Title: Probabilities and Choices in Many Worlds

Date: Sep 23, 2007 10:00 AM

URL: http://pirsa.org/07090074

Abstract: Orthodox thinking about chance, choice and confirmation is a philosophical mess. Within the many-worlds metaphysics, where quantum chanciness engenders no uncertainty, these things come out at least as well, if not better.

Probabilities and Choices in Many Worlds

David Papineau

Perimeter Institute
23 Sept 2007

Introduction

Those who say Everett can't explain probability are employing a double standard.

Orthodoxy can't explain probability any better.

Indeed it explains it rather worse.

Subjective Uncertainty

David Albert says that the trouble is that Everettians lose the kind of uncertainty that involves ignorance about the future of chancy QM set-ups.

Some Everettians seem to agree with him—they seek to show how such ignorance is possible within Everettianism, and suggest that this will allow Everett to tell the orthodox stories about probability.

This is a bad move. The orthodox stories about probability have no special virtue.

Subjective and Objective Probs

Subjective probabilities = credences = degrees of belief. Defined in terms of dispositions to behaviour—the odds at which you'd think it fair to bet on some proposition.

Objective probabilities (= chances = propensities) are real non-mental quantities in the external physical world. (Mod squared amplitude/ long-term frequency/. . .)

The Principal Principle

The 'Principal Principle' says that you should match your credences to the objective probabilities. (You should bet with the objective odds.)

This of this as a description that fixes the reference of 'objective probability'. So it's analytic that objective probability is that quantity to which you should match your credence. But it's an empirical fact that mod squared amplitude/ long-term frequency/. . . is that quantity.

No Problem for Everett So Far

Everettians can agree about all this, and moreover can say that mod squared amplitudes are objective probabilities, because it is true that these are the numbers to which you should match your credences.

(Are Everettians entitled to use the word 'probability' here, in the absence of ignorance? Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .) The real issue is whether our overall theory is coherent, not how we express it.)

Elimination or Reduction?

Are Everettians entitled to use the word 'probability' here, in the absence of ignorance?

Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .)

The real issue is whether our overall theory is coherent, not how we express it.)

("Theory-Dependent Terms" Phil of Sci 1996.)

No Problem for Everett So Far

Everettians can agree about all this, and moreover can say that mod squared amplitudes are objective probabilities, because it is true that these are the numbers to which you should match your credences.

(Are Everettians entitled to use the word 'probability' here, in the absence of ignorance? Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .) The real issue is whether our overall theory is coherent, not how we express it.)

Elimination or Reduction?

Are Everettians entitled to use the word 'probability' here, in the absence of ignorance?

Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .)

The real issue is whether our overall theory is coherent, not how we express it.)

("Theory-Dependent Terms" Phil of Sci 1996.)

The Principal Principle

The 'Principal Principle' says that you should match your credences to the objective probabilities. (You should bet with the objective odds.)

This of this as a description that fixes the reference of 'objective probability'. So it's analytic that objective probability is that quantity to which you should match your credence. But it's an empirical fact that mod squared amplitude/ long-term frequency/. . . is that quantity.

No Problem for Everett So Far

Everettians can agree about all this, and moreover can say that mod squared amplitudes are objective probabilities, because it is true that these are the numbers to which you should match your credences.

(Are Everettians entitled to use the word 'probability' here, in the absence of ignorance? Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .) The real issue is whether our overall theory is coherent, not how we express it.)

Elimination or Reduction?

Are Everettians entitled to use the word 'probability' here, in the absence of ignorance?

Let's not get hung up about words. (Are we entitled to use the word 'electricity' given it's not a fluid? . .)

The real issue is whether our overall theory is coherent, not how we express it.)

("Theory-Dependent Terms" Phil of Sci 1996.)

Justifying the Constraint on Credences

Everettians say it's true that we should match our credences to the squared amplitudes. Doesn't this claim need to be justified?

But does orthodoxy do any better?

Orthodoxy can't say that if you bet with objective probability you will win (not even in the (finite) long run)—just that you'll probably win.

Frequency Theories

What about in the infinite long run? Well, it's not obvious that the frequency must match the objective probability even in the infinite long run.

Still, orthodoxy (but not Everett) has the option of reducing objective probability to long run frequency.

Two options. (1) Reduction to hypothetical infinite long run frequency. Horrible theory.

(2) Reduction to actual long-run frequency. Pretty nasty too.

Frequencies Don‘t Help

More importantly, where’s the justification, even if we accept a reduction of probability to frequency?

True, given this reduction, betting with the objective probabilities will make us sure to win ***IF*** we go on betting until the end of the universe.

But why does it follow that we should bet with the objective probabilities ***NOW***?

Everett at Least as Well Off

I (and many others—Putnam, Hacking, Mellor, early David Lewis, . . .) conclude that orthodoxy, just like Everett, should just take as primitive the Principal Principle with chances as squared amplitudes (and make the connection with frequencies via the non-reductive laws of large numbers).

So far, then, Everett is on a par with orthodoxy.

The Deutsch-Wallace and Zurek proofs aim to show that it's better off. They say the symmetries in Everettian QM mean that the Principal Principle w.r.t. the squared amplitudes follow from basic principles of rationality.

A Puzzle for Orthodoxy

I think there's another respect in which Everett is better off even if these proofs beg the question.

Even after we grant orthodoxy a primitive Principal Principle, there's still something very puzzling: the orthodox don't want max obj exp utility, they want to win in the one actual future—not the same thing.

Given that they want the latter result, why have they primitively committed themselves to performing an action that guarantees the former result?

