Belief about Probability

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Credences are beliefs about evidential probabilities. We give the view an assessment-sensitive formulation, show how it evades the standard objections, and give several arguments in support.

I. The View

A. Credences are beliefs about probabilities

Bayesian versions of decision theory and confirmation theory are both so insightful and so powerful that, we believe, they must be correctly describing some state of mind and its normative role. We take 'credence' to name this state of mind, so we do not want to debate whether credences are a real rather than a fictional state of mind. There must be something real, something that can be rational, and that can make other states and actions rational, in the ways these theories describe. Our topic is a debate over the nature of this state.

The two sides in our debate agree that a credence involves a degree, some kind of thing that is supposed to conform to the structure of mathematical probability.

On one side of the debate, the traditional Bayesian (as we'll understand them here) says credence is *degree of belief*. The degree is in the *attitude*. So, for example, a high credence that it will rain has for its representational content *that it will rain*, and a low credence that it will rain is a different attitude with the same content. The two attitudes differ in their degrees, but not in their contents.[1]

On our side in this debate, we say: the degrees are only *in the contents* of our beliefs. Credences, in our view, are beliefs about probabilities. So, a high credence that it will rain is a

[1] See, e.g., Titelbaum (2022, pp.16-7): "Generally, contemporary Bayesians think of the numerical value of a credence not as part of the content towards which the agent adopts the attitude, but instead as an attribute of the attitude itself. I adopt a credence *of 60%* towards the proposition that the Democrats will lose; no proposition *containing* the value 60% is involved."

belief that represents the high degree of something. It represents that there is a high probability—or high likelihood, or high chance[2], to use plainer language for the same thing—that it will rain. Some Bayesians would call this a "full" belief, but we say it's the only kind of belief there is.

Our debate is over a foundational question not only for philosophy of mind, action theory, and epistemology, but psychology, economics, and any other field that is concerned with reasoning under uncertainty. Correctly understanding the nature of credence has wide significance.

In the rest of section I, we'll further explain our version of the view that credence is a belief about probability before defending it against objections in section II and then arguing in favor of it in section III.

B. The proper formulation

What kind of probability is credence a belief about? On the usual understanding, "subjective" probability just *is* credence, so we certainly do not mean that credence is a belief about subjective probability. And on the usual understanding, "objective" probability is something that is independent of anyone's psychology or evidence. We do not mean that credence is a belief about objective probability in that sense, since we think credence is a belief about a kind of probability that varies as certain evidence varies.

Following Williamson (2000, ch.10, pp.211-2) we'll call our intended notion "evidential probability", and we'll say that a proposition's unconditional evidential probability—its "ur-prior" as it's called—is how intrinsically plausible it is, and its evidential probability conditional on *e* is how well supported it is given evidence *e*. It is controversial whether there is a more reductive analysis of evidential probability.[3] Even if there is not, these and other

[2] Philosophers have developed an idiom among themselves to use "chance" to distinctively mean objective probability. But we'll use "chance" in the ordinary way, where it is synonymous with "likelihood" and "probability". This will often help us state our view in ways that are more concise and sound more natural. And using "chance" in the ordinary way will also be helpful when we introduce explicit arguments for our view that appeal to ordinary language later (see section III.A).

[3] Williamson (2000, ch.10) argues there is no reduction, Eder (forthcoming) responds and offers several defensible suggestions, and Climenhaga (forthcoming) adds new arguments for the anti-reductivist side.

generalizations as well as paradigm examples make it clear what ordinary notion we are using here. For another generalization that helps partially characterize the notion, there is this conditional: if an ideally rational thinker with (total) evidence *e* has a credence of *n* in proposition *p*, then the evidential probability of *p* given *e* is *n*—as we'd put it, the ideally rational thinker's beliefs about evidential probabilities will match the correct evidential probabilities (given their evidence).[4] The Principal Principle also characterizes evidential probability, though again without providing a general analysis. What the Principal Principle says, in one basic form, is that $E(p / O(p) = n) = n$, where E and O are evidential and objective probability.[5] And the following is a paradigm example of evidential probability: if you know a fair coin was first tossed in order to decide whether a second toss would involve a double-heads or double-tails coin, then the evidential probability that the second toss is heads is ½. The objective probability here is 0 or 1, and the subjective probabilities (psychological states that can vary from person to person) could be anything at all, but the evidential probability is necessarily ½. Examples like that also show why general skepticism about evidential probabilities would require a very powerful and surprising argument. It's a firm piece of common sense that there *is* a probability of ½ that the second toss will come up heads, and this kind of probability can't generally be identified with objective or subjective probability.[6]

For readers still inclined toward some skepticism about evidential probability, we offer two points. First, read this paper as not just blindly assuming the hypothesis that there are evidential probabilities, but as showcasing the elegant theory of credence it can give us.[7] Second, for propositions you don't have any (precise) credence in, you can doubt there is any (precise) evidential probability yet still accept our view. If you have no (precise) credence it will be

[4] See Climenhaga (forthcoming) for a nice argument for the stronger claim that evidential probabilities (he prefers the label "epistemic probabilities") *explain* the rationality of subjective probabilities.
[5] See Lewis (1980).
[6] A reductivist about evidential probability, like Eder (see fn.2 above) who suggests we can identify evidential probability with a kind of rational subjective probability, would not count as a skeptic about evidential probability. What a reductivist does is not eliminate it but identify it with a sub-species of subjective probability.
[7] Williamson (2000, ch.10, p.213) similarly explores what kind of insightful theory we gain from the assumption there are evidential probabilities which are determined by ur-priors. See also Climenhaga (2020) for one valuable attempt to say what determines evidential probabilities and ur-priors, but here we are not committing to any particular answer to the deep and difficult question of what determines them.

raining in Paris in exactly 100 years, you can doubt that your evidence determines any (precise) evidential probability in that, but still accept that credences are beliefs about evidential probabilities. So, skeptical readers are free to think that there sometimes is no evidential probability or no precise one, but we ask them to accept that at least sometimes there is an evidential probability.

We will also make use of the assumption that there is never more than one evidential probability (for a single proposition given a fixed body of evidence). This might sound like a commitment to the controversial "uniqueness" thesis, which is rejected (in some form or other) by self-described "permissitivists". But we are only ruling out one particularly radical form of permissivism. To accept the kind of permissivism we're ruling out, you'd need to accept that the chance of rain is both, say, 10% *and* 25%, or something like that, and you couldn't clarify that you're talking about different times of day or different locations or that you were talking about the range of an imprecise probability or talking about what you thought at two different times.[8]

Having clarified that we will be presenting a theory that's about evidential probability rather than other kinds of probability, let's now clarify what goes into the content of a belief about evidential probability.

Although evidential probabilities themselves depend on evidence, nevertheless a belief about evidential probability is *not* a belief *about evidence*. So, when you have the belief that the chance of rain is high, your belief is correct, and its content is true, given certain bodies of evidence but not others. But, you do not thereby have a belief about evidence. You don't thereby have a belief about any particular body of evidence, or a belief about evidence in a general sense either.

Perry (1986, p.147) made the distinction that we're relying on here when he contrasted what a belief is *about* with what a belief—as he put it—*concerns*. A belief concerns anything that contributes to whether it is true or false. So, you could have the view that any belief depends

[8] Defenders of the controversial forms of uniqueness often begin their defenses by making the present observation about the plausibility of uniqueness for these kinds of probability claims (intending it to serve as a more uncontroversial starting claim). See, e.g., White (2013, pp.313-4), or Horowitz, Dogramaci, and Schoenfield (forthcoming, sec. I).

(for its truth) on a possible world, but of course not all beliefs are about possible worlds. For another possible example, consider two children in different time zones who both believe it is noon, one correctly and one incorrectly (because both beliefs *concern* time zones) while neither child has any beliefs *about* time zones.

