

**HPS/PHIL 93872**

**Spring 2009**

**Historical Foundations of the Quantum Theory**

Don Howard, Instructor

***Recommended Readings:***

David Z. Albert. *Quantum Mechanics and Experience*. Cambridge, MA: Harvard University Press, 1992.

Sunny Y. Auyang. *How is Quantum Field Theory Possible?* New York: Oxford University Press, 1995.

Jim Baggott. *Beyond Measure: Modern Physics, Philosophy and the Meaning of Quantum Theory*. Oxford: Oxford University Press, 2004.

Leslie E. Ballentine. *Quantum Mechanics: A Modern Development*. Singapore: World Scientific, 1998.

Jeffrey Barrett. *The Quantum Mechanics of Minds and Worlds*. Oxford: Oxford University Press, 1999.

Mara Beller. *Quantum Dialogue: The Making of a Revolution*. Chicago: University of Chicago Press, 1999.

Michel Bitbol. *Schrödinger's Philosophy of Quantum Mechanics*. Dordrecht: Kluwer, 1996.

Michel Bitbol and Olivier Darrigol, eds. *Erwin Schrödinger: Philosophy and the Birth of Quantum Mechanics*. Paris: Editions Frontieres, 1992.

David Bohm. *Causality and Chance in Modern Physics*. London: Routledge and Kegan Paul, 1957.

David Bohm. *Wholeness and the Implicate Order*. London: Routledge and Kegan Paul, 1980.

David Bohm and Basil J. Hiley. *The Undivided Universe: An Ontological Interpretation of the Quantum Theory*. London: Routledge, 1993.

Katherine Brading and Elena Castellani, eds. *Symmetries in Physics: Philosophical Reflections*. Cambridge: Cambridge University Press, 2003.

Harvey Brown and Rom Harré, eds. *Philosophical Foundations of Quantum Field Theories*. Oxford: Clarendon Press, 1988.

Laurie Brown and Lillian Hoddeson, eds. *The Birth of Particle Physics*. New York: Cambridge University Press, 1983.

Laurie Brown, Max Dresden, and Lillian Hoddeson, eds. *Pions to Quarks: Particle Physics in the 1950s*. New York: Cambridge University Press, 1989.

Laurie Brown, Abraham Pais, and Sir Brian Pippard, eds. *Twentieth Century Physics*, 3 vols. New York: American Institute of Physics Press, 1995.

Jeffrey Bub. *Interpreting the Quantum World*. Cambridge: Cambridge University Press, 1997.

- Jeremy Butterfield and Constantine Pagonis, eds. *From Physics to Philosophy*. Cambridge: Cambridge University Press, 1999.
- Craig Callender and Nick Huggett, eds. *Physics Meets Philosophy at the Planck Scale: Contemporary Theories in Quantum Gravity*. Cambridge: Cambridge University Press, 2001.
- Cao Tian Yu. *Conceptual Developments of 20<sup>th</sup> Century Field Theories*. Cambridge: Cambridge University Press, 1997.
- David C. Cassidy. *Uncertainty: The Life and Science of Werner Heisenberg*. New York: W. H. Freeman, 1992.
- Catherine Chevalley. "Introduction: Le dessin et la couleur." In Niels Bohr. *Physique atomique et connaissance humaine*. Edmond Bauer and Roland Omnès, trans. Catherine Chevalley, ed. Paris: Gallimard, 1991, pp. 17-140.
- Rob Clifton. *Quantum Entanglements: Selected Papers*. Jeremy Butterfield and Hans Halvorson, eds. Oxford: Oxford University Press, 2004.
- James T. Cushing. *Theory Construction and Selection in Modern Physics: The S Matrix*. New York: Cambridge University Press, 1990.
- James T. Cushing. *Quantum Mechanics: Historical Contingency and the Copenhagen Hegemony*. Chicago: University of Chicago Press, 1994.
- James T. Cushing and Ernan McMullin, eds. *Philosophical Consequences of Quantum Theory: Reflections on Bell's Theorem*. Notre Dame, IN: University of Notre Dame Press, 1989.
- Olivier Darrigol. *From C-Numbers to Q-Numbers: The Classical Analogy in the History of Quantum Theory*. Berkeley: University of California Press, 1992.
- Olivier Darrigol. *Electrodynamics from Ampère to Einstein*. Oxford: Oxford University Press, 2000.
- Bernard d'Espagnat. *Conceptual Foundations of Quantum Mechanics*, 2<sup>nd</sup> ed. Reading, MA: W. A. Benjamin, 1976.
- Charles P. Enz. *No Time to Be Brief: A Scientific Biography of Wolfgang Pauli*. Oxford: Oxford University Press, 2002.
- David Favrhøldt. *Niels Bohr's Philosophical Background*. Det Kongelige Danske Videnskabernes Selskab. Historisk-filosofiske Meddelelser, no. 63. Copenhagen: Munksgaard, 1992.
- Jan Faye. *Niels Bohr: His Heritage and Legacy. An Anti-Realist View of Quantum Mechanics*. Dordrecht: Kluwer, 1991.
- Jan Faye and Henry Folse, ed. *Niels Bohr and Contemporary Philosophy*. Dordrecht: Kluwer, 1993.

