Belief, Reason & Logic*

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I aim to do four things in this paper: sketch a conception of belief, apply epistemic norms to it in an orthodox way, canvass a need for more norms than found in orthodoxy, and then check the relation between orthodox and new norms by looking at logic's role within epistemic theory. A perspective will unfold on which the epistemology of "coarse" belief – also known as "full" or "binary" belief – springs from the epistemology of "fine" belief – also known as confidence. But the epistemology of fine belief will be shown to outstrip the epistemology of point-valued subjective probability. Clarifying the overall picture will lead to a critical discussion of a view recently defended by David Christensen.

1. Belief

It is obvious that we believe, disbelieve and suspend judgement in things. This is a manifest fact. It is obvious that we invest levels of confidence in things. This too is a manifest fact. These sides of our mind turn on "coarse" and "fine" belief respectively. The former involves a notion of belief slotting into a three-fold scheme of psychological categorization. The latter involves a notion of belief slotting into an indefinitely large scheme of psychological categorization.

Although it is obvious that we enjoy coarse and fine belief, it is not obvious how they relate to one another. What interesting metaphysical relation exists, if any, between coarse and fine belief? And how do their epistemologies fit together, if at all? We shall assume a Lockean take on these issues. Specifically: we shall assume that coarse belief is ontologically nothing over and above sufficiently strong confidence, that disbelief is ontologically nothing over and above sufficiently weak confidence, and that suspended judgement is ontologically nothing over and above confidence middling in strength – confidence

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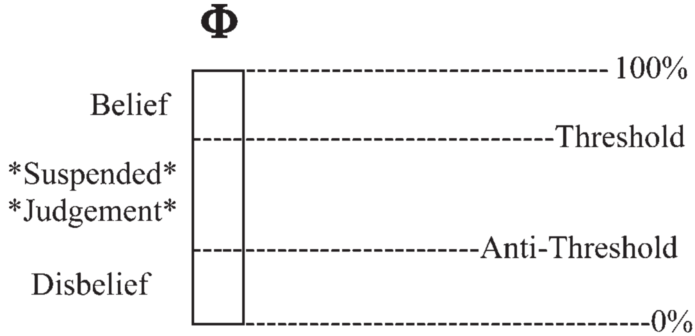
neither strong enough for coarse belief nor weak enough for disbelief. Our launch point will be this picture:



As confidence in Φ goes up and down, one's status as a believer, disbeliever or suspender of judgement is there by fixed. To believe coarsely – on this Lockean picture – is to have sufficiently strong confidence, to *dis*believe coarsely is to have sufficiently weak confidence, and to suspend judgement is to have confidence neither sufficiently strong for coarse belief nor sufficiently weak for coarse disbelief.[1]

Our guiding slogan will be "Confidence first!" Confidence will be taken as explanatorily basic; and the explanatory import of coarse belief, if any – together with the explanatory import of coarse epistemology, if any – will be shown to derive fully from the explanatory import of confidence and its epistemology. It will also be shown that the explanatory import of coarse belief and its epistemology are theoretically fundamental. A key burden of the paper is to explain how these claims can all be true.

2. Reason

We turn to the orthodox application of epistemic norms to levels of confidence. That application involves thinking of ideally rational

[1] We shall also assume that "sufficiency" is a vague and contextually-variable matter. The stars surrounding suspended judgement in the diagram mark the fact that I do not accept this bit of the Lockean picture. By my lights suspended judgement is a *sui generis* kind of attitude, a primitive kind of 'committed neutrality' (as Selim Berker suggested I call it). Arguing that point would take us beyond the scope of this paper. For more on the nature of coarse belief, disbelief and suspended judgement, as well as the belief-making threshold, see Sturgeon *forthcominga* and *forthcomingb*: ch. 6.

levels of confidence as point-valued subjective probabilities – or "credences" as they are known. The mathematics of the model need not concern us. Two simple rules – endorsed by the approach – serve nicely to ground our discussion.

The first is the two-cell partition principle for credence:

> If $\mathbf{\Phi}_1$ and $\mathbf{\Phi}_2$ form into a logical partition, and your rational point-valued subjective probability for them is cr_1 & cr_2 respectively, then:
> $(\mathrm{cr}_1 + \mathrm{cr}_2) = 100\%$.

The idea here is both simple and compelling. If two claims form into a logical partition – if logic guarantees exactly one of them is true – and your credence in them is cr_1 & cr_2 respectively, then to be ideally rational those credences should sum to 100%. Ideally rational credence in $\mathbf{\Phi}$ and $\neg\mathbf{\Phi}$, for instance, adds up in that way – it sums to unity – and so it should be with any two claims which make for a logical partition.

