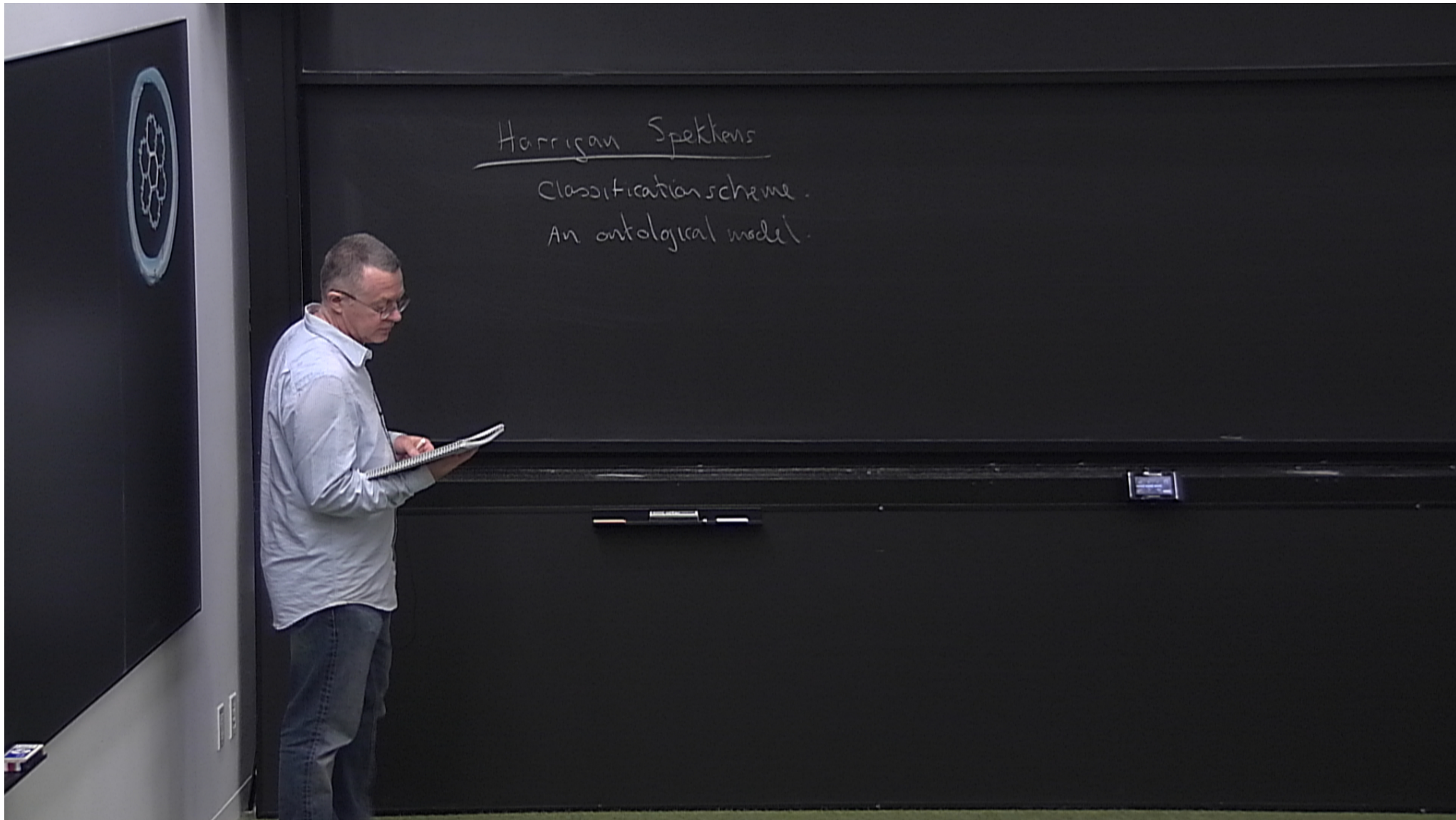


Title: PSI 2015/2016 Foundations of Quantum Mechanics - Lecture 5

Date: Jan 08, 2016 11:30 AM

URL: <http://pirsa.org/16010058>

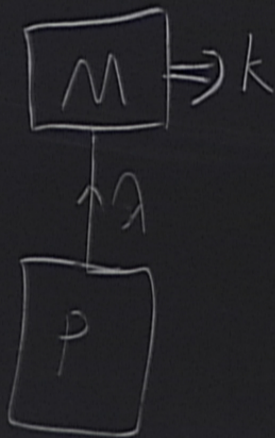
Abstract:



Harrigan Spekkens

Classification scheme.

