φαντασία). (For some help with the translation of the Greek terms in this context, see G. Striker "Academics Fighting with Academics" (*Assent and Argument. Studies in Cicero's* Academic Books, edited by B. Inwood & J. Mansfeld (Brill, 1997), 257-276), n.1 on 258-259.) One of the conditions the Stoics imposed on a cognitive impression is that it not possibly have a false proposition as its content, and it is this condition that Brittain supposes that the Roman Philo eliminated in his novel conception of knowledge. (18-19, 150-151.) (Cf. Michael Frede, "The Sceptic's Two Kinds of Assent and the Question of the Possibility of Knowledge," 146.) The Roman Philo thought that the provisional beliefs of his previous Philonian/Metrodorian position are instances of knowledge because these beliefs are acquired in terms of cognitive impressions properly understood. Whereas the Philonian/Metrodorian position allows only provisional assent because it holds that assent is always compatible with error, the Roman/Philonian position allows unprovisional assent because it rejects the Stoic conception of knowledge and holds that true belief acquired in a way that does not eliminate the possibility of error may nevertheless be knowledge. (For an analytic statement and discussion of this Roman Philonian innovation, see Jonathan Barnes, "Antiochus of Ascalon" (*Philosophia Togata. Essays on Philosophy and Roman Society*, edited by M. Griffin & J. Barnes (Oxford University Press, 1989), 51-96), 72-73, 76, 84-85.)

The description of Philo's three epistemological positions constitutes the philosophical core of *Philo of Larissa*, but the book has much more in it. After setting out the argument for his interpretation of Philo's historical thesis in chapters 4 and 5, Brittain discusses Philo's ethics and rhetoric in chapters 6 and 7 respectively. These chapters are particularly interesting because they situate Philo's epistemology within the context of empiricist medical theory and the ancient discussion of what counts as a τέχνη or "art" generally. In the Appendix, Brittain cites and translates what he takes to be all the ancient texts that mention Philo. This is followed by a Bibliography that Brittain says "ought to be reasonably complete for Philo studies from the period 1850-1998" (x). I would be surprised if he were wrong in either case.

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The Book of Evidence. PETER ACHINSTEIN. Oxford and New York: Oxford University Press, 2001.

Subjective Bayesianism is the current orthodoxy in confirmation theory. In broad outline, this view claims a) that confirmation is a relation of positive relevance, viz., that a piece of evidence confirms a theory if it increases its probability; b) that this relation of confirmation is captured by Bayes's theorem; c) that, hence, the only factors relevant to confirmation of a theory are its prior probability, the likelihood of the evidence given the theory and the probability of the evidence; d) that the specification of the prior probability of (*aka* prior degree of belief in) a theory is a purely subjective matter; e) that the only (logical-rational) constraint on an assignment of prior probabilities to several theories should be that they obey the axioms of the probability calculus; f) that, hence, the reasonableness of a belief does not depend on its content; nor, ultimately, on whether the belief is

made reasonable by the evidence; and g) that degrees of belief are probabilities and that belief is always a matter of degree. This theory has had many successes. Old tangles, like the ravens paradox or the grue problem, are resolved. New tangles, like the problem of old evidence (how is a piece of evidence that is already known and entailed by the theory can raise the posterior probability of the theory above its prior?), have been, to some extent, resolved. But there is still a pervasive dissatisfaction with subjective Bayesianism. This dissatisfaction concerns all of the theses (a) to (f) above, but it is centred mostly around the point that subjective Bayesianism is *too* subjective to offer an adequate theory of confirmation and of rational belief. Yet, up until recently this dissatisfaction had not borne fruits in a fully developed *alternative* theory of confirmation. Perhaps, only Deborah Mayo's error-statistical approach was a fully developed alternative, but this too faced considerable problems, one central among them being that she takes all probabilities to be relative frequencies. One thing is sure. Probability theory should place a central role in a theory of confirmation. But how are we to interpret probabilities if we want to avoid the subjective element of Bayesianism and the (unrealistically) objective element of the error-statistical approach?

We should all be grateful to Peter Achinstein's new book: *The Book of Evidence*. For, it advances a fully worked out alternative theory of confirmation which avoids both subjective Bayesianism and the error-statistical view. This account makes room for reasonable belief. It also makes room for *objectivity* in epistemic judgements, without falling foul of an unrealistic reliance on relative frequencies (or, for that matter, on an unworkable principle of indifference). All of us who wanted a platform for an objective and workable theory of confirmation will find in *The Book of Evidence* a fixed reference point.

Two are the main planks of Achinstein's approach. The first is that for something e to be evidence for a hypothesis H, it must be the case that the probability of H given e should be higher than 1/2. That is, $prob(H/e) > 1/2$. So, Achinstein does not work with a positive relevance requirement. As he shows in detail, that a piece of evidence e increases the probability of a hypothesis H does not make belief in H reasonable. Rather, he works with an absolute concept of evidence: e is evidence for H only if e is not evidence for the denial of H. This is meant to capture the view that evidence should provide a *good reason* for belief. He is certainly right in claiming that if scientists have a concept of evidence, it is this absolute concept. The second plank of his theory is that this absolute conception of evidence is not sufficient for reasonable belief (though it is necessary). What must be added is that there is an *explanatory connection* between H and e in order for e to be evidence for H. To be more precise, what is also necessary is that the probability that there is an explanatory connection between H and e, given H and the evidence e, should be more than 1/2. Call $E(H/e)$ the claim that there is an explanatory connection between H and e. Achinstein's second plank is that $prob(E(H/e)/H$ & $e) > 1/2$. Briefly put, the idea is that e is evidence (a good reason) for H only if $prob(E(H/e)/e$ & $H) > 1/2$ and $prob(H/e) > 1/2$. (Actually, that's not quite accurate, as Achinstein explains in detail. What needs to be added—apart from taking e to be true and not entailing H—is that the *product* of these two probabilities should be greater than 1/2.)