The second rule of thought endorsed by the orthodox application of norms to levels of confidence is the logical implication principle for credence:

> If $\mathbf{\Phi}_1$ logically implies $\mathbf{\Phi}_2$, and your rational credence in $\mathbf{\Phi}_1$ is cr_1, then you should not invest credence in $\mathbf{\Phi}_2$ less than cr_1.

The idea here is also simple and compelling: in the epistemic ideal one never invests less confidence in one thing than one invests in something from which it follows. When you are rationally 70% sure of $\mathbf{\Phi}$, for instance, you should never be 65% sure of $(\mathbf{\Phi} \mathbf{v} \mathbf{\Psi})$.

By adding more rules like these a position is created known as *Probabilism*. It is a view on which ideally rational degrees of belief are measured by point-valued probability functions, and ideally rational degrees of belief rationally change by conditionalisation (or perhaps Richard Jeffrey's generalisation of that rule). If such a picture is right, however, point-valued probability is central to ideal rationality. Point-valued probability is the metaphysical and explanatory linchpin in the area, the theoretical un-moved mover, the key to fine belief and its rational idealisation.

So what of coarse belief and its epistemology?

Well, Probabilism and Locke's take on coarse belief jointly entail that the metaphysics of coarse belief fully derives from point-valued subjective probability. In turn that suggests that the epistemology of coarse belief is itself fully derivative; and this leads to a perspective common to Bayesian epistemology: namely, the view that the epistemology of coarse belief is unimportant, the view that the epistemology of coarse belief is at best a by-product of Probabilism.

Here is Richard Jeffrey vocalising the sentiment:

> By 'belief' I mean the thing that goes along with valuation in decision-making: degree-of-belief, or subjective probability, or personal probability, or grade of credence. I do not care what you call it because I can tell you what it is, and how to measure it, within limits. . .Nor am I disturbed by the fact that our ordinary notion of belief is only vestigially present in the notion of degree of belief. I am inclined to think Ramsey sucked the marrow out of the ordinary notion, and used it to nourish a more adequate view.[2]

And here is Robert Stalnaker crystallising the thought to be resisted:

> One could easily enough define a concept of belief which identified it with high subjective or epistemic probability (probability greater than some specified number between one-half and one), but it is not clear what the point of doing so would be. Once a subjective or epistemic probability value is assigned to a proposition, there is nothing more to be said about its epistemic status. Probabilist decision theory gives a complete account of how probability values, including high ones, ought to guide behaviour, in both the context of inquiry and the application of belief outside of this context. So what could be the point of selecting an interval near the top of the probability scale and conferring on the propositions whose probability falls in that interval the honorific title 'believed'?[3]

The worry behind each of these quotes is obvious: *if* coarse epistemology springs from its fine cousin via a belief-making threshold – if it is Lockean, in our terms – then coarse epistemology is pointless; it is at best a theoretical shadow cast by real explanatory theory (Probabilism); and it is at worst an un-refined bit everyday lore to be jettisoned like other bits of quotidian nonsense.

3. More Norms Please

My view is that the perspective just sketched is mistaken. In turn I think that because two other things seem true: Probabilism seems

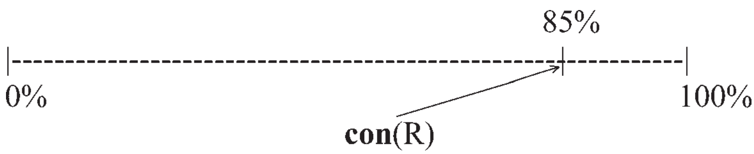
[2] Jeffrey 1970: 132.
[3] Stalnaker 1984: 148.

to be an incomplete epistemology of confidence; and the complete epistemology of confidence seems to contain coarse belief as such. To see this, consider a few thought experiments.

Case 1

When faced with a black box you are rationally certain of this much: the box is filled with a huge number of balls; they have been thoroughly mixed; exactly 85% of them are red; touching one will not change its colour. You reach into the box, grab a ball, and wonder about its colour. You have no view about anything else relevant to your question. How confident should you be that you hold a red ball?

You should be 85% confident, of course. Your confidence in the claim that you hold a red ball is well modelled by a position in Probabilism's "attitude space":



Here we have one attitude *ruled in* by evidence and others *ruled out*. The case suggests a principle I aim to defend:

Out-by-In Attitudes get ruled out by evidence because others get ruled in.