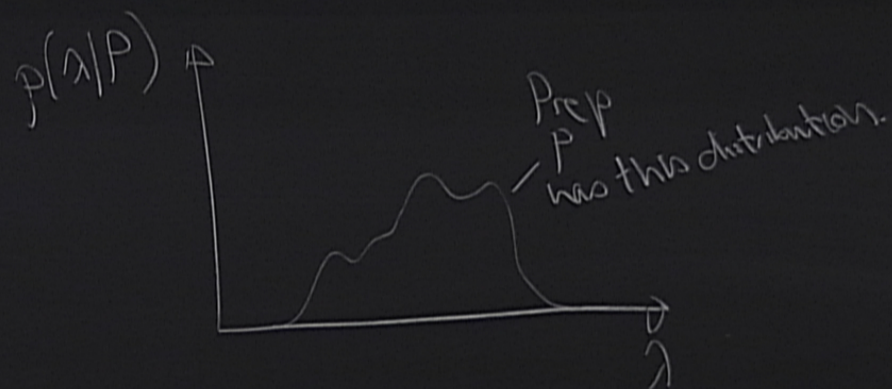
An ontological model.



λ is called the ontic state
(also hidden variables)

$\lambda \in \Lambda$ ont. state space.

ontic state
(in variables)
in state space.



P

$\lambda \in \Lambda$

ont. state space.

$P(k|K)$

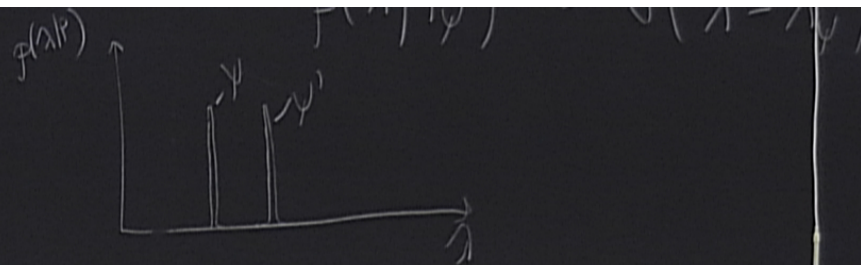
An ontological model for QT has

$$\text{tr}(\hat{E}_k^M \hat{P}_P) = \int d\lambda p(k|M,\lambda) p(\lambda|P)$$

Defn ψ -incomplete means not ψ -complete

Defn ψ -ontic An ont. model is ψ -ontic
if, for any pair of preparations P_ψ and P_ϕ
(of distinct pure states) we have

$$p(\lambda|P_\psi)p(\lambda|P_\phi) = 0 \quad \forall \lambda$$



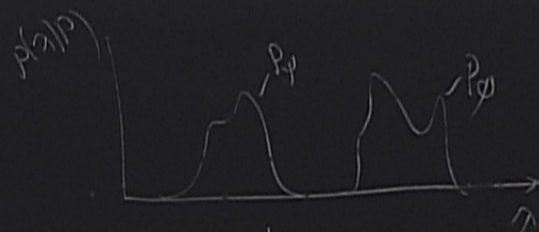
complete

model is ψ -ontic

partitions P_ψ and P_ϕ

we have

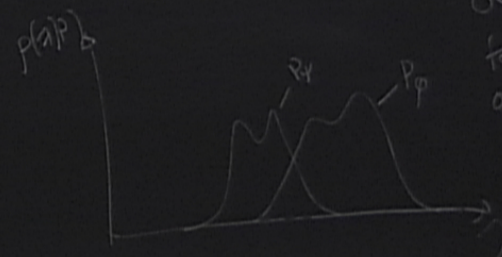
$$P_\psi = 0 \quad \text{for } \lambda \in \Lambda_\phi$$