Both planks had been present in Achinstein's earlier work (though the second plank has been considerably modified). What Achinstein now adds is a detailed analysis of how these two requirements yield a theory of reasonable belief (or,

better a theory of degrees of reasonable belief). This is effected, among other things, by two key moves. The first is his idea that belief is a threshold concept with respect to probability (and so is the concept of 'good reason for belief' and of 'justification for belief'—see p. 74 & 93). So, belief is like *critical mass*—there must be enough of it to count for anything.) The second of his key moves is his concept of objective epistemic probability.

I cannot do justice to these two key moves in this short space. But here is a thumbnail presentation. With regard to the first move (belief is a threshold concept), Achinstein offers two arguments. One is that the fact that a certain hypothesis has a certain (small or very small) probability does not imply that there is (or that a subject has) a corresponding degree of belief in it. There is a small chance that I win the national lottery, since I bought one ticket (out of the x millions, say). It does not follow that I believe to the degree 1/x millions that I will win. The other argument is that attempts to offer a concept of belief that admits of (smooth and continuous) degrees based on a rational reconstruction of the ordinary concept of belief or on idealised cases of betting behaviour fail on two counts: they fail to resonate with the ordinary concept of belief and they are unnecessary anyway, since choosing to bet at certain odds need *not* imply that there are corresponding degrees of beliefs (see pp. 79-80).

With regard to the second move (objective epistemic probability), Achinstein introduces the all-important concept of 'reasonable belief' and, in particular, of 'degree of reasonableness of belief'. Reasonable belief is a *normative* concept: it relates to what one ought to believe, given the evidence. But for Achinstein, its normative character is not autonomous. It supervenes on certain physical (and mathematical) facts (see p. 96 & 109) in the sense that the reasonableness of a belief is dependent, ultimately, on certain causal and explanatory relations that exist between the fact reported in a hypothesis and the facts that constitute the evidence for this hypothesis. Now, it is important to stress that though the reasonableness of a belief is also a threshold concept (a belief should have enough of reasonableness in order to be reasonable), it admits of degrees. The degree of reasonableness of a belief is, ultimately, a function of its probability (p. 98). So, some facts might make it reasonable to degree r to believe that p (so the relevant belief has some degree of reasonableness r), and yet the belief in p might not be reasonable (because its degree of reasonableness is less than 1/2.) It's not hard to see why Achinstein needs this smooth-with-respect-to-probability notion of degree of reasonableness of belief: it gives him an entry point into probabilities. For degrees of reasonableness of belief are taken to be probabilities (p. 97 & 101). These are his objective epistemic probabilities. They are *objective* because they are independent of the epistemic situation one is in. That's why Achinstein also calls epistemic probabilities "abstract" (p.98 & 100 & 170): they capture how reasonable certain facts make a belief that p. Epistemic probabilities are, however, *epistemic* in the sense that they represent degrees of reasonableness of belief rather than relative frequencies, chances and the like (p.100). So, the canonical form of probability statements is: The degree of reasonableness of believing H is equal to r, which is to be distinguished from the form: It is reasonable to believe H to the degree r. The distinction is obvious since the latter form requires degrees of belief, which Achinstein denies, since he takes belief to be a threshold concept.

These are the bare bones to which *The Book of Evidence* adds flesh. Some of it is critical (why, for instance, the notion of positive relevance is bankrupt). But most of it is constructive. In chapter 8, Achinstein shows how his notion of evidence can cast new light on the realism-instrumentalism controversy. In chapters 9 to 11, he shows how some old touchstones for any theory of confirmation (the ravens paradox, the grue problem, the prediction vs accommodation issue) can be solved within his theory. Finally, the last chapters (12-13), which discuss Perrin's experimental argument for molecules and J J Thomson's experiments with cathode rays, try to deliver on a central promise that Achinstein issues in the very beginning of the book: that his notion of evidence should be (and has been) useful to working scientists.

Before I close, I want to register a couple of general qualms. One issue that seems to need more attention is this: *why* are degrees of reasonable belief probabilities? Achinstein says something in reply (see p.101), but it is very brief and somewhat unclear. Now, one possible answer to this (which is not Achinstein's), is that degrees of reasonableness of belief are probabilities because degrees of belief are. That degrees of belief are probabilities is captured by the standard Ramsey-de Finetti justification. But, obviously, this justification is inconsistent with Achinstein's view that belief is a threshold concept. Another issue is that the central concept of *reasonableness* is not fully explicated. Perhaps, however, the concept of reasonable belief might be so central to our way of thinking about the world that it may well resist a full analysis in terms of other concepts.

The Book of Evidence is a real philosophical advance—a huge step forward in our ways of thinking about evidence.

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