MacFarlane (2014, p.87) appeals to Perry's distinction when he introduces additional parameters into points of evaluation, the entities that make a belief true or make it false.[9] One additional parameter that we need to introduce for the purpose of making true (or false) certain epistemic claims is what Yalcin (2007) influentially called an *information state*. An information state plays the role of a body of evidence. It can be modeled as a set of propositions, perhaps the set of propositions somebody knows, or possesses as their total evidence. Adding an information state helps explain the truth conditions of epistemic claims expressed using 'might' and 'must', and even 'if'.

For our purposes, we need more in a point of evaluation than just an information state. Our purpose is to explain the truth conditions of attributions of evidential probability. For this, a point of evaluation needs to determine, as Yalcin (2007, sec.7) already observed, a probability function. The probability that we will need is the conditional probability on the relevant evidence—whether you correctly believe the chance of rain is high depends on the evidence. We propose that a point of evaluation includes two things that jointly make true (or false) a belief, or an assertion, about evidential probability: an unconditional probability function and a body of evidence. The unconditional probability function is meant to model the ur-priors of evidential probability, in the "intrinsic plausibility" sense of Williamson (2000, ch.10). Call it w, since we can understand a possible world as a rich enough sort of entity that it includes all the facts about these unconditional evidential probabilities. (We don't assume unconditional evidential probabilities vary from world to world. They may be necessary, like truths of pure mathematics or morality.) We also need to include a total body of evidence, modeled as a set of

[9] Though we'll most closely follow MacFarlane's framework, the basic idea (of making truth relative to an additional parameter beyond the standard worlds and times) is an intrinsically natural one that was independently developed in slightly different ways by others, among them Kölbel (2002), Richard (2004), and Egan, Hawthorne and Weatherson (2005).

propositions—call it *i*. Then we can propose the following principle concerning the truth of the simplest beliefs and assertions about evidential probability, ones with the same form as "there's a high chance that it will rain":

> **Truth (at a point of evaluation) for credence:** A simple attribution of evidential probability will be true at a point of evaluation <*w*, *i*> iff it attributes the conditional evidential probability that results from updating the ur-prior of *w* with the evidence of *i*.

So, the belief or assertion that there's a high chance that it's raining is true in all those <*w*, *i*> pairs where the evidence updates the ur-priors of rain to any high probability. And we can understand the content of a credence in one sense of content, the truth-conditional content, to be a set of <*w*, *i*> pairs.

More complex epistemic claims, for example conditionals that embed attributions of probability, will have more complex truth conditions, but generally *w* and *i* will play the key roles. This paper will focus on the simplest constructions. Once we've settled the debate that we want to have here, a debate about whether the degree is in the attitude or the content of a credal state of mind, it then becomes a substantial research project in formal semantics to extend the truth conditions from the simplest constructions to more complex ones.[10]

An important question for us is: *whose* evidence is the relevant evidence in determining whether a belief about evidential probability is true or false? We need to answer this question before we can say when a belief about probability is true, i.e. monadically true, not just true at this or that point of evaluation. If Lee believes the chance is high that it will rain, her belief will be true iff the chance is high given the evidence, but is the relevant evidence Lee's own evidence,

[10] We are proposing a view about the content of simple attributions of evidential probability, and making no proposal about more complex constructions. Note that some complex constructions that embed attributions of evidential probability need not be assessment-sensitive, in particular attributions of beliefs about evidential probability ("Fred believes there's a high chance of rain."). That's of course compatible with the present proposal, namely that the truth *of the content* of the ascribed belief is assessment-sensitive. Whether or not *Fred believes* it's likely to rain is plausibly not assessment-sensitive, but whether or not *what Fred believes* is true is assessment-sensitive. MacFarlane (2014, pp.156-8, 275-6) himself thinks that the truth of the similar attribution, "Fred believes it might rain", is not assessment-sensitive.

and if so, is it the evidence she has now or had when she formed her belief, or is it instead someone else's evidence, perhaps at some other time?

We think MacFarlane's assessment-sensitive theory gives the best answer to this question. On his view, there is no privileged body of evidence in the way there is a privileged world (the actual world). So, we don't say an attribution of evidential probability is true iff the actual world makes it true, or anything like that. Instead, the view is presented in normative terms, where the fundamental norm privileges no particular body of evidence.[11] We will state the norm as follows.

> **Norm for (monadic) truth of credence:** an assessor in context <*w*, *i*> *ought* to assess an attribution of evidential probability (whether the attribution was made in the assessor's context or in another) as true iff the attributed probability matches the probability (the ur-prior) of *w* updated by the total evidence *i*.

This norm is telling you to decide if other people are correctly or incorrectly assigning probabilities to rain (and so on) by seeing if they're assigning the probability rain has *given your own present evidence*. This has the consequence that you ought to disagree with the views of others (even if they formed or hold those views in a different context from your own), and you ought to revise your own views (even if the views were perfectly rational in the context in which you formed them), if those views attribute evidential probabilities that don't match the conditional probabilities given the evidence in your own present context. This makes it appear as if your own evidence is privileged like the actual world is, since you'll assess all attributions of probability using your own evidence. But since the theory itself doesn't actually mention you, the theory does not privilege you or anyone else. We think the resulting theory is novel to the literature. It has many influential precedents though.

[11] See MacFarlane (2014, sec. 10.4.1, and the general framework of chapter 5).

Lance (1995) and Moon & Jackson (2020) say credence is a belief about evidential probability (or about the "fair" odds or the "rational" probability, as Lance puts it). (This makes their views closest to ours, though many other authors are variously skeptical that there are degrees of beliefs.[12]) With these authors, we share the general "belief-first" approach (as Moon and Jackson put it) that says credences are a kind of belief. But these authors do not add the assessment-sensitive twist that we think is essential to making the view defensible. As we'll discuss, this is why many Bayesians have (rightly) rejected that version of the view.

Of course, our view is deeply indebted to MacFarlane. But MacFarlane (2014) only makes a very brief gesture in the direction of our view when he develops his assessment-sensitive theory of simple epistemic modals like 'might' and 'must'. He does not there explore the issue of probability attributions any further than suggesting that to account for them "we would probably want a more complex representation of information states that defines a probability distribution on an algebra of subsets of worlds (see Yalcin 2007)." (p.262) And the brief gesture does not envision the two-part contribution of an unconditional ur-prior and an information state that updates it to a conditional probability, as we propose, nor does it interpret them as evidential probabilities.

Yalcin (2007, p.1021) considers our kind of view (he even gives it a name, 'content probabilism') but he does not endorse it. He holds the traditional Bayesian view that the degree in credence is a degree in the attitude and rejects our view that the degree is in the content of the attitude.[13]

Moss (2018) is our ally in proposing that credences are beliefs with probabilistic contents.[14] But beyond that common ground, her view and ours are very different. Moss develops a formal model of the contents of our credences as sets of probability spaces.[15] However, when

[12] Among them, Moon (2017) gives a number of negative arguments against the view that belief itself comes in degrees.
[13] See Yalcin (2011, sec. 9) and Yalcin (2012a, sec. II) for his endorsements of the traditional view.
[14] It's actually not clear that Moss *identifies* credences and beliefs with probabilistic contents. She describes the relation various ways, including as a determination relation and as one or another in-virtue-of relation; see Moss (2018, pp. 31, 132), Moss (2019, p.259), and Moss (2020, p. 93). But we think she easily could endorse an identity thesis, as we do.
[15] A probability space is an ordered triple consisting of a domain of worlds, an algebra over those worlds, and a probability measure (a function) defined over that algebra.

asked what the truth-conditions are of the belief that it's likely to rain, Moss can only give the deflationary answer that the belief that it's likely to rain is true iff it's likely to rain (p.120). Moss must settle for that deflationary answer because a set of probability spaces does not itself have or determine a truth-condition. A set of probability spaces can be true only in the nominal and derivative sense that, e.g., we could consider the number 5 to be true if we used numbers to model the contents of beliefs. By contrast, an attribution of an evidential probability, e.g. a belief or assertion that the chance is high that it will rain, can naturally, and not derivatively, be assessed for truth. We thus hope to give a substantive (rather than deflationary) theory of their truth-conditions, as we described above, in terms of points of evaluations that contain probabilities, as our <*w, i*> pairs do.

