

Title: Decisions, Decisions, Decisions: Thoughts about actions in an Everett World

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Abstract: The most common objection to the Everett view of QM is that it '\cannot make sense of probability\'. The '\Oxford project\' of writers such as Deutsch, Wallace, Saunders and Greaves seeks to meet this objection by showing that the Everett view allows some suitable analogue of decision under uncertainty, and that probability (or some suitable analogue of probability) can be understood on that basis. As a pragmatist, I\'m very sympathetic to the idea that probability in general needs to be understood in terms of its links with decision; but I\'m sceptical about whether the Everett picture provides a suitable analogue of decision under uncertainty. In this talk I\'ll try to justify my scepticism.

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Postscript – a new kind of fatalism?

Decisions, Decisions, Decisions

Huw Price

Centre for Time
University of Sydney

23 September 2007



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‘Classical probability is mysterious, too’



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‘Classical probability is mysterious, too’

- Papineau on the ‘Decision-Theoretic Link’:



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‘Classical probability is mysterious, too’

- Papineau on the ‘Decision-Theoretic Link’:

‘[W]hy are rational agents well advised to choose actions that make their desired results objectively probable? ... [T]here is no good answer to this question [M]any philosophers in this area now simply take it to be a primitive fact that you ought to weight future possibilities according to known objective probabilities in making rational decisions. ... It is not just that philosophers can’t agree on the right justification; many have concluded that there simply isn’t one.’ (Papineau 1996, 238)



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- Emphasise the practical ...



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- Emphasise the practical ...

'The [Principal Principle]¹ is intended by Lewis to provide a *functional definition* of chance ... i.e. it *defines* chance by what it does ... "chance" is that property of the physical world – *whatever that property is* – that fits the "chance" role of the [Principal Principle].' (Wallace)

¹ "If I know that the chance of an outcome is p then I am rationally required to  have credence p in that outcome."

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- And don't worry about the metaphysics.

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- Consider people who mark in blue on their maps the places where they find stuff they can drink and wash in.



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- There might be other mysteries in the vicinity – e.g., about why blue lines are correlated with contour lines in a distinctive way,



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- There might be other mysteries in the vicinity – e.g., about why blue lines are correlated with contour lines in a distinctive way, or whether there is any unified physical account of the stuff we drink and wash in –



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- There might be other mysteries in the vicinity – e.g., about why blue lines are correlated with contour lines in a distinctive way, or whether there is any unified physical account of the stuff we drink and wash in – but these are not the practical puzzle about why places marked with blue lines are good for washing and drinking.



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Applying this to probability:

- If we start with idea that a map of probability is a guide to decision under uncertainty, it isn't a mystery why the map can be used for exactly that purpose.
- There might be other mysteries in the theory.



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- If we start with idea that a map of probability is a guide to decision under uncertainty, it isn't a mystery why the map can be used for exactly that purpose.
- There might be other mysteries in the vicinity – e.g., about whether, or why, decision-theoretic 'blue lines' are correlated with something else on our maps – but there *is* a practical puzzle about why probability properly guides action.



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- There might be other mysteries in the vicinity – e.g., about whether, or why, decision-theoretic 'blue lines' are correlated with something else on our maps – but these are not the practical puzzle about why probability properly guides action.
- (Would it matter if there wasn't any unified story about 'something else' that correlated with decision theoretic probability? If so, why?)



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Lessons

- We shouldn't lose sight of the fact that probability begins with decision under uncertainty.

As long as we keep that in mind, there isn't any mystery about
Popperian Decision-Theory. Click



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- We shouldn't lose sight of the fact that probability begins with decision under uncertainty.
- As long as we keep that in mind, there isn't any mystery about Papineau's Decision-Theoretic Link.

The crucial basis for the coherence of Everettian probability is whether decision makers accept (and/or are suitably equipped to accept) a bet that is not in the spirit of the game.



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Lessons

- We shouldn't lose sight of the fact that probability begins with decision under uncertainty.
- As long as we keep that in mind, there isn't any mystery about Papineau's Decision-Theoretic Link.
- The crucial issue for the coherence of Everettian probability is whether decision under uncertainty – or some suitable analogue – does make sense in the many worlds case.