In Case 1, after all, it seems intuitively right that everything but 70% credence is ruled out by your evidence precisely because that very credence is itself ruled in.

Case 2

Now the set up is just as before save this time you know that exactly 80-to-90% of balls in the box are red. How confident should you be that you hold a red ball?

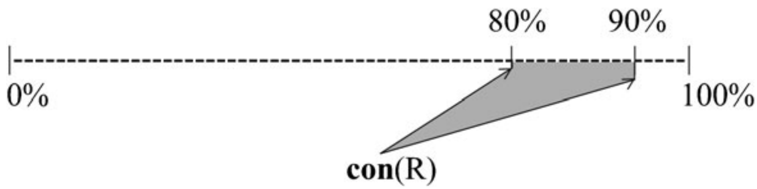
You should be exactly 80-to-90% confident, of course. Your confidence in the claim that you hold a red ball *cannot* be well modelled with a position in Probabilism's attitude space. Your evidence is too rough for that. Certain attitudes within Probabilism's attitude space – within credal space, as we might put it – are ruled out by your evidence in Case 2. But no attitude in credal space is itself ruled in. This puts pressure on the Out-by-In principle.

I want to resist that pressure by insisting that there are more attitudes in our psychology than are dreamt of in Probabilist epistemology. There are more kinds of confidence than credence. Moreover, non-credal confidence is often the right epistemic reaction to everyday evidence. Each of these points is important, if true, so consider them in turn.

A moment's reflection suggests that there are more kinds of confidence than credence. After all, propositional attitudes are individuated functionally. Point-valued subjective probabilities are highly specific functional properties. Being 37% sure that Φ, for instance, is a highly-specific functional property indexed to Φ's truth. There are good questions about its metaphysics and epistemology, to be sure – does it get pinned down by theory? does our knowledge of it come through knowledge of betting behaviour? And so on. But questions like these are not our concern. Our focus is solely on the fact that point-valued subjective probabilities – like being 37% sure that Φ – are highly specific functional properties. Their functional nature is guaranteed by functionalism about propositional attitudes. Their high specificity is guaranteed by their strength being measured by *point-valued* probability functions.

Such functional properties are not the only explanatorily-basic functional properties in our psychology. It is perfectly possible to be more coarsely organised. When a pure Probabilist agent takes an attitudinal stand on Φ – when she invests credence in Φ – she does so by manifesting a highly-specific functional property, one whose nature is indexed to Φ's truth and whose relative strength is measured – under idealisation, at least – with point-valued probability. We needn't do anything like that. It is possible that we manifest coarser functions in our basic psychology, coarser functions indexed to Φ in exactly the way that credence lent to Φ is so indexed. But that means we can adopt a propositional attitude outside the psychological repertoire of a pure Probabilist agent. We can adopt a non-credal level of confidence. We can adopt what I call a *thick confidence*.

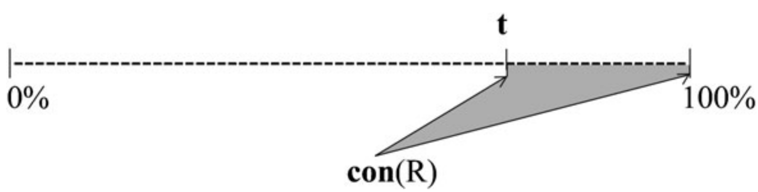
To get a feel for this, think back to Case 2. Evidence in it demands more than a point in credal space. It demands something more like a region instead. Evidence in Case 2 rules in a thick confidence like this:



Everyday evidence tends not to rule in credence, being too coarse-grained for that job. This does not mean that everyday evidence tends not to rule in confidence. It just means that such evidence tends to warrant thick confidence.[4]

The point to be emphasised is of first importance to epistemic theory: *evidence and attitude should match in character*. Precision in evidence should prompt precision in attitude. Imprecision in evidence should prompt imprecision in attitude. Evidence is normally imprecise – in everyday life, anyway – and so thick confidence is normally the right attitudinal reaction to it. Yet thick confidence is something over and above credence. It is functionally too coarse to be any kind of credence.

This opens up notional space, at least, for a *reduction* of Lockean coarse belief to confidence; and in turn that softens the conceptual ground for a confidence-theoretic understanding of basic norms for coarse belief. After all, suppose coarse belief is Lockean. Then coarse belief will be identical to a certain thick confidence. Specifically, it will be identical to thick confidence stretching from the belief-making threshold to certainty. The picture will be this:



[4] In fact the sharp-edged nature of evidence in Case 2 is itself uncommon. A much more typical example would involve knowing merely that there were *roughly* 80–90% red balls in the box, or that *most* of the balls are red. This introduces the fact that imprecision in evidence can aptly warrant a *vague* propositional attitude. But the issues surrounding this fact are best left aside in this paper. Further discussion can be found in Sturgeon *forthcominga* and *forthcomingb*: ch. 6.