The Committed Gambler

To bring out the point, compare the ordinary bettor with the committed gambler—someone who doesn't care about winning. You can't ask the committed gambler—why have you committed yourself to maximizing obj exp utility, given you want something else? The committed gambler doesn't want something else.

No Nagging Question

Similarly with Everettians. Everettians don't want something that might or might not happen, once they've maximized obj exp utility. So they don't face the nagging question that arises for orthodoxy—why have you primitively committed to doing X when what you're after is Y?

("Rational Decisions and The Many Minds Interpretation of Quantum Mechanics" Monist (1997); reprinted in The Roots of Reason.)

Statistical Inference

What about inferring probabilities from the evidence?

Neyman-Pearson is quite rightly no longer taken seriously.

Bayesian updating: on learning E, set new $Pr_n(H)$ equal to old $Pr_o(H/E)$ (= $Pr_o(H) \times Pr_o(E/H)/Pr_o(E)$).

Does this only make sense given orthodox metaphysics?

Well, tell me what the orthodox justification is . . .

The Evidential Proposition

A general worry for Everett: updating requires some E that you're initially unsure about and later come to believe to degree 1.

What's this E?

"This coin will have some successor that shows H." But that we were always sure about.

Statistical Inference

What about inferring probabilities from the evidence?

Neyman-Pearson is quite rightly no longer taken seriously.

Bayesian updating: on learning E, set new $Pr_n(H)$ equal to old $Pr_o(H/E)$ (= $Pr_o(H) \times Pr_o(E/H)/Pr_o(E)$).

Does this only make sense given orthodox metaphysics?

Well, tell me what the orthodox justification is . . .

The Evidential Proposition

A general worry for Everett: updating requires some E that you're initially unsure about and later come to believe to degree 1.

What's this E?

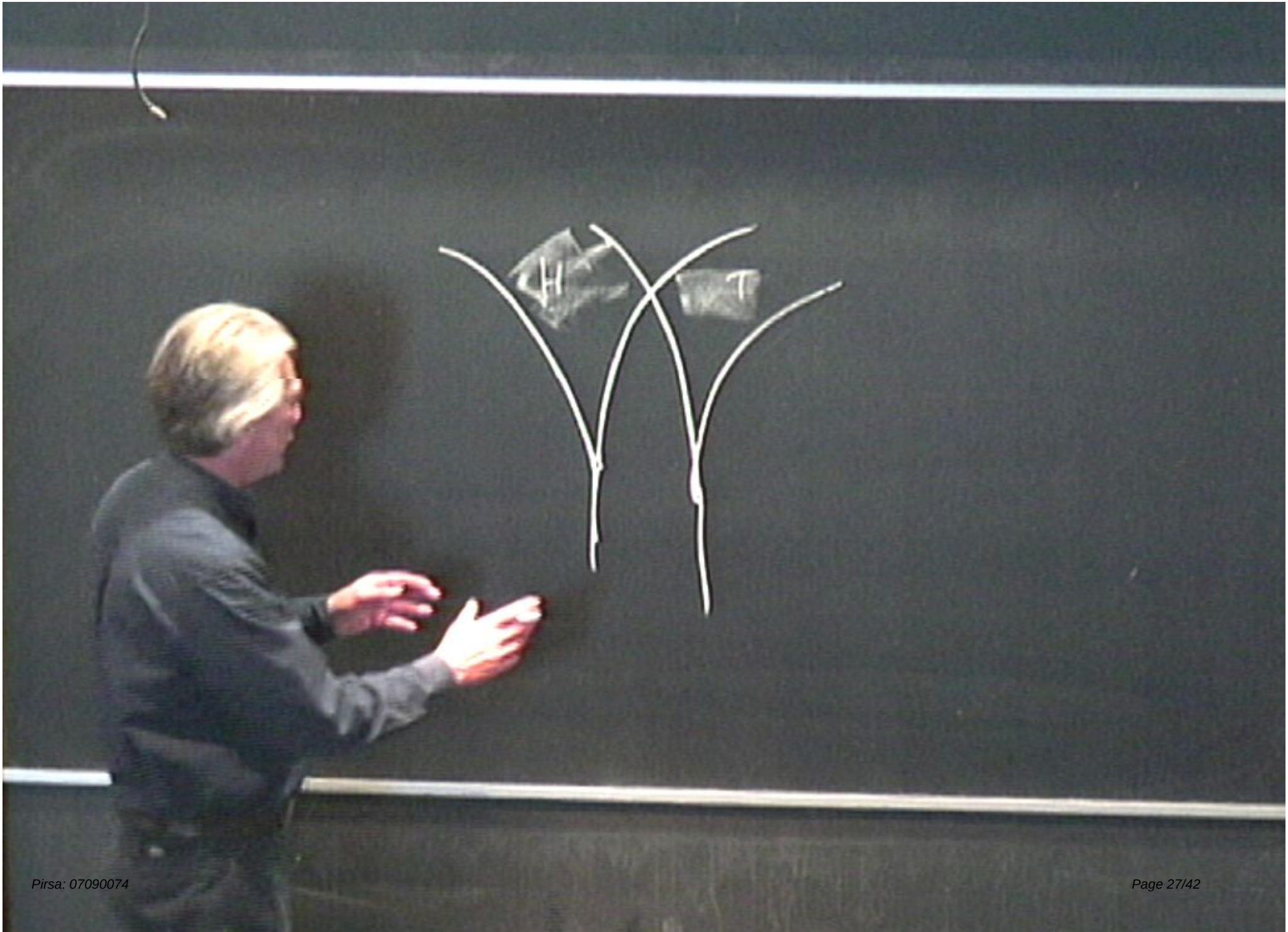
"This coin will have some successor that shows H." But that we were always sure about.