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My project

- Begin by applauding the Deutsch-Wallace ("Oxford") approach to Everettian probability for beginning with the issue of rational decision making, as to allow its own-world rivals make the same



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My project

- 1 Begin by applauding the Deutsch-Wallace (“Oxford”) approach to Everettian probability for beginning with the issue of rational decision (asking it to allow its one-world rivals to do the same).

- 2 Raise some difficulties for the view that rational agents in an Everett world should conform to an MEU model of choice.



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- 2 Raise some difficulties for the view that rational action in an Everett world should conform to an MEU model *at all* – i.e. should aim to maximise a weighted sum of individual utilities.



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- 2 Raise some difficulties for the view that rational action in an Everett world should conform to an MEU model *at all* – i.e., should aim to maximise a weighted sum of in-branch utilities — rather than the *branch* utilities.



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- 2 Raise some difficulties for the view that rational action in an Everett world should conform to an MEU model *at all* – i.e., should aim to maximise a weighted sum of in-branch utilities — *whether via the Born rule or otherwise.*



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Thinking about preferences

- A preference is a desire *that* some state of affairs should obtain – if of some person or persons should turn out to be true



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The Elmer picture provides the paradigm of how our values shape our preferences.



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Thinking about preferences

- A preference is a desire *that* some state of affairs should obtain – *that* some proposition should turn out to be true.
- The Everett picture provides the ontological basis for a new kind of preference – *non-actual, but seems just as good*.



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Thinking about preferences

- A preference is a desire *that* some state of affairs should obtain – *that* some proposition should turn out to be true.
- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – the *global preference* about the future self-state.



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- A preference is a desire *that* some state of affairs should obtain – *that* some proposition should turn out to be true.
- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – viz., a ‘global’ preference about the future QM state.



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Thinking about preferences

- A preference is a desire *that* some state of affairs should obtain – *that* some proposition should turn out to be true.
- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – viz., a ‘global’ preference about the future QM state.
- For an agent whose only preferences are of this kind, the choice between QM games isn't a choice between two weighted sets of alternative ‘possible’ outcomes – it is simply a choice between two certain outcomes – i.e. the two ‘dissected states’ – which is still, though the probabilities are questioned.



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- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – viz., a ‘global’ preference about the future QM state.
- For an agent whose only preferences are of this kind, the choice between QM games isn’t a choice between two weighted sets of alternative ‘possible’ outcomes – it is simply a choice between two certain outcomes (i.e., the two different states which result from the two games in question).

Conclusion



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- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – viz., a ‘global’ preference about the future QM state.
- For an agent whose only preferences are of this kind, the choice between QM games isn’t a choice between two weighted sets of alternative ‘possible’ outcomes – it is simply a choice between two **certain** outcomes (i.e., the two different states which result from the two games in question).

● Conclusion: It is not the time to panic about the Everett picture of QM, but to think about the implications for the MEU model.



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- For an agent whose only preferences are of this kind, the choice between QM games isn’t a choice between two weighted sets of alternative ‘possible’ outcomes – it is simply a choice between two **certain** outcomes (i.e., the two different states which result from the two games in question).
- **Conclusion:** It can’t be true *in general* that rational choice of QM games conforms to a MEU model. At most, the MEU model applies (non-trivially) only to the component of choice which is not guided by such global preferences.



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- The Everett picture provides the ontological basis for a new kind of preference – unfamiliar, but surely not irrational – viz., a ‘global’ preference about the future QM state.
- For an agent whose only preferences are of this kind, the choice between QM games isn’t a choice between two weighted sets of alternative ‘possible’ outcomes – it is simply a choice between two **certain** outcomes (i.e., the two different states which result from the two games in question).
- **Conclusion:** It can’t be true *in general* that rational choice of QM games conforms to a MEU model. At most, the MEU model applies (non-trivially) only to the component of choice which is not guided by such global preferences.