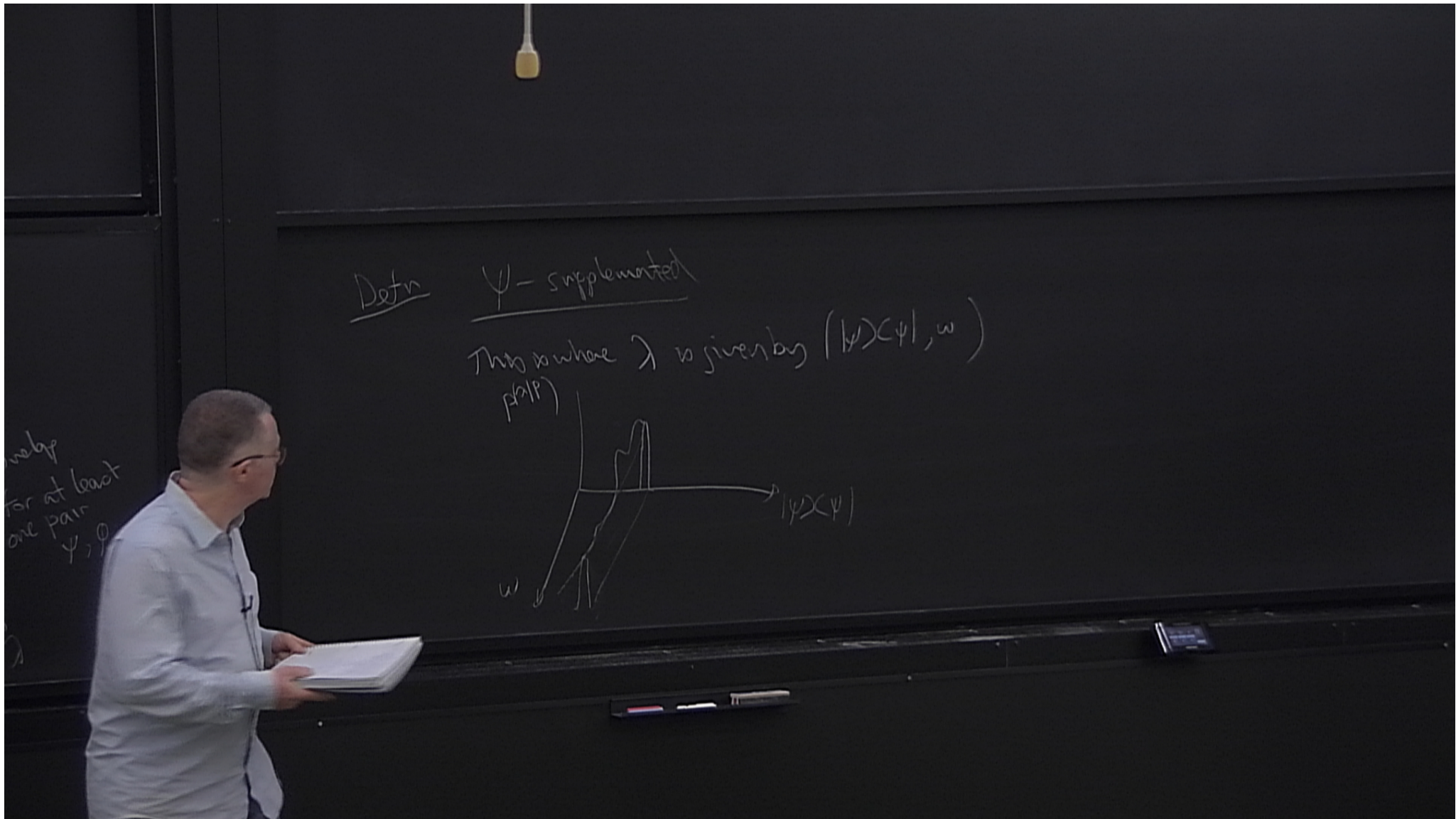
non-overlapping -

ψ -epistemic

means not ψ -ontic

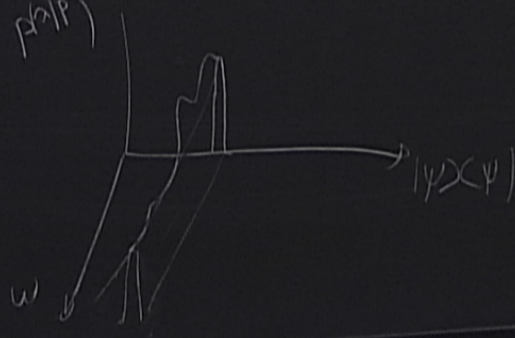


Overlap
for at least
one pair
 ψ, ϕ .



