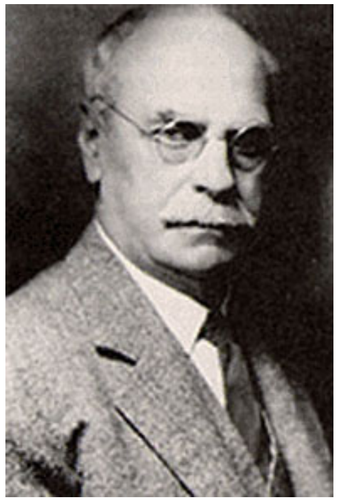
Drude-Lorentz Model

ART. XXV.—*On a New Action of the Magnet on Electric Currents;** by E. H. HALL, Fellow of the Johns Hopkins University.

Some of the series seemed to show a slight increase of resistance due to the action of the magnet, some a slight decrease, the greatest change indicated by any complete series being a decrease of about one part in a hundred and fifty thousand. Nearly all the other series indicated a much smaller change, the average change shown by the thirteen series being a decrease of about one part in five millions.

Apparently, then, the magnet's action caused no change in the resistance of the coil.

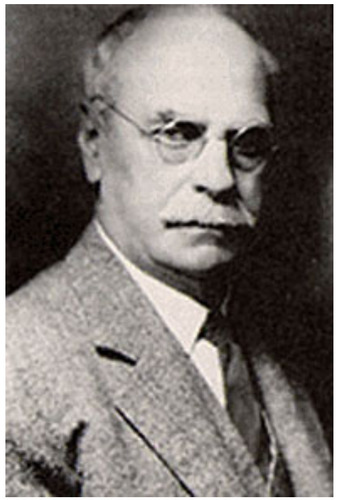


Edwin Hall
1855-1938

Table 1.4
HALL COEFFICIENTS OF SELECTED ELEMENTS IN MODERATE TO HIGH FIELDS[a]

METAL	VALENCE	$-1/R_H nec$
Li	1	0.8
Na	1	1.2
K	1	1.1
Rb	1	1.0
Cs	1	0.9
Cu	1	1.5
Ag	1	1.3
Au	1	1.5
Be	2	−0.2
Mg	2	−0.4
In	3	−0.3
Al	3	−0.3

[a] These are roughly the limiting values assumed by R_H as the field becomes very large (of order 10^4 G), and the temperature very low, in carefully prepared specimens. The data are quoted in the form n_0/n, where n_0 is the density for which the Drude form (1.21) agrees with the measured R_H: $n_0 = -1/R_H ec$. Evidently the alkali metals obey the Drude result reasonably well, the noble metals (Cu, Ag, Au) less well, and the remaining entries, not at all.



