Book reviews

Cases in Biochemistry; Kathleen Cornely, John Wiley and Sons Inc.; New York, 1999. 125 pp. £ 15.50 (pb). ISBN 0-471-32283-0

All of us who teach biochemistry hope that our students will see the subject other than simply as lists of genes, structural motifs and pathways to be memorised and regurgitated at the end of the year in order to gain a good grade. Many of our students will, we hope, continue in biochemical or biomedical research, and so increase the factual burden for future generations of students; even for those who may not make their careers in research the key skills of problem solving and data interpretation are, or should be, an important element in the education we provide. In order to foster these skills we have developed a variety of methods of introducing an element of problem solving into our teaching; the difficulty is that while it is relatively easy to craft a problem suitable for undergraduate students on a topic that is close to our main research interests, it is less easy to develop problems on many other topics that we teach.

This book provides a total of 31 problem solving and data interpretation cases, each with at least one reference to a relevant research paper, review or standard reference work. Each case is prefaced by a 'focus concept' that describes the content – e.g. the 'focus concept' for the case concerning the role of uncoupling proteins in obesity states "the properties of adipose tissue that uncouple oxidative phosphorylation are discussed and possible links between uncoupling proteins and obesity are examined." This is followed by a list of prerequisites for the case – i.e. the information that must be understood before the problem can be tackled. In this case the prerequisites are: electron transport and oxidative phosphorylation; mechanisms of uncoupling agents; fatty acid oxidation. There then follows a brief explanation of the background of the problem, and a series of questions, some of which are questions that will probe the students' understanding of the topic, and others which require the interpretation of experimental data. At the end of the book (pages 106–125) there are answers to 14 of the 31 cases.

The cases cover a wide range, starting with a case of acute aspirin overdose, which provides a way of making students think about pH and blood buffering, and progressing through topics such as the structure of insulin, structure–function relationships of haemoglobin, production of methanol in ripening fruit, site-directed mutagenesis of creatine kinase, purification of phosphofructokinase, glycogen storage disease, etc. Many of the problems are directly relevant to human biochemistry, and hence will be useful to those of us who teach medical students, but there are a number of problems concerning plant and bacterial biochemistry as well, so that 'pure' biochemists will not feel excluded.

It is obvious from the way in which the cases are set out, and from the Preface, that the author sees these cases as being used to accompany a conventional taught course; she states that she has used them as out-of-class assignments, with a positive response from the students. Certainly this book will provide us with a host of ideas for such assignments. However, if this is the case then providing answers to (some of) the problems will defeat the object of the exercise. If, on the other hand, the intention is to provide students with a means of self-assessment, to ensure that they have indeed achieved the objectives of the relevant part of the course, then the omission of answers to the remaining problems will frustrate the diligent student. Of course, we can always do the work ourselves, and provide answers to the students when they have completed the exercise.

I can see a number of ways in which the cases in this book could be used. One, obviously, is for students to assess their understanding of the subject in their private study, with no input from the teachers (other than, perhaps, to provide answers at appropriate stages in the course). The cases could also be used as the author suggests, as out-of-class assignments, linked to formative or summative assessment. Equally, each of the cases would provide an excellent basis for a small group tutorial discussion, or a student-led seminar in which each student has to present the answer to one of the questions posed. Finally, in many cases the problem could be tackled by the students working in small groups *before* the relevant material has been presented in lectures – most of these cases would serve admirably for a problem-based learning course in which the students decide what they need to understand to solve the problem. In this case I would want to hide the list of prerequisites at the beginning of each case.

However this book is used, it will provide us with excellent material to enliven our teaching, and it should also inspire us to craft more such problems relevant to our own teaching.

David A. Bender

RNA–Protein Interaction Protocols. Methods in Molecular Biology, vol. 118; Edited by S.R. Haynes, Humana Press; Totowa, New Jersey, 1999. xix+481 pp. $ 74.50 (hb). ISBN 0-896-03568-9

