

*Probability & the evidence of our senses*

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Our knowledge of the world comes to us, one way or another, through our senses. I know there's a table here, because I see it, and that there's traffic outside, because I hear it. And similarly for our other senses. I know when it's cold, because I feel it; when there's sugar in my tea, because I taste it; smoke in the air, because I smell it; and so on.

The knowledge we get directly from our senses in this way is of course only a small part of what we know about the world. Most of our knowledge depends also on memory. It isn't my senses that are now telling me what I saw yesterday: my knowledge of that comes from my memory of what I saw then. Then again there are many things I know—about Queen Victoria, for example—not because I'm seeing, hearing or remembering them, but because I've been told about them. Most of our knowledge of history comes not from our own observation of historical events, but from professional historians; just as most of our knowledge of science, whether of microphysics, biology or cosmology, comes from professional scientists.

But all this knowledge still comes in the end through people's senses. My second-hand knowledge of history and science comes through my senses: through my hearing what historians and scientists say or seeing what they write. And their first-hand knowledge comes through their senses: from what they see written in historical documents, or by means of scientific instruments such as microscopes and telescopes.

This is not to say that our knowledge of the world depends only on our senses. To see things through a microscope, for example, it isn't enough to have good eyesight. One needs to know what to look for and how to recognise it, skills that aren't easily acquired, as all microscopists know (Hacking 1983 ch.11). And history, as everyone knows, is harder still: our knowledge of history depends not only on the skilled observation of historical data, but on its availability, selection and interpretation.

Indeed all our knowledge depends on interpretation in the sense of depending on our concepts. To see that it's raining we need the concept of rain; historians of the French Revolution need the concept of a revolution; and astronomers need the concept of a star. Where these concepts come from is a contentious question, whose answer will no doubt vary from concept to concept. Most, I suppose, come from our language and our society, although some basic ones may come from our senses, and others from our genes. But wherever they come from, our knowledge of the world

will still depend on our senses. To know that it's raining you need more than the concept of rain: you need to see, hear or feel—or be told by someone who sees, hears or feels—that it's raining. So our theory of knowledge, whatever else it does, must answer the question: how do our senses give us our first-hand knowledge of the world? That is undoubtedly one of the central questions of philosophy, and one that occupied Ayer throughout his philosophical career.

But why should it have occupied him? Why is it a philosophical question, as opposed to a question in the physiology, psychology or sociology of perception? What more needs saying about how our senses give us knowledge than how (once we have the relevant concepts) our eyes, ears and other senses do in fact let us know that it's raining, that there was a French revolution, the Big Bang, and so on? Those are not philosophical questions, and even if answering them presents practical or even theoretical problems, it's not immediately obvious why it should present conceptual ones.

But it notoriously does, and the source of these problems lies in our concept of knowledge, or rather in what philosophers take this concept to entail. Different philosophers of course hold different views about that, which I shan't even try to survey. But since the same problems arise on almost all of them, we may as well discuss them in terms of Ayer's view of knowledge—much of which I anyway accept—and that is what I shall do.

Ayer (1956 ch.1) rejects the view that knowing something is being in a special state of mind distinct from believing it. That view was quite widely held when Ayer wrote, and it still has some adherents; but not many, and since most philosophers today agree with Ayer, I shan't argue that point again here. It is however worth repeating that knowing need not be a special state of mind for there to be more to my knowing something than my believing it. The difference between knowing and believing need not lie in my state of mind: it can, and does, lie in other facts about it. Specifically, for a belief of mine to be knowledge, the proposition I believe must be true, and my belief in it must be warranted in some way—something must entitle me to believe it. Or, as Ayer (1956 p.35) put it,

the necessary and sufficient conditions for knowing that something is the case are first that what one is said to know be true, secondly that one be sure of it [i.e. fully believe it], and thirdly that one should have the right to be sure.

Not everyone who agrees with Ayer that knowledge is belief plus something extra agrees with him about what the extra something is. But I do, and I shall take his two extra conditions—truth and entitlement—for granted. However, these two conditions themselves raise contentious conceptual questions. First, there is controversy about what it is for a belief to be true. But that isn't what I want to

discuss, and for present purposes we can take the concept of truth for granted. What I want to discuss is the other, entitlement, condition: what it is to 'have the right to be sure' of something, or—as I shall put it—to be warranted in believing it. This is the condition which makes the fact that our senses give us first-hand knowledge of the world appear to pose a serious conceptual problem.

