believed to contain a magnetized white dwarf (it isn’t) and that V861 Sco is a black-hole candidate (the identification with a nearby X-ray source has been known for at least three years to be incorrect).

Taken as a whole, though, this is a book to be recommended: it is no mean achievement to have made accessible subjects of the complexity tackled here.—ANDREW KING.


One of the best ways of learning about the equilibrium states of physical systems is to consider perturbations of them. A familiar example is the way in which stellar oscillation theory can be used to study the internal structure of the Sun and stars. Of course, such investigations are greatly complicated by uncertainties in our knowledge of some basic ingredients of the equilibrium model, for example convection and mixing. Black holes have the distinction of being completely ‘clean’ in this respect: all possible equilibrium states are completely characterized by the total mass and angular momentum of the black hole and its total electric charge.

Remarkably, Einstein’s field equations specifying the gravitational field can be solved exactly in these cases; moreover the solutions are of such miraculous simplicity as to allow many of their important properties to be studied analytically. In particular, the equations governing electromagnetic and gravitational perturbations have some surprising and elegant properties. These subtle hidden symmetries clearly fascinate Professor Chandrasekhar, and the result is this very thick book, mainly devoted to a study of the perturbation equations.

The book deals with a very specialized area, so that it is hard to know to which class of reader one should recommend it. It is certainly not for beginners, and even within its chosen area its range is restricted. One would not, for example, find it particularly straightforward, using only this book, to work out the electromagnetic field due to a point charge in the presence of a black hole. This is of course a rather academic problem, but it illustrates the emphasis the book places on the analytic properties of the perturbation equations rather than the relationship of the perturbing fields to their sources. Comparatively little attention is paid to global aspects, so that perturbations of non-asymptotically flat solutions supposedly representing black holes are treated without mention of the fact that the very definition of a black hole in a non-asymptotically flat space-time is a tricky problem in itself.

Despite such reservations, one cannot but wonder at the heroic labour which the writing of this book must have involved. At the end of one chapter of some hundred pages, almost every one dense with formulae, we read “... the nature of the developments simply does not allow a presentation that can be followed in detail with modest effort: the reductions that are necessary to go from one step to another are often very elaborate and, on occasion, may require as many as ten, twenty or even fifty pages. In the event that some reader may wish to undertake a careful scrutiny of the entire development, the author’s derivations (in some 600 legal-size pages and in six additional notebooks) [my italics] have been deposited in the Joseph Regenstein Library of the University of Chicago.”!

—ANDREW KING.