Although Moss argues against views on which credences are beliefs about evidential probabilities (2018, sec.3.3), we will argue below (sec. II.A) that her criticisms don't target our version of the view. We suspect there is nothing in principle stopping anyone from theorizing about the content of credences in Moss's way while also theorizing about the truth-conditions of credences in our way. Moss has said, in a reply to MacFarlane in a symposium on her book, "[a]lthough I do not endorse relativism in the book, my theory is relativist-friendly."[16] We can likewise be friendly toward Moss's formal theory of contents. Our aim in this paper is not to critically compare our view with Moss's any further, but to defend and argue for a view that she can also be friendly toward: credences are beliefs about assessment-sensitive evidential probabilities.

[16] See Moss (2020, p.124). See also Moss (2018, pp.127-8) for related comments about a different version of relativism.

II. In Defense

The view that credence is a belief about probability is generally dismissed by contemporary epistemologists.[17] So, before we give the arguments that we think best support our view, we had better first explain why, when it is developed in the way we've proposed, the view evades the objections that make it so unpopular. While we can't discuss every possible objection, we've tried to select the ones we sense are most influential. We'll begin with a family of objections that includes Yalcin's and Moss's own reasons for rejecting a view like ours.

A. Lost Disagreements

We claim that when you have a high credence that it will rain, you believe the chance is high that it will rain, where we interpret chance as evidential probability. So, if someone disagrees with you, then they must believe the chance is not high that it will rain. But if their evidence is different from yours, how can the two of you be believing incompatible contents about evidential probability? Intuitively, if you believe the chance of rain is high, and your disputant believes the chance of rain is not high, then there is a genuine disagreement in the sense that one of you must believe something that's false. How do we account for that?

This sort of worry about lost disagreement has caused a lot of trouble for earlier versions of our kind of view, such as Moon & Jackson (2020).[18] If the first belief was based on one batch of evidence, and the disputant based their belief on different evidence, why would two beliefs that concern evidence, held by two people with different evidence, be inconsistent? Your disputant is not disagreeing with the thought that the chance is high that it will rain given the original evidence you based that belief on. And you were not originally thinking that the chance of rain is high even given any new evidence that might be had by anyone who might disagree with you, even an eavesdropper you never meet. So what is the disagreement over?

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[17] See again footnote 1.
[18] See, e.g., Yalcin (2011, sec. 3.2) and Moss (2018, pp.7-8, secs. 2.1 & 3.3).

A related worry: if you accept the new belief that the chance is not high, how can our view explain how you have changed your mind? Like the disputant, you now seem to disagree with your earlier view, but how?

MacFarlane's assessment-sensitive framework, as designed, provides the reply. First, as we emphasized, beliefs about evidential chance *concern* evidence, but they are not beliefs *about* anyone's evidence, yours or your disputant's.[19] Second, although the points of evaluation that make these beliefs true or false must contain a body of evidence, we can and (on MacFarlane's view) *should* assess both of the two beliefs from a single point of evaluation, our own context of assessment. And no point of evaluation, including ours, will make true both the belief that the chance is high that it will rain and the belief that the chance is not high. (Recall our modest form of "uniqueness".) So we will see you and your disputant as engaged in a genuine disagreement, the kind where you believe two things that cannot both be true. And the same goes for your past and future selves when you revise your view.

Moss (2018, pp.7) also objects that views like ours cannot make sense of intuitive disagreements, but she uses a different example. Imagine, she says, that two demi-gods believe "exactly the same propositions", but they have different credences about whether it will rain. She adds (p.8) that such a case of disagreement is possible even if the demi-gods share the same evidence, and even if they agree on what credences are supported by the evidence. Moss takes her case to show that some disagreements are over probabilistic contents, and not over propositional contents.

We respond that Moss's case doesn't pose any problem for our view. We've proposed that credences are beliefs that have truth-conditional contents as their objects (sets of $<w, i>$ pairs). Are these contents propositions? "Proposition" is a technical term that can be used in different

[19] Moon & Jackson (2020, pp.663-6) also claim credences are not beliefs about evidence (see the next sub-section), but this alone doesn't suffice to overcome the present objection, because they do not have assessment-sensitive truth-conditions. They endorse subject-sensitive truth conditions: "the relevant proposition S must believe for S to have a credence is the proposition that Mp, *given S's evidence.*" (p.658, fn. 23, italics in original; the operator 'M' is an epistemic modal such as 'Very probably' or 'It might be that'.) Thus, on this view, when you have a high credence that it will rain, and someone else has a low credence that it will rain, there is no inconsistency between the two, since these beliefs concern two different bodies of evidence. (Moon & Jackson only endorse subject-sensitivity in a footnote, so we imagine they might ultimately be happy to accept our suggestion that the belief-first approach to credence is best developed in the assessment-sensitive way.)

ways, ways that include or exclude the entities that we've proposed are the contents of credences. If our proposed contents don't count as "propositions", then our view handles the case just as well as Moss's own view does, assigning the two gods beliefs in different non-propositional contents. If, perhaps more naturally, our proposed contents do count as "propositions", then we'd reply that Moss's case is not possible. We'd say the demi-god who believes it's likely to rain believes a proposition (the proposition that it's likely to rain) that the other god, who doesn't believe it's likely to rain, does not believe. It would beg the question against our view to still insist, without further argument, that the case is possible exactly as it was described, where the gods differ in their credences but not in which propositions they believe. If there were an argument that the case is possible, we'd have to respond to that argument, but Moss only offered the case as intuitively possible.

B. Conceptual Demands

A common objection to the view that credence is a belief about probability is that it is implausibly conceptually demanding. It is possible, the objector says, to have a high credence that it will rain without having any concepts other than those required for thinking it will rain.[20]

The objection would be effective against a view that said having a credence requires deploying the concept of evidence. Since we say beliefs about evidential probability only concern evidence (like a child's belief may only concern a time-zone), the concept of evidence is not deployed in these beliefs.

Moon & Jackson (2020, p.663-6) want to likewise argue that beliefs about evidential probability are not beliefs about evidence. They don't appeal to Perry's about/concerns distinction. Instead they point out that having a belief about *X* doesn't require having beliefs about notions in *X*'s analysis. For example, a belief about knowledge doesn't require thoughts about justification or truth. This argument has weight but is inconclusive. Someone who held beliefs about bachelors or hexagons without having any beliefs about men or the number six

[20] See, e.g., Christensen (2004, pp.19-20).

arguably would have only a deferential grasp of the concepts of bachelor and hexagon. Since knowledge more plausibly has no analysis at all, it's a less clear case. Still, Moon & Jackson's argument is valuable and complements our argument that we don't have beliefs about all the parameters of the points of evaluation that those beliefs concern.

We do accept that any creature with a credence has a belief about probability—or about chance or likelihood, again to use plainer words for the same thing. Is that too demanding? We think it's about as demanding as it should be, and it should indeed be somewhat demanding. A belief about chance demands more of you than, for example, a belief about possibility demands. We're considering thoughts that would be expressed by saying something like "It might rain but the chance is low." This thought requires some sophistication. Moreover, we can attribute these thoughts—we can attribute these credences—only by using the concept of chance in our attribution, embedding it under the attitude verb. (We discuss this aspect of attributions more below, in section III.A.) This is a plausible sufficient condition for attributing the concept. It would be very odd to instead suggest that someone can think (de dicto) that *x* is *F* but have no concept of *F*. If there is any good reason to think of concept possession in that odd way, the Bayesian hasn't, to our knowledge, attempted to provide it.

