Indian psychology to the rescue: Why quantum physics makes perfect sense after all

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"It is often stated that of all the theories proposed in this century, the silliest is quantum theory. ...
The only thing quantum theory has going for it is that it is unquestionably correct."

— Michio Kaku, *Hyperspace*, OUP, 1995

Why silly?

Correct in what sense?

“Silly” because (for one thing) the theory does not conform to the interpretative framework that has reigned supreme for at least twenty-five centuries.

For that long, theorists have tried to explain the world from the bottom up, on the basis of some fundamental multiplicity —ultimate constituents or an intrinsically differentiated space or spacetime.

Accordingly, they have used explanatory concepts that network reality across space and time, such as composition, interaction, and causal evolution.

The bottom-up framework no longer works, for quantum physics does not license an absolute and unlimited objectification of our distinctions.

If we conceptually partition the physical world into smaller and smaller regions of space or intervals of time, we reach a point at which our distinctions between regions or intervals no longer correspond to anything in the physical world.

And if we go on dividing material objects, their parts lose their distinguishability and become identical in the strict sense of numerical identity.

- Quantum mechanics explained, *International Journal of Quantum Information* 7, 435–458 (2009)
- A fuzzy world, *The Nature Description in Quantum Field Theory*, edited by I. Licata & A. Sakaji (Springer, 2009)
- Objective probability and quantum fuzziness, *Foundations of Physics* 39 (2), 137–155 (2009)
- The Pondicherry interpretation of quantum mechanics: An overview, *PRAMANA—Journal of Physics* 64, 171–185 (2005)
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- The world according to quantum mechanics, *Foundations of Physics* 32, 217–254 (2002)
- Reflections on the spatiotemporal aspects of the quantum world, *Modern Physics Letters A* 17, 1107–1122 (2002)
- Making sense of a world of clicks, *Foundations of Physics* 32, 1295–1311 (2002)
- Why the laws of physics are just so, *Foundations of Physics* 32, 1313–1324 (2002)
- What quantum mechanics is trying to tell us, *American Journal of Physics* 68, 728–745 (2000)

There are now numerous “no-go theorems” to the effect that explanations networking reality across space and time also don’t work anymore.

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- Kochen, S. and Specker, E.P. (1967), The problem of hidden variables in quantum mechanics, *Journal of Mathematics and Mechanics* 17, 59–87.
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Quantum physics is correct in that no experiment or observation has ever contradicted the probabilities it predicts.

More "silliness":

- Quantum physics is (i) the fundamental framework of theoretical physics and (ii) a probability calculus. An apparent oxymoron!
- Measurable quantities have values only if, and only to the extent that, they are actually measured. To *be* is to be *measured*!

Peres, A. (1978), Unperformed experiments have no results, *American Journal of Physics* 46, 745–747.

As long as we consider the spatiotemporal differentiation of the physical world complete, as the vast majority of physicists do, the positive implications of these perplexing matters will remain lost on us.

How could the vast majority be wrong?

In fact, they are not even wrong, for the world's *incomplete* spatiotemporal differentiation is implied by the manner in which quantum physics assigns probabilities, which is testable, while its *complete* spatiotemporal differentiation is an assumption about what happens or is the case between measurements, and such an assumption is neither verifiable nor falsifiable.

Science operates within an interpretative framework that *formulates questions* and *interprets answers*.

The obsolete bottom-up framework asked questions about composition and the causal networking of reality across space and time.

If physical reality is modelled from the top down, an entirely different set of questions arises.

The top-down framework is traditionally associated with the concept of manifestation: there is an Ultimate Reality, and the primary question is, how does this manifest itself? More specifically, how does it take on the aspect of a multitude of material objects?

Pursuing this question, we arrive at a unified conception of matter and space that is elegant and economical by any standard:

By entering into spatial relations with itself, UR creates both matter and space, for space is the totality of existing spatial relations, while matter is the apparent multitude of corresponding relata — "apparent" because the relations are self-relations.