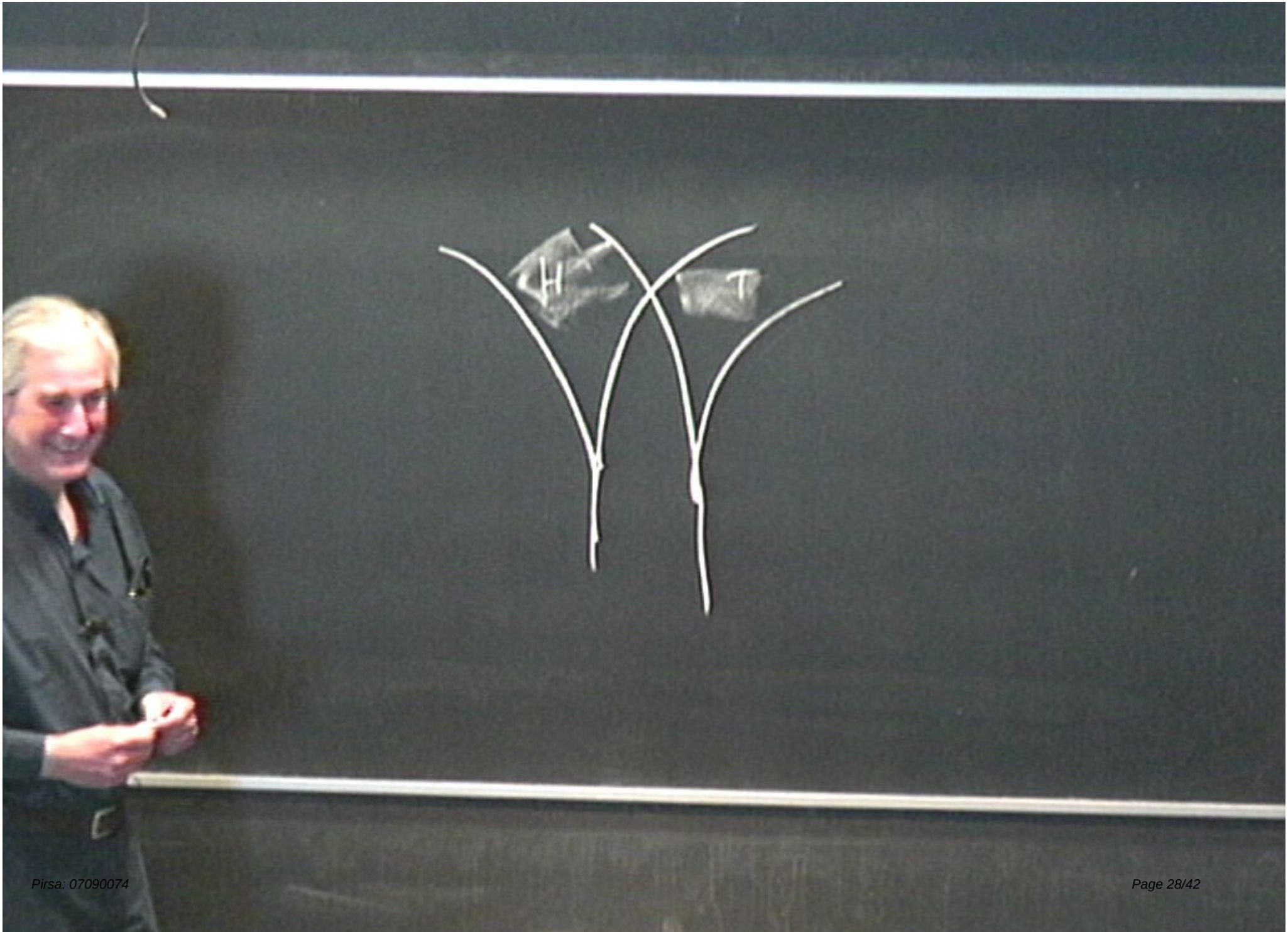
The Saunders-Wallace Version of Lewis

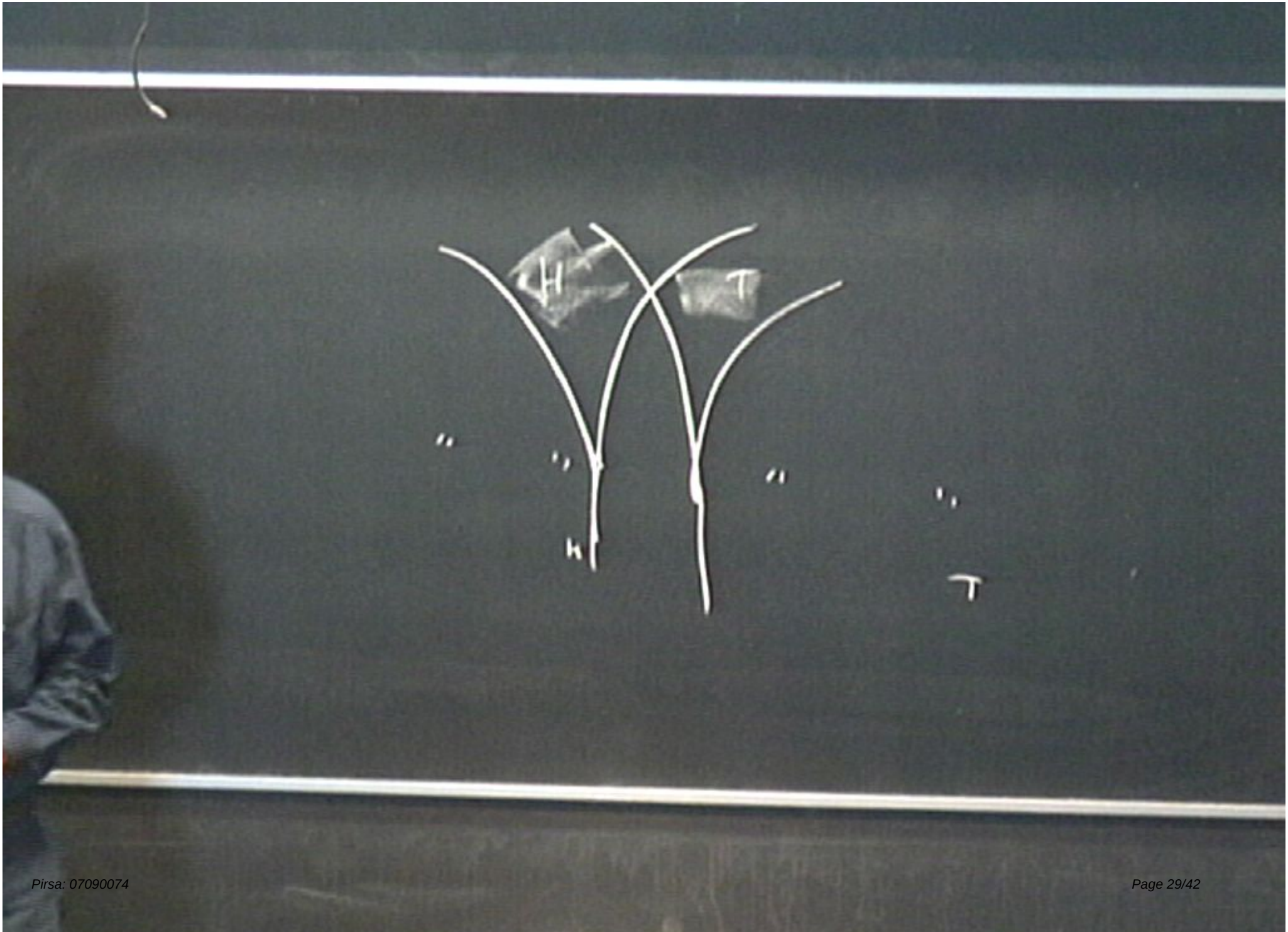
Saunders and Wallace have a suggestion: there's already two of us with our two coins—Heady and Taily—and we each say "My coin will be H" and neither if us knows if our own claim is true.

Well, that gives us genuine ignorance, and deals with conditionalization.

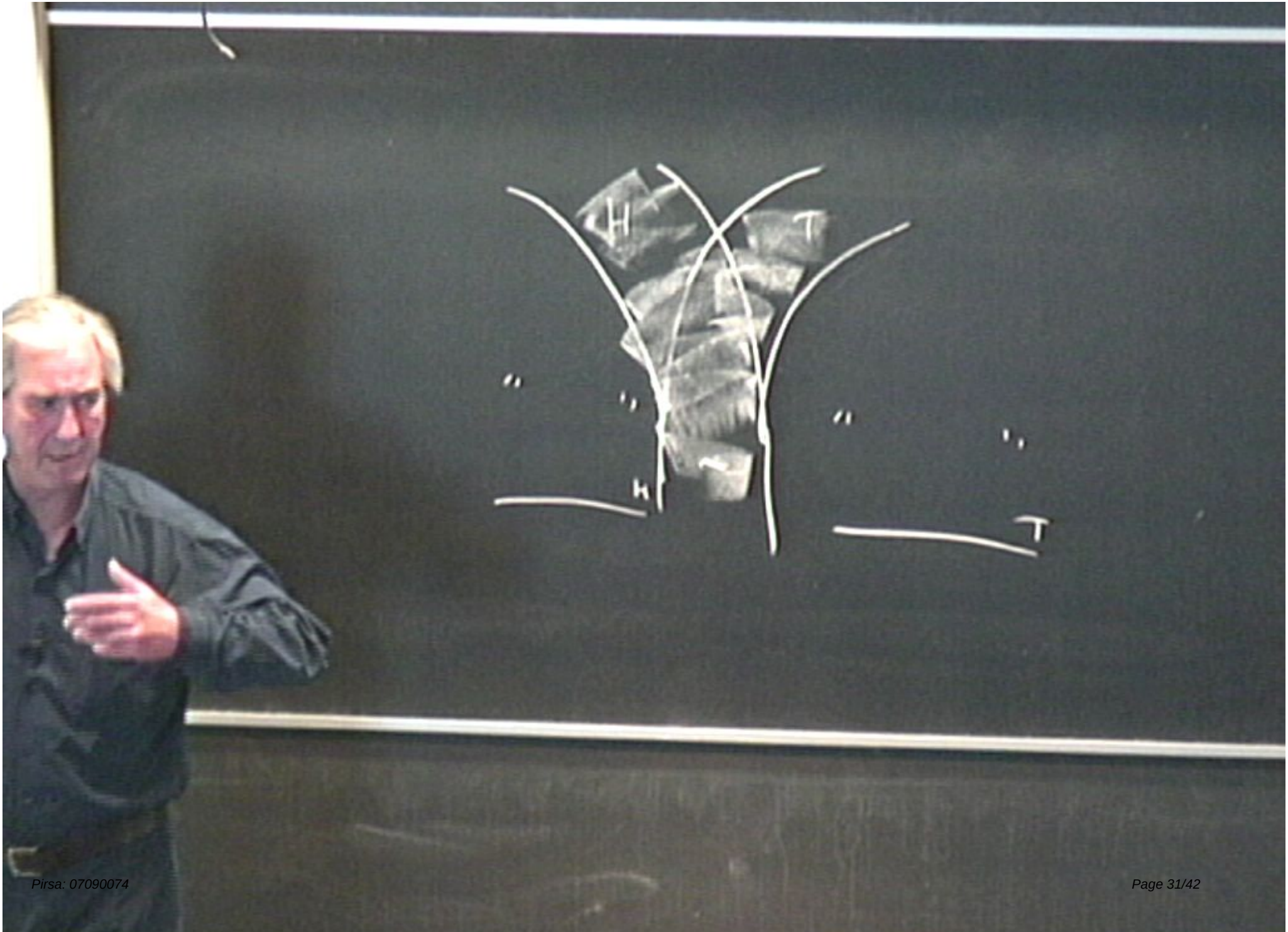
But having two utterances here seems unmotivated.

