Having thus briefly indicated the scope of these books, it remains to say something of the quality of the material in them. First, it should be said that there is a freshness about the physical exposition, even though it is often fragmentary, which is admirable. The vector composition of angular momenta is very clearly explained. There is also a welcome emphasis on numerical magnitudes. On the other hand, the books do have some quite serious defects which ought not to pass unnoticed in review. There are errors of commission as well as of omission. Of the former, among the more serious are the misleading application of the correspondence principle to give $\Delta l = \pm 2$ as selection rule for a linear symmetric molecule (p. 106), and the statement (p. 191) that quantum theory gives the frequency of a spectral line but no indication of its intensity or polarization. The table of nuclear spin moments (p. 251), moreover, is both arbitrary and inaccurate; and there are rather many printing errors in the mathematics. Of the omissions, three that spring to mind are the lack of diagrammatic illustrations of transmission coefficient formulæ, the absence of any general proof of the orthogonality of solutions of Schrödinger's equation, and, although the radial wave-function for a hydrogen atom is discussed in great detail, no indication is given that a second-order differential equation has two independent solutions. There is also, perhaps less surprisingly, a complete absence of formal perturbation theory; and there are no adequate references to primary sources.

Consequently, it seems to me that these are two excellent books to give to a first-rate mathematician about to turn to theoretical physics and who needs to get a good feel of the physical field, but that they are less satisfactory as a theoretical exposition for physicists.

Apparently these two volumes form only the first half of a longer work by Prof. Guinier which will deal also with the quantum theory of metals and the statistical and thermal properties of matter. It is probably on this account that the present books possess no indexes. G. S. RUSHBROOKE

WHO ARE WE?

Science and Humanism

Physics in Our Time. By Prof. Erwin Schrödinger. Pp. ix+68. (Cambridge: At the University Press, 1951.) 8*s*. 6*d*. net.

IN addition to their obligation to prosecute fundamental researches, the professors at the Institute for Advanced Studies at University College, Dublin, are bidden to deliver certain public lectures. This task —by no means a light one—Prof. Erwin Schrödinger regards as of major importance, and the result is this booklet, slender in bulk, but weighty in content.

About a sixth of the available space is introductory; the remainder is wholly devoted to an unfolding of twentieth-century physics and its implications for mankind. Let it be said at once that the sheer brilliance—and ease—of this veritable *tour de force* should not lull the reader into thinking that all is plain sailing: he is being taken through some very deep waters indeed by a skipper who knows the rocks and eddies so well that full speed can prudently be maintained.

Early on we are confronted with a flat denial that science is good because it is known to confer material benefits. Almost in the same breath (for the lecture style is conserved) comes a timely warning that specialist studies have scarcely any value in themselves; it is only in a grand synthesis of all the knowledges that mankind is likely to find satisfaction. Characteristically, too, there follows the observation that it is usually the man of science who imputes to the atomists of ancient Greece a fluke-like turn in their concepts of discontinuity in Nature, whereas the classical scholars take the more rational (and incidentally the more generous) view that the savants of Abdera knew full well what they were about.

The hard core of that which Prof. Schrödinger has to say is embedded in his discussion of individuality, permanence, the continuum, causality, and free-will. Because of the impossibility of attributing 'sameness' to a particle—say an electron—our sense of what is enduring must be due essentially to configuration (*Gestalt*) rather than to those entities themselves which, in a sense, are responsible for the arrangement. In a word, 'shape' may persist, but any attempt to label its elements is truly meaningless. Moreover, it may be noted that we are nowadays intent upon mastering, if we can, the secrets of form in the world around us, and that it is by no means only the men of science who are engaged in the search. Maybe philosophers and artists will contribute their quota (as they seem to be doing), and thus play their part in the grand symphony of an ever-broadening awareness.

We now brace ourselves to struggle with the idea of the continuum, and the formidable difficulties which it raises. The possibility of continuous observation cannot be upheld; there is not, in fact, a gap-less technique available for a full recording of natural phenomena. But wave-mechanics does provide a description of something upon acceptably classical lines by means of field equations. By such means, at least, it is believed that information is obtained about observed facts and their interdependence.

Perhaps the hardest portion of Prof. Schrödinger's lectures is that which deals with dyadic and triadic fractions, namely, fractions built upon the base 2 or 3 rather than upon the conventional base 10. The purpose is to exhibit the somewhat mysterious character of the continuum by a process somewhat akin to the method of exhaustions. A fine thread of academic pleasantry can be followed here, as an encouragement to the general reader. Otherwise, it would seem that the author's intention is mainly psychological in driving home these mathematical refinements.

Towards the close, there are two points of profound significance to notice. One is frankly æsthetic—the incongruity of invoking all the physical paraphernalia of quantitative *Methodik* to probe the subject–object relationship. The other is the emphasis upon interaction (as opposed to a type of unilateral play) in the same context. Both these considerations run parallel, odd as it may appear, to the main course of traditional theism, in demanding a certain balance between immanence and transcendence; and this, not only to avoid an arid deism on one side, and a vague polytheism on the other, but also to enable humanity to rise to full stature.

Prof. Schrödinger, for his part, faithfully interprets the epistemological aspect of this same thing as the task of science, namely, to seek an answer to the age-long question of Plotinus—"Who are we?"

F. I. G. RAWLINS