

HPS/PHIL 93872  
Historical Foundations of the Quantum  
Theory  
TTh 11:00-12:15  
241 DeBartolo

Spring 2009

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Office Hours: TTh 12:45-1:45

**Text:** There is no required text for this course. All readings will be distributed individually in class or electronically.

**Requirements:** Each student will be required to do two presentations to the class, on topics to be chosen from the syllabus in consultation with the instructor. Each of these presentations will be worth 20% of the final course grade. 10% of the final course grade will be based on class participation. A term paper (minimum fifteen pages) worth 50% of the course grade will complete the requirements for the course, the term paper topic also to be chosen in consultation with the instructor.

**Schedule:**

<b>Date:</b>	<b>Topic:</b>	<b>Readings:</b>
13 Jan.	Introduction–The Place of History in Foundational Studies. Empirical and theoretical preliminaries	
15 Jan.	Planck and black-body radiation.	Martin Klein. “Planck, Entropy, and Quanta, 1901-1906.”
20 Jan.	Einstein and the photo-electric effect.	Martin Klein. “Einstein’s First Paper on Quanta.”
22 Jan.	The Bohr model of the atom and spectral series.	Max Jammer. “Regularities in Line Spectra”; “Bohr’s Theory of the Hydrogen Atom.”
27 Jan.	The Bohr-Sommerfeld “old” quantum theory; Einstein on transition probabilities.	Max Jammer. “The Older Quantum Theory.”
29 Jan.	The Bohr-Kramers-Slater theory.	Max Jammer. “The Transition to Quantum Mechanics.”
3 Feb.	Bose-Einstein statistics.	Don Howard. “‘Nicht sein kann was nicht sein darf,’ or the Prehistory of EPR, 1909-1935.”
5 Feb.	Heisenberg and matrix mechanics.	Max Jammer. “The Formation of Quantum Mechanics,” §§ 5.1-5.2.
10 Feb.	Schrödinger and wave mechanics.	Max Jammer. “The Formation of Quantum Mechanics,” § 5.3.

12 Feb.	De Broglie and the origins of pilot-wave theory.	James T. Cushing. "Early Attempts at Causal Theories: A Stillborn Program."
17 Feb.	Complementarity and the indeterminacy principle.	Niels Bohr. "The Quantum Postulate and the Recent Development of Atomic Theory."
19 Feb.		Mara Beller. "The Dialogical Birth of Bohr's Complementarity."
24 Feb.	The Einstein-Podolsky-Rosen argument and and Bohr's reply.	Albert Einstein, Boris Podolsky, Nathan Rosen. "Can Quantum-mechanical Description of Physical Reality Be Consdiered Complete?"
26 Feb.		Niels Bohr. "Can Quantum-mechanical Description of Physical Reality Be Consdiered Complete?"
3 Mar.	Von Neumann and the axiomatization of quantum mechanics. London and Bauer on measurement theory.	John von Neumann. "The Measruing Process"; Fritz London and Edmond Bauer. "The Theory of Observation in Quantum Mechanics."
5 Mar.	The invention of the "Copenhagen Interpretation."	Don Howard. "Who Invented the Copenhagen Interpretation? A Study in Mythology."
9-13 Mar.	<b><i>Spring Break</i></b>	
17 Mar.	Relativistic quantum mechanics, second quantization, and the origins of quantum field theory.	Silvan S. Schweber. "The Birth of Quantum Field Theory" and "The 1930s."
19 Mar.	Early QFT continued	
24 Mar.	Ballentine and the statistical ensemble interpretation.	L. E. Ballentine. "The Statistical Interpretation of Quantum Mechanics."
26 Mar.	Bohm and the revival of hidden variables theories. Gleason, Kochen and Specker, and the no-go theorems.	David Bohm. "A Suggested Interpretation of the Quantum Theory in Terms of 'Hidden' Variables. I and II."
31 Mar.		
2 Apr.	Bell's theorem and the Jarrett analysis.	James T. Cushing. "A Background Essay."
7 Apr.		

9 Apr.	Everett, Wheeler, DeWitt and the relative state interpretation.	Hugh Everett. “‘Relative State’ Formulation of Quantum Mechanics.”
14 Apr.	Wave Functions in Configuration Space	TBA
16 Apr.	Decoherence.	Wojciech Zurek. “Decoherence and the Transition from Quantum to Classical—Revisited”; Wojciech Zurek. “Decoherence, Einselection, and the Quantum Origins of the Classical.”
21 Apr.		
23 Apr.	Van Fraassen and the modal interpretation.	Michael Dickson. “The Modal Interpretations of Quantum Theory.”
28 Apr.	Identity and Individuation in Metaphysics	TBA
4 May	<b><i>Term Papers Due</i></b>	