Defn ψ -supplemented

This is where λ is given by $(|\psi\rangle\langle\psi|, \omega)$
 $P(\lambda|P)$

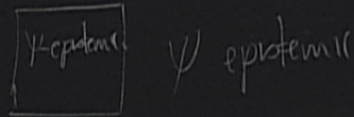
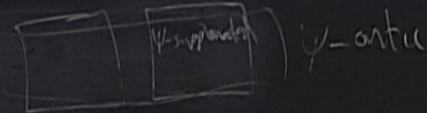


$$P(\lambda|P_\psi) = f(\omega) \delta(\hat{P} - \hat{P}_\psi)$$

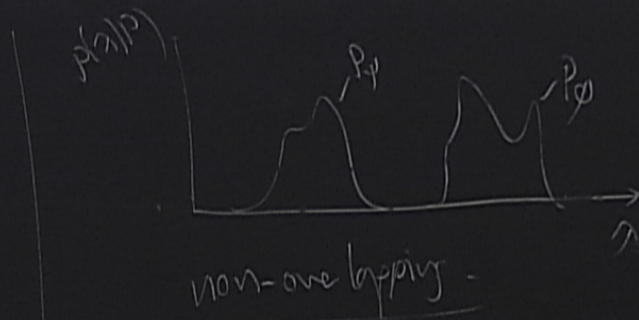
$$w \rightarrow |\psi\rangle\langle\psi|$$

