the experienced structure analyst, particularly if his interests lie in protein crystallography. The discussion is, however, very detailed and a newcomer to the field is likely to be confused rather than enlightened.

As would be expected from the price, the book is well produced and properly indexed. There is, however, at least one serious misprint. An occasionally confusing feature is that Greek letters are sometimes written and sometimes spelt, thus gamma prime and γ' are used interchangeably throughout.

K. W. MUIR

Functions for Order

The Method of the Correlation Function in Superconductivity Theory. By G. Lüders and K. D. Usadel. (Springer Tracts in Modern Physics, Vol. 56.) Pp. 215. (Springer-Verlag: Berlin and New York, 1971.) 78 DM ; $21.50.

THIS book is essentially a review paper covering in some detail the work initiated by Professor Dr Lüders and furthered by his collaborators at Göttingen, on certain types of second order transition from the superconducting to the normal state. This is strictly theoretical work. There is nowhere any mention of experimental results nor comparison of theory with experiment. Any reader who hopes to profit from this book must start sufficiently well versed in solid state theory that he can accept definitions like that of the function *G*, introduced with no more explanation than that

$$G_{\alpha\alpha'}(\mathbf{r},\mathbf{r}') = \langle \psi^*_{\alpha'}(\mathbf{r}')\,\psi_\alpha(\mathbf{r})\rangle$$

where "angular brackets denote an average with respect to the grand canonical ensemble" and the symbols "in the bracket are, in second quantization language, operators for the creation of an electron with spin α' at the position $\mathbf{r}'$ and for the annihilation of an electron with spin α at the position $\mathbf{r}$". If sentences like these are no obstacle, readers will find this a carefully written text. The authors are in general very candid: they are careful to point out where weaknesses lie; where steps in an argument, or the assumptions on which it is based are weak or where it owes a debt to other workers.

The book is divided into three parts. First comes a number of general results based ultimately on the Gorkov equations. The approach is closely modelled on one introduced by de Gennes, who showed that near a second order transition (where the pair potential Δ (**r**) is vanishingly small), the relationship between Δ (**r**) and the properties of normal metal can be expressed in terms of a certain correlation function, which nevertheless plays rather a minor role in the work described here. Nevertheless, the authors say of the title they have chosen that "this baptization (sic) should be regarded as an homage to de Gennes".

In the first part of the book, it is shown, among other things, that the problem of a superconductor in a magnetic field first taking into account boundary scattering, then scattering by impurities (magnetic and non-magnetic) can be formulated—near a second order transition at least—in terms of a distribution function obeying the Boltzmann equation. Various approximation methods are reviewed in Part II. Finally, the theory is applied in Part III to derive results for critical magnetic fields in four types of system. Some results are obtained outside the regimes of the Ginzburg–Landau and "diffusion" (short normal metal mean free path) approximations.

The English is a little eccentric in places and there is a rather large number of spelling mistakes, but neither of these things is likely to cause confusion. The frequent use of "shall" rather than "will" lends a certain flavour to the prose. To theorists interested in these problems, this will be a valuable book. It will be particularly useful to English-speaking theorists because much of the work was originally published in German. At the price, however, it is not likely to find its way to many private bookshelves.

J. G. PARK

Soviet Telescopes

Radio Astronomy: Instruments and Observations. Edited by D. V. Skobel'tsyn. Translated from the Russian. (Proceedings (Trudy) of the P. M. Lebedev Physics Institute, Vol. 47.) Pp. vii+184. (Consultants Bureau: New York and London, 1971.)

TECHNICAL information on facilities for radio astronomy research in the USSR is scarce. *Lebedev Trudy 47,* originally prepared in 1968, collects together a miscellany of twenty technical reports embracing a range of subjects from heavy engineering to theoretical plasma physics. The book gives some idea of progress in instrument development up to three years ago at the Radio Astronomy Laboratory of the Lebedev Institute.

Since 1966, a group at Serpukhov has investigated how the velocity of the interplanetary plasma changes with distance from the Sun. Their instrument comprises three telescopes located at the apices of an equilateral triangle with sides 220 km in length, and simultaneous measurements at 85 MHz are made at each station. This facility is broadly similar to one built by the University of Cambridge for research on the solar wind. Unfortunately, the Soviet astronomers cannot realize the full potential of their telescope "because of the impossibility of computer analysis" for processing correlation data.

Several papers describe engineering design exercises for fully steerable parabolic reflector telescopes. One of the most difficult problems encountered in the design of large aerials is the need for high mechanical rigidity in the reflector. By supporting the reflector at many points rather than using the conventional two-point support structure, it is possible to increase the mechanical rigidity ten-fold. In the case of a 70 metre parabolic reflector, it is theoretically possible to obtain elastic distortions of only 1.2 mm (root mean square) and 3 mm (maximum). A dish constructed to these design specifications would be capable of observations at 2 cm wavelength.

In common with many other observatories, the Lebedev Institute is active in the development of low-noise parametric and maser amplifiers covering the whole gamut of radio astronomy frequencies. A typical example is a 5.2 cm spectral line receiver constructed in 1966 which has a noise temperature of 30 K.

A remarkable development is the construction of an interferometer with a 50 km baseline, operating at 34–36 MHz. Instrumental resolution has been a primary consideration in radio astronomy, and one way of achieving higher resolving power is to link widely separated telescopes by radio transmission. The first such interferometer was constructed by Jodrell Bank, and instruments in the West have usually been used for observations at frequencies of 408 MHz and higher. At 35 MHz there is a relatively high level of atmospheric and industrial interference which tends to vitiate the measurements. However, the investigation of radio source structure at lower frequencies is of great interest, and the Russian astronomers are hoping to overcome some of the interference problems by using tunable receivers which can be readjusted to select areas of low noise in the chosen waveband.

This particular version of the Russian original has fallen into a common trap. The translation was evidently not perused by an expert on the subject, so that in some parts the text reads like a computer translation: we find, for example, tract instead of waveguide, diapason for wideband and many incorrect transliterations of radio source names. All in all, the translator has spoilt the ship for a ha'p'orth of tar. The catchpenny title will doubtless trick some librarians into purchasing this book which really has very limited appeal. No observational data are presented, and most of the instrumental reports are extremely specialized.

SIMON MITTON