

## About the Cover

To represent the many scientists who have made major contributions to the foundations of thermodynamics and statistical mechanics, the cover of this book depicts four significant figures along with some associated equations and graphs.

- James Clerk Maxwell (1831-1879) for his work on thermodynamics and especially the kinetic theory of gases, including the Maxwell relations derived from perfect differentials and the Maxwell-Boltzmann Gaussian distribution of gas velocities, a precursor of ensemble theory (see Sections 5.2, 19.4, 20.1).
- Ludwig Boltzmann (1844-1906) for his statistical approach to mechanics of many particle systems, including his Eta function that describes the decay to equilibrium and his formula showing that the entropy of thermodynamics is proportional to the logarithm of the number of microscopic realizations of a macrosystem (see Chapters 15-17).
- J. Willard Gibbs (1839-1903) for his systematic theoretical development of the thermodynamics of heterogeneous systems and their interfaces, including the definition of chemical potentials and free energy that revolutionized physical chemistry, as well as his development of the ensemble theory of statistical mechanics, including the canonical and grand canonical ensembles. The contributions of Gibbs are ubiquitous in this book, but see especially Chapters 5, 6, 12, 13, 16, 17, 20, and 21.
- Max Planck (1858-1947, Nobel Prize 1918) for his quantum hypothesis of the energy of cavity radiation (hohlraum blackbody radiation) that connected statistical mechanics to what later became quantum mechanics (see Section 18.3.2); the Planck distribution of radiation flux versus frequency for a temperature 2.725 K describes the cosmic microwave background, first discovered in 1964 as a remnant of the Big Bang and later measured by the COBE satellite launched by NASA in 1989.

The following is a partial list of many others who have also made major contributions to the field, all deceased. Recipients of a Nobel Prize (first awarded in 1901) are denoted by the letter N followed by the award year. For brief historical introductions to thermodynamic and statistical mechanics, see Cropper [?, pp. 41-136] and Pathria and Beale [?, pp. xxi-xxvi], respectively. In order of their year of birth:

Sadi Carnot (1796-1832); Julius von Mayer (1814-1878); James Joule (1818-1889); Hermann von Helmholtz (1821-1894); Rudolf Clausius (1822-1888); William Thomson, Lord Kelvin (1824-1907); Johannes van der Waals (1837-1923, N1910); Jacobus Van't Hoff (1852-1911, N1901); Wilhelm Wien (1864-1928, N1911); Walther Nernst (1864-1941, N1920); Arnold Sommerfeld (1868-1951); Théophile de Donder (1872-1957); Albert Einstein (1879-1955, N1921); Irving Langmuir (1881-1957, N1932); Erwin Schrödinger (1887-1961, N1933); Satyendra Bose (1894-1974); Pyotr Kapitsa (1894-1984, N1978); William Giaque (1895-1982, N1949); Wolfgang Pauli (1900-1958, N1945); Enrico Fermi (1901-1954, N1938); Paul Dirac (1902-1984, N1933); Lars Onsager (1903-1976, N1968); John von Neumann (1903-1957); Lev Landau (1908-1968, N1962); Claude Shannon (1916-2001); Ilya Prigogine (1917-2003, N1977); Kenneth Wilson (1936-2013, N1982).