- Markus Fierz and Viktor F. Weisskopf, eds. *Theoretical Physics in the Twentieth Century: A Memorial Volume to Wolfgang Pauli*. New York: Interscience, 1960.
- Henry Folse. *The Philosophy of Niels Bohr: The Framework of Complementarity*. Amsterdam: North-Holland, 1985.
- Paul Forman, "Weimar Culture, Causality, and Quantum Theory, 1918-1927: Adaption by German Physicists and Mathematicians to a Hostile Intellectual Environment." *Historical Studies in the Physical Sciences* 3 (1971), 1-114.
- A. P. French and P. J. Kennedy. *Niels Bohr: A Centenary Volume*. Cambridge: Harvard University Press, 1985.
- Kostas Gavroglu. *Fritz London: A Scientific Biography*. Cambridge: Cambridge University Press, 1995.
- George Greenstein and Arthur G. Zajonc. *The Quantum Challenge: Modern Research on the Foundations of Quantum Mechanics*. Sudbury, MA: Jones and Bartlett, 1997.
- Richard Healey. *The Philosophy of Quantum Mechanics: An Interactive Interpretation*. Cambridge: Cambridge University Press, 1989.
- John L. Heilbron. *The Dilemmas of an Upright Man. Max Planck as Spokesman for German Science*. Berkeley: University of California Press, 1986.
- John L. Heilbron and Bruce R. Wheaton, eds. *Literature on the History of Physics in the 20<sup>th</sup> Century*. Berkeley: Office for History of Science and Technology, University of California, 1981.
- Armin Hermann. *The Genesis of the Quantum Theory (1899-1913)*. Claude W. Nash, trans. Cambridge, MA: M.I.T Press, 1971.
- Lillian Hoddeson et al., eds. *The Rise of the Standard Model: Particle Physics in the 1960s and 1970s*. New York: Cambridge University Press, 1997.
- John Honner. *The Description of Nature: Niels Bohr and the Philosophy of Quantum Physics*. Oxford: Clarendon Press, 1987.
- R. I. G. Hughes. *The Structure and Interpretation of Quantum Mechanics*. Cambridge, MA: Harvard University Press, 1989.
- Chris Isham. *Lectures on Quantum Theory: Mathematical and Structural Foundations*. London: Imperial College Press, 1995.
- Max Jammer. *The Conceptual Development of Quantum Mechanics*. New York: McGraw-Hill, 1966.
- Max Jammer. *The Philosophy of Quantum Mechanics: The Interpretations of Quantum Mechanics in Historical Perspective*. New York: John Wiley & Sons, 1974.