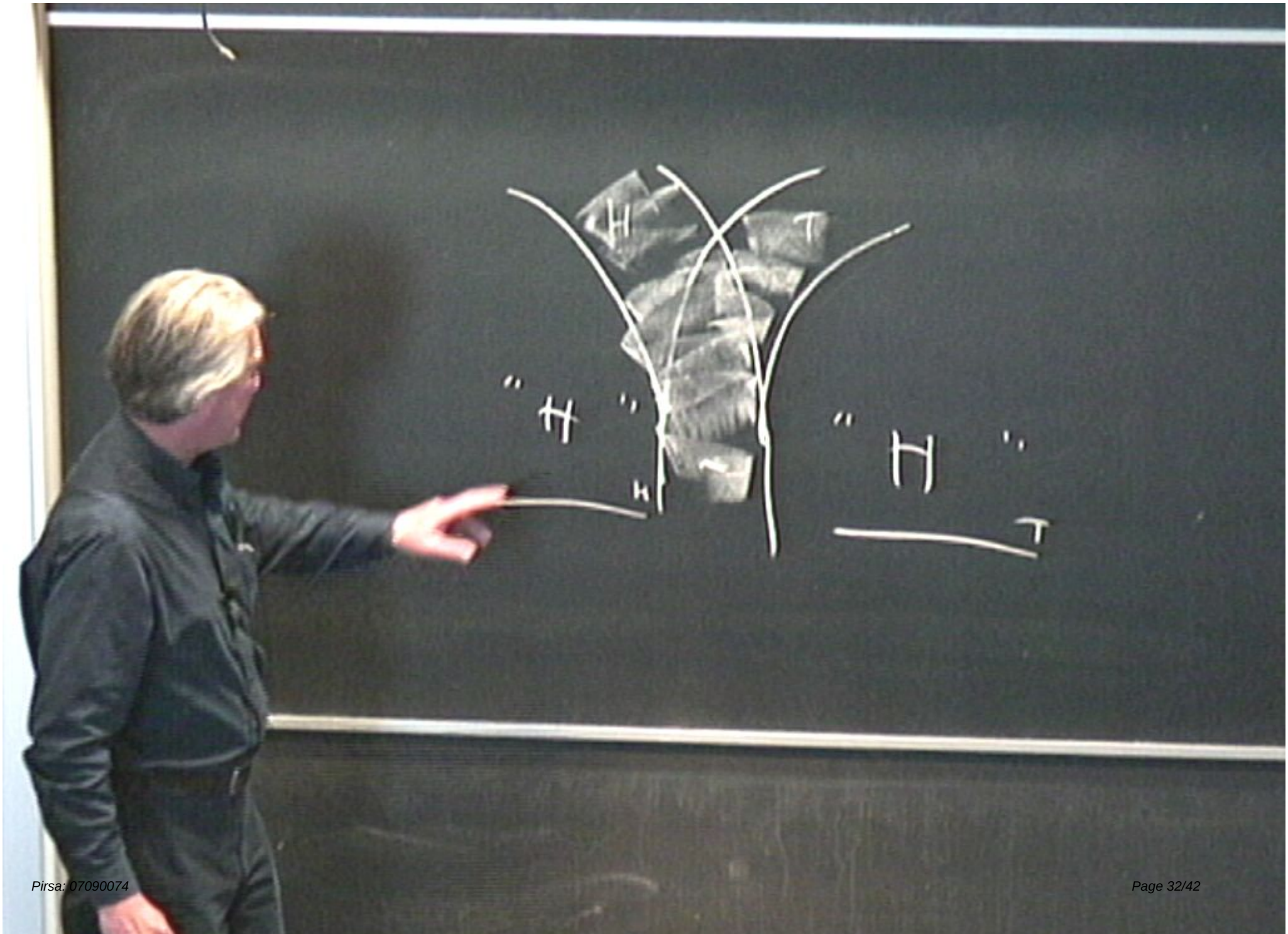



H
T


H
T
H
T


H
T
H
T


H
T
H
T


H
T
" H "
H
" H "
T

References to Persisting Objects

I think there's a genuine outstanding issue here—here Everett does lag behind orthodoxy. We Everettians need to explain a semantics for future claims about persisting objects that allows Es to go from p ($0<p<1$) to 1.

But we can have this without ignorance.

After all, this problem has been there from the start.

References to Persisting Objects

I think there's a genuine outstanding issue here—here Everett does lag behind orthodoxy. We Everettians need to explain a semantics for future claims about persisting objects that allows Es to go from p ($0<p<1$) to 1.

But we can have this without ignorance.

