the background there is an appeal to the Principle of Indifference, a cornerstone of logical interpretations, which assigns equal probabilities to evidentially balanced alternatives. John Bigelow and Robert Pargetter (1997) apply a version of the principle of indifference to the problem of induction, arguing that an inductive argument becomes deductively valid when augmented by a premise encapsulating one's total evidence, and when the conclusion asserts what it is reasonable for that person to believe on the basis of that evidence. Patrick Maher, a student of Stove's at the University of Sydney as an undergraduate, maintains that the so-called 'interpretations' of probability are best understood as attempts to explicate probability concepts of ordinary language, and that there are two such concepts: inductive probability and physical probability. He argues that the usual objections to inductive logic rest on a failure to grasp this conception (2006). Stove's doctoral student Peter Forrest has proposed an intuition-based account of rationality constraints on otherwise subjective probability (1986), building on the work of Brian Ellis. Later in his career, Forrest has subscribed to a theory of logical probabilities similar to that of Richard Swinburne, who has appealed to them in the service of theism.

This brings us to another important strand of probability-based research in Australasian philosophy: probability theory's application to problems in the philosophy of religion. J. L. Mackie (1982) and Hájek (2003b, 2008) view Pascal's Wager and Hume's miracles argument through the lens of Bayesian decision theory and confirmation theory. Bruce Langtry also employs probability theory in his work on miracles (e.g., 1988), and in his discussion of the problem of evil in his book on divine providence (2008). Mark Colyvan, Jay Garfield and Graham Priest (2005) argue that probability theory is misused in various design arguments for theism.

The relationship between probabilities and the logic of conditionals has preoccupied various Australasian philosophers. In his path-breaking "Probabilities of Conditionals and Conditional Probabilities" (and its sequel, "Probabilities of Conditionals and Conditional Probabilities II"), Lewis offers 'triviality results' against the hypothesis (associated with Ramsey, Stalnaker, and Adams) that

$$P(A \rightarrow B) = P(B \mid A) \; (P(A) > 0),$$

where '$\rightarrow$' is a conditional connective. (Reprinted in Lewis 1986 and 1998 respectively.) These results have subsequently been strengthened and generalized in Hájek (1994) and in Peter Roeper's co-authored book (Roeper and Leblanc 1999). Bigelow and Pargetter (1991) argue that 'probably' can modify the subjunctive conditional connective itself, rather than modifying either the antecedent or consequent or an entire 'if-then' proposition. Frank Jackson (1979) has used the fact that $P(p \rightarrow q \mid p) = P(q \mid p)$ to explain why the assertibility of an indicative conditional equals the probability of its consequent given its antecedent.

Non-classical logics have flourished in the antipodes, so it is only natural that probabilities based on such logics, and other heterodox accounts of probability, have been studied by Australasian philosophers. Ed Mares (1997) has written on

paraconsistent probability measures—probability functions that sometimes give positive values to contradictory propositions—and he has discussed how they should be updated in that context. Brian Weatherson (2003) has advocated a probability theory that is underpinned by intuitionistic logic. He has also argued (2005) that there are several philosophical applications of *imprecise* (also called 'vague') probabilities —for example, that imprecise probabilities, rather than indifference principles, offer the best hope for capturing the idea that *a priori* states of opinion should be symmetric over possible outcomes. Colyvan has contributed to debates on non-classical approaches to credence (2004), and he has appealed to imprecise probabilities in co-authored, interdisciplinary work in ecology (available at Colyvan 2009).

There are now several departments in Australasia with a serious interest in the philosophy of probability. Its continued flourishing Down Under is—probabilistically speaking—a safe bet.

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