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The global challenge

- In other words, an Everettian agent might attach values to the state itself – not merely because its state is the state simply because she prefers our world to the exclusion of the other ones for another reason. She might prefer it for the welfare of her co-descendants who will be in it.



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- In other words, an Everettian agent might attach values **to the state itself**
– i.e., might prefer one game to another simply because she prefers one future evolution of the state function to another, *where this preference is not explained in terms of in-branch utilities.*
- On the contrary, the in-branch utilities would reflect the global preferences.



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- On the contrary, the in-branch utilities would reflect the global preferences – i.e., lower values would be large or infinite, according to whether they believed her probability to have been lost at the global level.



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The global challenge

- In other words, an Everettian agent might attach values **to the state itself** – i.e., might prefer one game to another simply because she prefers one future evolution of the state function to another, *where this preference is not explained in terms of in-branch utilities*.
- On the contrary, the in-branch utilities would reflect the global preferences – her descendants would be happy or unhappy, according to whether they believed her preferences had been met at the global level.



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- In this case, there's no space of differentially-valued outcomes, to which analogues of probabilistic weights can attach (non-trivially).
- To say anything for the possibility of a Branching MEU model needs to say what a branch is.



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- In this case, there's no space of differentially-valued outcomes, to which analogues of probabilistic weights can attach (non-trivially).

● So any argument for the rationality of a Born-weighted MEU model needs to come with a rider: *it only applies to games of a certain type, determined by an external global state.*



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- So any argument for the rationality of a Born-weighted MEU model needs to come with a rider: *e.g., that it only applies to actions in so far as they are determined by non-global preferences.*



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Three reasons why this might matter

- ① Because the DW argument appeals to global preferences at crucial points, in claiming that rational agents should be indifferent between games which give rise to the same QM state – if this is not a direct appeal to global preferences, what else would explain it? (e.g. deep-seatedly like the question-begging)



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Three reasons why this might matter

- 1 Because the DW argument appeals to global preferences at crucial points, in claiming that rational agents should be indifferent between games which give rise to the same QM state – if this isn't a *direct* appeal to global preferences (which the rider would exclude), it looks suspiciously like question begging.

- 2 Because rational expectations theory is unlikely to be rational on its own, as to the welfare of their co-descendants (and, thereby, in other branches, as the rider claims is unproblematic for us).



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- 2 Because reflective Everettian agents are unlikely to be indifferent *in practice* to the welfare of their co-descendants (and others!) in other branches, so that the rider is unrealistic *de facto*.
- 3 Because reflective Everettian agents would care about their co-descendants in a way which isn't captured by the probabilistic attitudes of the MEU model, rendering the standard assumption



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- 3 Because reflective Everettian agents *should* care about their co-descendants in a way which may be in tension with the recommendations of the MEU model, when the rider is assumed.

Phil



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Plan: discuss in detail the role of question-begging in the DW argument



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Plan: Say no more about (1), but something about (2) and (3).



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Caring about one's alter egos

• Should in-branch 'net satisfaction' be expected to coincide in the Everett and one-world cases?

• Or should the value Everettian agents ascribe to branches of development depend on how they believe their co-descendants are faring in other branches?



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A fundamental disanalogy?

- If I win a risky bet, I don't care about the misfortune of my unlucky possible twin (who loses) – because he doesn't exist.



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A fundamental disanalogy?

- If I win a risky bet, I don't care about the misfortune of my unlucky possible twin (who loses) ... because he doesn't exist.

✓ But in the Everett case my good fortune comes at a cost to others who have to suffer.



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- If I win a risky bet, I don't care about the misfortune of my unlucky possible twin (who loses) ... because he doesn't exist.
- But in the Everett case my good fortune comes at a cost to someone very close to me. Mightn't this make it different?



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An example:



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An example:



- Suppose a shark swallows my right leg (here at Bondi Beach). I'm offered a procedure which clones (and reflects) my surviving leg, to make a replacement.