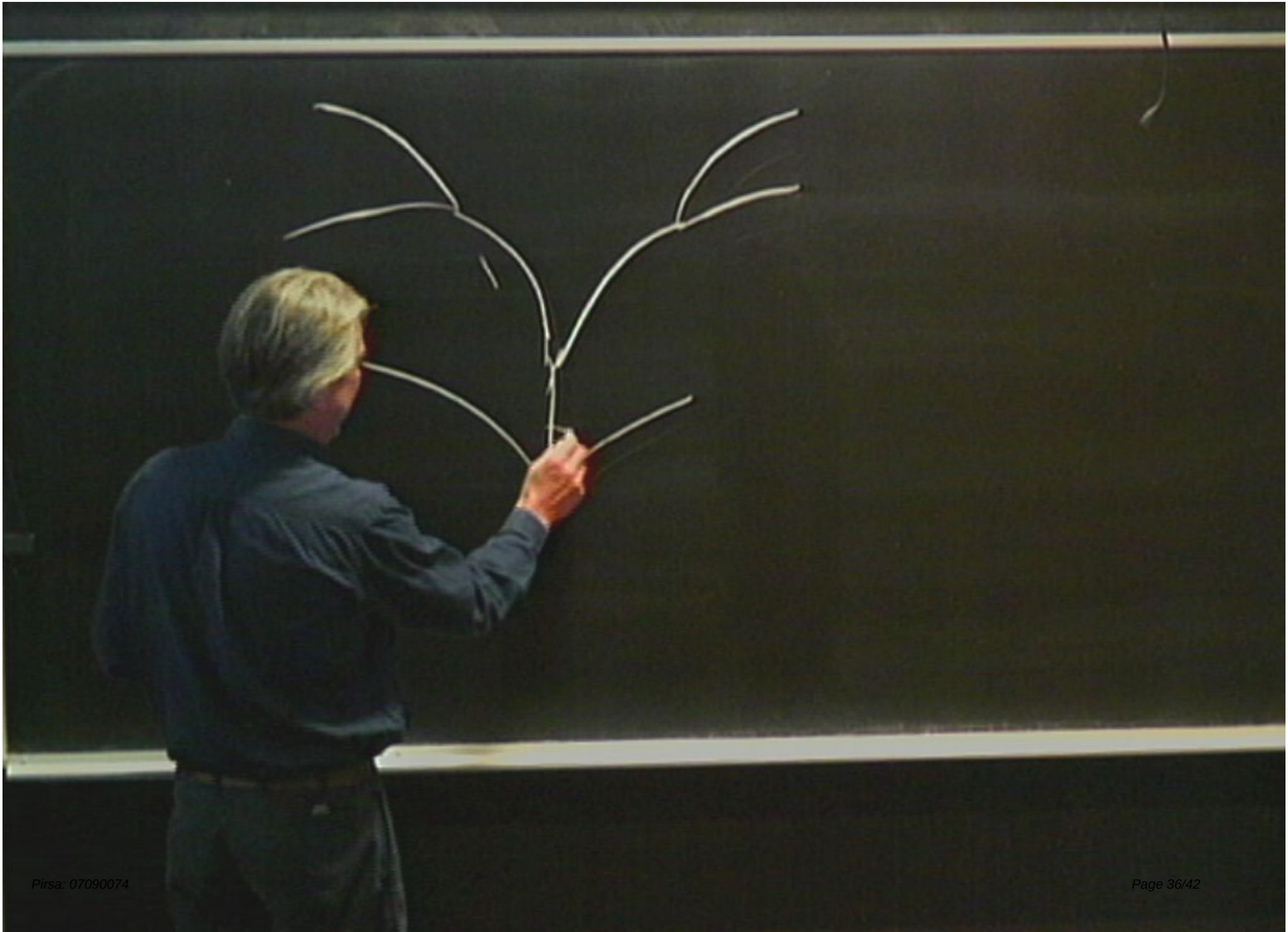
After all, this problem has been there from the start.

