

Course Reader Contents
History 181B, Spring 2008
Modern Physics
Prof. Cathryn Carson

1. *Course Schedule (Major Assignments)*
Reading Instructions and Questions
Roadmaps
2. Isaac Newton, selections from *Mathematical Principles of Natural Philosophy* (1686), trans. Andrew Motte and Florian Cajori (Berkeley: University of California Press, 1934), vii-viii, 1-7, 13-14, 401-410, 543-547.
3. Isaac Newton, selections from *Opticks, or A Treatise on the Reflections, Refractions, Inflections & Colours of Light* (1704) (New York: Dover, 1952), 26-33, 186-191, 317-320, 338-341.
4. James Prescott Joule, "On the Mechanical Equivalent of Heat" (1849), in *The Scientific Papers of James Prescott Joule* (London: Dawsons of Pall Mall, 1887), 298-328.
5. Rudolf Clausius, selection on "The Second Law of Thermodynamics" (1850), in *A Source Book in Physics*, ed. William Francis Magie (Cambridge, MA: Harvard University Press, 1963), 228-233.
6. Charles-Augustin Coulomb, "Law of Electric Force" (1785), in *A Source Book in Physics*, ed. William Francis Magie (Cambridge, MA: Harvard University Press, 1963), 408-417.
7. James Clerk Maxwell, selection from "On Faraday's Lines of Force" (1855), in *The Scientific Papers of James Clerk Maxwell*, ed. W. D. Niven (Cambridge: Cambridge University Press, 1890; New York: Dover, 1952), v. 1, 155-159.
8. James Clerk Maxwell, letter to Thomson, 10 December 1861, in *Origins of Clerk Maxwell's Electric Ideas as Described in Familiar Letters to William Thomson*, ed. Sir Joseph Larmor (Cambridge: Cambridge University Press, 1937), 34-35.
9. James Clerk Maxwell, selection from "On Physical Lines of Force" (1861), *Scientific Papers*, v. 1, 488-489.
10. *Handout: Maxwell's Unification of EM and Light*
11. Pierre Duhem, selection from *The Aim and Structure of Physical Theory* (1906), trans. Philip P. Wiener (Princeton: Princeton University Press, 1982), 80-86.
12. Ernst Mach, "The Economy of Science" (1883), in *The Science of Mechanics: A Critical and Historical Account of its Development*, trans. Thomas J. McCormack, 3rd ed. (Chicago: Open Court, 1907), 481-494.
13. Martin J. Klein, "Mechanical Explanation at the End of the Nineteenth Century," *Centaurus* 17 (1972): 58-82.
14. Paul Forman, John L. Heilbron, and Spencer Weart, selections from "Physics circa 1900: Personnel, Funding, and Productivity of the Academic Establishments," *Historical Studies in the Physical Sciences* 5 (1975): 1-185, Tables I and A.5.
15. W.C. Röntgen, "On a New Kind of Rays," *Nature* 53 (1896): 274-276.
16. J.J. Thomson, "Cathode Rays," *Philosophical Magazine* 44 (1897): 293-316.
17. Cathryn Carson, "The Origins of the Quantum Theory," *Beam Line* (Stanford Linear Accelerator Center) 30:2 (2000): 6-19.
18. Albert Einstein, "On the Electrodynamics of Moving Bodies" (1905) in *Einstein's Miraculous Year: Five Papers That Changed the Face of Physics*, ed. John Stachel (Princeton: Princeton University Press, 1998), 123-160.
19. Werner Heisenberg, "The Theory of Relativity," in *Physics and Philosophy: The Revolution in Modern Science* (New York: Harper & Row, 1958), 110-127.
20. Albert Einstein, selection from "Autobiographical Notes," in *Albert Einstein: Philosopher-Scientist*, vol. 1, ed. Paul Arthur Schilpp, (New York: Harper Torchbooks, 1949), 2-53.
21. Werner Heisenberg, "Quantum Theory and its Interpretation," in *Niels Bohr: His Life and Work as Seen by His Friends*, ed. S. Rozental (Amsterdam: North-Holland, 1967), 94-108.