We give a similar reply to a different version of the over-demandingness objection recently raised by Jackson (forthcoming). (Jackson does not endorse the view defended in Moon & Jackson 2020!) Jackson proposes that there are cases where you can have a high credence in some content *p* that is so complex that you cannot take any attitude, including belief, toward the content that there is a high chance that *p*. We reply that the normal way of attributing to someone a high credence that *p* is to say that the person thinks there's a high chance that *p*, which leads us to worry that it begs the question against us to insist it's possible to have the credence but not the belief that our view identifies with that credence. What's more intuitive to us is to take at face value our practice of attributing credences by attributing beliefs about chances.

(For now, here in section II, we mean to be only defending ourselves. Our claims that our critics have begged the question against us are not meant to persuade anyone to adopt our view.

In section III.A, we'll develop this idea about the ordinary form of attribution as a positive argument for our view.)

C. Epistemic Akrasia

A family of objections involve cases of epistemic akrasia. In ordinary epistemic akrasia, you believe that *p* even though you also believe, or even know, that it is irrational to believe *p*. Against views that identify credence with a belief about probability, the worrisome kind of akrasia occurs when you have high credence that *p* even though you also believe, or even know, that the chance of *p* is low on your evidence (or, equally well, swap 'high' and 'low'). How can a view like ours admit that this is possible?

Our reply, of course, is that we identify a high credence with (a) a belief that the chance is high, and not with (b) a belief that the chance is high on your evidence (or on any other evidence). So, you could believe the chance is high, even though you do not believe the chance is high on your evidence.

An objector might press the worry. How can these beliefs really be distinct? Suppose you *know* that *e* is your total evidence. Won't your beliefs about the chances of things be the same as your beliefs about their chances on *e*? We reply that, though the two beliefs should match (it's akratic to divorce them), they are still distinct mental states. And the distinctness of the mental states can be highlighted in several ways.

First, the two *contents* are clearly different on our view because they have different truth conditions. The first content is assessment-sensitive, but the other is not.

Second, the two mental states have different functional roles. A high credence (a belief that the chance of *p* is high) has an essential causal connection to action. A belief that the chance of *p* is high on some particular evidence *e* only causes action indirectly and contingently. The functional role of this belief would seem to be something quite different, seemingly a role it plays in epistemic evaluation. Just telling someone that the chance of *p* is high, even as a way of expressing disagreement with them, is *not* a way of making an epistemic evaluation of them, it is

not for example a way of telling them that their belief that the chance is low is irrational. By contrast, telling someone that the chance of *p* is high given *e* is a way of telling them something about rationality, specifically that only high credence is rational if your evidence is *e*.

And third, it's only when you *know* that *e* is your evidence that it's a clear case of irrational akrasia to believe the chance of *p* is high but the chance of *p* given *e* is low. When you cannot tell exactly what your evidence is (as, for example, in Williamson's unmarked clock cases[21]), it might be perfectly rational to "level-split", i.e. you rationally believe that the chance of *p* is low on your evidence (because, while you're unsure what exactly your evidence is, it's extremely likely that it's evidence that makes *p* unlikely), but you also rationally believe the chance of *p* is high (because it turns out that your actual evidence does indeed make the chance of *p* high, and you're properly basing your credence in *p* on that evidence). In cases like these, we think there isn't even any temptation to identify a belief about the chance of *p* with any belief about the chance of *p* on any body of evidence.

We'll briefly also address a somewhat related worry here—briefly because we think Moon & Jackson (2020, sec. 4.c) already presented the correct reply. Suppose you know the evidential probability of *p* is either high or low, but you're uncertain which. Can't you then decide to assign a middling credence to *p*? The right reply is that, in any adequately fleshed out example like this, it will turn out that your uncertainty is either over the objective probability or else over the evidential probability given certain evidence. For an example of the former kind, Moon and Jackson describe Fred as having a credence of ½ in Goldbach's conjecture even though Fred knows the conjecture's true probability must be 0 or 1. Here the right diagnosis is that Fred knows the objective probability is 0 or 1 while he believes the evidential probability is ½. For an example of the latter kind, suppose a meteorologist knows that their data makes rain either very likely or very unlikely, but they also know that they were given a drug that has disrupted their ability to correctly interpret the data, and so they adopt a credence of ½ in rain. Here the right diagnosis is that the meteorologist has one belief about the evidential probability

[21] See Williamson (2014).

given their data—this is a belief that doesn't just *concern* the data, but is *about* the data. But this belief is not the meteorologist's credence. Their credence is ½, a belief that is about evidential probability but is not about (it rather only concerns) evidence.

Should the meteorologist assess their own credence as a false (though useful) belief, since they also know their data makes the evidential probability of rain something other than ½? The answer depends on controversial questions about higher-order evidence, but we favor the natural reply that the meteorologist's relevant evidence includes more than just their meteorological data, and in particular includes their knowledge about the drug, and so ½ may be the correct probability relative to their total evidence.

D. Conditional Credence

How can conditional credence, cr(q / p), be a belief about the probability of something?

If we say it's a belief about the probability of the corresponding conditional, if-p-then-q, then we'll run up against Lewis's famous triviality result. That result shows that if the conditional probability matches the probability of the conditional, then the conditional probability matches the probability of the consequent, which is absurd.[22] The conditional probability it will rain given that the clouds are getting dark is not the probability that it will rain.

Can we say conditional credence, cr(q / p), is a belief about the conditional probability of q given p? This would be a straightforward way of extending to conditional credence our main view that credence is a belief about probability. But the proposal raises new worries about conceptual demands. How can an ordinary thinker have a belief about conditional probability, where this is distinct from belief about the probability of the conditional? Doesn't grasping the concept of conditional probability usually require taking a course in probability theory? But conditional credences are so important to decision theory and confirmation theory, where these theories say how all of us should act and reason, that we must be able to attribute conditional

[22] See Lewis (1976).

credences to ordinary people. A belief about conditional probability seems too academic to play this role.

No wonder this objection has convinced so many Bayesians that credences are not beliefs about probabilities. How do we reply?

Here is our proposal. Conditional credence, cr(q / p), is a suppositional belief. It's a belief about the probability of q, where this belief is held under the supposition of p. The proposal is simple, it isn't over-demanding on ordinary people, it avoids triviality, and it even has exciting pay-offs.

The proposal is not over-demanding since suppositional beliefs are familiar things to us all. In *reductio*, we begin with a supposition and then proceed to form some suppositional beliefs, including a suppositional belief in an absurdity. While the concept of *reductio* is academic, the reasoning itself is as ordinary as the experience of realizing you've double-booked appointments and then thinking, "uh oh".

Some philosophers say "if" means the same as "supposing that".[23] Their view suggests another way to formulate our proposal: a conditional credence of n in q given p, i.e. cr(q / p) = n, just is the state of mind of believing that if p then E(q) = n. The attribution of evidential probability has a narrow scope, entirely inside the consequent of the conditional. This is of course not the contrasting wide scope belief that E(if p then q) = n, which faces the triviality threat. We like this way of formulating our view equally well.

Some linguists and philosophers have entertained a semantics for the language of probabilities and conditionals that, in some ways, parallels the proposal we're making here about what the mental state of conditional credence is. For a simple example, Rothschild (2013, secs. 2.1 and 3) observes that one could avoid Lewisian triviality by saying that language whose surface form is "Prob(q-if-p) = n" must always be interpreted as having the form "Prob(q) = n if

[23] See Edgington (2020, sec. 3). As Edgington explains, the theory that "if" means the same as "supposing that" is largely supported (not by searching for truth-conditions for conditionals but instead) by considering the close connections between uncertainty toward conditionals and conditional credence.

p" (though he rejects the view).[24] This partially resembles our proposal. But our proposal is not about the semantics of language. Our proposal is about the content of the state of mind that Bayesians have theorized about under the name of conditional credence. And we don't insist that English attributions of probabilities to conditionals must *always* be interpreted such that the probability operator attaches to just the consequent. But that interpretation would match the content that we claim conditional credence has, and so it is the natural and presumably correct interpretation of language that is being used to express a conditional credence.

One exciting pay-off of our proposal is that it immediately explains why Bayesian conditionalization is rational. Conditionalization is an instance of Modus Ponens! This is one part of a more general advantage our view has at explaining why credence plays the rational role that it does, an issue we return to at more length below.