Probabilism may give a complete account of rational credence. It does not give a complete account of rational confidence. The view entails that ideally rational agents always assign, in reaction to their evidence, point-valued subjective probability to questions of interest. It is obvious that this is not so. *Often* our evidence is too coarse for subjective probability. *Normally* our evidence is too coarse for that tool; and when that is so epistemic perfection rules out credence in favour of thick confidence. There should be character match between attitude and evidence on which it is based.

We deal in coarse evidence most of the time. As a result, we should mostly adopt an attitude at the heart of both coarse and fine epistemology. We should mostly adopt a thick confidence. Often that confidence will spread from the belief-making threshold to certainty; and when it does everyday evidence will warrant nothing finer-grained than coarse belief. Coarse epistemology can be of theoretical moment even if Probabilism is the full story of rational credence, for coarse epistemology captures a central concern of everyday rationality.

4. Logic and epistemic theory

We have before us a picture of fine-grained epistemology. I close by elaborating that picture in three steps: first I pose a question about logic's role within epistemic theory; then I sketch David Christensen's answer to that question; then I pose a worry for his answer. The result will help clarify how basic norms for thick confidence – and hence basic norms for coarse belief – are best conceived.

Question: what is logic's fundamental role in epistemic theory?

Probabilism invites the view that logic's role in that theory is echoed directly by its basic role in shaping point-valued probability functions. The idea is that logic helps shape rational belief – in the first instance, anyway – in just the way it shapes point-valued probability functions. Once thick confidence enters the scene, however, it is unclear what to say about logic and rational belief. After all, thick confidence is not usefully modelled by a single point-valued probability function. This suggests the injection of thick confidence into epistemic theory prompts a non-trivial shift in view about logic's basic role within epistemology. It suggests the epistemology of thick confidence should re-conceive logic's role in shaping rational belief.

David Christensen rejects that idea, defending instead a Probabilist answer to our question about logic even after thick confidence – or 'spread out credence', as he calls it – is found within epistemic theory. Christensen notes that thick confidence is naturally modelled by richly-membered sets of point-valued probability functions. He infers from this that an epistemology of thick confidence will preserve Probabilism's take on logic sketched in the last paragraph. "On any such view," he says

> ideally rational degrees of belief are constrained by the logical structure of the propositions believed, and the constraints are based on the principles of probability. Wherever an agent does have precise degrees of belief, those degrees are constrained by probabilistic coherence in the standard way. Where her credences are spread out, they are still constrained by coherence, albeit in a more subtle way. Thus the normative claim that rationality allows, or even requires, spread-out credences does not undermine the basic position that I have been defending [in this book]: that logic constrains ideal rationality by means of probabilistic conditions on degrees of confidence.[5]

This passage trades – rather tacitly – on a subtle-but-mistaken projection. Specifically, it trades on a mistaken projection of this

(a) The way large-scale features of a model of thick confidence are metaphysically grounded

onto

(b) The way large-scale features of thick confidence are metaphysically grounded.

Let me explain.

Suppose we model ideally rational thick confidence with sets of point-valued probability functions.[6] In the event, large-scale properties of the model will be reductively explained by the workings of (collections of) point-valued probability functions; for entities used in the model are literally built from such functions. Further still – and for the same reason – dynamical properties the model will be defined directly by the workings of point-valued probability functions. The basic explanation of our model's large-scale properties, then, will come reductively from the workings of such functions. In turn that means the fundamental role of

[5] Christensen 2004: 150.

[6] A typical approach would use convex sets of point-valued probability functions to model thick confidence. It would also apply conditionalisation (where defined) to members of those sets to model rational shift in thick confidence. See Joyce 2005 for a nice discussion of the approach's strengths.

logic – in determining the large-scale features of our model – will itself come reductively from logic's role in shaping point-valued probability functions.