To see why, we must ask how our senses warrant our beliefs about the world. Apparently, they do it by giving us evidence for them, as the familiar phrase in my title, 'the evidence of our senses', indicates. For example, what an eye-witness says he saw at the scene of a crime provides evidence for the jury's beliefs about what happened there. What historians see in the documents they decipher provides evidence for their beliefs about the French Revolution. What astronomers see through telescopes, directly or *via* (e.g.) photographs, provides evidence for their beliefs about remote parts of the universe.

But what beliefs do our senses give us evidence for, and what makes what they give us evidence for those beliefs? Let me take these questions in turn. First, the beliefs for which our senses give us evidence are, on the whole, the ones they cause us to get. Suppose for example that our eye-witness's testimony causes our jury to believe that the defendant was indeed at the scene of the crime: then that is the belief for which what the eye-witness saw is their evidence. Similarly, if seeing a jocular entry in Queen Victoria's diary convinces a historian that she was amused after all, then that again is the belief for which his seeing that entry is his evidence. And the beliefs which seeing the results of experiments causes scientists to get are likewise the very beliefs for which those results are their evidence.

This is not of course to say that our senses only, or always, give us evidence for the beliefs they cause. Our historian might, for example, have believed that Queen Victoria was amused before he ever saw her diary: the fact that his seeing it wasn't the cause of his belief doesn't stop it being evidence for it. But usually the beliefs for which our senses give us evidence are the ones they cause; and since these are the paradigm cases, on which all the others depend, they are the ones I shall discuss.

Now for my second question. Even when our senses do cause the beliefs for which they give us evidence, that may still not be how they give us evidence for them. The question remains: how do our senses give us evidence?—a question whose answer will naturally depend on what evidence is. Now I'm assuming, of course, that having evidence for a belief is one way of satisfying Ayer's third condition for making the belief knowledge. It's a way of warranting the belief, i.e. of warranting its truth: that is, the truth of the proposition believed. And what makes being warranted a virtue in a belief is the fact that, although not all beliefs are true, truth is what all beliefs aim at. Why, and in what sense, they do so are questions I can't go into here—except to say that one good reason for wanting true beliefs is that

our beliefs need to be true to ensure that the actions they combine with our desires to cause will succeed in fulfilling those desires (Whyte 1990).

At any rate, the fact that, for whatever reason, belief always aims at truth is what underlies Ayer's first condition for knowledge: it is why, in order for a belief to achieve the status of knowledge, it must be true. And this in turn provides the point of Ayer's third condition, that the belief be warranted. For what warranting a belief is supposed to ensure is that the proposition believed is true. So this in particular is what evidence is supposed to do: ensure the truth of the belief for which it is evidence.

Or at least that's what evidence is supposed to do when it's conclusive. But of course evidence isn't always conclusive. What our eye-witness saw may not prove that the defendant was at the scene of the crime: it may not entail the truth of that proposition. But it may still warrant it to some degree. So evidence for the truth of a belief can come by degrees, not only in amount (how much evidence there is) but also in how *probable* the evidence makes it that the belief is true. A good look at a well-lit politician, for example, makes it far more probable that he is whom he appears to be than a quick glimpse of a dimly lit one does.

Providing a measure of how strongly beliefs are warranted is not of course the only use of probability; but it is an important one, and it is the one I want to discuss. In particular, how should probability be understood when used in this way? For probability has several very different interpretations, and which of them we should apply here is a seriously disputed question. And this dispute matters because, as we shall see, applying the wrong interpretation generates intractable conceptual problems about how our senses give us our first-hand knowledge of the world. And that, I shall argue, is why Ayer and many others have found these problems so intractable: they have not applied the right interpretation of probability. That is what I propose to show: how applying wrong interpretations generates these conceptual problems, and how applying the right one dissolves them.

First, therefore, I must say something about the relevant interpretations of probability; though I needn't say much, and nothing very technical. There is of course a mathematical calculus of probabilities (Howson and Urbach 1989 ch.2) which—for example—makes a proposition's probability of being false 1 minus the probability of its being true. But the details of this calculus don't matter here. What matters here is not the mathematics of probability, but how that mathematics, whatever it is, should be interpreted when used as a measure of how strongly evidence warrants a belief: that is, as what we may call 'evidential probability'.