At the same time we understand why measurable quantities have values only if, and only to the extent that, they are actually measured, and why the fundamental framework of theoretical physics is a probability calculus:

Manifestation is a transition from numerical identity to effective multiplicity, from indefiniteness to definiteness, from indistinguishableness to distinguishability.

Quantum mechanics affords us a glimpse at this transition via formless and numerically identical particles, non-visualizable atoms, and partly visualizable molecules.

But the indefinite and indistinguishable cannot be described — nor even *defined* — without the help of probability distributions over events that are definite and distinguishable. What is instrumental in the world's manifestation — the so-called microworld — can only be described in terms of the finished product, the so-called macroworld.

THE WORLD ACCORDING TO QUANTUM MECHANICS

Why the Laws of Physics Make Perfect Sense After All

An invaluable supplement to standard textbooks on quantum mechanics, this unique introduction to the general theoretical framework of contemporary physics focuses on conceptual, epistemological, and ontological issues. The theory is developed by pursuing the question: what does it take to have material objects that neither collapse nor explode as soon as they are formed? The stability of matter thus emerges as the chief reason why the laws of physics have the particular form that they do.

The first of the book's three parts familiarizes the reader with the basics through a brief historical survey and by following Feynman's route to the Schrödinger equation. The necessary mathematics, including the special theory of relativity, is introduced along the way, to the point that all relevant theoretical concepts can be adequately grasped. Part II takes a closer look. As the theory takes shape, it is applied to various experimental arrangements. Several of these are central to the discussion in the final part, which aims at making epistemological and ontological sense of the theory. Pivotal to this task is an understanding of the special status that quantum mechanics attributes to measurements — without dragging in "the consciousness of the observer." Key to this understanding is a rigorous definition of "macroscopic" which, while rarely even attempted, is provided in this book.

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Wanted: a suitable metaphysical embedding for “the mother of all sciences,” physics.

An excellent candidate: the quintessential system of Indian psychophilosophy, which describes Ultimate Reality (*brahman*) as *sat*-*chit*(-*tapas*)-*ānanda*.

According to this system, *Brahman* relates to the world as

- the substance, *sat*, that constitutes it,
- the consciousness, *chit*, that contains it,
- the force, *tapas*, that determines it,
- (subjectively speaking) an infinite delight or bliss, *ānanda*,
- (objectively speaking) an infinite quality or value that expresses and experiences itself in it.

Within a bottom-up framework of thought, what ultimately exists is a multitude (e.g., particles, spacetime points) without intrinsic quality or value. In many traditions this is fittingly referred to as “dust.” In such a framework it is hardly possible to give a non-reductive account of quality and value.

Within the suggested top-down framework, quality and value are the very heart of reality.

Within a bottom-up framework of thought, it is hardly possible to give a non-reductive account of consciousness.

Within the suggested top-down framework, the substance that constitutes the world and the consciousness that contains it are one. The world exists both *by* it (qua substance) and *for* it (qua consciousness).

However, physics (*per se*) is exclusively concerned with *Brahman*'s aspects of substance and force; it has nothing to say on the subject of consciousness.

There is a notion, which has gained traction among certain audiences, that quantum physics presupposes "observers" and therefore consciousness.

This notion is a gratuitous solution to a pseudo-problem — one of a slew of pseudo-problems that arise if the spatiotemporal differentiation of the physical world is considered complete.

Physicists like to think of themselves as potentially omni-scient, in principle capable of knowing the furniture of the universe and the laws by which this is governed.

So what do they do when faced with a fundamental theory? Since “fundamental” lacks a comparative, they cannot explain it in terms of a “more fundamental” theory. The one remaining possibility is to reify the mathematical symbols and/or equations, to pretend that these represent physical entities or describe physical processes.

During the reign of classical physics, the reification of a mathematical formalism has met with some measure of success, but quantum physics has made it abundantly clear that this has never been more than a sleight of hand.