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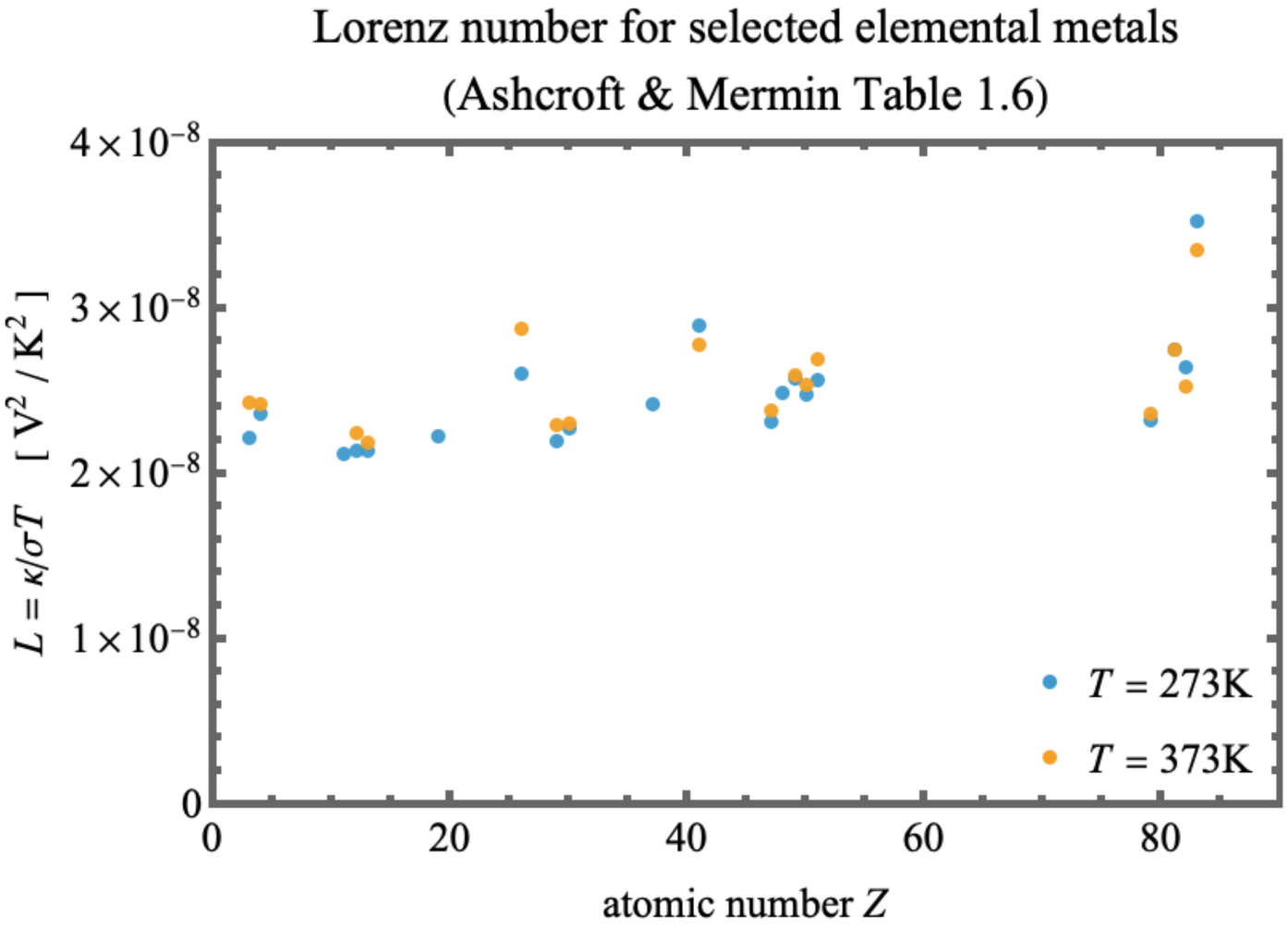
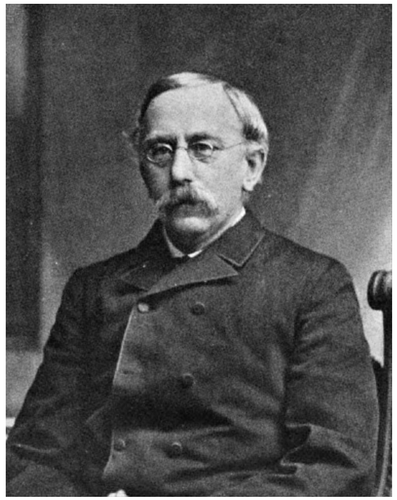
1855-1938