One influential interpretation of probability, which Ayer unaccountably overlooks, is the subjective one (e.g. de Finetti 1931). This takes the probability calculus to measure the strength of our beliefs. That is, it takes belief to come by degrees—we can believe things more or less strongly—and uses the calculus to

measure those degrees as so-called 'subjective probabilities'. Of course what matter here are degrees of warrant rather than degrees of belief, but the two are connected. For suppose my evidence for the proposition that it's raining gives it a probability 0.8 of being true. Should I not then believe this proposition to that very degree: in other words, give it a subjective probability of 0.8? Arguably I should, since arguably we should believe any proposition to just the degree to which our evidence warrants its truth.

But this connection on its own does not justify a subjective interpretation of evidential probability. We still need an interpretation of probability to make sense of degrees of warrant as well as degrees of belief. But subjectivists do offer to make sense of degrees of warrant by saying, not how strongly I should believe a proposition given my present evidence for it, but how I should *change* my degree of belief in it if I get more evidence (Jeffrey 1983 ch.11). The adequacy of this so-called Bayesian theory of evidence is indeed a moot point (Kyburg 1978), but not one we need discuss. For the trouble I want to discuss is caused by another feature of subjectivism which it shares with the two quite different interpretations of probability that Ayer (e.g. 1973 ch.VIII.B) does consider.

The first of these is the logical interpretation, which takes evidential probability to measure a logical relation between a proposition and the evidence for it (Carnap 1962). This relation is not of course deductive: it doesn't make evidence *entail* the proposition it's evidence for, i.e. make it impossible for that proposition to be false if the evidence is true. Evidence which does that (as for example the evidence that you're reading this entails that you're reading something) is indeed conclusive; but it's also very rare. Most evidence, as we've seen, does not entail what it's evidence for. Hence the idea of a weaker logical relation of 'partial entailment' which can make the truth of one proposition warrant the truth of another more or less strongly.

The most obvious and basic objection to this idea is that there really is no such logical relation (Ramsey 1926 sect.2). If one proposition's being true makes it more or less probable that another one is, that is a matter not of logic but of contingent fact. It isn't logic that makes what an eye-witness sees good evidence that the defendant was at the scene of the crime: it is facts about the light, the witness's eyesight, what the defendant looks like, and so on. If the strength of logically inconclusive evidence is to be measured by probabilities at all, they must surely be contingent probabilities, not logical ones.

I think this is indeed a fatal objection to any logical theory of evidential probability. But it isn't the only objection, and not the one I want to press. For it certainly doesn't apply to the Bayesian theory, nor to the other interpretation of probability Ayer considers, the frequency interpretation. This identifies probabilities with so-called relative frequencies: i.e., in simple cases, with fractions (see Russell 1948 pt V, chs III-IV). For example, it identifies the probability of a smoker's getting

cancer with the fraction of similar smokers who do get cancer. The frequency interpretation faces objections too; but at least, unlike the logical interpretation, it makes evidential probabilities contingent. Its problem with them is simply that evidential probabilities look nothing like frequencies. With what frequency, for example, could we identify the probability that the defendant was at the scene of the crime, given what our eye-witness saw? The best candidate, I suppose, is the frequency among similar scenes (where a similar eye-witness sees something similar) of scenes at which someone who looks like the defendant was present. But even that is most implausible; and in general it is so hard to find credible frequencies for evidential probabilities to be that few philosophers take the frequency interpretation of them seriously.

But I want to press a different objection, related to one which Ayer himself pressed against the logical and frequency theories, and which applies also to the Bayesian theory: namely, that they all interpret evidential probability as a relation between evidence and what it's evidence for. They differ of course in what they say the relation is. The logical theory says it's logical, whereas the other two say it's contingent: either on some frequency, or on how strong our beliefs were to start with. But one way or another, all three theories take evidential probability to be a relation between propositions: the one that states our evidence, and the one for whose truth this is our evidence. And this is the feature, that all these theories take for granted, which makes it so hard to say how our senses can give us first-hand knowledge of the world.

