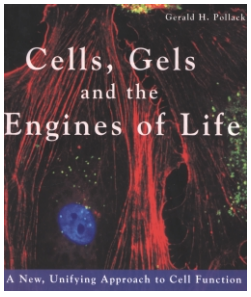
Book Review

A phase transition for cell biology?

Cells, Gels and the Engines of Life
by Gerald Pollack
Ebner & Sons, 2001.
$55 (hbk)/$27.95 (pbk) (xiv + 305 pages)
ISBN 0 96268 951 3/0 96268 952 1



Gerald Pollack has written a rollicking romp through cell biology that should rock the science. He has taken the principles of physical chemistry and applied them to the fundamental processes of the cell in a lucid explanation of how these 'engines of life' might work. To be fair, the experimental science is mostly not his own, but represents his deep understanding and appreciation of the work of people such as Gilbert Ling and Albert Szent-Györgyi. If they are collectively correct, this work represents a paradigm shift in cell biology, and Pollack performs a service comparable to the popularization of Copernicus by Galileo. (The author is not shy about the extreme nature of his views and draws his own analogy to the Copernican revolution in the opening paragraphs.) Pollack has hit upon water structuring by proteins and phase changes to explain everything from cell division to muscle contraction, expanding the idea of phase changes to include everything from voltage changes to conformational changes in proteins. His explanation of the sodium–potassium gradient is simple, clear and elegantly chemical. I like the book most of all because it has a protein-centric view.

The first chapter is the most shocking and could rest on shakier ground than later chapters where Pollack is in his element. In the first chapter, the very foundations of membrane biology are questioned: the membrane does not form a barrier, pumps are not pumps at all and the cell is not a water balloon. There are plenty of intriguing experiments and illustrations to support these ideas. What the membrane and pumps do is left for others to determine, but the phenomena Pollack discusses are real and often at odds with the orthodox explanations, whether the new explanations stand or not. In later chapters, he moves into the two foundations of his new paradigm: water structuring and phase transitions. He is on *terra firma* when he describes muscle cells or any kind of movement; this is where his prose and his ideas shimmer. Pollack writes simply and lucidly about the meaning of the very fundamental processes of order. He explains how the entropy gained from water destructuring might be used, and generalizes as to the purposes of various types of phase transitions. The analogies to gels are entirely appropriate, insightful and useful.

'Cells, Gels...' is a good read in the sense that you can take it to the beach or it can keep you up all night. This is a book my husband, a physician, might enjoy, or any scientist, amateur or professional, but it probably assumes too much for the general public. Pollack has gone out on a limb to shake up the status quo of cell biology and for this alone we should be grateful. The illustrations by David Olsen contribute substantively to communicate the ideas in simple and fun ways. The prose is elegant and eloquent and the analogies are colorful, illuminating and memorable. For example, in speaking of the cooperativity of phase transitions, he writes, 'Once the critical threshold is crossed, the transition proceeds with the inevitability of a sneeze'. Pollack's ideas have made me think more deeply about my own science and, I suspect, will affect the thinking of any life scientist with an open mind and a sense of adventure. Whether they will withstand the passage of time and experiments to come, we shall see.

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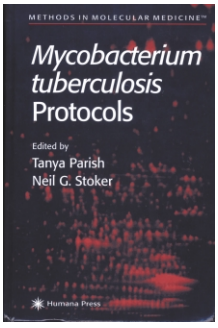
Revisiting protocols for *Mycobacteria*

Methods in Molecular Medicine Series: *Mycobacterium tuberculosis* Protocols
edited by T. Parish and N.G. Stoker
Humana Press, 2001.
$135 (hbk) (xiv + 403 pages)
ISBN 0 89603 776 2



Great strides have been made during the past decade to advance our understanding of the molecular biology of *Mycobacterium tuberculosis*, the causative agent of tuberculosis (TB). This work, along with the biochemical studies of the early pioneers, is inevitably bringing us closer to new lines of treatments for this disease. Many of these studies have been comprehensively reviewed in textbooks and journals in the past few years, including a 'Mycobacteria Protocols' book edited by Parish and Stoker in 1999 (published by Humana Press). Unfortunately, on reading their latest book, '*Mycobacterium tuberculosis* Protocols', I feel that many of the chapters have been preempted by these other reviews. Material covered in several chapters has been described in the previous protocols book, some with almost the same title, and the material is really only incremental in nature. Several of the chapters describe methods that are not unique to mycobacteria, but are basic, common molecular techniques, which have been described elsewhere in detail for other organisms. Having said that, I did find that the majority of the chapters were well written with clear descriptions of materials and methods, and all made good use of the notes section to explain the experimental rationale, although a few more figures would certainly have helped.

Perhaps the most significant step in TB research in recent years has been the determination of the genome sequence of *M. tuberculosis*. The release of this wealth