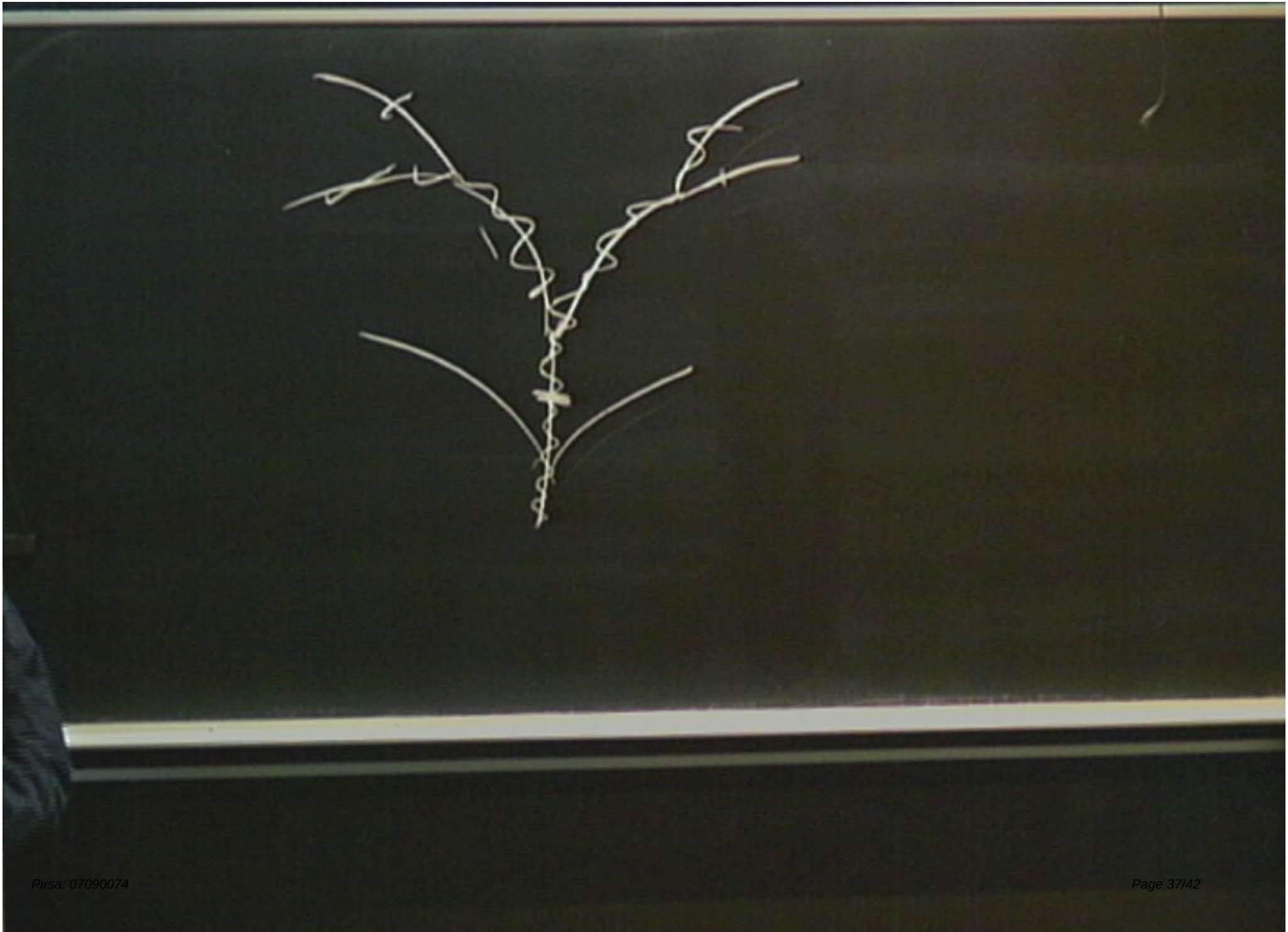
Plenty of Options

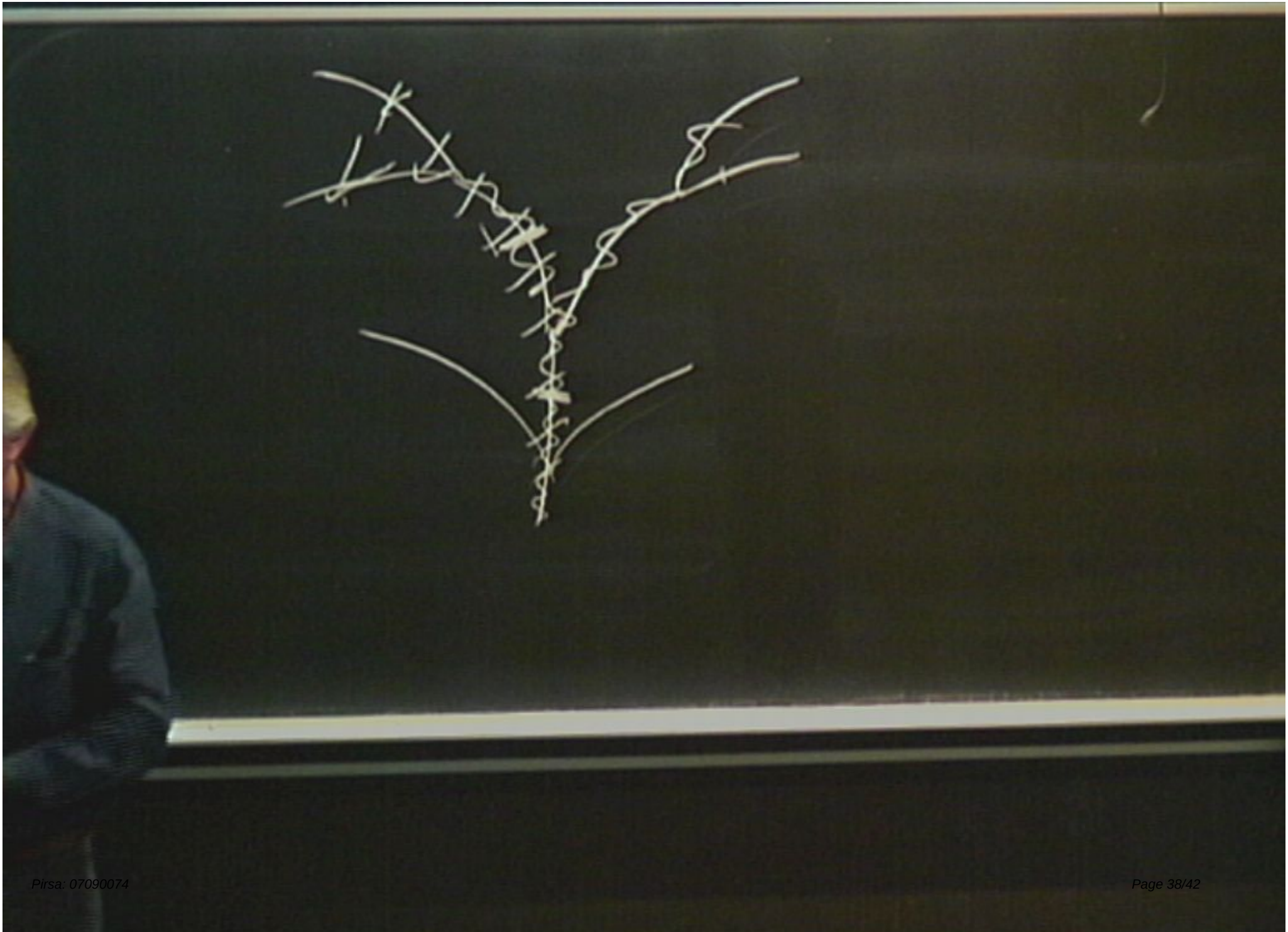
As it happens, there is a lot of existing philosophical work, in the Parfittian tradition about personal identity, about the semantics for future claims about persisting objects that splt..