Why so? Why can't evidential probability be a relation, logical or contingent, between one proposition, *P*, which we believe and another one, *Q*, which states our evidence for *P*? The reason Ayer (1973 ch.VIII.B.3) gives is that *P* will have many different but equally good probability relations to other propositions we believe: *Q*<sub>1</sub>, *Q*<sub>2</sub>, and so on. Which of these should we adopt? For what we really want to know, about any proposition *P* that we believe, is how probable, given our evidence for it, is its truth? And that question cannot be answered just by the relational facts that *P* is very probable relative to *Q*<sub>1</sub>, most improbable relative to *Q*<sub>2</sub>, fairly probable relative to *Q*<sub>3</sub>, and so on. The answer to that question must come from something else, that will fix the right *Q* for *P*'s evidential probability to be relative to.

The standard solution to this problem is to say that the right *Q* is the conjunction of all our relevant beliefs: *Q*<sub>1</sub> and *Q*<sub>2</sub> and *Q*<sub>3</sub> and ... so on. In other words, *P*'s evidential probability is its probability relative to all the evidence we have for or against it. And that seems roughly right, although it does present more problems. One is that, as it stands, it makes evidential probabilities subjective, since *P* can have one probability relative to my evidence, and a quite different one relative to yours. Yet if we discovered this we should certainly think that one of us was wrong: we don't really think that evidential probability is subjective. So perhaps it's relative not

to the evidence we actually have, but to the evidence available to us: which then poses the further problem of saying what it is for evidence to be 'available'.

However, since this is still not the problem I want to press, I'll waive it, and suppose for simplicity that, for me, P's evidential probability is relative to the totality Q of my evidence for or against it. But what is Q? It can't just be the conjunction of all the propositions I believe. For one thing, that will include P; and P's probability relative to itself, or to any conjunction including it, is 1. In other words, if our beliefs could be evidence for themselves, they would all be conclusively warranted. But of course they can't be: no belief can be evidence for itself. But what then distinguishes the beliefs that are our evidence from the other beliefs for which they are evidence?

Well, one might think that nothing does and nothing needs to, on the grounds that even if our beliefs can't be evidence for themselves, they can at least be evidence for each other. So collectively, if not individually, they can bootstrap themselves, so to speak, into evidential respectability. But this so-called 'coherence' theory of evidence and hence of knowledge (see Armstrong 1973 p.155) seems to me so absurd that I propose (like Ayer) to say no more about it. For at least so far as our senses are concerned, there is a fairly clear *prima facie* distinction between the evidence, Q, which they give us about how things look, sound, feel, taste and smell, and other beliefs, P, for which Q is our evidence. The distinction between P and Q, moreover, need not be either universal or absolute, since we can obviously have different evidence for different beliefs. In particular, therefore, our beliefs can form evidential hierarchies: that is, one belief for which our senses give us evidence can thereby become evidence for another belief. For example, the blurred view I see through a window may give me evidence for believing it has water on it, which may in turn be my evidence for believing it's raining; and so on. And where, in such hierarchies, our evidence stops being the evidence of our senses is not a question to which we need a general answer.

The question we do need an answer to is not where our hierarchies of sensory evidence stop, but where, and how, they start. I've said that our beliefs can't be evidence for themselves. But surely some of them must be: for how, unless they are, can they provide evidence for our other beliefs? The whole object of evidence is, after all, to warrant the belief it's evidence for: in other words, to ensure its truth. But if my believing Q never ensures that even Q is true, how can it ensure that anything else I believe is true? Our hierarchies of sensory evidence must therefore surely start with beliefs which do warrant themselves in this way. And so, according to Ayer (1964a ch.I) and many others, they do: with beliefs in 'sense data'. Sense data are items like pains, sounds, patches of colour in our visual fields: items so given to us in experience that we can only believe in them if they're really there, so that our beliefs about them really do warrant themselves in the sense of ensuring their own

truth. This is the essential feature of sense data, the feature which enables them to be the starting points of our evidential hierarchies: to be, in other words, as the name 'sense data' implies, the ultimate evidence of our senses.