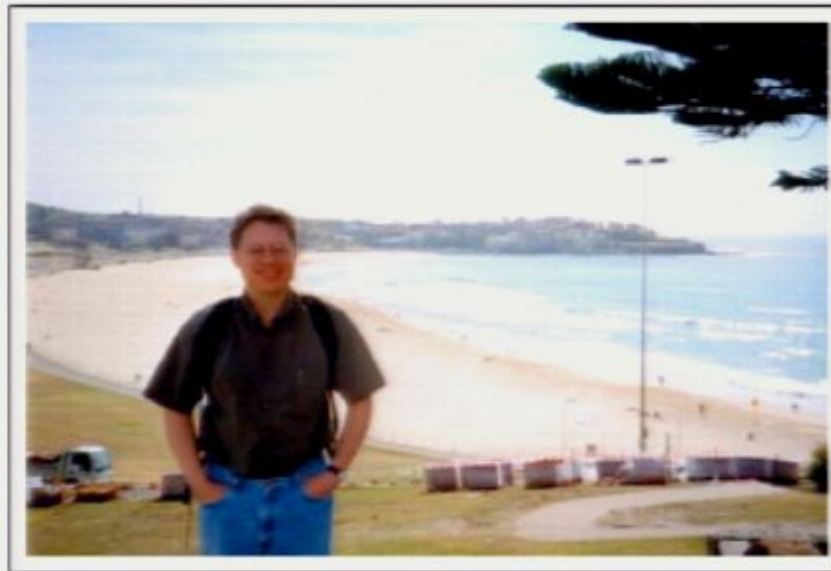
There's a small risk that I might lose both legs; but if this risk is sufficiently small, it will be a risk worth taking.



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An example:



- Now suppose I learn that the procedure actually clones all of me, and normally leaves my duplicate with no legs – that's where the spare leg comes from. (He only gets the legs when the procedure 'fails'.)

Doesn't this make a difference to my subjective notion of getting my leg back?



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A reply?

- Why not meet this challenge by emphasising the agent's point of view before the bet? Isn't it my *self*'s responsibility to *myself* to take account of my believing me of my obligation to feel guilty about my good fortune?



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- Why not meet this challenge by emphasising the agent's point of view before the bet? Isn't it my earlier self's responsibility to take this into account (thus relieving me of any obligation to feel guilty about my good fortune)?

Answer



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Answer

This just pushes the problem onto the past.



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Answer

- This just pushes the problem somewhere else – shouldn't my earlier self's policy reflect the same kind of disquiet?

And doesn't this recommend a policy according to which the value of a bet isn't always the weighted sum of one-world utilities seen in the absence of regret about performance?



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- Decision in the Everett world concerns the welfare of a group of future individuals – all our future descendants



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- Decision in the Everett world concerns the welfare of a group of future individuals – all one's future descendants.

★ This is highlighted by the fact that the Everett approach, but not the MEU or subjective expected utility approach, is well



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- Decision in the Everett world concerns the welfare of a **group** of future individuals – all one's future descendants.
- This is highlighted by Greaves' 'caring measure' approach, but true for the 'subjective uncertainty' approach as well.

Challenges:



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● Challenge: isn't distributive justice based on equal weighting of different individuals' interests – not equal weighting of different future selves' interests?

● Answer: yes, but the 'caring measure' approach is based on the idea that we care about the welfare of all our future selves, not just the one we are currently in.

● This is a more plausible basis for distributive justice than the idea that we should only care about the welfare of the one individual who is currently in the world.

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²My disquiet in the Bondi example isn't offset even by certainty that it's me who gets the legs.

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- This is highlighted by Greaves' 'caring measure' approach, but true for the 'subjective uncertainty' approach as well.²
- **Challenge:** Isn't rational decision in such a context fundamentally different from any weighted sum model?

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Distributive justice

- A weighted sum allocation of goods to a group always permits a large cost to one individual to be offset by small gains to others.
- A principle of maximisation, such as utilitarianism, thus conflict with plausible principles of justice.