But that does not mean that the fundamental role of logic in shaping *the phenomena being modelled* – thick confidence – itself derives from logic's role in shaping the phenomena modelled by point-valued probability functions. We must sharply distinguish the metaphysics of entities which model thick confidence from the metaphysics of thick confidence itself. On the approach under discussion, entities used to model thick confidence are built exclusively from point-valued probability functions. The nature of those entities derives exclusively from the nature of functions out of which they are built. But thick confidence is not built from credence; and its nature does not derive from the nature of credence.[7] The metaphysics of our model misleads about the metaphysics of the phenomena being modelled; for the metaphysics of sets of point-valued probability functions fails to echo the metaphysics of thick confidence. The former is reductively shaped by probabilistic atoms (point-valued probability functions). The latter is not reductively shaped by anything. It is non-reductive through and through. Thick confidence is an explanatorily basic bit of our psychology.

To see this more clearly, recall the two-cell partition principle for credence:

> If $\mathbf{\Phi}_1$ and $\mathbf{\Phi}_2$ form into a logical partition, and your rational point-valued subjective probability for them is cr_1 & cr_2 respectively, then:
> $(\mathrm{cr}_1 + \mathrm{cr}_2) = 100\%$.

A generalisation of this thought applies to thick confidence. It can be sketched by appeal to intervals in the unit interval rather than points in that interval. The result is a two-cell partition principle for confidence:

> If $\mathbf{\Phi}_1$ and $\mathbf{\Phi}_2$ form into a logical partition, and your rational confidence in them is $[a,b]$ & $[c,d]$ respectively, then: $(a + d) = 100\%$ and $(b + c) = 100\%$.

If you are 20-to-30% confident in $\mathbf{\Phi}$, for instance, you should be 70-to-80% confident in $\neg\mathbf{\Phi}$. And so on. But notice: the two-celled partition principle for credence is a limit case of the two-celled partition principle for confidence. The latter does not hold because the

[7] Indeed thick confidence cannot be built from credence. The functional nature of attitudes makes that impossible.

former holds, not even because the former holds in a range of cases. The order of explanation goes from general fact to limit-case instance. The two-cell partition principle for credence holds *as* a limit case of the two-cell partition principle for confidence.

Or recall the logical implication principle for credence:

> If $\mathbf{\Phi}_1$ logically implies $\mathbf{\Phi}_2$, and your rational credence in $\mathbf{\Phi}_1$ is cr_1, then you should not invest credence in $\mathbf{\Phi}_2$ less than cr_1.

A generalisation of this thought applies to thick confidence. And it too can be sketched by appeal to intervals in the unit interval rather than points in that interval. The result is a logical implication principle for confidence:

> If $\mathbf{\Phi}_1$ logically implies $\mathbf{\Phi}_2$, and your rational confidence in $\mathbf{\Phi}_1$ is $[a, b]$, then you should not invest confidence $[c, d]$ in $\mathbf{\Phi}_2$ when c is less than a.

When you are 70-to-80% sure of $\mathbf{\Phi}$, for instance, you should not invest a confidence $[c, d]$ in $(\mathbf{\Phi} \mathbf{v} \mathbf{\Psi})$ when c is less than 70%. But notice: the logical implication principle for credence is a limit case of the logical implication principle for confidence. The latter does not hold because the former holds, not even because the former holds in a range of cases. The order of explanation goes from general fact to limit-case instance. The two-cell partition principle for credence holds *as* a limit case of the two-cell partition principle for confidence.

Thick confidence is normally modelled by entities built from point-valued probability functions. The behaviour of those entities is itself determined by the behaviour of functions out of which they are built. Christensen infers from this fact that point-valued probabilistic norms are basic to the epistemology of thick confidence. But that is a faulty projection. Thick confidence is not itself built from credence, and its norms do not derive from those for credence. The metaphysical source of the large-scale properties of our model of thick confidence does not itself model the metaphysical source of the large-scale properties of thick confidence. This is true if the best model of thick confidence is built from entities which model credence. It is true even if that is not so. The point holds no matter how thick confidence is best modelled.

Probabilism captures a slice of a larger epistemic pie. The epistemology of coarse belief captures another slice of the pie. Its focus is on the rational role of a particular thick confidence, namely, the one stretching from the belief-making threshold to certainty. There are basic norms for coarse belief; but all basic norms traffic solely in confidence.[8]

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[8] It seems fairly likely that all static norms for thick confidence will have limit-case instances modelled by facts about point-valued probability functions. It seems totally unclear whether the same will be true of dynamical norms for thick confidence, whether they will likewise have limit-case instances modelled by standard update rules for probability functions. It seems totally unclear, for instance, that anything like conditionalisation will turn out to be a limit-case instance of a dynamical norm for thick confidence. And this very much calls into question the idea that a full-dress theory of thick confidence will be a generalisation of Probabilism. The topics relevant here go well beyond the scope of this paper. See Sturgeon *forthcomingb*: ch. 6 and 7 for further discussion.