

*The Laws of Belief—Ranking Theory and its Philosophical Applications.* BY WOLFGANG SPOHN. (Oxford: OUP, 2012. Pp. xv + 598. Price H/b £83.00, P/b £30.00.)

Reaching print at a time when the Laplacian conception of probability is so popular that talk of ‘degrees of belief’ appears almost completely normal, Wolfgang Spohn’s masterwork might raise eyebrows by devoting 600 closely printed pages to ranking theory. Yet the book is one of great gravity in more than the literal sense.

As part of the surge in research on formal models for rational belief revision that began in the 1980s, Spohn developed a broadly Baconian approach to probability under the term ‘ordinal selection function’. Now more commonly called a ‘ranking function’, this remains a key representational device for constructing an idealized normative account of *why* doxastic states change.

Ranking functions represent both a doxastic system's prior state and the posterior state that arises in response to sensory or other relatively firm evidence. At any rate, such states are said to be adequately characterized by this formal device. Ranking theory thus provides a general description for prior–posterior transitions among consistent and deductively closed sets of belief, while leaving the initial state largely unconstrained.

In retaining (near-)correspondences to focal theorems of the Laplacian conception, ranking theory makes for a widely applicable theory of Baconian probability that is particularly suited to study normative aspects of doxastic change. Consistently keeping other generalized accounts of evidence-updating clearly in view for comparative purposes (such as Bayesian or Jeffrey conditionalization), Spohn sets out to model belief and disbelief. While his aim is to model *full* (dis)belief, Spohn refrains from equating this state with probability zero or one, or any value arbitrarily close by. Ranking functions are meant to carry information on the extent to which a full belief in some proposition, B (or, a disbelief in  $\sim$ B), remains differentially retractable given another full belief, A. Thus structured, a doxastic system plausibly falls under a kinematic description whenever new content is induced through conditionalization on evidence. So the revision of beliefs, as it were, obeys 'laws of motion', or analogous 'laws of belief'.

Ranking theory assigns logical tautologies to the infinite positive rank, logical contradictions to the infinite negative rank, and reserves rank zero for what a system presently neither believes nor disbelieves (*epoché*). Hence, whatever a doxastic system (dis)believes will fall somewhere in the space spanned by these extremes, subsequently perhaps coming to move within this space as experience and reasoning operate. Stating laws that *should* apply to both contingent and (revisable) a priori propositions then provides a doxastic dynamics, formulated in a framework successfully generalizing no lesser of an axiomatic contender than AGM belief revision theory (Alchourrón, C.E., P. Gärdenfors, and D. Makinson 1985).

The upshot is a ratio-scale treatment of simple and conditional belief-updating in, well, the full sense of 'full belief'. Spohn thereby seeks to remedy some of what he finds wanting in Laplacian probability, on one hand, and in extant theories of belief revision, on the other. He aims at offering a solution to the Lottery paradox that is non-trivial, in the sense that full rather than graded belief is retained, and an account of iterated belief revision where doxastic change is driven by reasons. Because conditionalization for Spohn falls under laws that render plain belief corrigible in response to reasons, ranking theory has the potential to greatly sharpen extant debates in philosophical epistemology and the philosophy of science, broadly construed. To point out but one feature, the theory models at least four types of the relation 'A is a reason for B' (i.e., supererogatory, sufficient, necessary, or insufficient reason)

more elegantly than by comparing  $P(B|A)$  with  $P(B|\sim A)$ , or with  $P(B)$ , as in extant accounts of conditional dependence such as Bayesian confirmation theory (see p. 107).

By taking all reasons to comprise only deductive and non-deductive (read: inductive) reasons or counter-reasons—now barely 100 pages into the book—Spohn is able to avoid any need for a ‘third-way logic’ of the non-monotonic, defeasible, default, plausible, presumptive, or auto-epistemic kind. Ranking theory confronts ‘reflective equilibrium’ head on by contrasting the Laplacian image of the balance of reasons, itself reflecting the law of the lever applied to a beam balance, with a ranking theoretic image that reflects a spring balance, where

[...] the force of the reason A, represented by its two-sided rank [i.e., one representing ‘belief in A’, the other side ‘disbelief in A’], pulls the two-sided rank of the focal proposition B to its proper place within the interval fixed by the relevant conditional ranks [i.e., ‘B given  $\sim A$ ’, and ‘B given A’]. In this way, the rank of each proposition is fixed by the forces exerted on it by all other propositions [...] [which] is a figurative way of saying that one could not change the rank of a single proposition in a ranking function without violating the ranking theoretic laws. (p. 117)

So all hangs together, and must cohere; every rational belief change should see a reason that drives it.

Many correspondences to standard and non-standard probabilities arise throughout the discussion, owing to the steady formal rigour of Spohn’s treatment, at times on higher dimensional planes. Such correspondences are always viewed from a stance of methodological separatism: keep probabilities to one side, ranks to the other. This stance reflects a desire to keep the discrete notion of ‘full belief’ a meaningful one, and provides a useful reminder that ‘justified acceptance of propositional contents’ remains incompletely understood, where especially the comparative case is basic to a theory of confirmation. Understandably, the book carefully avoids attempting an analysis of knowledge.

Spohn’s theoretical framework improves our understanding of confirmation primarily because, methodologically, speculation comes first, norms second, and what people actually do comes last, after a great deal of formal detail. Nevertheless, ‘when subjects exactly conform to this model, then, no doubt, the conditionalization rules are causal laws of belief change (whatever the subvenient microcausal story may be)’ (p. 119). This exposes ‘What to believe?’ to great freedom, while tasking speculative theory with normative constraints on ‘How (not) to change belief in response to evidence?’. As the book develops, a way towards objectivity is paved, one that remains (correctly) understood as a frame-relative notion.

Following the introductory overview, chapters two to six give an extended presentation of ranking theory. Though using mostly abstract examples here, large sections would make valuable readings for a graduate-level course in

epistemology. Chapters seven to eleven elaborate on the foregoing by comparing ranking theory with extant theoretical accounts, including measurement theoretic aspects. These chapters are mostly suited for specialists, the comparison with Pascalian probability in chapter ten excepted. Devoted to applications of ranking theory, the book's second major part provides an original and—in view of the variety of audiences addressed—hardly uncontroversial discussion of natural modalities, *ceteris paribus* conditions, and causation in chapters twelve to fifteen, as well as perception, justification, and the (revisable) a priori in chapters fifteen to seventeen.

Although the level of formalism can make for hard reading, the greater part of the book is accessible also to less formally inclined readers. Well-written and carefully edited, the book is overall a rewarding and pleasurable read. Most importantly, perhaps, Spohn's work conveys not doctrines but a refined theoretical framework that invites further application. The book is an apt demonstration of how clear theoretical commitments, significant formal ability, and sheer tenacity bring forth insights with great precision that fruitfully contributes to extant issues in philosophy and the sciences at large. The deserving winner of the '2012 Lakatos Award for an outstanding contribution to the philosophy of science', Wolfgang Spohn has succeeded in making a strong case for speculative formal philosophy.

#### REFERENCE

- Alchourrón, C.E., Gärdenfors, P. and Makinson, D. (1985) "On the Logic of Theory Change: Partial Meet Contraction and Revision Functions", *Journal of Symbolic Logic*, 50, 510–30.

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