Various options: Parfit himself
Lewis himself
Stage theory
Perry's lifetime theory. ("Can the Self Divide?" J Phil 1972.)

All of these, apart from Parfit himself, promise to allow that "The coin will be H" will be evaluated as between 0 and 1 before the spin, and as 1 (on the relevant branch) after.







Orthodoxy No Better Once More

Of course, the resulting semantics/metaphysics for persisting objects and probability will differ substantially from the orthodox story.

But (now we're on this) it's not as if orthodox semantics/metaphysics for probabilities has any great philosophical merit itself.

Orthodoxy No Better Once More

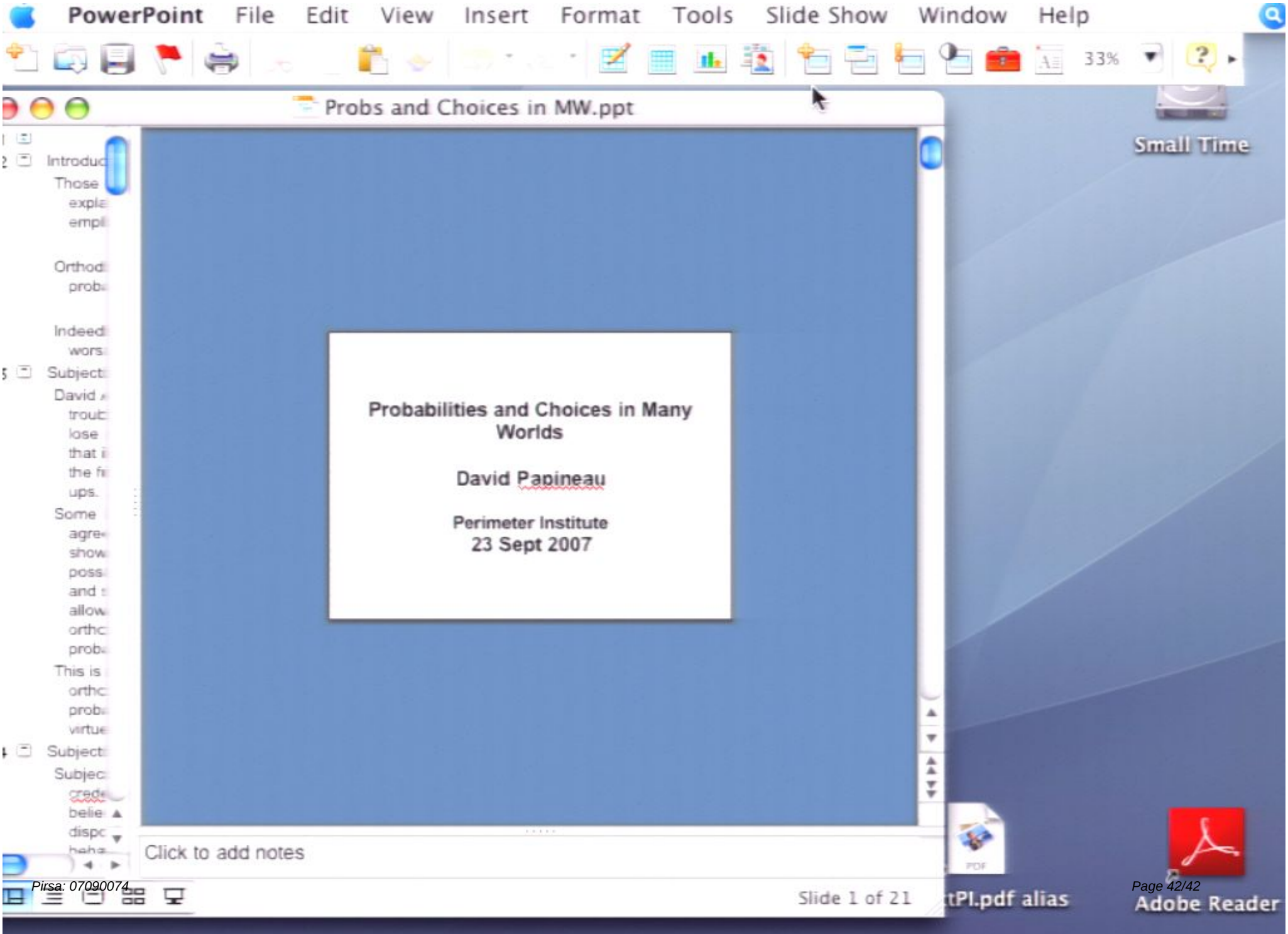
Of course, the resulting semantics/metaphysics for persisting objects and probability will differ substantially from the orthodox story.

But (now we're on this) it's not as if orthodox semantics/metaphysics for probabilities has any great philosophical merit itself.

The End

Everettians should understand probability in a way that detaches it from ignorance.

When this is done Everett handles probability at least as well as orthodoxy and probably better.


PowerPoint File Edit View Insert Format Tools Slide Show Window Help
33%
Probs and Choices in MW.ppt
Small Time
Probabilities and Choices in Many Worlds
David Papineau
Perimeter Institute
23 Sept 2007
Click to add notes
Slide 1 of 21
tPI.pdf alias
Adobe Reader