REVIEWS


All workers in theoretical astrophysics are familiar with the several monographs that ‘Chandra’ (as he is known to all generations) has written over the decades. The need to give each book a certain balance means inevitably that much material that is scientifically relevant and at least of historical interest is not subsumed into the text. Further, Chandra has done much important work that he has not subsequently incorporated into books, so there is every justification for the present series of volumes.

The decisions on which papers to select has been largely the responsibility of Chandra’s collaborator Norman Lebovitz (with some advice from Chandra himself and from Martin Schwarzschild), and they have jointly shown very good judgement. Volume 3 contains seminal papers on dynamical friction; the monumental Rev. Mod. Phys. article on ‘Stochastic Problems in Physics and Astronomy’, followed by a short tribute to Smoluchowski (a pioneer in this area); and the series of papers with Guido Münch on ‘Brightness Fluctuations in the Milky Way’. Papers on turbulence written some forty years ago may possibly look dated to those active in the contemporary field of chaos, but it remains a pleasure for me to re-read the account of Heisenberg’s elementary theory in Chandra’s Henry Norris Russell Lecture, ‘Turbulence — a Physical Theory of Astrophysical Interest’. One is reminded that the cosmogonical picture proposed by C. F. von Weizsäcker and outlined in this lecture has echoes in current activity on accretion disks, in spite of Chandra’s gentle remark that “it is the usual fate of cosmogonical theories not to survive”.

I have a special admiration for the way Chandra and Lebovitz took up the classical problem of the equilibrium and stability of rotating self-gravitating ellipsoids, using the tensor-virial method and so avoiding the complications of ellipsoidal harmonic analysis. More than half of Volume 4 is devoted to applications of this method. Its elegance shows up in the derivation of the points of bifurcation along the Maclaurin, Jacobi, and Jeans sequences, and in the rigorous discussion of the Roche problem. Also included are two comprehensive papers on the Riemann ellipsoids — generalizations of the Maclaurin-Jacobi sequence, with internal motions of uniform vorticity. These models (disinterred from the literature by Chandra and Lebovitz) are of more than just mathematical interest; for example, they have stellar dynamical analogues. Applied to homogeneous bodies the virial method yields exact results, but it is also valuable for the approximate study of inhomogeneous bodies, as shown by the Chandra-Lebovitz paper on non-radial oscillations and convective instability of gaseous stars.

Other nuggets collected in these two volumes include the paper with George Backus, extending the proof of Cowling’s anti-dynamo theorem to magnetic fields with high-order O-type neutral points; some papers on force-free fields; an elegant discussion on adiabatic invariants in the motions of charged particles; and a paper which formally relates the temperature gradient at the onset of thermally driven convection to the balance between energy input from buoyancy