This book is extremely useful for all RNA molecular biologists. In particular the novice in the RNA field who discovers that his or her favourite gene is posttranscriptionally regulated, but also those more experienced RNA scientists who want to broaden their experimental approach to include other strategies will find much useful information in this book. It provides a comprehensive collection of protocols covering a wide variety of approaches in the RNA–protein field, including old-fashioned techniques that are still proving their worth in today's science, as well as state-of-the-art protocols that are generally written by their inventors. Each protocol has a short introduction, providing sufficient information to enable the interested reader to grasp the subject content and understand the experimental goals, followed by an easy step-by-step protocol. Detailed notes provide the reader with those small, but important, tips that are often left out of the methods section in research papers, and a selection of key references to representative examples. The volume can be divided into two main sections. The first part (chapters 1–21) includes general techniques applicable to essentially any RNA–protein complex. It covers RNA transcription and specific RNA modification at terminal and internal sites, various RNA–protein crosslinking methods, RNA footprinting or interference studies, quantitative measures of affinity or kinetics studies using filter binding, gel shift or surface plasmon resonance. A number of genetic approaches are outlined including selections from a population of variant protein molecules using translational repression, transcriptional antitermination, or phage display systems. Also the opposite approach where RNA variants are affinity selected from random or natural sequence libraries are described. Moreover, alternative methods are included for characterisation of unknown protein partners of a defined RNA and for depletion and affinity purification of RNP complexes. The latter part (chapters 23–35) takes its aim more specifically towards the analysis of ribonucleoprotein complexes associated with mRNA splicing, polyadenylation, and turnover. Protocols for preparation of U snRNPs, hnRNP complexes, nuclear and cytosolic extracts, spliceosomes, and SR proteins are described in great detail, and conditions for preparing and analyzing in vitro splicing, polyadenylation, and mRNA turnover in cell-free extract reactions are carefully outlined. Only one chapter is devoted to translational aspects describing the preparation of in vitro translation extracts from tissue culture cells. This topic is thinly covered in this book. For instance, no protocols are given for preparation

PII: S0014-5793(00)02007-X

and analysis of ribosomes or ribosomal RNA. The individual authorship of each chapter naturally leads to some variability in the level of detail, repetition of standard protocols and different solutions to similar problems. However, the advantage is that the protocols in general are coherent and easy to follow. It is also noteworthy that the chapters are mostly written by authors who have either invented the technique or possess much hands-on experience. I highly recommend this volume as a laboratory manual essential for any scientist exploring the world of RNA.

Jorgen Kjems

Molecular Methods in Developmental Biology. *Xenopus* and Zebrafish. Methods in Molecular Biology, vol. 127; Edited by M. Guille, Humana Press; Totowa, New Jersey, 1999. xii+217 pp. $ 89.50 (hb). ISBN 0-896-03790-8

Some people, apparently, like reading recipe books. I like reading methods books. Give me, on a four hour journey to Llandudno Junction, a £10 upgrade to First Class and *Molecular Methods in Developmental Biology: Xenopus and Zebrafish*, and I set out a happy man. Was I as happy by the time we reached Crewe? Read on.

According to the preface, this book is aimed, as one might expect, at newcomers to the field of developmental biology. This being so, one of the criteria to be satisfied is that the chapters are easy to read and are presented in sufficient detail for anyone, no matter how inexperienced, to carry out the procedure in question. Here, I should say at the outset, the book succeeds. This is probably because the chapters are written not by the 'usual suspects' but by younger researchers who are still working at the bench and who may even have carried out the techniques they describe. The chapter on microinjection of *Xenopus*, for example, by the editor himself, is detailed and includes many of the little hints that are only acquired through hard-won experience. The same goes for Qiling Xu's chapter on zebrafish microinjection and indeed for all of the chapters where I could claim to have some knowledge of the technique. I am confident, therefore, that a newcomer to the field of *Xenopus* or zebrafish development (or both) would find this book useful.

But it is not only newcomers to a field who read methods books, and I enjoyed the book because of a few tips that might make life in the lab easier and because of one insight concerning freon that might (when we test it) turn failure into success. This is probably why I like reading methods books so much – one sentence can explain instantly why your experiments haven't been working and can turn weeks of frustration into fruition!