22. Werner Heisenberg, "The Physical Content of Quantum Kinematics and Mechanics" (1927), in *Quantum Theory and Measurement*, ed. John Archibald Wheeler and Wojciech Hubert Zurek (Princeton: Princeton University Press, 1983), 62-84.
23. Albert Einstein, selection from "Autobiographical Notes," in *Albert Einstein: Philosopher-Scientist*, vol. 1, ed. Paul Arthur Schilpp, (New York: Harper Torchbooks, 1949), 80-87.
24. George Gamow, "The Exclusion Principle," *Scientific American* 201:1 (July 1959): 74-86.
25. Wolfgang Pauli, "Exclusion Principle and Quantum Mechanics" (1946), in *Nobel Lectures: Physics, 1942-1962* (Amsterdam: Elsevier, 1964), 27-42.
26. Spencer R. Weart, "The Birth of the Solid-State Physics Community," *Physics Today* 41:7 (July 1988): 38-45.
27. Paul A.M. Dirac, "Theory of Electrons and Positrons" (1933), in *Nobel Lectures: Physics, 1922-1941* (Amsterdam: Elsevier, 1965), 320-325.
28. Freeman J. Dyson, "Field Theory," *Scientific American* 188:4 (April 1953): 57-65.
29. *Handout: American Nobel Laureates before 1940*
30. "Oppenheimer: A Life," print version of online exhibit, 2004.
31. Otto Robert Frisch, "The Interest Is Focussing on the Atomic Nucleus," in *Niels Bohr: His Life and Work as Seen by His Friends*, ed. S. Rozental (Amsterdam: North-Holland, 1967), 137-148.
32. O. Hahn and F. Strassmann, "Concerning the Existence of Alkaline Earth Metals Resulting from Neutron Irradiation of Uranium" (1939), in *The Discovery of Nuclear Fission*, ed. Hans G. Graetzer and David L. Anderson (New York: Arno Press, 1981), 44-47.
33. Lise Meitner and O.R. Frisch, "Disintegration of Uranium by Neutrons: A New Type of Nuclear Reaction," *Nature* 143 (1939): 239-240.
34. Selections from *Physics and National Socialism: An Anthology of Primary Sources*, ed. Klaus Hentschel and Ann M. Hentschel (Basel: Birkhäuser, 1996), 1-5, 18-21, 119-127, 152-157.
35. *Handout: How Does a Fission Bomb Work?*
36. Victor Weisskopf, "Working on the Bomb," in *The Joy of Insight: Passions of a Physicist* (New York: Basic Books, 1991), 122-155.
37. Andrei Sakharov, "The Tamm Group," in *Memoirs*, trans. Richard Lourie (New York: Alfred A. Knopf, 1990), 90-105.
38. Arthur Roberts, "Take Away Your Billion Dollars," *Physics Today* 1:7 (1948): 17-21.
39. Banesh Hoffmann, Postscript, *The Strange Story of the Quantum*, 2nd ed. (New York: Dover, 1959), 243-263.
40. Freeman J. Dyson, "Tomonaga, Schwinger, and Feynman Awarded Nobel Prize for Physics," *Science* 150 (1965): 588-589.
41. Steven Weinberg, "A Unified Physics by 2050?," *Scientific American*, special edition on *The Edge of Physics* (Spring 2003): 4-11.
42. Richard D. Mattuck, selection from *A Guide to Feynman Diagrams in the Many-Body Problem*, 2nd ed. (New York: Dover, 1976), 1-24.
43. George Gamow, "Galaxies in Flight," in *Scientific American Reader* (New York: Simon and Schuster, 1953), 5-12.
44. P.W. Anderson, "More is Different," *Science* 177 (1972): 393-396.
45. J.S. Bell, "Six Possible Worlds of Quantum Mechanics," in *Speakable and Unspeakable in Quantum Mechanics: Collected Papers on Quantum Philosophy* (Cambridge: Cambridge University Press, 1987), 181-195.
46. J.L. Heilbron, "An Historian's Interest in Particle Physics," in *Pions to Quarks: Particle Physics in the 1950s*, ed. Laurie M. Brown, Max Dresden, and Lillian Hoddeson (Cambridge: Cambridge University Press, 1989), 47-54.
47. "What Do Physicists Do?," in *A Random Walk in Science: An Anthology*, comp. Robert L. Weber (London: Institute of Physics, 1973), 37.