A Novel Framework for Interpreting Quantum Mechanics

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Inspired by the mathematical facts that *a*) small objects are not just smaller than larger objects of the same shape but also more 2-dimensional (as indicated by the ratio of surface area to volume), and *b*) in Euclidean Space the representation of an object in a higher-dimensional space takes on in the manner of an actualizable potentiality all possible manifestations that depend on the dimension the object intrinsically lacks, the framework presented here derives the path integral for the simplest possible case, a single free particle, from 5 axioms. This framework, called the Dimensional Theory (DT) [1][2], postulates that there exists a lower limit in which spacetime reduces to a 2+1 version, which for definiteness will be called *areatime*. Objects in this limit are subject to a distinct metric interval and consequently a distinct proper time. The distinctness of their proper times from the proper time of spacetime objects implies that areatime objects do not 'age' in spacetime, and consequently do not have spacetime histories in their proper frames. Such objects are postulated to manifest themselves in terms of all possible histories, while the passage of time for such objects to the passage of time for spacetime observers is related via a certain symmetry that can be mathematically transformed to the standard quantum phase $e^{i\frac{S}{\hbar}}$. Associating each history with a path and each path with the phase factor finally leads to the path integral.

The dimensional theory supplies a geometric underpinning for the Copenhagen interpretation because it provides clearer, geometrically based answers to issues which the under that interpretation remain obscure. For example, according to it, *i*) 'measurements' reflect situations in which objects that actually exist in areatime under certain interactions emerge in spacetime; *ii*) it is not meaningful to assign definite properties to quantum objects prior to a 'measurement' because they do not actually exist in spacetime until they are 'measured' *iii*) the 'cut' between the quantum system and the classical observer reflects the fact that the former is subject to the areatime metric interval whereas the latter is subject to the spacetime metric interval *iv*) the uncertainty principle arises from the fact that in the limit in which space vanishes, spacetime does not vanish as well but reduces to a constant quantity of variable shape of areatime; and *v*) particles described by the same non-separable wavefunction by virtue of being associated with the same phase factor $e^{i\frac{S}{\hbar}}$ are associated with the same proper time, and therefore the same areatime metric interval. This means that they exist in the same region in areatime until a measurement causes them to emerge in different regions of spacetime, giving rise to the well-known correlations between spacelike separated measurement outcomes without violating special relativity.

This framework sharply segregates the domains between quantum theory and general relativity and has significant implications for understanding the relation between quantum theory and special relativity, as well as our most fundamental understanding of dynamic concepts such as mass, energy and momentum. It makes definite testable predictions of phenomena which are so unexpected that researchers are not currently looking for them. In particular, it predicts that radiation in transit does not produce gravitational fields, much in contrast to the predictions of general relativity [3][4][5][6][7][8].

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