432018 PHILOSOPHY OF PHYSICS (Spring 2002)

Essays I: Quantum Mechanics

The following essay titles are concerned with the first part of the course and a list of suggested readings is provided. (Note: your readings for the lectures and seminars is relevant too!) Your essay should be about 2,000 words long (but *certainly* no longer than 2,500 words) and should be handed in at the beginning of your seminar in Week 6 (i.e. on Thursday 14th of February).

1. Discuss the implications of quantum mechanics for a realist view of science.

   - L. Wessells, *'The Way the World Isn't: What the Bell Theorems Force Us to Give Up'* in J. Cushing and E. McMullin (eds.), *Philosophical Consequences of Quantum Theory* (University of Notre Dame Press, 1989).
   - M. Jammer, *Philosophy of Quantum Mechanics* (Wiley, 1974), Ch. 11.
   - M. Redhead, *Incompleteness, Non-Locality and Realism* (OUP, 1987), Ch. 2 (esp. pp. 46-51).
   - A. Fine, *The Shaky Game* (University of Chicago Press, 1984).

2. Describe the nature of the measurement problem and compare and contrast the many worlds and the many minds 'solution' of it.

   - Papers in the *Symposium on the 'Many Minds' Interpretation of Quantum Mechanics* in the British Journal for the Philosophy of Science, **47** (1996), pp. 159-248.

3. Compare and contrast Bohm's theory and the Copenhagen interpretation.

   - D. Bohm, *A Suggested Interpretation of the Quantum Theory in terms of "Hidden" Variables* in J. A. Wheeler and W. H. Zurek (eds.), *Quantum Theory and Measurement* (Princeton University Press, 1983).
   - D. Bohm, *The Undivided Universe* (Routledge, 1995).
   - J. Cushing, *Underdetermination, Conventionalism and Realism: The Copenhagen vs. the Bohm interpretation of Quantum Mechanics* in S. French and H. Kamminga (eds.), *Correspondence, Invariance and Heuristics* (Kluwer, 1993).
   - J. Cushing, *Quantum Mechanics: Historical Contingency and the Copenhagen Hegemony* (University of Chicago Press, 1994).
   - P. R. Holland, *The Quantum Theory of Motion: An Account of the de Broglie-Bohm Causal Interpretation of Quantum Mechanics* (CUP, 1993).

4. Outline a derivation of the Bell inequalities, making your premises clear. Carefully discuss the implications of these results.

   - J. Bell, *On the Problem of Hidden Variables in Quantum Mechanics* in Wheeler and Zurek (above).
   - J. Bell, *On the Einstein Podolsky Rosen Paradox* in Wheeler and Zurek (above).
   - J. P. Barret, *Bell's Theorem: A Guide to the Implications* in Cushing and McMullin (above).
   - L. Wessells, *The Way the World Isn't: What the Bell Theorems Force Us to Give Up* in Cushing and McMullin (above).
   - M. Redhead, *Incompleteness, Non-Locality and Realism* (OUP, 1987), Ch. 4.

James Ward (e-mail: `j.m.ward@lse.ac.uk`)