

Title: Causality in Qbism

Speakers: Jacques Pienaar

Collection: Indefinite Causal Structure

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Abstract: The approach to quantum theory known as QBism notoriously asserts that the quantum state is not even a partial representation of reality, but instead quantifies an agent's subjective degrees of belief about future experiences. Despite its counter-intuitive premise, QBists argue that this interpretation has the potential to illuminate and demystify certain aspects of quantum theory. In this talk I will discuss how 'causality' might be interpreted by a QBist, and whether doing so might help us understand the bizarre hypothetical phenomenon of 'indefinite causality'.

REALITY, QBism, CAUSALITY

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To learn QBism:

William James, "Pragmatism"

Von Baeyer, "QBism, the
future of QM"

D. Zahavi, "Phenomenology,
the basics"

B. Stacey, "QBism and
Assumption (Q)"

The Scientific process

(1) Separate irrelevant context
from "relevant variables"
 \Rightarrow Scientific obs.

(2) Factor out the observer

$$\begin{aligned} (\text{observation}) &= (\text{observ. frame}) \\ &+ (\text{object}) \end{aligned}$$

\Rightarrow "Scientific reality"

Theories have 2 jobs

1. Predictive/operational

2. Explanatory/descriptive

How do we get to the description of

(1) Perception is "raw material" "reality"
of science.

QM

Problem: QM is "contextual"

Problem: Wigner's friend

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QBism is

- Subjective probability
- Methodology to extracting description from QM.
- Rejection EPR criterion of reality

Bayesian Updating

$$\begin{array}{l} P_B(H) \quad P_B(H,E) \\ P_B(E) \end{array}$$

$$P_B(H|E) = \frac{P_B(H,E)}{P_B(E)}$$

B = Background
Context

"internal coherence"

→ E happens.

Bayesian Updating

$$P_{\{B,E\}}(H) = P_B(H|E)$$

"coherence in the world"

