

## Preface to the Third Edition

The basic problem in the interpretation of quantum mechanics is to reconcile the quantum features of the mathematics with the fact that our perceptual experiences are described in the language of classical physics. Observed physical objects appear to us to occupy definite locations, and we use the concepts of everyday life, refined by the ideas of nineteenth-century physics, to describe both our procedures for obtaining information about the systems we are studying, and also the data that we then receive, such as the reading of the position of a pointer on a dial. Yet our instruments, and our physical bodies and brains, are in some sense conglomerates of atoms. The individual atoms appear to obey the laws of quantum mechanics, and these laws include rules for combining systems of atomic constituents into larger systems. Insofar as experiments have been able to determine, and these experiments examine systems containing tens of billions of electrons, there is no apparent breakdown of the quantum rules. Yet if we assume that these laws hold all the way up to visible objects such as pointers, then difficulties arise. The state of the pointer would, according to the theory, often have parts associated with the pointer's being located in visibly different places. If we continue to apply the laws right up to, and into, our brains, then our brains, as represented in quantum mechanics, would have parts corresponding to our seeing the pointer in several visibly different locations. Inclusion of the effects of the environment does not remove any of these parts, although it does make it effectively impossible to empirically confirm the simultaneous presence of these different parts.

The orthodox solution to this problem is simply to postulate, as a basic precept of the theory, that our observations are classically describable. This postulate is incorporated into the theory by asserting that any conscious observation will be accompanied by a "collapse of the wave function" or "reduction of the wave packet" that will simply exclude from the prior physically described state all parts that are incompatible with the conscious experience. This prescription works beautifully. When combined with the rule that the probability that this perception will occur is the ratio of the

quantum mechanical weighting of the reduced state to the quantum mechanical weighting of the prior state, one gets predictions never known to fail. This ad hoc injection, in association with “consciousness”, of “classical” concepts into a theory that is mathematically incompatible with those concepts, is the origin of the mysteriousness of quantum mechanics.

There is mounting evidence from neuroscience that our conscious thoughts are associated with synchronous oscillations in well-separated sites in the brain. This opens the door to a natural way of understanding, simultaneously, both the mind–brain and quantum–classical linkages. Oscillatory motions play a fundamental role in quantum mechanics, and they embody an extremely tight quantum–classical connection. This connection allows the quantum–classical and mind–brain connections to be understood together in a relatively simple and direct way.

Chapters 13 and 14 are new in this edition. Both describe simple models that achieve a simultaneous solution of these two problems. The first paper, entitled “Physicalism Versus Quantum Mechanics”, is concerned more with the philosophical aspects, whereas the second, entitled “A Model of the Quantum–Classical and Mind–Brain Connections, and the Role of the Quantum Zeno Effect in the Physical Implementation of Conscious Intent” focuses more on technical matters pertaining to the question of the time scales associated with the quantum-mandated influence of our conscious intentional actions upon our physically described brains. These two papers, and the second one in particular, involve more equations than any of the other papers in the book. But these equations describe properties of simple geometric structures, and the meanings of the equations are described also in geometric terms.

To make room for the new articles without appreciably lengthening the book, the old chapter 5 has been removed. Its content significantly overlapped that of other chapters, so its removal mainly eliminates redundancies.

The two new chapters describe in terms meant to be generally understandable to nonphysicists who are not uncomfortable with mathematics the technical foundations of the approach to the mind–brain connection pursued in this book and further developed in its sequel, the Springer volume *Mindful Universe: Quantum Mechanics and the Participating Observer*.

Berkeley, October 2008

Henry P. Stapp



<http://www.springer.com/978-3-540-89653-1>

Mind, Matter and Quantum Mechanics

Stapp, H.P.

2009, XVII, 301 p., Hardcover

ISBN: 978-3-540-89653-1