Unfortunately, the idea of sense data poses notoriously intractable problems. It is not even clear that there are any, i.e. that our senses give us infallibly true beliefs even about our own experiences. And even if they do, it is even less clear how such beliefs could give us enough evidence to warrant all the other beliefs our senses give us. How can all our knowledge of our present surroundings, never mind all our knowledge of history and science, be warranted by a handful of visual and other experiences? I, like many others, cannot see how anything could meet both the conditions that sense data need to satisfy: that beliefs about them must (i) be self-warranting and (ii) provide enough evidence to warrant all the other beliefs about the world that we get through our senses. This is the dilemma with which the concept of sensory evidence confronts the theory of knowledge, and it seems to me quite intolerable.

How can we escape this dilemma? Not by pretending that the problem it poses is unreal because in everyday life we play a 'language game' in which we all talk as if our senses were trustworthy. So we do, but that doesn't explain why they are, i.e. why our trust in our senses is so often rewarded with true beliefs and hence successful actions and predictions. Nor, on the other hand, can we honestly escape the dilemma by pretending to be sceptics, by claiming that after all we don't really know most of the things which we can all see and hear to be going on around us. No one believes that, and philosophers shouldn't say things they don't believe: philosophy is not a branch of fiction.

To escape our dilemma what we need to realise is that our senses need not warrant our beliefs by giving us *evidence* for them. In particular, my senses needn't give me sense data in order to give me evidence for the other beliefs they give me, since they can warrant my beliefs without giving me any evidence for them at all. That they can do this is really undeniable—especially by those who believe in sense data. For as we've just seen, our beliefs about our own sense data are by definition warranted, not by any other beliefs of ours, but by the sense data themselves. My belief that I'm in pain is not warranted by anything else I believe, but simply by the fact that I'm in pain and that, pain being what it is, we believe we're in pain when and only when we are in pain. There is a link between being in pain and believing one is in pain which makes our beliefs about whether or not we're in pain very probably if not certainly true. This is what warrants those beliefs and makes them knowledge. And this is why we need no evidence to warrant the belief that we're in pain, or that we're not in pain—or that we're having, or not having, experiences of any other kind: sounds in our ears, colour patches in our visual field, sensations of touch, taste, smell, feelings of joy, grief, and so on. Beliefs about all these things are

warranted—made at least very probably true—not by any evidence but simply by the fact that these experiences are self-intimating: that what causes us to believe we’re having them is that we *are* having them. This is precisely what enables our hierarchies of sensory evidence to start with beliefs about our present experiences: this is what makes them sense *data*.

But if beliefs about experiences can be warranted in this way, so can other beliefs; and so in particular can the beliefs which constitute our first-hand knowledge of the world. Our senses can easily warrant the beliefs they give us about the things and events we perceive without giving us evidence for those beliefs. They can simply make those things and events intimate themselves to us, just as our experiences do, by making us generally believe they’re there if and only if they really are there. And that is precisely what our senses do, by providing causal links between us and our surroundings which make the fact that something is present be what causes us to believe that it is. That’s how my eyes tell me there’s a table here: by so linking me to it causally that the fact that it’s here causes me to believe that it’s here.

The causal link between the table and me may of course go *via* a visual experience, but that’s not what warrants my belief. My belief isn’t warranted by any self-warranting belief about my visual experience, as Ayer (1964b) eventually realised. But this is not, as Ayer thought, because experiences can warrant beliefs about other things directly, so that, as he put it (p.121),

in certain cases one acquires the right to be sure of a proposition not through holding any other beliefs, but simply because one is having or has had certain experiences.

That is true only of propositions about one’s experiences, not propositions about tables. My belief about my table is not warranted by any experience I’m having, but by its being so caused by the table—whether *via* an experience or not—that it’s very probably true.

In other words, the data of our senses are by no means restricted to our experiences. They include all the perceptible features of things and events which cause us, by means of our senses, to get beliefs about them only when those beliefs are at least very probably true. Such beliefs are just as well warranted by this fact about them as our beliefs about our experiences are, and are therefore just as able to start off the hierarchies of evidence which in turn warrant our other beliefs about the world.

Recognising this fact, that our senses can warrant the beliefs they give us without giving us evidence for them, rescues us immediately from the dilemma facing the traditional concept of sensory evidence. For if our senses need not *give* us evidence for the beliefs they give us, then those beliefs can simply *be* the evidence of our senses—which is, after all, just what we all naturally think they are.