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Distributive justice

- A weighted sum allocation of goods to a group always permits a large cost to one individual to be offset by small gains to others.
- A principle of maximising such a sum may thus conflict with plausible principles of justice:

It is true for one should not (necessarily) be gained at the cost of pain for another



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- A weighted sum allocation of goods to a group always permits a large cost to one individual to be offset by small gains to others.
- A principle of maximising such a sum may thus conflict with plausible principles of justice:

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Some attractive decision principles for Everettian agents

- Try to establish a baseline, below which you don't knowingly allow your descendants to fall (at least not simply for the sake of modest advantage to others).
- Encourage high lives, but not if it means forcing another person to fall below the baseline.



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The challenge

- It is (at best) an open question whether an Everettian agent should assess the value of a quantum bet as a weighted sum of the ‘one-world’ utilities of the in-branch outcomes ... even if we grant that those utilities (rather than global preferences about the state) are to be the primary drivers of the decisions in question.

The Oxford model of rational action seems to be able to be applied in at least two ways:



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- The Oxford model of rational action seems to need to be qualified in at least two ways:
 - Restriction on type of branch probabilities



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- The Oxford model of rational action seems to need to be qualified in at least two ways:
 - ① Restrictions on ‘out of branch’ preferences.
 - Restrictions to a sufficiently narrow range of utilities to avoid issues of justice, unfairness, etc.



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- These issues of 'justice' are no different from the one-world case, in which betting produces losers as well as winners.

Answer



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- In the one-world case the losers and winners are both benefit and burdened. In the Everett world there is a new sense in which this is not so: the losers are like the distributive justice case.



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- You've ignored the weights – don't get into protocol choices that the lowly are all low-weight branches.



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Answer

- Tap being in the wrong problem



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Answer

- This brings me to another problem ...



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A fundamental issue

- What entitles us to give less consideration to low-weight futures and descendants?



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The one-world solution

- In the limit, no matter how fine my "epistemic grain", the low-weight alternatives simply disappear off my epistemic map.
- This is, alas, giving the "credence-existence" link a much weaker probability equivalent to zero – but the price we must pay.



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- That is, any graining has a resolution limit, beneath which low probability equates to zero, for the purposes at hand.
- For the purposes of my choice of the probabilities, it is just as if I believe that the low-weight alternatives don't exist.



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- So for the purposes of my view of the possibilities, it is just as if I believe that the low-weight alternatives *don't exist* – and it isn't a weird way to harden one's heart about the reality of possible worlds.



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g. If all this, the credence-existence link.



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Appeal to frequencies?

- Everettrians might have an answer to this challenge, if weight could be construed in terms of frequency, and we had a suitable principle of indifference – allowing the different versions equally



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- If it is not correct that it would be a good idea to take Y because the world is such that you should be a human X or because Y is equally good as the alternative, then you should be a human X or because Y is equally good as the alternative.



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 - As the Oxford school have emphasised, it is doubtful both whether we have well-defined frequencies in the Everett framework, and whether mere frequency could be a relevant consideration – branching seems far too 'contingent' for that.



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Isn't sizism unavoidable?

- Claim: There are too many low-weighted branches



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Reply I

- The fact that we can't (practically) consider all branches is no *justification* for ignoring a salient branch of which we are already well aware (such as the branch containing my legless twin).

What we need is some explanation of why the low-weighted branches are practically *ignored* (despite not being the purview of deliberation).



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- And besides, the problem also occurs 'above the grain' – what entitles us to privilege heavily-weighted branches over moderately-weighted branches?
- (Again, the answer B-errie: there are none of them, since all the branches



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The sub-problems

- 1. An agent might simply value the global state, bypassing MEU altogether.
- 2. There's pressure to think about branch or state indifference in the context of the Everett tree, which is potentially problematic to the extent that non-branching worlds go.



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The basic problem
Sub-problems

The sub-problems

- 1 An agent might simply value the global state, bypassing MEU altogether.
- 2 There's no reason to think that in-branch agents are indifferent to the rest of the Everett 'tree' (either in general or specifically to the fate of their co-descendants within it). This is a reason to think that if the Born rule is wrong, past-*et*.-present-*et*.-future-*et*. value of an Everettian world would be greater than equal value of the corresponding one-world branch.



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3 In general, rational decision on behalf of a group may be expected not to go by a weighted sum of individual utilities, when the welfare of some comes at severe cost to others.