Traditional Bayesians have not completely ignored the proposal we're endorsing here. Titelbaum (2022, p.80), for example, says the following about it: "Suppose an agent assigns $\mathrm{cr}(q \mid p) = r$. Would we suggest that the agent believes that if p, then the probability of q is r? This proposal mangles the logic of conditional credences." Why does this "mangle" things? Titelbaum observes that conditionals with this form seem to violate certain classical laws of logic. An old riddle illustrates how: given that at least one of Arshile's two children is a girl, what is the chance both are girls? The correct answer by Bayes' theorem is ⅓, but we could use reasoning by cases (aka disjunction elimination), a classically valid rule, to reach the *incorrect* answer of ½. (If the older child is a girl, then the probability both are is ½, and if the younger child is a girl, then the probability both are is again ½, and since either the younger or older is a girl, it follows by reasoning by cases that the answer is ½.) Titelbaum's objection is that if we accepted reasoning by cases in arguments like this one, then we'd mangle things like Bayes' theorem (see p.77).

[24] The basic idea we're proposing is also similar to Yalcin's (2007, sec.7) idea that antecedents serve to update information states, an approach which many other semanticists now also follow.

We could retreat to only claiming that conditional credences are suppositional beliefs, no longer adding that these are the same thing as beliefs in certain conditionals, but we see no need to retreat. We don't think our view is under significantly greater pressure than everyone already is to reject the use of reasoning by cases in arguments like the one above. Everyone has to face the intuitive data that it is possible to embed probabilistic operators in the consequents of conditionals and these conditionals behave non-classically. Even theorists who reject our view that credences are beliefs about probabilities must account for such data. (Yalcin, for example, rejects our view but positively argues that the data cannot be denied: these conditionals generate genuine counterexamples to classical logic.[25]) But theorists who accept our view will be at an advantage explaining why it is so intuitive that these inferences are irrational, and why any plausible semantics should therefore classify them as invalid. On our view, the inferences involve beliefs that just *are* conditional credences, and so those beliefs must obey the rational norms for credences, including the laws of probability, and those laws force these anti-classical patterns of belief, such as the rejection of a conclusion that follows by reasoning by cases from accepted premises. (That suffices to explain why the inference is *irrational*. To show that it is *invalid*, we would add that the correct semantics will vindicate the norm of probabilism, a claim we will support in sec. III.D.) In the end then, far from posing any special problem for our view, the anti-classical intuitions call out for an explanation that our view helps provide.

Finally, let's say how our view evades triviality. Exactly *which step* of the proof would fail if it were adapted and applied to our proposal (if, in effect, you replaced every "cr(q-if-p) = n" in the original proof with our "you believe that, if p, then the probability of q is n")? Though there are countless versions of the triviality proof, our general answer is that the failure occurs at whichever step of the proof would fail if you were to replace "cr(q-if-p)" with "cr(q / p)" throughout (and of course the proof must then fail, since triviality doesn't arise from just having conditional credence in your theory). In Lewis's original proof, it's his use of the law of total probability that's the step that would become illicit if the proof were adapted to our view, just as

[25] See Yalcin (2012b).

the proof would fail if this step were applied to "cr(q / p)" instead of to "cr(q-if-p)".[26]

Though we cannot explicitly discuss each of the countless ways that Lewis's argument has been repackaged and generalized, we should mention that some authors give triviality proofs specifically targeting the view that credences are, or necessarily correlate with, beliefs about probability, in particular Schroeder (2018) and Goldstein (2019). But these particular proofs explicitly rely on assumptions we've already rejected, including the assumption that the contents of beliefs just are sets of possible worlds, and the assumption that MacFarlane-style relativism is false.[27]

We hope we've said enough in this section to convince many Bayesians to no longer dismiss as a non-starter the view that credence is belief about probability. Now, in the next section, we turn to giving arguments that we hope may persuade some of them that the view is even true.

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[26] Lewis uses the simplest version of the law of total probability, the version which applies to unconditional probabilities, which is fine when "q-if-p" expresses a single proposition that can have an unconditional probability, but it's not fine when you replace "q-if-p" with our proposal (just as it's not fine if you replace "q-if-p" with "q / p" in this part of Lewis's proof). Our proposed notion behaves logically just like conditional probability, and so only the *conditional* version of the law of total probability applies to it, but Lewis's proof requires the unconditional version.
See, e.g., step 3.55 in Titelbaum's textbook presentation (2022, p.79) of Lewis's proof, which isolates the step that is correct for the unconditional probability of q-if-p:

(3.55) cr(q-if-p) = cr(q-if-p / q) cr(q) + cr(q-if-p / ~q) cr(~q).

But this becomes incorrect when revised so as to apply to the conditional probability of q given p. It becomes:

(3.55*) cr(q / p) = cr(q / p & q) cr(q) + cr(q / p & ~q) cr(~q).

This is incorrect. To be a law of probability, "cr(q)" would need to be "cr(q / p)" and "cr(~q)" would need to be "cr(~q / p)".

[27] For these assumptions, see Schroeder (2018, pp.304, 319) and—at least for Goldstein's initial proofs of triviality—Goldstein (2019, p.189).

Goldstein's deeper aim in his paper is to go on to give triviality proofs that hold even in a framework of dynamic semantics, but he does not suggest there is a triviality proof that holds for assessment-sensitive relativism.

Schroeder himself actually goes on to describe options for how to block his own proof and endorse the view that you have a 20% credence that it will rain iff you believe it's 20% likely that it will rain (see esp. p.308, and also fn. 33). His own (tentative) proposal is a version of expressivism, but he leaves open other options, and he does not rule out ours (see pp.318-9 where he mentions the relativist option, though not our version of it).

See also Lennertz (forthcoming) for a critique of these triviality proofs (as well as one by Russell & Hawthorne (2016), which less directly targets the view that credences are beliefs about probabilities). Lennertz argues that the proofs all fail if we say that you have a credence iff you believe a probabilistic proposition, but *which* proposition that is varies relative to your evidence. This is like Moon & Jackson's (2020) subject-sensitive version of the belief-first approach to credence. Lennertz observes (like we did in section II.A) that this kind of view appears to raise problems like the ones we called "lost disagreement". Lennertz's excellent paper deserves a fuller discussion than we can give here, but our position, in short, is that we can have our cake and eat it too if, as we propose, we build evidence (the i parameter) into the contents of the beliefs, but we make the truth-conditions of those contents assessment-sensitive: the evidence parameter gives us the required variation in content, and the assessment-sensitivity secures disagreement.

III. In Support

A. Ordinary Language

When a Bayesian talks about a high credence, or a high degree of belief, that it will rain, they claim that they are talking about an attitude that has a degree, but doesn't represent a degree—the content supposedly is just that it will rain. But 'credence' and 'degree of belief', when the Bayesian uses them, are technical terms. We must use ordinary language to introduce technical terms, and when we examine the relevant ordinary language for this, it sounds like we're talking about an attitude that only represents a degree.

Consider first *attributions* of credences. The ordinary way to do this is to say things like, "Pollock thinks there's a very small chance that it will rain.", or "Willem thinks there's a 90% chance of rain.". This sounds like what our view predicts. We're attributing an attitude that represents chance. Now admittedly, there is also an ordinary way to attribute credence where we characterize an attitude as having, but not representing, a degree. We can use various attitude verbs to say things like "Pollock *doubts* it will rain", or "Willem is *very confident* that it will rain". But that usage is expressively limited. We need to have in our vocabulary a distinct attitude verb for each degree we want to attribute in a credence. To attribute the full range of credences, and to attribute very precise credences, we need to put the degree in the content, describing exactly what chance of rain Willem, for example, thinks there is (a 90% chance, or a 91% chance, and so on).

