The Empirical Predictions of Bohmian Mechanics and GRW Theories

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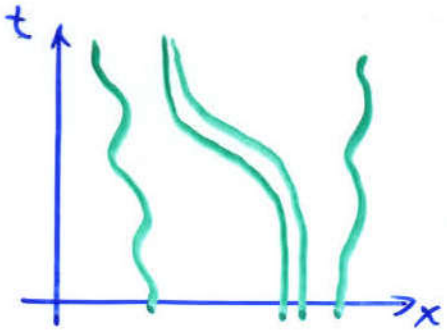
recent papers:

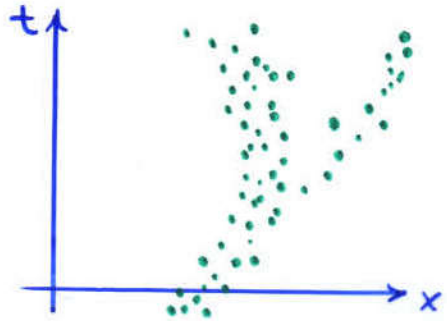
GoTuZa, arXiv: 0710.0885
BaGhi&al, J Phys A, arXiv: 0707.2940
AlGoTuZa, BJPS, arXiv: quant-ph/0603027

3 Quantum Theories Without Observers

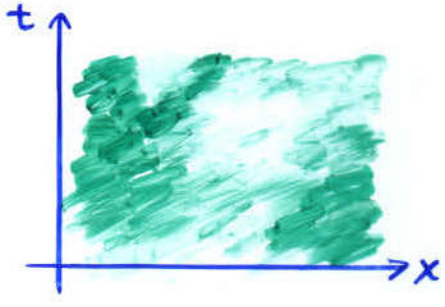
... with 3 choices of primitive ontology:



Bohmian mechanics (BM)
PO = particles,
represented by world lines



GRWf
PO = flashes,
represented by world points



GRWm
PO = continuous matter,
represented by density fct $m(x,t)$

Bohmian Mechanics

For a non-relativistic universe of N particles,

$\vec{Q}_k(t)$ = position $\in \mathbb{R}^3$ of particle $k \in \{1, \ldots, N\}$ at time t

$Q(t) = (\vec{Q}_1(t), \ldots, \vec{Q}_N(t))$ configuration $\in \mathbb{R}^{3N}$

$$\frac{dQ}{dt} = v(Q(t)) \qquad \text{law of motion}$$

with vector field v on $\mathbb{R}^{3N}$ given by

$$v_k = \frac{\hbar}{m_k} \operatorname{Im} \frac{\psi_t^* \nabla_k \psi_t}{\psi_t^* \psi_t}$$

involving a wave fct of the universe

$$\psi_t : \mathbb{R}^{3N} \longrightarrow \mathbb{C}^m$$

evolving according to the Schrödinger eq

$$i\hbar \frac{\partial \psi_t}{\partial t} = H \psi_t, \quad \text{e.g. } H = -\sum_{k=1}^{N} \frac{\hbar^2 \nabla_k^2}{2m_k} + V$$

The wave fct tells the matter how to move.