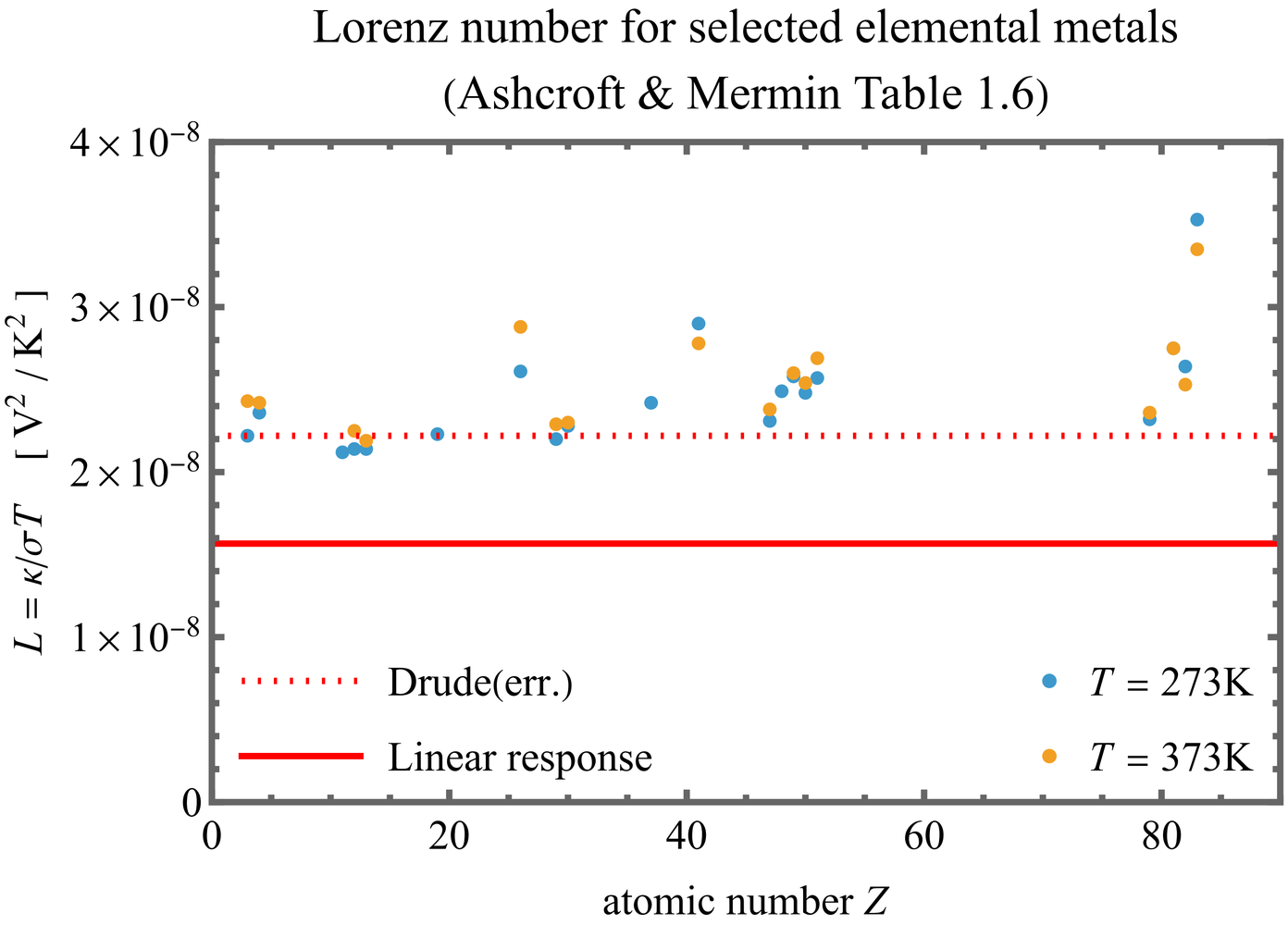
Gustav Wiedemann
1826-1899

?

