REVIEW BY URIEL FRISCH AT THE RELEASE OF "THE PHYSICS OF FLUIDS AND PLASMAS" BY ARNAB RAI CHOUDHURI BANGALORE, INDIA, OCTOBER 13, 1998

Arnab Rai CHOUDHURI is Associate Professor of Physics at the Indian Institute of Science here in Bangalore. He did his PhD work at the University of Chicago where he was closely associated with Eugene Parker. Then he went to NCAR's High Altitude Observatory where my wife and I met him eleven years ago. I remember that he attended the NCAR summer school at which I lectured. After that he was in Bangalore and frequently visited abroad, for example, to the United Kongdom and Germany.

Prof. CHOUDHURI is particularly well known for his work on solar magnetic fields for example on three-dimensional realistic simulations of flux tubes and for work on dynamo models.

Since the late eighties Prof. Choudhuri has been lecturing in Bangalore on topics that are covered in the book released today.

I guess most of the people who are here today have at least some interest in astrophysics. So, we all know that one of the major stumbling blocks in trying to understand cosmical objects is our limited understanding of the nonlinear dynamics of fluid, plasmas and self-gravitating gas. This is the reason why astrophysicists but also geophysicists have been involved heavily in turbulence and plasma research.

Fortunately, there are quite a few things in the dynamics of astrophysical fluids and plasmas which we *do* understand. In those instances where linear theory suffices e.g. for obtaining the threshold of convective instability or gravitational collapse, the understanding can be quantitative. When nonlinear theory is required only qualitative understanding is the rule for astrophysical procoesses, the reason being that nonlinear processes of astrophysical interest are rarely close enough to a threshold of instability where perturbation theory can be applied.

Choudhuri's book contains more then a fair sample of those things that are reasonably well understood. To quote from Parker's review of his book "*...the author applies the theoretical tools to such diverse phenomena as magnetic buoyancy and sunspots, magnetohydrodynamic dynamos, stellar winds, jets, coronal heating, magnetic reconnection, accretion disks, etc.*".

Since the book is intended for graduate students with no prior understanding of fluids and plasmas it actually concentrates on giving the necessary background, the astrophysical examples being presented as a set of numerous and pleasant excursions.

Prof. Choudhuri does more than cover fluids and plasmas. He shares with me the conviction that such matters cannot be understood in depth without looking at the underlying microscopic theory such as non-equilibrium statistical mechanics. So, his textbook also covers a reasonable amount of statistical mechanics, including the Boltzmann equation, the Chapman–Enskog expansion, the BBGKY hierarchy, etc.

Actually, when I look at the various topics covered in the book I find that it is a very good approximation to the list of things I had myself to learn from a variety of sources, involving at least half a dozen different books in statistical mechanics of fluids and plasmas.

Having it all in one place is going to be of great benefit to astrophysicists all over the world and, I guess, beyond the astrophysical community. Indeed, I would not hesitate to recommend his book to anybody with an interest in fluids or plasmas and their microscopic foundations.

I am not going to list to you the table of contents because there is hardly anything missing and still the book is of manageable size and superbly written. It also has numerous exercises and a remarkable subject index which, judging from my own experience, may have taken quite a long time to produce. I understand that the whole process of writing and correcting extended over a period of five years. These were not years lost! Thank you so much, Prof. Choudhuri, for producing such a nice and original textbook which should quickly become a bestseller.