

Why Do We See a Classical World?

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Classical and Quantum World

Preliminary

- „Classical world“ like classical mechanics:
„realistic“ universe of facts, independent of observer, only registered by him
- „Quantum world“ like quantum mechanics:
„phenomenal“ world of potentialities.
Measurements change states, active role of observer, exclusion of local realism

Phenomenal World

- World only given as appearing to observer
- Classical realistic view: The world essentially appears as it is
- This is a strong (naïve?) assumption. Metzinger: transparent vs opaque models
- More cautious: World view taking into account phenomenal character of the world, GQT is a general structure in this sense
- But no “ontophobic” ban on ontology, construction of ontological scenarios (e.g classical, Bohm) admissible, even mandatory. Quantum like scenario: World of potentialities appearing, rather “worlding” (German: “weltend”)

Generalised Quantum Theory

- *System* (identification, isolation, subsystems)
- *State*
- *Observable* (Features open for investigation), global and local observables
- *Measurement* (Performing investigation belonging to observable A with result a , which has **factual** validity)

Moreover: After measurement of A with result a the system resides in an *eigenstate* z_a , in which a measurement of A yields the result a with certainty. For *complementary* observables A and B measurements are not interchangeable and for given measured value a of A there is in general no common eigenstate z_{ab} of A and B . (Measurement as preparation)

Human mind from inner perspective quantum like (“now” factual)

(N. Bohr, W. Pauli, C.G. Jung, W. James)

Classical World as Special Case

- Classical theory as a special case of GQT: All observables are compatible, order of measurements does not matter, Simultaneous attribution of values possible for all observables
- This is a strong additional assumption, remember introspection example. From the standpoint of GQT quantum like theories are more natural, “ontological parsimony”
- This justifies the question posed in the title of this talk: Starting from an quantum like scenario: What suggests a classical world?

Fundamentals of Human Existence

- Figure of “*oppositeness*”, *epistemic cut* cognition always by someone of something, man as the being saying “I”
- *Temporality* of existence: Movie rather than panorama, sliding window of privileged “now” ;related to this
- *Facticity*: World of Facts, “now” as focus of factuality
- *Causality* and *freedom* both stem from the same root: Temporality unfolded into past, present and future
- “*Agentivity*”: planning and worrying, factum = made
- *Emotionality*: important but not topical here

Evolutionary Epistemology

- Above mentioned fundamentals in part make classical impression
- Question: Are they a result of evolution?
- Human apparatus of cognition must not ruin survival chances, transparent models evolutionally favoured, but problems with evolutionary epistemology,
 - Assumption of a rigid classical realistic background world toward which evolution happens
 - Some degree of opaqueness of this model desirable
 - "Correct" world view not necessarily evolutionarily favoured

Reflexions of Existential Basics in GQT

1

- **Epistemic cut:** Central importance of measurements, observations, observables astride of epistemic cut
- **Temporality:** leaves a trace in the importance of the (temporal) order of measurements

Reflexions of Existential Basics in GQT 2

- **Facticity:** Measurement results factual, Boolean logic valid for them, Quantum world: State before measurement describes world of potentialities (of facts) or, better, of timeless extendedness instead of factual localization in a “now”. Measurement results as inroad of a classical world into the quantum world
- **Agentivity, causality:** They become apparent in planning and execution of experiments and in the existence of dynamical equations of motion

Digression: Language 1

- Not surprisingly, existential basics are deeply rooted and reflected in the human language:
- “Propositionality of language”, (E. Tugendhat), phrases claim or inquire about facts
- Temporality in sequentionality of utterings and in modes of actions, aspects and tenses of verbs

Digression: Language 2

- Depending on whether speaking man primarily conceives himself as acting or experiencing there in an inclination to
 - Distinction between past vs non past (not influentiable vs influentiable) or future vs non future (invisibillity vs visibility)
 - Nominativic vs ergativic sentence structure (sometimes split ergative for past)
 - See future as approaching from the front or from the rear (Aymara, Babylon)

Reasons for Classical Worldview 1

The world we live in largely (but not exclusively) looks classical. (Quantum reserve: Interior world) Why favouring of classical world?

- Categorical reasons, tendency to ontologize existentials
- Macroscopic validity of classical mechanics. But C.M. refers to an idealised world, restatement of question rather than answer. Decoherence theory: Quantum state becomes indistinguishable from mixture. But no complete description of measurement process in physical terms. In QT and even more so in GQT measurement is an act of cognition with a physical substrate but not identical with it

Reasons for Classical Worldview 2

- Striving for reliability and stability in relation to things and other beings necessary for survival (Bow and arrow, stock of consistent histories strengthens identity). Creation of “Islands of stability” (H. Primas: partially Boolean systems), suppression of inconsistencies
- Information is always factual (even about QT). Propositionality of language. Flooding with facts, which peremptorially demand attention and respect (death!). Facts can be stored as documents

Reasons for Classical Worldview 3

- In a world of surprises uncertainties tend to be explained by lack of knowledge. This suggests a classical background model, which can be distinguished from a quantum model only in exceptional cases
- Autonomy of Individuals paradigmatic for unpredictability, hidden agent model
- Stabilization of facts by continuous observation: quantum Zeno effect

Reserves for non Classical World View

- Formation of concepts (observables) as active, highly creative process suggests “quantum like” world view (“active information”)
- Measurement process as not merely physical process of cognition, measurement result as classical inroad.
- Internal world as quantum like reserve, in particular in systems concerning human mind and its products. Creative potential and possibly evolutionary advantage of simultaneous presence of possibility space (Quantum computer)
- Measurement and cognition by entanglement

Transcending the Categorical Framework

- Man as the being trying to transcend itself and even its categorial framework (“Existence”!)
- Partial emancipation: Unfolding of the mere “now” into past, presence and future, freedom as planning and worrying creature, emergence of contrafacticity, investigation of possibility space, discovery of quantum theory, aesthetic sense
- Mysticism and classical mechanistic reductionism as opposite extremist attempts to escape egocentricity and epistemic cut.