The 17 chapters follow the standard format of the *Methods in Molecular Biology* series, consisting of a short introduction followed by a list of the equipment required and the details of the protocols. At the end of each chapter is a series of notes providing tips and alternative approaches when these might be appropriate. The first two chapters by Jeremy Green and by Mizuno and colleagues are not, strictly, molecular, but their inclusion is (rightly) justified by the editor, who points out that the *Xenopus* 'animal cap assay' and tissue transplantation in the zebrafish represent two of the major uses of these species and frequently presage the molecular techniques described in the rest of the book. Thus, chapters 3–8 address methods of analysing gene expression, including RNase protection analysis, in situ hybridisation and immunocytochemistry. There is also an excellent chapter on quantitative RT-PCR by Steinbach and Rupp which, unusually, genuinely addresses quantitation. If you'll excuse a brief rant, there are far too many papers around these days which refer to semi-quantitative PCR – shorthand for "I can't be bothered to do it properly, but I did 25 cycles and this band's a bit more intense than that one, so the gene must be expressed at higher levels".

These chapters on the measurement of gene expression are followed by an article describing the preparation and synthesis of mRNA for experiments involving ectopic gene expression, and then by the aforementioned descriptions of microinjection itself, in both *Xenopus* and zebrafish. Experiments involving injection of DNA are also described, with Cleaver and Krieg discussing injection of DNA into *Xenopus* and Joore describing how to do promoter analysis in zebrafish.

I would have expected the next chapter to address methods of promoter analysis in *Xenopus*, making particular use of transgenesis, but here I was disappointed. The development of a technique to create transgenic *Xenopus* by restriction enzyme-mediated integration has revolutionised the field, but the approach is not described here. It is true that the inventors of the method, Amaya and Kroll, have already written about their technique elsewhere, but surely someone could have written something! By way of consolation, Evans's group has described their approach for transient transgenesis which makes use of constructs containing adeno-associated virus inverted terminal repeat sequences. This may prove useful for promoter mapping and ectopic expression experiments, and its inclusion in this book may promote the wider adoption of the technique.

The last three chapters in the book were for me the most useful, in that they describe molecular biological techniques that do not feature in most developmental biology methods books and which have been tailored by the authors to work in *Xenopus*. The chapters address band-shift analysis using oocyte and embryo extracts, DNA footprinting with embryonic extracts, and in vivo footprinting. All three articles are excellent.

Is anything missing? In his preface, editor Guille points out that the book does not include zebrafish genetics, although he is right that treatments of positional cloning are available elsewhere. One's view of other omissions depend on where you draw the line between 'developmental' and 'molecular' biology. A newcomer to the field might have appreciated descriptions of *Xenopus* and zebrafish husbandry to go alongside the opening embryological chapters, and perhaps short outlines of normal development, complete with fate maps and methods of lineage labelling. A chapter on cell culture methods might also have been useful. But these are rather minor quibbles. Overall, the book is very useful, and Guille (who wrote, sometimes with colleagues, five of the 17 chapters) should be congratulated.

Jim Smith

Bringing Chemistry to Life. From Matter to Man; Edited by R.J.P. Williams and J.J.R. Fraústo da Silva, Oxford University Press; Oxford, 1999. xxii+548 pp. £ 75.00 (hb). ISBN 0-198-50546-9

Chapter 1, *The development of man's ideas concerning nature*, gives an introduction to the classical attempts to understand the physical world by relating all natural manifestations to a few basic elements such as earth, water, air, and fire. The faultiness of this reductionist approach is compared to the weakness of a holistic approach, the latter claiming that the whole is more than the sum of its parts. The core of the chapter deals with the development of modern views regarding basic elements and their interrelationship, as formulated in the periodic system. It is surprising, however, to notice a strong penchant for algebra, in the form of simple series of numbers, as a basic principle behind the periodic system, resembling early attempts to explain a planetary system from the phonetic law. However, the authors surely know better, as will be seen in chapter 3; but for some reason they want to keep their readers in suspense. The chapter concludes with an excellent account of the highly varying abundance of elements in the universe.

Chapter 2, *Forces and related energies*, contains a general description of forces, beginning with gravitational and electrostatic forces

and fields, followed by the introduction of energy forms and interconversions. By avoiding specific approximations such as bonding, the authors claim (correctly) that this very generalistic explanation applies to all bulk interactions up to the level of planetary systems – hardly useful for many readers. The approach is strictly non-mathematical resulting in a very wordy presentation, although occasionally relapsing into phrases like: "It is then easy to show by integration that the capability of doing work on going from $r = r_1$ to $r = 0$ is proportional to $-1/r$ ..." (p. 30). Admittedly, the present reviewer considers mathematics a helpful tool in scientific argumentation.