Space of ant. models

ψ -complete ψ -incomplete

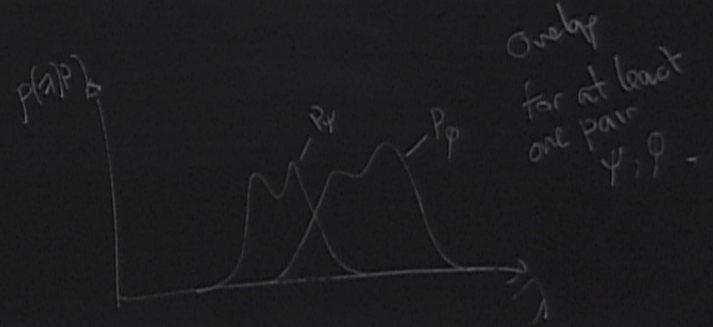


ψ -ontic
 and P_ψ and P_ϕ
 are
 ψ -epistemic
 means not ψ -ontic

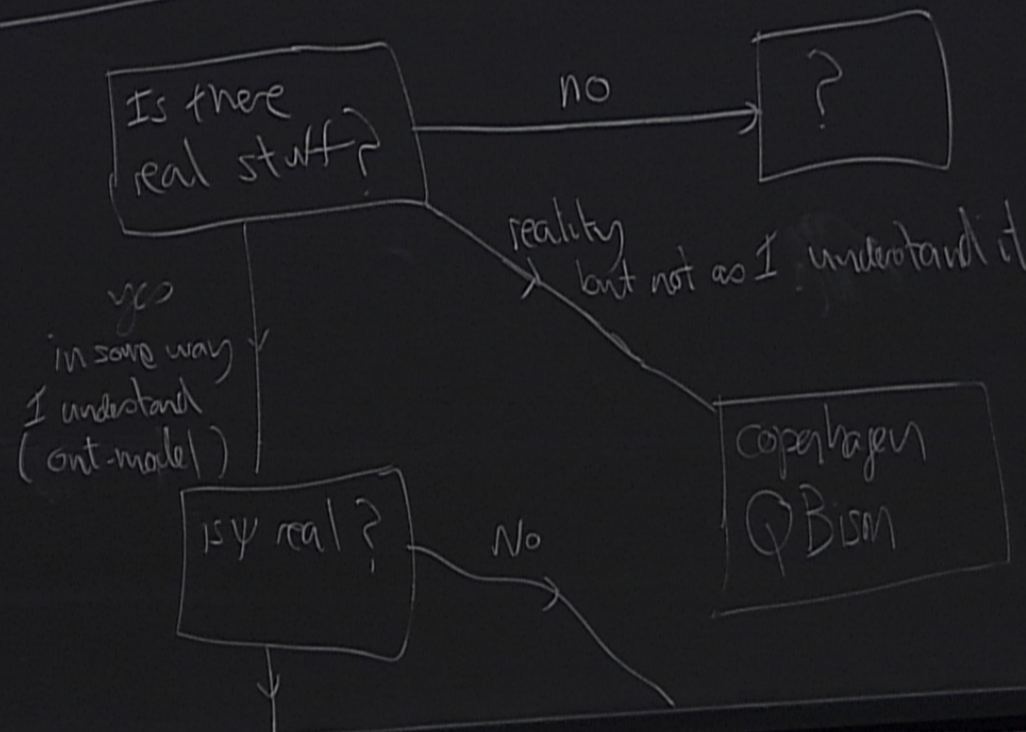


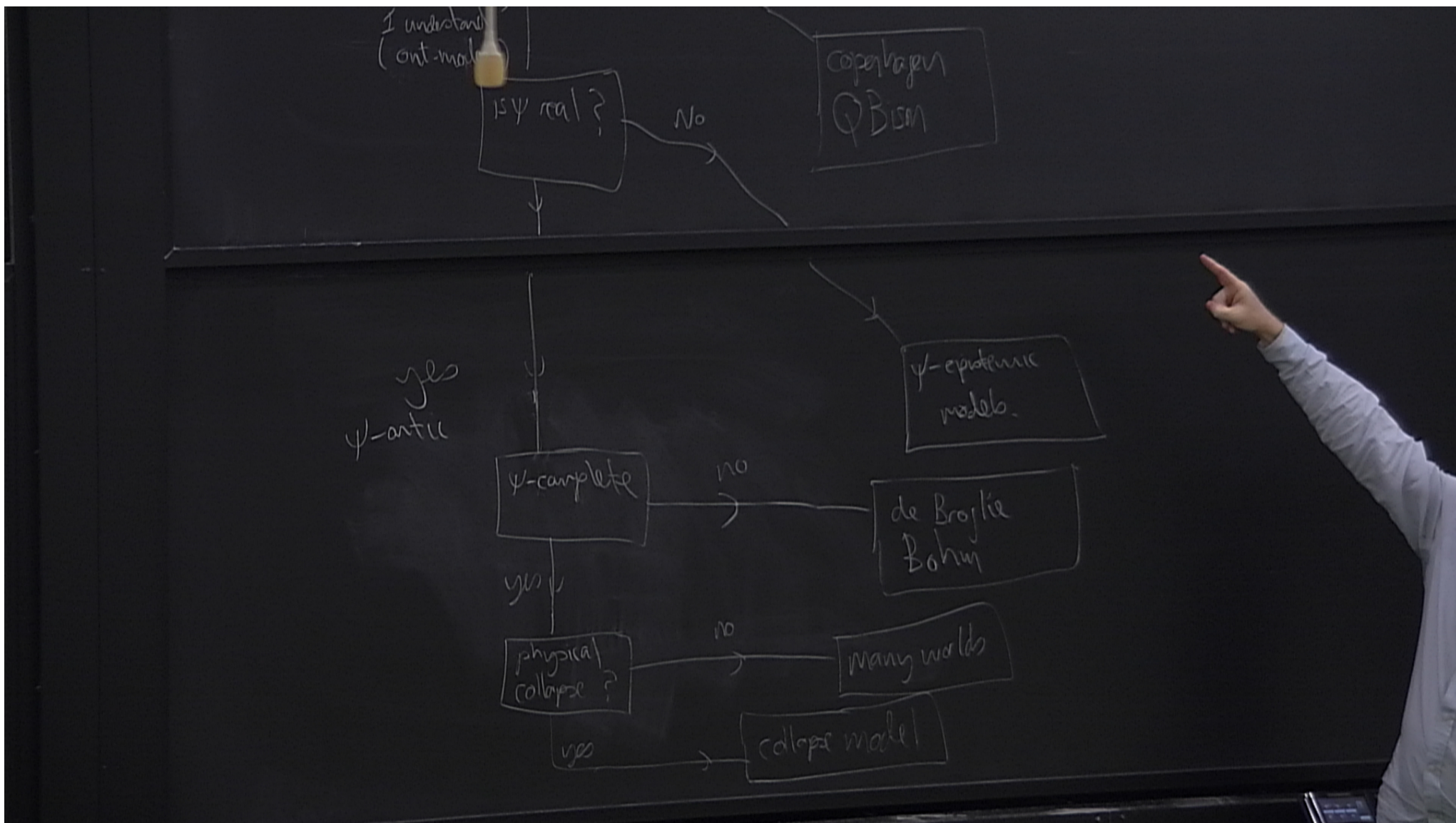
ψ -epistemic means not ψ -ontic

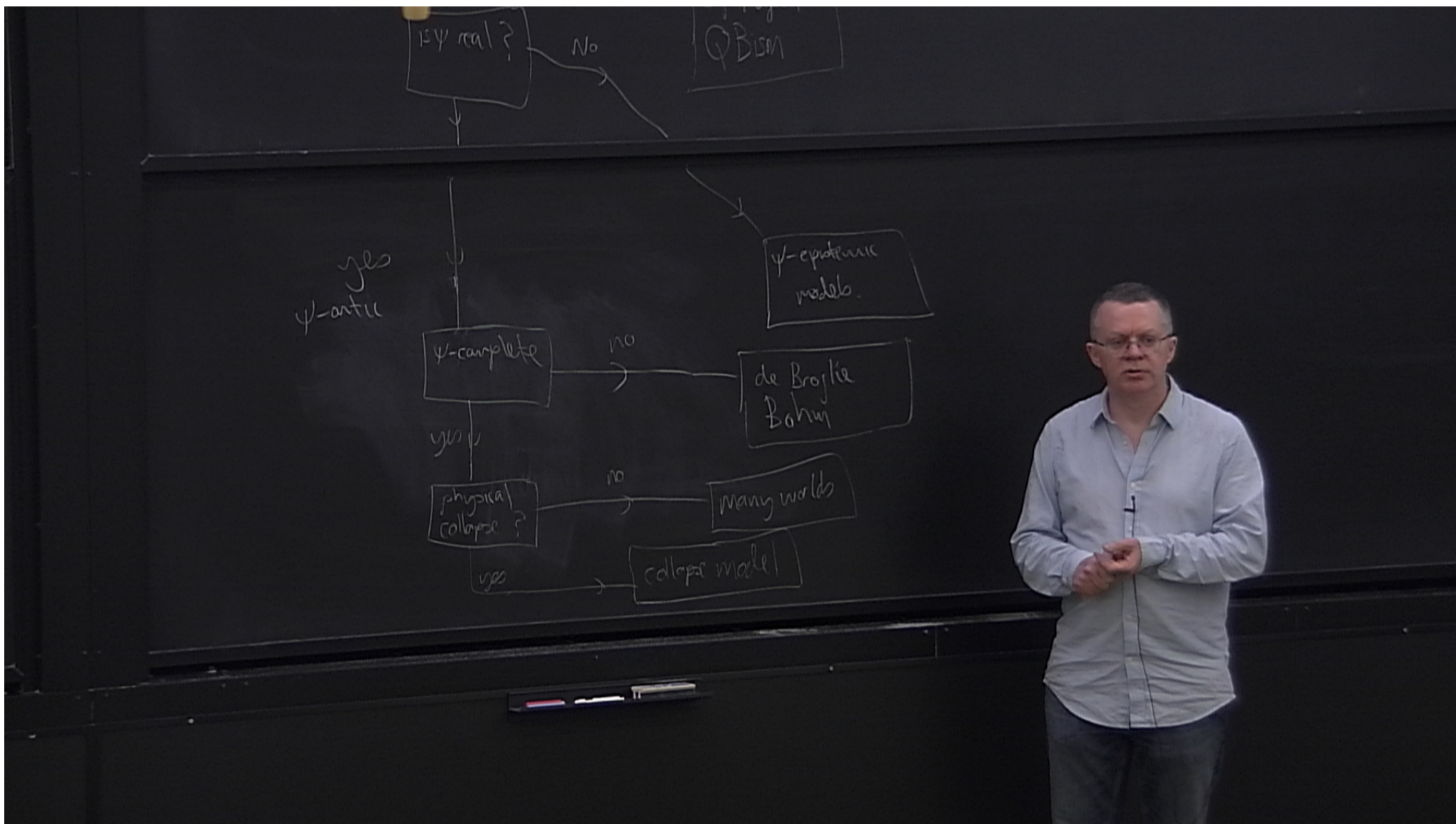
$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$$



Interpretations flow chart







Issues to watch out for

- ① How does the interpretation solve the reality problem?
- ② Is the interp. nonlocal (and how so)?
- ③ Is the interp. a good departure point for making progress in physics (QG in particular)?

