

# Short History of Condensed Matter Physics<sup>1</sup>

Time	Events/Achievements/People	Nobel Prizes
-3000BC 3000-500BC 500BC- Early Theories ca. 1700 19th century  1820 1853 1879	Stone Age Bronze Age Iron Age Demokritus: Idea that an “atom” exists. Aristotle: All metals are a mixture of sulfur and mercury. Revival of the idea of an atom by Newton and others. Physics is considered to be “solved” by Classical Mechanics, Electromagnetism, and Thermodynamics. Metallurgy becomes important and is described by empirical laws. Classification of crystal symmetries (Brillion). Wiedemann-Franz Law (for thermal and electrical conductivity). Hall effect	
1897 1900 1911 1912 1913 1905 1907-1913 1920’s  1925-1928 1926-1928 1928-1933  1947	Thompson discovers the electron. Drude (and Lorentz): classical electron gas in metals. Onnes (and Holst) discover superconductivity in mercury. Van Laue discovers diffraction of X-rays by crystals. W.H. & W.L. Bragg use X-rays to analyze crystals. Fundamentals of Photoemission (Einstein) Specific Heat of solids (Einstein, Debye, Born) Raman Scattering Electron Diffraction (Davisson, Thomson) Quantum Mechanics (Schrödinger, Heisenberg, Pauli, Dirac) Sommerfeld, Pauli: The electron gas with Dirac statistics. The Quantum Theory of an electron in a solid: Band Structure (Bloch, Peierls, Brillouin, Van Vleck) Magnetism (Pauli, Landau, Heisenberg, Bethe) Transistor Effect (Shockley, Bardeen, Brattain)	Onnes 1913 Van Laue 1914 H&L. Bragg 1915 Einstein 1921  Raman 1930 D., T. 1937  Anderson, Mott, Van Vleck 1977 Alvén, Néel 1970 S., B., B. 1956
1950’s 1950  Late 1950’s  1957 1958  1960’s  1970’s 1972 1980 1982 1985 1986 1988 1991 1995 2003	Development of Quantum Field Theory (Feynman, etc, etc) Ginzburg-Landau: phenomenological theory of superconductors  Theory of interacting electrons in solids (Landau, Migdal) Neutron Scattering and Diffraction (Brockhouse, Shull) Bardeen, Cooper, Schrieffer: Theory of superconductivity Josephson Effect of electron tunneling in superconductors  The understanding of the resistance minimum in metals: The Kondo Effect (Kondo, Anderson 1969) Density Functional Theory (Kohn, Pople) Theory of Liquid Crystals The renormalization group Superfluid He <sup>3</sup> (Lee, Osheroff, Richardson) The Integer Quantum Hall Effect The Fractional Quantum Hall Effect (Tsui, Störmer, Laughlin) Fullerenes C <sub>60</sub> (Curl, Kroto, Smalley) Discovery of High Temperature Superconductivity Giant Magnetoresistance Carbon nanotubes (Iijima) Experimental Bose-Einstein Condensation (Ketterle, Cornell, Wieman) Single Graphene sheets discovered	Ginzburg, Leggett, Abrikosov, 2003 Landau 1962 B.,S., 1994 B.,C.,S. 1972 Esaki, Giaever, Josephson 1973 Anderson, Mott, Van Vleck 1977 1998 (Chemistry) de Gennes 1991 Wilson 1982 L.,O.,R. 1996 von Klitzing 1985 T, S., L. 1998 1996 (Chemistry) Müller, Bednorz 1987 Fert, Grünberg 2007  K., C., .W. 2001 Geim,Novoselov 2010

<sup>1</sup>Review article on the history of Cond. Mat. Physics: L.Hoddeson, G.Baym, M.Eckert, *Rev. Mod. Phys.* **59**, p.287 (1987).