Putting it all together again

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Growth of the Bacterial Cell.
By J.L. Ingraham, O. Maaloe and F.C. Neidhardt.
Sinauer/Blackwell Scientific: 1983. Pp.435. $25, £19.75.

THE end-point of cell biology is a description of living cells as a unity. But the use of mutants to identify and analyse the bits from which cells are constructed has been so rewarding that efforts to understand how they work in concert have taken second place. This book thus joins a select company of texts on bacterial physiology; it attempts to describe the structure and function of bacterial cells in the context of their growth and division.

The approach chosen is first to examine the structure and composition of a typical bacterial cell using *E. coli* as a model. In fact, the book could just as well have been given the title "Growth of *E.coli*". Later sections look at the assembly of major cell components (such as the envelope and ribosomes); the polymerization of key macromolecules (DNA, RNA, protein, peptidoglycan, phospholipid, polysaccharides); fuelling reactions; and transport. There is a long section devoted to growth of individual cells and of cultures, dealing with concepts such as balanced growth, with the theory of continuous culture, and with cell composition and growth yield under different cultural conditions. Control of gene activity is also covered in detail.

The book ends with an attempt to provide an analysis of the variation of cell composition with growth rate, couched in terms of models which assume that composition is optimized to achieve maximum rate and efficiency.

Within the boundaries set for themselves, the authors' style is refreshingly clear and their treatment thorough. Even well-worn topics such as the operon model of control are made interesting. Speculation about the adaptive significance of the phenomena described provokes the reader's attention and only occasionally gets out of hand ("It is the inclusion of the entire genome in a single molecule that makes the prokaryotic mode of DNA replication and cell division workable").

Nevertheless, the coverage of some topics is disappointingly slight or even absent. One example is the treatment of the interrelated subjects of growth of the envelope, cell shape and septation. Another is initiation of DNA synthesis and its control. Recent discoveries about the control of plasmid replication surely deserved a mention; while in view of its key role in cell growth, the control of initiation of chromosome replication also merited more serious treatment. The cursory coverage of this topic perpetuates such misconceptions as the belief that there must be proteins involved in initiation that are consumed in the process.

Are not osmoregulation and control of *p*H also central topics for a book on growth physiology? They are not mentioned. On the other hand, the extensive treatment of bacterial genetics seems out of place, as do a number of the appendices ("Genetic Mapping" and "A Genetic Approach to Characterising Complex Promotors", for example).

Readers familiar with the excellent book *Control of Macromolecular Synthesis* by O. Maaloe and N.O. Kjelgaard (W.A. Benjamin, 1966), may be disappointed that this new one does not take the analysis of cell growth much further forward. It is essentially a restatement of the old ideas. Maaloe's hypothesis of passive regulation — suggested as the mechanism which optimizes the proportion of protein synthesizing capacity which is devoted to the synthesis of the protein synthesizing system itself — is discussed at length although it remains largely speculative and does not seem easy to reconcile with the observation that the rate of protein synthesis is not affected by a reduction in DNA concentration.

Despite these shortcomings, the book does contain much good quantitative information about *E. coli* that is not readily found elsewhere. There are also helpful quantitative problems at the end of each chapter. The book assumes a knowledge of general biochemistry and metabolic pathways, and this allows the authors to offer a sophisticated text that biochemistry students can use to take their understanding of bacterial physiology forward. Those who think of themselves as geneticists or as molecular biologists will also find in it a new and useful perspective on cell growth. □

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Grains of evidence

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An Atlas of Past and Present Pollen Maps of Europe 0-13000 Years Ago.
By B. Huntley and H.J.B. Birks.
Cambridge University Press: 1983. Pp.667. £85, $174.

QUATERNARY palynologists are, by nature, patient people; a thousand years in their sight is but a few centimetres of sediment. But the publication of the Huntley and Birks pollen maps has, nevertheless, been awaited with eager, sometimes almost frenzied expectation. The reason for this lies in the fact that these maps represent the digestion and collation of a vast bank of data abstracted from published information, usually pollen diagrams, from a total of 843 geographical locations scattered over Europe. All European palaeopalynologists and many from other parts of the world must have spent a large portion of their working lives poring over a mere fraction of these European diagrams and I am confident that no one has previously drawn information systematically from them all. The maps, therefore, offer us speedy and comfortable access to an abundance of data — hence the anticipation.

The main aim of the *Atlas* is to provide a graphic representation of changing vegetation on a continental scale over the past 13,000 years, that is from the latter part of the last glaciation. In the main, this is achieved by plotting pollen contours for each of the major pollen taxa at time intervals varying from 500 to 2,500 years, depending upon rates of change. For trees and shrubs the values plotted are expressed as a percentage of trees plus shrubs, and for herbs as a percentage of total land pollen (plus the taxon under consideration if it was omitted from the original pollen sum). Pollen taxonomy is on the whole conservative, being limited by the degree of discrimination used by the many primary authors. Thus Ericaceae is not subdivided, though *Quercus* is separated into deciduous and evergreen types. A separate map is plotted for each taxon at each sampling interval and is preceded by a discussion of the taxonomy and pollen dispersal characteristics of that taxon, together with a description and interpretation of the main changes observed.

The selection of sites for data abstraction is clearly an important aspect of the research underlying this book. Mainly those which are well dated using radiocarbon techniques are used. This was obviously necessary, though it has resulted in the exclusion of some significant data, such as the contribution of *Phillyrea* to the pollen rain of southern Iberia. Ideally, only influx data would have been used but in practice this is impossible because of the lack of sites from which such information is available. The use of percentage data undoubtedly results in some confusing pictures, however; a tree species which is invading an open landscape, for example, would be better represented in proportional terms than one invading a region already bearing forest, though invasion rate and population density may be the same. Sites with old sediments (>10,000 years) are generally less frequent than those with recent material, so the resolution of the contour maps is less fine for these. Overlay sheets showing the precise location of the sites abstracted for each time sample are vital for the indication of this resolution capacity and are supplied, together with overlays of physical features and national boundaries.