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Beating a path

Peter Satir

Ciliary and Flagellar Membranes. Edited by Robert A. Bloodgood. *Plenum: 1990.* Pp. 431. £63.75, \$102.

IN THESE days of megabuck cell and molecular biology, where delimited areas of science teem with data-hungry laboratories pursuing directed goals, it is unusual to discover an area of some depth and practical importance where 'small' science still prevails. This collection of articles, centred around the properties of ciliary and flagellar membranes of organisms ranging from protists to man, reveals both the advantages and disadvantages of research on problems where the whole world contains the same number of investigators as one article sometimes does in more popular fields. A chief advantage is an individualistic focus on unsolved issues whose solution could yield completely new insights into how cells work, but a corresponding disadvantage is the relatively slow resolution of issues and limited advance per unit time.

By contrast to the axoneme (the internal cytoskeleton of the cilium), which is the subject of several books and of an elegant opening review here by Whitman, the ciliary membrane is not well understood. This is, as Bloodgood points out, the first volume to attempt to review what is known about this membrane in any comprehensive way. Although some of the articles are flawed — being either too narrow or, conversely, overly broad — the book is worth reading from cover to cover. An array of unsolved important problems jumps from virtually every chapter. Here is a membrane domain at once responsible for the initiation of mating in some organisms and unexplained gliding movements in others; a domain that has affinity for special long stringy mastigemes and scales; that interacts with the egg cumulus during ovum transport in mammals or specifically with bacteria in the aetiology of human whooping cough; and a membrane that might even cause sandflies to bite more frequently during the transmission of *Leishmania*. The molecular and mechanistic bases of these phenomena are understood in only a rudimentary way. Yet, as the chapters by Vickerman and Tetley and by Tuomanen in particular show, it might be advantageous to study these properties more closely for clinical purposes.

One question that this diversity of function raises is whether the ciliary membrane is distinguishable from the cell membrane, where diversity would perhaps be more expected. The answer, one of the few on which all the contributors seem to agree, is that the ciliary

membrane differs significantly in composition and properties from the somatic membrane of the cell body. Ciliary and cell membranes are often readily separable because of procedures that induce a clean deciliation in cells, and the authors of several articles discuss results showing that ciliary membranes contain more sterols and are probably stiffer than cell membranes.

In many instances, the ciliary membrane develops above a ciliary necklace, which may be a barrier to free diffusion from cell to cilium in the plane of the membrane and which has glycoconjugates on its surface. The ciliary membrane may grow and is sometimes shed continuously. The outer segment of the vertebrate rod, discussed here by Besharse and Horst, is a spectacular example of continuous growth and differentiation of a specialized ciliary membrane. A promising approach is to use the connecting cilium of the rod to develop antibodies against the necklace and to use these to define some common biochemical features, and eventually functional properties, of the necklace region of all the ciliary membranes.

One wonders whether cyclic nucleotide-gated channels of the rod or of olfactory ciliary membranes (not reviewed in the volume) are present in the less specialized ciliary membranes. Unfortunately, discussion of the channel properties of ciliary membranes is one of the weaker parts of the collection. Another weakness is the coverage of sperm, which is largely restricted to the sperm of mammals and mainly presents information relating to the whole cell rather than to the flagellar membrane. On the other hand, a contribution capturing the essence of the subject — and which points out our current limitations of knowledge — is that by Williams on *Tetrahymena* ciliary membranes.

If you are working in a crowded field of cell or molecular biology and want to switch to one where most of the important questions are still to be answered, one where the subject will tickle your brain, this is a book for you. □

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Corrections

■ In M. Irving's review of "Molecular Mechanisms in Muscle Contraction" by J. M. Squire (*Nature* **345**, 398; 31 May 1990), the last word of a sentence in the penultimate paragraph was inadvertently omitted. The correct sentence should read: "These are discussed in detail in a lucid and thoughtful chapter by Brenner, who also reviews the relationship between solution studies of the actin-myosin ATPase and muscle fibre mechanics."

■ On page 395 of the same issue, two sentences were transposed out of sequence in J. S. Jones's review of "The Search for Eve" by M. H. Brown. The two sentences at the bottom of the middle column of the review should be in the right-hand column, immediately under the illustration. □