(Although Bayesians can attribute the full range of precise credence by saying things like, "Willem is 90% confident that it will rain", and "Pollock has 5% confidence that it will rain", this is more invented language, not ordinary language. These uses of "confident" and "confidence" are not part of ordinary language.[28])

Next consider first-personal *expressions* of credence, as opposed to third-personal attributions. Here the evidence from ordinary language is unequivocal. The only ordinary way to

[28] Williamson (forthcoming, sec. 5), makes this point.

express your own credence is to use language that puts the degree in the content, not the attitude. To express a high credence that it will rain, the only ordinary thing you can say is something like "There's a high chance that it will rain." You could put the degree in the attitude if you resort to self-reporting that you're confident that it will rain (or doubtful, or agnostic, or whatever else we can say using the various attitude verbs in our language). But that is an attribution of confidence (to yourself), not an expression of confidence. Philosophers of language have argued that expression plays a special and fundamental role in communication, so the data about how we do so is important to respect.

Finally, consider conditional credence. Here again the data is unequivocal. The only way we can talk about conditional credence in ordinary language (whether we're attributing or expressing it) is by talking about degrees in contents, not in attitudes. Again, the attitude verbs aren't just expressively limited. They simply won't work. To most clearly see why, take an example involving undetectable deception: "If I'm a BIV, then it's likely the world is a sad place."[29] Translating this into language that modifies the degree of attitude gives incorrect results. "If I'm a BIV, then I'm confident the world is a sad place." is a mistranslation (it plausibly says something false while the original was true). And talking about confidence in a conditional will run into Lewis's triviality results.

Our conclusion is that Bayesians cannot take ordinary language at face value. They need to endorse some kind of error theory here. While that's possible, it's a cost, and so we have a strong reason to favor our view.[30]

B. Degree of Assertion?

In a typical assertion, you believe what you assert, and you intend for your audience to recognize that you hold, and want to share, this belief. This overlap between the contents of our

[29] Ordinary language can make this into an attribution of conditional credence by embedding the probability operator in the consequent: "Pollock believes that if he's a BIV, then it's likely the world is a sad place."
[30] See Moon (2017) for another argument that natural language suggests that belief does not come in degrees. And Moon also gives some additional compelling arguments (different from any we give in this paper) that belief does not come in degrees.

assertions and our beliefs is essential to the story of how we can so reliably come to learn from others through linguistic testimony.

So what happens when you assert that it's likely that it will rain? What was asserted? The answer is obvious: that it's likely that it will rain. The content of the assertion—*what* was asserted—is not that it will rain. The content must be that it's likely that it will rain. Bayesians simply cannot say that *assertion* comes in degrees in the same way they say belief comes in degrees. Someone who asserts that it's very likely that it will rain did not *assert to a greater degree* than someone who asserts that it's unlikely that it will rain. Assertion is binary. Its content is its only resource for how it can involve degrees of probability. You can also appreciate the point we're making here if you think about other assertoric speech acts such as *saying* or *telling*, which also makes it clear that the degree is only in what got said or told, not in the saying or telling. It is no more plausible to claim that *telling* comes in degrees than it is to claim that by literally uttering "It will rain" you told Pollock *exactly the same thing* as Lee did when she said "It will probably rain".

Since Bayesians do not put probabilities in the contents of our beliefs, they must sever the connection between the contents of assertion and the contents of the beliefs that we intentionally express by those assertions. They cannot accept that, if you said that it's likely that it will rain, *we can believe what you said*. But the Bayesian is denying a firm piece of common sense. If you said that it's likely that it will rain, and we trust you, then we can sincerely inform you *that we believe what you said*. We simply don't see how Bayesians can accept this bit of common sense unless they come around to agreeing with us that what we assert and what we believe are the same thing here.

Bayesians could propose a novel account of how an assertion can "express a credal state" where this isn't simply a matter of asserting a probabilistic content that we also believe, as we'd suggest.[31] But they'd still need to explain away the datum that when we report such speech acts

[31] See Yalcin (2012a, sec. IV) for some initial thoughts on how a "credal expressivist" might give an account of expressing a credence. Yalcin claims that the credal expressivist faces no special problem in providing such an account of expressing a credence that is not already posed by the question what it is to express ordinary "binary" belief via the assertion of an ordinary

(e.g., "Pollock told us that it is likely to rain") we talk as if the degree is in the content (what Pollock told us), rather than as a modifier of the relevant speech-act verb (the telling). If ordinary speakers are in error here, we'd like a compelling explanation for why. In our view, there is no error to be explained since we think people can believe the very thing they assert here.

Moss (2018, p.26) agrees with us that we assert and believe the same probabilistic contents. However, she applies that claim in her overall line of argument very differently. The way Moss proceeds is to first argue (ch.1) that credences are beliefs whose contents are "sets of probability spaces", and then argue (ch. 2) that we assert things we believe, and thus conclude that the contents of our assertions are also sets of probability spaces. She does not argue in the way we have in this sub-section. We think the simple argument we're making has not been made previously in the literature. To repeat/summarize, our argument went like this: (premise 1) we do not assert to a degree, therefore (conclusion 1) it must be the *contents* of assertions that are probabilistic, and since (premise 2) we assert the same things that we believe (the claim that Moss also used in her own line of argument), it follows that (final conclusion / our main view) the contents of our beliefs must be probabilistic.

C. Introspection and Imprecision

Even if you can easily introspect that you have a high credence in something, it is usually extremely hard to introspect *precisely how high* your credence is. It is also usually hard to say, of two comparably high credences, which one is higher, or whether they are even unequal.

Our view offers a nice explanation of why we can't introspect these facts about our minds. On our view, there can easily be nothing there for you to introspect. This is because our view nicely explains something else as well: our view explains how we can easily have an

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factual sentence like 'Allan is in his office'." (p.139). We take the argument of this section to show that the credal expressivist *does* face special worries, given that they deny that our assertions express mental states with probabilistic contents.
Credal expressivists might come up with some account of how, when we make assertions with contents about the chance of this or that, we express a mental state with a very different content, one not about any chances, but even if they did provide some such account (which they have not as yet), it is hard to see how they could explain, as neatly as our view does, the intuitive datum that, in these examples, the content of our assertion perfectly matches the content of the mental state the assertion expresses. They would have to give an error-theory of this datum.

imprecise credence (a high credence that it will rain, say) without having any precise credence (a .86 credence that it will rain, for example). This happens when we *represent* some facts about the chance (of rain, say) without representing the precise chance. Without a representation (of precise chance), there is no (precise) credence, and thus nothing to introspect. The situation is analogous to the author saying Holmes was tall without saying precisely how tall (as the novels in fact did), and thereby leaving no fact about Holmes's precise height for anyone to discover.

Likewise, sometimes we can introspect only that we are comparatively more confident of one thing than of another, and our view can explain this by saying in such a case we are simply representing that the chance of the one is higher than the chance of the other. In this case, the only kind of credence we actually have is a comparative credence. Again, analogously, the author may say Holmes is taller than Watson but say nothing more about their heights.

The Bayesian view has a hard time explaining these things. The Bayesian view seems to imply that, if we have a credence, then we have a precise credence. This is because Bayesians say credence is a degree in an attitude, a degree in some kind of real psychological state. But if some real entity has a magnitude, it usually must have a precise magnitude. Unlike Holmes, you cannot be tall without having some precise height. So, if an attitude really has a degree, we'd expect it to have a precise degree. But if it has a precise degree, we'd expect it to be reasonably accessible to introspection.

To see why it's so odd for precise credences to be so opaque to introspection, compare them with other mental states. First, compare Bayesian credences with sensations. Sensations come in degrees, like sensations of pain, coldness, or the phenomenal experience of a shade of red. We might struggle to verbalize its degree, but we do have an introspectable sense of exactly how painful/cold/red it is. It's exactly *that* painful/cold/red. But, for almost all credences, we don't have any corresponding introspectable sense that it's exactly *that* likely (to rain, for example). Next, compare Bayesian credences with other attitudes. When we have an ordinary type of propositional attitude toward some proposition *p*, like a fearing that *p* or a wondering

whether it's true that *p*, we can usually introspect that we have an attitude of that type toward *p*.[32] So if, as the Bayesian view has it, each credence toward *p* is a distinct type of attitude (the attitude of believing-that-*p*-to-degree-*n*), then why can't we introspect that we have an attitude of that type toward *p*?

