to the first and subject to the same field. The output from the pick-up coils is then displayed on a cathode-ray tube, along with a signal representing the field variation. This display can then be photographed and the period of the oscillation can subsequently be measured.

3. *The modulation technique.* This technique was introduced by Shoenberg and Stiles (1964) and makes use of the extreme stability of superconducting magnets in their superconducting mode of operation. In this method, the specimen is placed inside a superconducting solenoid (giving, typically, fields up to 50 to 100 kG). When the current in the solenoid has been raised to a suitable value, the value of the current is made to change quite slowly (in some applications the magnet is put in its superconducting mode to hold the field constant). An additional coil is then used to modulate the field in the specimen at quite low frequencies (operation down to, say, 60 c/s presents no difficulties). Since the susceptibility of the specimen is oscillatory, there is a non-linear response in the specimen; for convenience the second (or higher) harmonic of the input signal is picked up and amplified. From this response as a function of the applied field the period of the de Haas–van Alphen oscillations can be found.

Because the modulation frequency can be made so low, this method lends itself readily to high pressure measurements; the superconducting solenoid, the modulating coil and the pick-up coil can all be outside the high-pressure vessel, which need contain only the single crystal of the metal under study (see for example, O'Sullivan and Schirber, 1966; Melz, 1966b).

2. *High-field Magneto-resistance*

The oscillatory behaviour of the magnetic susceptibility known as the de Haas–van Alphen effect, just discussed, arises from the quantization of the electron orbits in a magnetic field. These oscillatory effects are observable if the mean free path of the electrons is sufficiently large or, differently expressed, if $\omega_c\tau > 1$. Here ω_c is the cyclotron frequency and τ is the relaxation time of the conduction electrons involved in the particular orbit considered.

Under these conditions many other properties show corresponding oscillatory effects; in particular the resistivity of the sample in high magnetic fields (the Shubnikov–de Haas effect — Shubnikov and de Haas, 1930) and the Ettinghausen–Nernst effect. Both of these