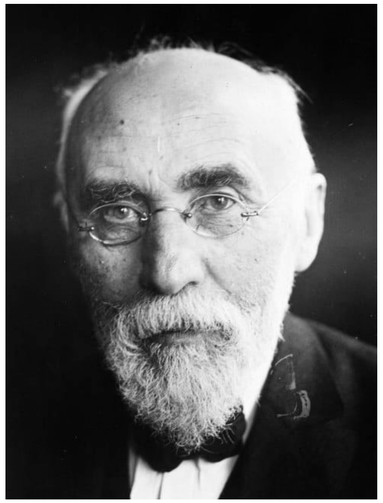
Rudolf Franz
1826-1902



Ludvig Lorenz
1829-1891



Paul Drude
1863-1906



Hendrik A Lorentz
1853-1928
Nobel Prize in 1902

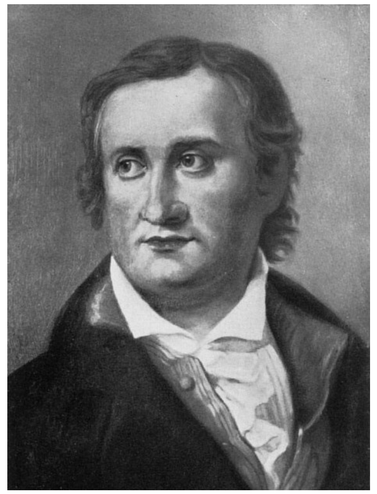
Drude + linear response:

$$S = -\frac{k_B}{e} = -86\,\mu\text{V/K}$$

Table 1.1 Seebeck coefficient values of different materials at $T = 273$ K

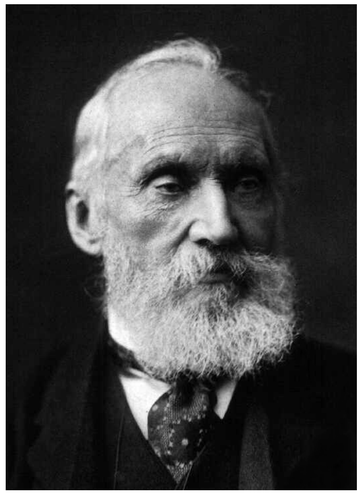
Metal	S (μVK^{-1})	Metal	S (μVK^{-1})
Ni	−18.0	Pd	−9.00
Pt	−4.45	Pb	−1.15
V	+0.13	W	+0.13
Rh	+0.48	Ag	+1.38
Cu	+1.70	Au	+1.79
Mo	+4.71	Cr	+18.0

Macia, Enrique, ed. "Thermoelectric materials: advances and applications." (2015).

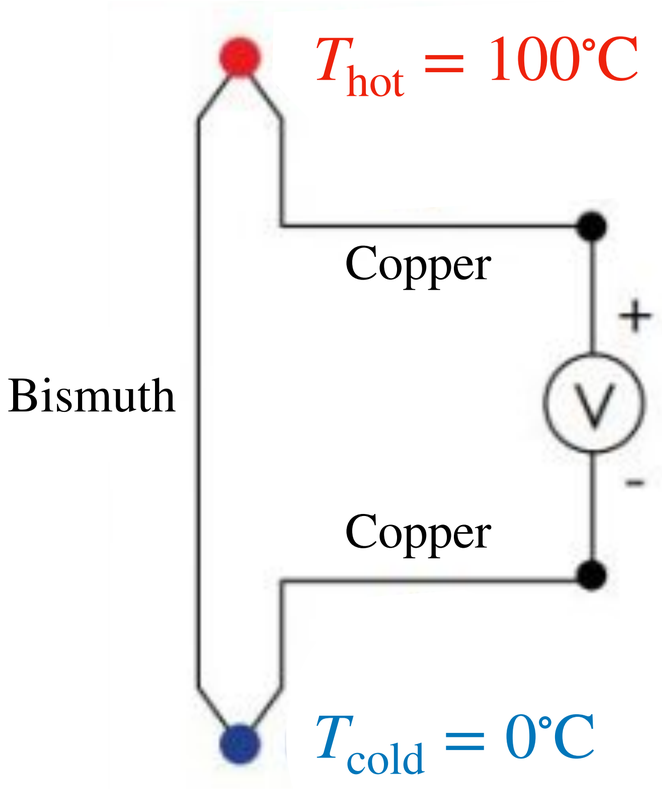


Thomas Seebeck
1770-1831

Hans Christian Ørsted
1777-1851



Lord Kelvin
1824-1907



Georg Ohm
1789-1854