

book, readers eavesdrop on "conversations" — rather one-sided — between Teller and his two assistants, daughter Wendy and Wilson Talley. These appear as footnoted exchanges, sometimes a little trivial but usually amplifying or extending the main text. In one, his daughter tells how Teller's father, a lawyer, had hoped his son would become a chemist, but Teller showed greater enthusiasm for physics. So father took son to see their relative in Vienna, the famous physicist Paul Ehrenfest, who asked the young Teller, "Do you know what a curl is?". "Yes sir", replied Teller. "Let the boy study physics", said Ehrenfest. On such events hang dramatic turnings in history.

When Democritus advanced the concept of the atom as the smallest indivisible part of a substance, Plato sent him to see the local doctor, Hippocrates. The atomic, and molecular, structure of matter was not fully accepted before about 1910 and soon after, following Rutherford's discovery of the nucleus and Bohr's model of the atom, came the revolution in mechanics without which the behaviour of matter on the atomic scale could not be understood. Teller emphasizes the importance of Bohr's 'correspondence principle' in the early development of quantum mechanics and uses it as a guide to understanding the form of the hydrogen-atom energy levels. This is not one of the clearest sections of the book: the argument is not well presented and one of the diagrams is not consistent with the text.

The penultimate chapter deals with the debates over the probability interpretation of quantum mechanics, arriving at the uncertainty relations and the still troubling problem, for many physicists, of the description — or rather lack of one — for the act of measurement: that instant when a wave-function allowing a particle to have probabilities of being anywhere in a large volume "collapses" to give the certainty of its observation at a particular spot.

As one of the few still living who worked and talked with Heisenberg, Bohr, Pauli, Dirac and other leaders of the revolution in those golden years of discovery, it is perhaps natural that Teller finds "no truly novel intellectual developments in the last sixty years". It is true that in those early years were laid down most of the foundations for the considerable advances in physics that have been made since, and the practical consequences — as examples he discusses semiconductors and lasers in the last chapter — are still a long way from being exhausted.

This is a challenging, original, very personal account of the fundamentals of physics. Apart from some lapses it is lucid, laced with humour, anecdotes and

insights into other physicists, particular Bohr. But many paragraphs are peppered with mathematical statements, and although Teller promises to explain his maths he sometimes forgets and the 'high-school student' will occasionally be faced with complex mathematical expressions without help. Reading such sections is not easy; unlike a member of an audience at a lecture, one is not swept past the tricky bits by the momentum of spoken words.

Teller has entered a domain where few have dared tread; he attempts a book that goes beyond recounting the major landmarks on the way to modern physics to show that these new concepts and understandings could not be reached without the use, and development, of the mathematical language in which they

are expressed. This is a bold assignment, but readers who are genuinely interested in what physics is about and who are willing to think as they read, rather than just look at coloured pictures — of which there are none — will gain a real appreciation of the power of physics, and an inkling of the way a physicist thinks.

But why "Dark Secrets"? Perhaps a clue is to be found in Teller's words about atoms: "We have seen the atoms. We cannot escape them. When you learn how they behave, you may wish that they did not exist." □

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Keeping in shape

Nick Cowan

The Neuronal Cytoskeleton. Edited by Robert O. Burgoyne. Wiley-Liss: 1991. Pp. 344. £62.80, \$94.95.

FROM time to time, I receive requests for a cytoskeletal probe (most often tubulin) to be used as an example of what is referred to as a 'housekeeping function'. This irritating epithet carries with it the implication that, in stark contrast to the exciting system under study, the components of the eukaryotic cytoskeleton are involved in biologically mundane tasks, and are therefore quintessentially dull.

Fortunately, such perceptions are based entirely on ignorance, not least because the cytoskeleton is involved in such diverse and vital functions as cell division, the acquisition and maintenance of cell shape, intracellular transport and motility. Moreover, with the suspicion that cytoskeletal abnormalities may have a role in the pathogenesis of some neurodegenerative disorders (for example, Alzheimer's disease), the cytoskeleton has now acquired a measure of respectability not often enjoyed by housekeepers. This collection of review articles dealing with aspects of the neuronal cytoskeleton is therefore both timely and appropriate.

Assembling a dozen or so chapters from different authors for a book covering topics varying in scope from ultrastructural morphology to gene expression is not an easy task. This is particularly so given the competition from review articles in weekly or monthly publications, not to mention the recent profusion of journals dedicated largely to distillations from the literature.

Although journal reviews are usually shorter and often less comprehensive, they do tend to be much more up to date. Perhaps this reflects no more than the slower turn-around time for a hard-back volume compared with a journal (one tardy contributor can gum up the whole works). Even so, the absence of some important new information in the book is conspicuous, despite some notes added in proof.

For example, there is no discussion of the evidence that neurofibrillary tangles contain tau protein or tau protein fragments — indeed, the index has only two entries for Alzheimer's disease, one of which refers to the introductory chapter emphasizing the promise that the study of the cytoskeleton holds for understanding neurological disease. The chapter on microtubule-associated proteins asserts that "no sequence data is available for any of the MAP1 species", although the complete sequence of MAP1B and a study of the microtubule-binding properties of its repeated motifs were published in 1989. And in a section on post-translational modifications of tubulin, there is no mention of polyglutamyl-ation; this apparently unique process was described in January 1990, and accounts for the array of beta-tubulin spots seen on two-dimensional gels of whole extracts of brain.

Despite such shortcomings, there is a wealth of useful information in this well-produced book, which should live up to its claim of being valuable to researchers, clinicians, postdoctoral fellows and graduate students in neurobiology, if only in the short-term. Those interested in housekeeping functions, on the other hand, should perhaps turn their attentions elsewhere. □

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