for it "depends in a nonlocal manner on all the other trajectories which it [the particle] may have taken" (T. W. Marshall, in criticizing Bohm's theory). It is the magnitude of the quantum wavefunction that exerts this force, "piloting" the particle in an erratic trajectory.

Bell's result has provoked renewed interest in this model, because it is an explicit example of the nonlocality deemed necessary to give the predictions of quantum theory. The nonlocal force, which used to be considered a Defect, has become a Virtue. A delightful review of the set of ideas accompanying this model, together with computer pictures of the nonlocal potential and individual particle trajectories in various physical situations, is given by B. J. Hiley, a colleague of Bohm. Among three attempts at relativistic generalizations is P. Guéret's replacement of the point particle by an extended object, a soliton, in the spirit of de Broglie's "double-solution" theory, the original motivation for his 1927 pilot-wave model.

Surprising to me is the omission from this collection of an article on E. Nelson's 1966 stochastic model, which I regard as being at least as interesting as the de Broglie–Bohm model. By considering that a particle undergoes a peculiar kind of time-symmetric random walk, Nelson is able to arrive at the Schrödinger equation. Included, however, is an article by E. Santos on stochastic electrodynamics which starts with a purely classical picture of a particle immersed in a randomly fluctuating electromagnetic environment, and then attempts (unsuccessfully, so far) to drag the Schrödinger equation out of it.

The last few papers in the book deal with experiment. Two of them discuss ways one might detect a de Broglie–Bohm "empty" pilot-wavepacket containing no particle, A. Garuccio's being quite brief.

I have saved for last the three articles which are based solely on quantum theory. M. Cini presents a beautiful model of a quantum measurement. L. Mandel gives a brief but lucid description and explanation of optical interference experiments, including interference of two separate lasers. And H. Rauch carefully discusses some of the amazing neutron interference experiments which ". . . provide a unique tool for the realization of quantum mechanical textbook experiments on a macroscopic scale . . .". The authority of such work, based upon the solidly established formalism of quantum theory, when compared to the questing nature of the rest of the articles, recalls the prognostication of Einstein that, although the "statistical quantum theory" (as he insisted on calling it) would eventually be replaced by a more complete theory, ". . . the path will be lengthy and difficult". □

Philip Pearle is Chairman of the Department of Physics, Hamilton College, Clinton, New York 13323, USA.

Heavy-weight renal regulations

J.F. Lamb

The Kidney: Physiology and Pathophysiology, Vols 1 and 2. Edited by Donald W. Seldin and Gerhard Giebisch. *Raven: 1985. Pp. 2,273. $289.50.*

THESE two books are a comprehensive account of the current state of renal physiology, "conceived broadly as the study of those processes by which the kidney maintains the volume and composition of the body in the face of physiologic demands and pathologic disturbances".

The text is organized into four sections, the first of which deals with the general principles of electrolyte regulation, with main divisions into the organization of the body fluid compartments and solute–solvent transport. Section II is on the organization of the kidney, both structural and functional, and includes (perhaps rather perversely, for regulation in the kidney is in the next section) description of the renal regulation of certain extra-renal functions such as blood pressure. Section III gives a detailed account of the exchanges and regulation of water and the common electrolytes such as sodium and chloride, potassium, and so on, the trace elements, proteins and other macromolecules, both in normal and abnormal states. Section IV deals with renal failure and pharmacology.

Most of the chapters are quite short with a welcome use of explanatory diagrams and straightforward description of the problems in that particular area. Many have a fairly detailed, though not usually overlong, account of the history of the subject concerned; this does help to introduce it and puts present views into perspective. For example, it is pleasant to see the book start with Walser's model for the overall control of electrolytes and water excretion. Although this topic is discussed in mathematical terms, it is based on the idea of considering the body as a bucket with a hole in its side: the fluid level at the hole represents the zero point at which renal excretion is negligible, while levels above this drive excretion proportionally; inputs enter through the open top of the bucket. This simple model seems to fit the available data better than others and should be useful as a "mental picture" in designing tests of the process and for teaching. The succeeding chapters make equally rewarding reading, both for specialists and for the generalist.

Books such as these are a compromise between allowing experts the freedom to write endlessly on their pet subjects and keeping the length and complexity of the final text to a reasonable size. The editors have, I think, struck a reasonable balance between these conflicting requirements. This has been achieved, partly at least, by careful selection of the contributors who seem to have been chosen both for their ability to communicate the material as well as for their knowledge. The standard of production is high, with clear illustrations and (as far as I could see) few mistakes. The authors provide adequate cross-references to other sections of the books, and there is not much obvious duplication of material (though I did notice two near-identical tables — No. 2 on p.366 and No. 4 on p.415). Such extensive coverage of the subject has some penalties, mainly in the weight of each volume (over 8lb); for the not inconsiderable price, the publishers might have included a pair of book rests.

Overall, this is an excellent work, well deserving a place in departmental libraries where it will be consulted for information not only on the kidney but also on transport processes, current views on blood pressure regulation and much more besides. It should suit more senior students, postgraduates and research workers who wish to keep abreast of developments in these areas. □

J.F. Lamb is Professor in the Department of Physiology and Pharmacology, University of St Andrews, Bute Medical Buildings, St Andrews, Fife KY16 9TS, UK.

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Photograph by Dave Woodward

Female humpback whale with calf. The picture is taken from Wings in the Sea: The Humpback Whale *by Lois King Winn and Howard E. Winn. Publisher is University Press of New England, price is hbk $25, £23; pbk $15.95, £15.30.*