This account of the evidence of our senses does however face a couple of specious objections, to which I can here only sketch my replies. One is that to be sense data, things must logically guarantee the truth of our beliefs about them, which ordinary perceptible objects do not. For even if my eyes give my belief that there's a table here a probability 1 of being true, that probability is still contingent on facts about my eyesight, the lighting, and so on. So this belief, unlike my beliefs about my present experiences, might have been false; and this allegedly stops it being warranted. But that simply doesn't follow, any more than the fact that my table might not have been here stops my belief that it is here being warranted. Warrants can be real, and conclusive, without being necessarily so.

The other objection to this account is that it allows our beliefs to be warranted without our knowing they are, which to many people seems absurd. But is it? Imagine for example someone who doesn't know that he's not colour-blind, perhaps because he's never heard of colour-blindness. But in fact he isn't colour-blind, and his eyes can make his belief that something is red very probably true even though he doesn't know that they do. Does this really mean that that belief of his isn't warranted, just because he doesn't know it is? Surely not. For if it did, our eyes couldn't have warranted *any* of the beliefs they gave us about the colours of things before colour-blindness was discovered: and that really is absurd (see Mellor 1988b §5).

I conclude therefore, despite these objections, that our senses can and do warrant the beliefs they give us without giving us evidence for them. But what, finally, does that tell us about the probabilities involved? It certainly tells us something. For although on this view our senses still warrant the beliefs they give us by making them very probably true, these high probabilities are no longer *evidential*. They no longer measure a relation between one proposition that I believe and another one that states my evidence for it. Indeed the probabilities here are not relational at all. They are simply a sub-species of the non-relational probabilities which causes give their effects. For as I remarked at the beginning, the beliefs our senses warrant first are the beliefs they cause us to get: or more precisely, as we now see, the beliefs which they make the facts that make those beliefs true cause us to get. In other words, our senses warrant the beliefs they give us by making them effects of the very facts that make them true. Making my belief that there's a table here an effect of there being a table here is what makes that belief of mine very probably true and therefore warranted.

But how, and in what sense of probability, does the causation which links my belief to the fact that makes it true make it also very probably true? Where does this high probability come from? The answer is that it comes from the causation. Causes always give their effects probabilities (Mellor 1988a): 1 if the causation is deterministic, less if it's not—but still, in the cases that concern us, high. And these

causal probabilities, I have argued elsewhere (Mellor 1982, 1988a), are neither logical relations nor degrees of belief nor relative frequencies. They are what Popper (1957) first called propensities and what I (Mellor 1971) mean by ‘chances’: namely, objective non-relational properties, as real as lengths or temperatures, and present in every single case of causation, including the causation of our beliefs. The fact that there’s a table here can only cause me to believe there is by giving me a significant chance of acquiring that belief. And then, if that chance is high enough, that belief will be warranted. For that chance, the chance of my believing there’s a table here when there is, just *is* the probability that that belief of mine is true. And as we’ve seen, giving a belief a high enough probability of being true is precisely what it takes to warrant it.

That is how our senses warrant the beliefs they give us: by making the facts which make our beliefs true cause us to get them and thereby give them a high chance of being true. Why didn’t Ayer see this? I think the reason is that he simply overlooked this so-called propensity interpretation of probability, which is what this account of how our senses warrant our beliefs needs. He shouldn’t have overlooked it, since he not only attended the 1957 Bristol symposium at which Popper’s (1957) version of this interpretation was first presented, he took part in the discussion of it (Körner 1957 pp.78-89). But after that he never mentioned it, just as he never mentioned the subjective interpretation of probability. But that lapse mattered less, because a subjective interpretation can only give us a theory of evidential probability. And however natural it may be to think, as Ayer did, and many still do, that this is what we need, because our senses warrant our beliefs by giving us experiential evidence for them, it really isn’t, because they don’t. Only by seeing that, and by applying the right non-evidential interpretation of probability, can we account, as Ayer could not, for the evidence of our senses.<sup>1</sup>

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<sup>1</sup>This lecture has been somewhat revised for publication. The final version has been improved by comments made by Robert Nola (who drew my attention to Ayer 1964b) and Jamie Whyte.

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