4 Whether the independence-like, the Everettian, seems to lack any plausible first-principles



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Without the credence-existence link, the Everettian seems to lack any rationale for "sizism" (i.e., for giving pre-emptive to higher-weighted branches).



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- ④ Without the credence-existence link, the Everettian seems to lack any rationale for "sizism" – i.e., for giving preference to higher-weighted individuals. *What if there were a postulate that a good that there is no rational MEU alternative to a Born-weighted good would apply to a branch that is not a MEU model alternative?*



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A new argument for fatalism?

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When I form an intention to do then I am fatalistic that my intention will be thwarted



A new argument for fatalism?

- This whole issue takes for granted that free choice makes sense in the Everett world, as much as it does in the one-world case. But there are reasons to doubt that, too.

● Whenever I form an intention to ϕ , there's a small "probability" that my intention will be thwarted.

● Hence in an Everett world, I know that my decision to ϕ produces some descendants who ϕ and some descendants who don't ϕ .

● What would that mean in terms of a justification for treating weights as probabilities? Again we invoke the notion of an effective choice between events.



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• What reason then is at least in part a justification for treating weights as probabilities – you've made the notion of an effective choice between ϕ and $\neg\phi$.



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- What sense, then – at least *in advance* of a justification for treating weights as probabilities – can we make of the notion of an effective choice between games? (The problem isn't that my choice is unenforced, but that I can't make an effective choice between alternatives.)