Bayesians can try to argue that our credences don't have to be precise. Many Bayesians prefer to say we have imprecise credences. But the label 'imprecise' is misleading, because on the standard model, these "imprecise" credences have a perfectly precise range.[33] That still leaves a puzzle: why are the precise borderlines of these mental states so hard to *ever* introspect?

So, Bayesians have some explanatory burdens here. Either come up with a good model of genuinely imprecise attitudes[34], or explain why these precise mental states and our introspective access to them are so different from sensations and other attitudes.[35]

D. Norms and Contents

There are special norms for how credences can combine in the mind of the rational thinker, most notably the norm of *probabilism* which says that a rational thinker's credences obey the laws of probability. What explains why this is a norm of rational thought?

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[32] A referee raised the following possibility: if there are other attitudes that come in degrees that are similarly difficult to introspect, then it is no longer so odd that Bayesian degree of belief is hard to introspect. We reply: in the cases of other attitudes, the more plausible it is that the attitude can comes in degrees *and* the degree is in the attitude rather than the content, the more plausible it is that we *can* introspect the precise degree as easily as we already mentioned we can introspect precise degrees in sensations. Consider fearing (that *p*), for example. To the extent it is plausible that fearing (that *p*) is an attitude that comes in degrees and that the degree is in the attitude itself, it is likewise plausible that the degree (or intensity, as we might ordinarily call it) of the fearing is easy to introspect. The degree in such cases may even just be another degree of a sensation.

[33] As others have observed; see Mahtani (2019, sec. 8).

[34] Sturgeon (2008, 2020 ch.3) and Mahtani (2019) each explore avenues that, it's claimed, Bayesians might pursue in order to address the problem of precision.

Mahtani says the word 'credence' is vague, and she proposes a supervaluational theory of the vague language. Though this theory might then help explain why it's hard to evaluate sentences that use the vague word 'credence', it's not clear how this helps with the particular problem we've been concerned with (a problem she also mentions; see pp.7-8), namely the problem of explaining why the precise properties of the state of mind itself are hard to introspect.

Sturgeon proposes that credence can be fuzzy and can have fuzzy boundaries. We are happy to agree with that much, but there still remain the tasks of (i) explaining how a state of mind can have fuzzy properties, and (ii) explaining why we can't generally introspect precision in our degrees of our credences. With respect to (i), Sturgeon argues that the fuzziness is a matter of having a distinctive functional role (see in particular pp.5, 73-5 of 2020). That seems to us a sensible approach to task (i) for the Bayesian to pursue. But even then, it's not immediately clear how it can end up helping with task (ii). (Is the idea that there is a kind of ontic vagueness here and thus there exists nothing precise to introspect?) In any case, we don't claim to have shown that our theory is the only possible way to explain why people can't easily introspect the precise degrees of all their credences (namely, because the degree is in the content, not the attitude), but we do claim our explanation is elegant and hard to do better than.

[35] See Dogramaci (2016) and Moon & Jackson (2020, p.661), for a related argument: our kind of view nicely explains why you *can* introspect your credences to the large extent that you indeed can.

Explaining why probabilism is true has been a huge research project in Bayesian epistemology. The most influential proposals appeal to decision theoretic tools such as expected value and dominance principles.[36] While these arguments are clever and beautiful, they have always raised alarm bells for traditional epistemologists. Who would have guessed that the epistemic rationality of our mental states has to be explained using decision theory? (We said the norms of decision theory are so plausible they convince us credences are real, but these norms invoke credences only to say when decisions or actions are rational, not when credences are rational.) We think the Bayesian is resorting to decision theory because they cannot give a traditional kind of explanation of why epistemic norms like probabilism hold.

Our view lets us give a traditional and simple explanation. If our view is right, we can hope to explain these norms in the same way we traditionally explained norms of logical thought: the rationally prohibited thoughts have *contents* that are jointly *inconsistent*. Why is it irrational to have the (non-credal) beliefs it will rain or snow, and it won't rain, and it won't snow? This combination of beliefs is irrational because, or largely because, these contents are inconsistent. We can give the same kind of explanation for credences. Why is it irrational to have a high credence that it will rain and a lower credence that it will rain or snow? Our view says these credences are beliefs, and their contents are inconsistent. The contents are inconsistent in the traditional and simple sense that it is impossible for them to all be true at once. It's impossible that the chance it will rain is high while the chance it will either rain or snow is lower. Likewise for all violations of probabilism.

(As we'd prefer to interpret it, the claim of impossibility here means no point of evaluation, no $<w, i>$ pair, makes true all of the inconsistent contents. But other ways of understanding possibilities could also be used to explicate the inconsistencies here. And Moss (2018) attempts to explain logical relations like inconsistency between probabilistic contents without explicating those relations in terms of points of evaluation or any other kind of possibility. Some theory or other is required to fully develop the required notion of inconsistency

[36] See Vineberg (2016) and Pettigrew (2019).

here, since as we already observed in section II.D, we cannot just appeal to classical logic, since rational credences exhibit some violations to classical logic.)

There are various ways that we may want to further develop the basic idea here if we think inconsistency is only a part of the explanation of why there is irrationality. One traditional approach says the irrationality of some beliefs is explained specifically by the fact that we can know *apriori* that the believed contents are inconsistent.[37] But our view also has some standard resources to explain why we can have apriori knowledge that there is inconsistency (between the contents of credences that violate probabilism). In particular, we can hope to explain the apriority here in terms of our grasp of the *concepts* in the contents that we can know apriori to be inconsistent. Since we think the irrational credences here involve representations of probability and thus involve use of the concept of probability, we can propose that the conditions on a thinker's grasp of that concept explain why the thinker can have apriori knowledge of certain contents that involve that concept. How exactly the details of the explanation should go is something different epistemologists may disagree on and debate in the same ways they have debated various options for how to explain apriority in terms of our grasp of logical concepts.[38] We won't enter those debates here. Our main point here is just that our view of credence makes possible a strategy for explaining rationality in terms of the inconsistency of contents, and perhaps also in terms of our apriori knowledge of their inconsistency which we can then explain in terms of our grasp of the concept of probability as it features in those contents.

The Bayesian cannot explain the rationality of credences in these ways. Apriority for credences cannot be explained in terms of the concept of probability, because having credences does not involve having the concept of probability on the Bayesian view. And, the more serious deficiency, Bayesians cannot appeal to inconsistency to explain the irrationality of jointly

[37] More generally, facts about the rationality and the irrationality of basic rules for adopting beliefs and for withdrawing beliefs are explained not by facts about mere entailment and inconsistency, but by facts about *apriori* entailment and inconsistency. See Dogramaci (2013, esp. p.376) for some discussion of this idea, and an attribution of it to Descartes. See Boghossian (2003) for discussion of the reasons why we need more than mere inconsistency/entailment for irrationality/rationality, and for a view on which facts about which entailments that can be known apriori determine facts about which basic patterns of belief formation are rational. See Peacocke (2004) for a book length positive development of a similar theory of the apriori.

[38] See again Boghossian (2003) and Peacocke (2004).

prohibited thoughts because Bayesians don't put the right stuff into the contents of the credences to generate any inconsistency. For Bayesians, the contents of, for example, high credence it will rain and low credence it will rain or snow are consistent contents. This is because the contents here are just the contents *that it will rain* and *that it will rain or snow*, which are consistent.

As Moss (2018, p.11) rightly pointed out, the problem that the Bayesians have here is effectively their own Frege-Geach problem.[39] Moral expressivism, in certain forms, faces this problem when it says the beliefs that stealing is wrong and that stealing is not wrong are not really beliefs—or should not be fundamentally understood as beliefs—with those two inconsistent contents. That gives the expressivist the serious burden of finding some innovative way of explaining the rational tension between those two attitudes. Likewise for the Bayesian who denies that we have two beliefs with inconsistent contents in a situation that we'd ordinarily describe as having the belief that rain is likely and the belief that rain or snow is unlikely.