- Christa Jungnickel and Russell McCormmach. *Intellectual Mastery of Nature: Theoretical Physics from Ohm to Einstein*. 2 vols. Chicago: University of Chicago Press, 1986. See especially vol. 2: *The Now Mighty Theoretical Physics 1870-1925*.
- Martin J. Klein. "Planck, Entropy, and Quanta, 1901-1906." *The Natural Philosopher* 1 (1963), 83-108.
- Martin J. Klein. "Einstein's First Paper on Quanta." *The Natural Philosopher* 2 (1963), 59-86.
- Martin J. Klein. *Paul Ehrenfest*. Amsterdam: North-Holland; New York: American Elsevier, 1970.
- Martin J. Klein, Abner Shimony, and Trevor J. Pinch. "Paradigm Lost? A Review Symposium." *Black-Body Theory and the Quantum Discontinuity, 1894-1912*, Thomas S. Kuhn. *Isis* 70 (1979), 429-440.
- Helge Kragh, *Quantum Generations: A History of Physics in the Twentieth Century*. Princeton: Princeton University Press, 1999.
- Thomas S. Kuhn. *Black-Body Theory and the Quantum Discontinuity 1894-1912*. Oxford: Clarendon Press, 1978.
- Thomas S. Kuhn, et al., eds. *Sources for History of Quantum Physics: An Inventory and Report*. Philadelphia: American Philosophical Society, 1967.
- Robert B. Laughlin. *A Different Universe (Reinventing Physics from the Bottom Down)*. New York: Basic Books, 2005.
- Michela Massimi. *Pauli's Exclusion Principle: The Origin and Validation of a Scientific Principle*. Cambridge: Cambridge University Press, 2005.
- Tim Maudlin. *Quantum Non-Locality and Relativity: Metaphysical Intimations of Modern Physics*, 2<sup>nd</sup> ed. Malden, MA: Blackwell, 2002.
- Jagdish Mehra and Helmut Rechenberg. *The Historical Development of Quantum Theory*. New York: Springer-Verlag, 1982.
- Arthur I. Miller, ed. *Early Quantum Electrodynamics: A Source Book*. Cambridge: Cambridge University Press, 1994.
- John Walter Moore. *A Life of Erwin Schrödinger*. Cambridge: Cambridge University Press, 1994.
- Dugald Murdoch. *Niels Bohr's Philosophy of Physics*. Cambridge: Cambridge University Press, 1987.
- Roland Omnès. *The Interpretation of Quantum Mechanics*. Princeton, NJ: Princeton University Press, 1994.
- Roland Omnès. *Understanding Quantum Mechanics*. Princeton, NJ: Princeton University Press, 1999.
- Roland Omnès. *Quantum Philosophy: Understanding and Interpreting Contemporary Science*. Arturo Sangalli, trans. Princeton, NJ: Princeton University Press, 1999.

- Abraham Pais. *'Subtle is the Lord . . .': The Science and the Life of Albert Einstein*. Oxford: Clarendon Press; 1982.
- Abraham Pais. *Inward Bound: Of Matter and Forces in the Physical World*. Oxford: Clarendon Press, 1986.
- Abraham Pais. *Niels Bohr's Times, In Physics, Philosophy, and Polity*. Oxford: Clarendon Press, 1991.
- Roger Penrose. *The Road to Reality: A Complete Guide to the Laws of the Universe*. New York: Alfred A. Knopf, 2005.
- Aage Petersen. *Quantum Physics and the Philosophical Tradition*. Cambridge, MA: M.I.T. Press, 1968.
- Alastair Rae. *Quantum Mechanics*, 5<sup>th</sup> ed. New York: Taylor & Francis, 2008.
- Alastair Rae. *Quantum Physics: Illusion or Reality?*, 2<sup>nd</sup> ed. Cambridge: Cambridge University Press, 2004.
- Ulrich Röseberg. *Niels Bohr. Leben und Werk eines Atomphysikers 1885-1962*, 3<sup>rd</sup> ed. Heidelberg: Spektrum, 1992.
- Stefan Rozental, ed. *Niels Bohr: His Life and Work as Seen by His Friends and Colleagues*. New York: Interscience, 1967.
- Maximilian Schlosshauer. *Decoherence and the Quantum-to-Classical Transition*. Berlin: Springer, 2008.
- Silvan S. Schweber. *QED and the Men Who Made It: Dyson, Feynman, Schwinger, and Tomonaga*. Princeton, NJ: Princeton University Press, 1994.
- Emilio Segré. *From X-Rays to Quarks: Modern Physicists and Their Discoveries*. Berkeley: University of California Press, 1980.
- Emilio Segré. *From Falling Bodies to Radio Waves: Classical Physicists and Their Discoveries*. New York: W. H. Freeman, 1984.
- Lee Smolin. *Three Roads to Quantum Gravity*. New York: Basic Books, 2001.
- Paul Teller. *An Interpretive Introduction to Quantum Field Theory*. Princeton, NJ: Princeton University Press, 1995.
- Sin-itiro Tomonaga. *The Story of Spin*. Takeshi Oka, trans. Chicago: University of Chicago Press, 1997.
- B. L. van der Waerden, ed. *Sources of Quantum Mechanics*. Amsterdam: North-Holland, 1967; reprint New York: Dover, 1968.
- Bas. C. van Fraassen. *Quantum Mechanics: An Empiricist View*. New York: Oxford University Press, 1991.
- Bruce R. Wheaton. *The Tiger and the Shark: The Empirical Roots of Wave-Particle Dualism*. Cambridge: Cambridge University Press, 1983.

John Archibald Wheeler and Wojciech Hubert Zurek, eds. *Quantum Theory and Measurement*. Princeton, NJ: Princeton University Press, 1983.