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Confronting branching



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The global viewpoint



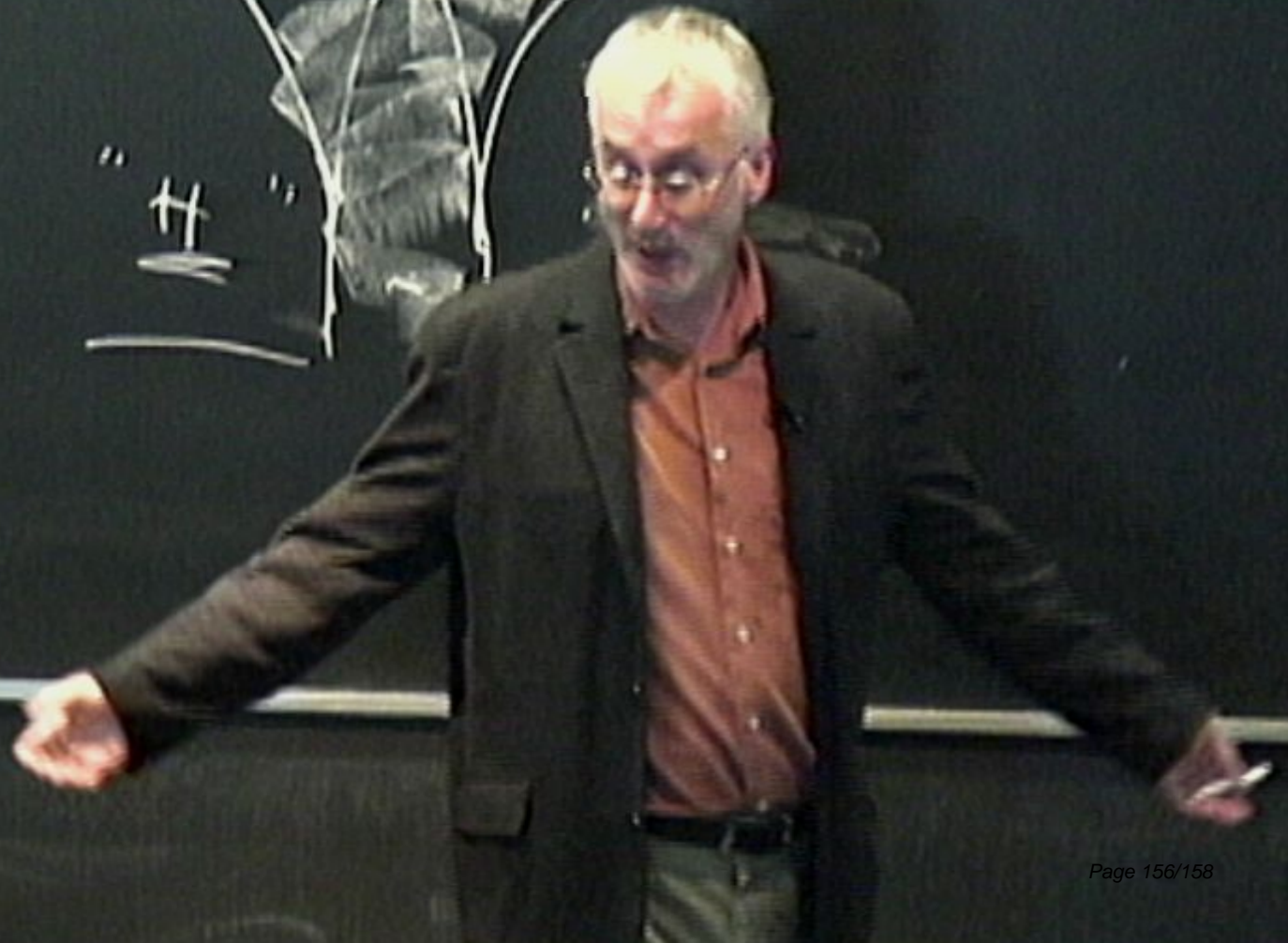
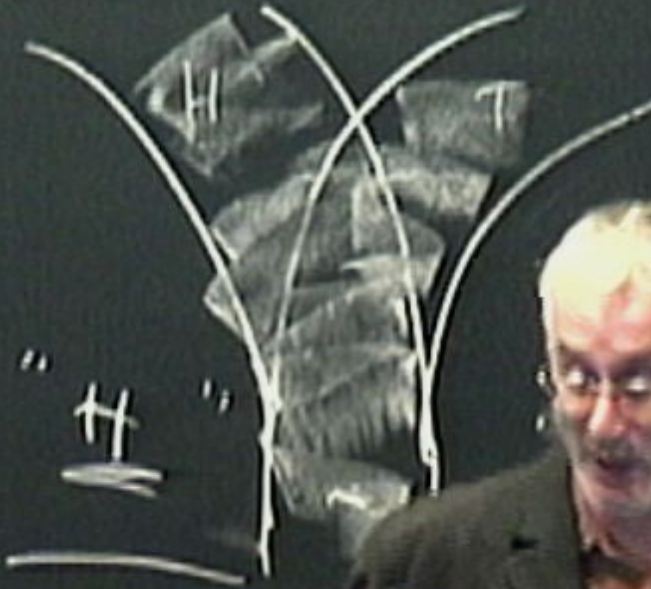
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The End



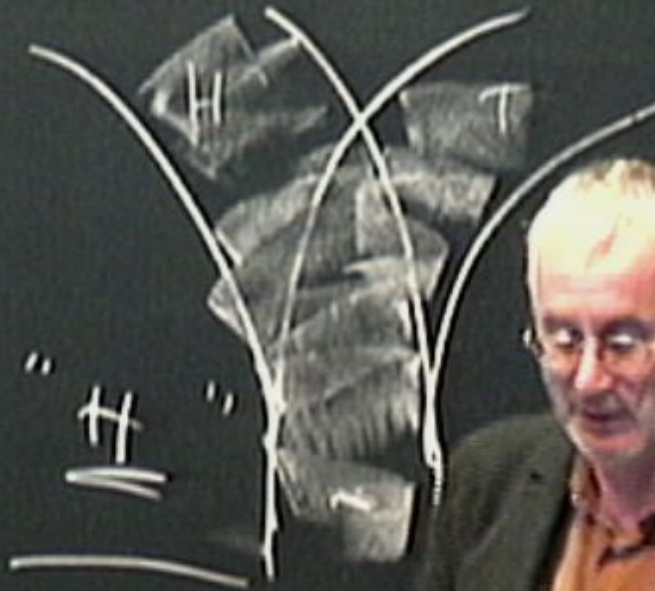
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