We can now better see the supportive significance of the very first point we made in defense of our view. Can our view explain the disagreements we intuitively find between certain people with different credences? Yes. How? By appealing to inconsistency in contents. And only a view like ours or Moss's can do so, a view that gives credences contents that stand in the right logical relations. We did pay the price of appealing to some innovative theory: we said these contents have truth-conditions that are assessment-sensitive. Moss likewise introduces a good deal of innovative theory when she develops her novel account of the contents of credences as sets of probability spaces. Whether you should prefer her view or ours would require seeing a more extensive comparative examination than we are giving here. What we hope to have made a strong case for in this paper is the preferability of our family of views—views that say credences are beliefs with probabilistic contents—to the Bayesian view. The Bayesian alternative must pay the price of developing something as innovative as the moral expressivist's idea of disagreement

[39] See also Lennertz (2021, esp. secs. 5-6) for further discussion of such Frege-Geach problems as they arise in formal epistemology.

in attitude, something that holds not by virtue of disagreement between contents. We think it's worth sticking with tradition if we can, and we can.

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References

1. Boghossian, Paul, 2003, "Blind Reasoning", *Proceedings of the Aristotelian Society,* 77(1), 225-248.
2. Christensen, David, 2004, *Putting Logic in Its Place*, Oxford University Press.
3. Climenhaga, Nevin, 2020, "The Structure of Epistemic Probabilities", *Philosophical Studies*, 177(11), 3213-3242.
4. Climenhaga, Nevin, forthcoming, "Epistemic Probabilities are Degrees of Support, Not Degrees of (Rational) Belief", *Philosophy and Phenomenological Research*.
5. Dogramaci, Sinan, 2013, "Intuitions for Inferences", *Philosophical Studies*, 165(2), 371-388.
6. Dogramaci, Sinan, 2016, "Knowing Our Degrees of Belief", *Episteme,* 13(3), 269-287.
7. Eder, Anna-Maria Asunta (forthcoming) "Evidential Probability and Credences", *British Journal for the Philosophy of Science*.
8. Edgington, Dorothy, 2020, "Indicative Conditionals", in *Stanford Encyclopedia of Philosophy*, ed. Zalta.
9. Egan, Andy, John Hawthorne, and Brian Weatherson, 2005, "Epistemic Modals in Context", in *Contextualism in Philosophy*, eds. G. Preyer and G. Peter, Oxford University Press.
10. Jackson, Elizabeth, forthcoming, "Why Credences Are Not Beliefs", *Australasian Journal of Philosophy* (Online First): https://doi.org/10.1080/00048402.2020.1867210
11. Köbel, Max, 2002, *Truth Without Objectivity*, Routledge.
12. Goldstein, Simon, 2019, "Triviality Results for Probabilistic Modals", *Philosophy and Phenomenological Research*, 99(1), 188-222.
13. Horowitz, Sophie, Sinan Dogramaci, and Miriam Schoenfield, forthcoming, "Are You Now, Or Have You Ever Been, an Impermissivist?", in *Contemporary Debates in Epistemology*, 3rd Edition, eds. B. Roeber, M. Steup, J. Turri, and E. Sosa (eds.), Wiley-Blackwell.

14. Lance, Mark, 1995, “Subjective Probability and Acceptance”, *Philosophical Studies*, 77(1), 147-179.
15. Lennertz, Ben, 2021, “Noncognitivism and the Frege-Geach Problem in Formal Epistemology”, *Philosophy and Phenomenological Research*, 102(1), 184-208.
16. Lennertz, Ben, forthcoming, “Credences are Beliefs about Probability: A Defense from Triviality”, *Erkenntnis*.
17. Lewis, David, 1976, “Probabilities of Conditionals and Conditional Probability”, *The Philosophical Review* 85(3), 297-315.
18. Lewis, David, 1980, “A Subjectivist’s Guide to Objective Chance”, in *Studies in Inductive Logic and Probability, Vol. 2,* ed. R. Jeffrey, Berkeley, 263-293. University of California Press.
19. MacFarlane, John, 2014, *Assessment Sensitivity*, Oxford University Press.
20. Mahtani, Anna, 2019, “Vagueness and Imprecise Credence”, in *Vagueness and Rationality in Language Use and Cognition*, ed. Dietz, Springer, 7-30.
21. Moon, Andrew, 2017, “Beliefs Do Not Come in Degrees”, *Canadian Journal of Philosophy* 47(6), 760-778.
22. Moon, Andrew, & Elizabeth Jackson, 2020, “Credence: A Belief-First Approach”, *Canadian Journal of Philosophy* 50(5), 652-669.
23. Moss, Sarah, 2018, *Probabilistic Knowledge,* Oxford University Press.
24. Moss, Sarah, 2019, “Full Belief and Loose Speech”, *Philosophical Review* 128(3), 255-291.
25. Moss, Sarah, 2020, “Precis of *Probabilistic Knowledge*” and “Reply to MacFarlane and Greco”, *Res Philosophica* 97(1), 93-96, 119-133.
26. Peacocke, Christopher, 2004, *The Realm of Reason*, Oxford University Press.
27. Perry, John, 1986, ‘Thoughts Without Representation”, *Proceedings of the Aristotelian Society, Supplementary* Vol. 60 (1986), pp. 137-151.
28. Pettigrew, Richard, 2019, “Epistemic Utility Arguments for Probabilism”, in *Stanford Encyclopedia of Philosophy*, ed. E. Zalta.
29. Richard, Mark, 2004, “Contextualism and Relativism”, *Philosophical Studies*, 119(1-2), 215-242.
30. Rothschild, Daniel, 2013, “Do Indicative Conditionals Express Propositions”, *Nous* 47(1), 49-68.
31. Russell, Jeffrey, & John Hawthorne, “General Dynamic Triviality Theorems”, *The Philosophical Review*, 123(3), 307-339.
32. Schroeder, Mark, 2018, “Getting Perspective on Objective Reasons”, *Ethics*, 128(2), 289-319.
33. Sturgeon, Scott, 2008, “Reason and the Grain of Belief”, *Nous*, 41(1), 139-165.
34. Sturgeon, Scott, 2020, *The Rational Mind*, Oxford University Press.
35. Titelbaum, Michael, 2022, *Fundamentals of Bayesian Epistemology*, Oxford University Press.

36. Vineberg, Susan, 2016, “Dutch Book Arguments”, in *Stanford Encyclopedia of Philosophy*, ed. E. Zalta.
37. White, Roger, 2013, “Evidence Cannot Be Permissive”, in *Contemporary Debates in Epistemology*, 2nd Edition, eds. M. Steup, J. Turri, and E. Sosa (eds.), Wiley-Blackwell, 312-323.
38. Williamson, Timothy, 2000, *Knowledge and Its Limits,* Oxford University Press.
39. Williamson, Timothy, 2014, “Very Improbable Knowing”, *Erkenntnis* 79(5), 971-999.
40. Williamson, Timothy (forthcoming) “Knowledge, Credence, and Strength of Belief” in *Expansive Epistemology: Norms, Action, and the Social World*, eds. A. Floweree and B. Reed, Routledge.
41. Yalcin, Seth, 2007, “Epistemic Modals”, *Mind* 116, 983–1026.
42. Yalcin, Seth, 2011, “Nonfactualism about Epistemic Modality”, in *Epistemic Modality*, eds. Egan & Weatherson, Oxford University Press, 295–332.
43. Yalcin, Seth, 2012a, “Bayesian Expressivism”, *Proceedings of the Aristotelian Society* 112 (2), 123-160.
44. Yalcin, Seth, 2012b, “A Counterexample to Modus Tollens”, *Journal of Philosophical Logic* 41(6), 1001-1024.