Because the positions of macroscopic objects are predictably correlated — their correlations evince no statistical variations — causal concepts remain applicable to the world of macroscopic experience.

On the other hand, since the "microworld" — which encompasses the transition from the One to the Many — can only be described in terms of probabilities, it is off limits to the causality that networks reality across space and time.

The only concept of (efficient) causality that still works in this domain is that implicit in the concept of manifestation: the causality of an infinite force that acts out of the timeless and spaceless status of *Brahman*.

If the force at work in the world is an infinite force, we need not worry about the impossibility, implied by quantum physics, of finding a physical mechanism or process that explains “how Nature does it.” It would be self-contradictory to demand such an explanation for the working of an infinite force.

But if this works under self-imposed constraints, as it obviously does, we may ask: why, and why these particular constraints? Where efficient causation fails, teleological explanation remains pertinent.

So why do the laws of physics have the particular form that they do?

As it turns out, all of the empirically well-tested physical laws — the so-called Standard Model of particle physics plus the general theory of relativity — are implied by the existence of objects that satisfy the following conditions:

- they are stable (they neither explode nor collapse as soon as they are created),
- they "occupy" space (they have spatial extent),
- they are "made of" finite numbers of objects that do not "occupy" space.

The need for sufficiently stable objects that "occupy" space is easy enough to accept. But why are these objects "made of" finite numbers of objects that lack spatial extent?

In the Vedantic/Aurobindonian scheme of things, the process of creation/ manifestation may usefully be divided into three stages:

- the first encompasses the development of infinite quality/delight (*ānanda*) into expressive ideas,
- the second is concerned with the translation of expressive ideas into executive forces,
- the third consists in the creation, by the executive forces, of revealing forms.

Each transition — from infinite quality to expressive idea, from expressive idea to executive force, and from executive force to revealing form — brings with it a diminution of the powers of consciousness.

In the original consciousness itself, Sri Aurobindo tells us, two poises of relation between self and world can be distinguished: a comprehending poise (*vijñana*) and an apprehending poise (*prajñana*).

In the former (*vijñana*), the self is where its objects are, coextensive with the content of its consciousness. No distance separates the perceiver and the perceived.

In the latter (*prajñana*), the self locates itself multiply within the content of its consciousness. There is a distance between the perceiver and the perceived, and objects are seen from outside, presenting their surfaces. It is here, in this poise, that space with its three dimensions — viewer–centred depth and lateral extent — becomes a reality.

An aside: it is also here — or by means of the psychological process that leads to this poise — that *Brahman* enters into spatial relations with itself. (When I said that *Brahman* creates both matter and space *by entering into spatial relations with itself*, you may have wondered how.)

The transition from the comprehending to the apprehending poise is effected by a multiple concentration of consciousness. This leaves the resulting individuals conscious of their mutual and numerical identity.

A first diminution of consciousness arises if the multiple concentration of consciousness becomes exclusive.

If the multiple concentration of consciousness becomes exclusive, the individual selves lose sight

- of their mutual and numerical identity,
- of the original unity of consciousness and substance,
- of the infinite quality/delight at the heart of existence.

(The consciousness of unity goes hand in hand with the consciousness of *ānanda*.)

To the extent that the individual remains capable of expressing and/or experiencing this quality/delight, it is by an influx of intuition or inspiration of whose origin it is unaware.

The multiple exclusive concentration of consciousness can be carried further,

beyond the point at which the translation of expressive ideas into executive forces also takes place subliminally,

to the point at which even the executive force at work in the individual falls dormant.

And since this is instrumental in creating and maintaining individual forms, what remains is a multitude of formless individuals — the apparent multitude of relata we call “particles” or (collectively) “matter”. The stage for the adventure of evolution has been set.

This, then, is the reason why objects that “occupy” space are “made of” finite numbers of objects that lack spatial extent.

Thank you!

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