Chapter 3, *Electrons in atoms and their energetics*, gives a rather detailed account of basic atomic structure and the electronic system, starting with the circular Bohr orbits, later extended with the elliptic Sommerfeld electron orbits, and concluding with the wave-mechanical model based on Schrödinger's wave equation. As experienced before, the authors insist on a gradual development of the topic, causing this reader to enter a harsh comment in the margin about the need of de Broglie's concept of standing waves, but then after ten pages of further reading having to erase the same comment – even more irritably. The level of explanation is very heterogeneous, and occasionally matters of importance such as hybridisation of electronic orbitals are only presented in a figure – not to mention the separation of the four fundamental natural forces, 10^{-12} s after the Big Bang that is put aside in the margin to page 62 with no explanation at all.

Chapter 4, *Ordering and stability of atom and component associations*, contains a general description of intramolecular binding of atoms to molecules and intermolecular binding of the latter to condensed phases. For unknown reasons the authors show a strong partiality for the condensed phases including mentioning of phase diagrams for alloys. On the other hand, by ignoring molecular orbital theory, which even in its simplest version (LCAO) could have given a clearer background of molecular morphology, the present treatise gives rise to a serious blunder, insisting on a double bond between oxygen atoms in the dioxygen molecule (i.e. singlet oxygen). Molecular dioxygen is in fact a bi-radical (triplet oxygen), and that explains the surprisingly low reactivity towards covalent compounds – of extreme importance for survival of life.

Chapter 5, *The balance between order and disorder*, introduces the idea of balanced systems between order and disorder, that is between solids, liquids, and gases, and connects this with energy. This particular view on order and disorder is followed consistently, but readers tending to think in structural terms should remember that order in this chapter means chemical bonds. Thermodynamic criteria for equilibria and non-equilibria are well treated but the topic remains difficult. It adds to the difficulties that the conventions used differ slightly from what is common for this reviewer. The authors in fact use a 4–5 page introduction to adjust the reader to their favoured universe of units and variables.

Chapter 6, *Dilute solutions and order–disorder balance*, combines the structural and energetic principles covered by chapters 4 and 5 on aqueous solutions. Intermolecular forces governing solubility, including formation of complexes and chelates by dative bonding, and aggregational patterns of amphipathic structures are well covered. The chapter also outlines basic principles in oxidation–reduction equilibrium as well as the conditions controlling redox potential in solutions; but acid–base chemistry is barely touched upon, which is a surprise, since changes in acidity on the crust of the young earth are an important argument in chapters 9 and following.

Chapter 7, *Systems with boundaries: compartments*, deals, in fact, with limitations in size rather than boundaries. Somewhat surprisingly the chapter opens with a very general description of shapes and sizes from crystals to folding and aggregation of biopolymers. Later there follows a description of biological membranes – under the heading 'shapes of liquid crystals and their coacervates' – focusing on osmotic pressure and electric potential difference between compartments. The chapter concludes with a summary of the restrictions imposed on chemical equilibria by the presence of surfaces, barriers, and electric (and other) fields, where the authors insist on unifying topics varying from a lake barred from the ocean by a dam to an organic compound barred from inorganic minerals by chemical bonds!

Chapter 8, *Change and its control*, claims to discuss the rate, called flow, at which balance is approached or inhibited by barriers to change of both compartments and chemical combinations. The chapter starts slowly by introducing time; later the authors for unknown reasons choose the stellar formation of elements to illustrate time-dependent phenomena – unfortunately by means of figure 8.2 (Rev. Modern Physics 1957) that this reviewer did not understand at all. Much later, after struggling through the following 40+ pages, the reader may nod in recognition of a few concepts from the chemical kinetics such as diffusion rate, collision complexes, catalysis, and activation energy. Understanding of feedback regulation, however, is hampered by a lack of discipline regarding references to a bewildering variety of phenomena including water level control in a lavatory.

Chapter 9, *The evolution of earth*, gives a most splendid account of the nature and the changes over time of the primitive atmosphere and the early sea as well as the surface of the early earth. An interesting point in this specification was that the changes in the atmosphere and the sea could be explained as a drift towards new equilibria due to ever changing boundary conditions, whereas the conditions of the solid state crust should be regarded as a complicated array of trapped metastable stages. The composition of the dynamic relations between the different zones of our earth at an early stage and today is described as well as possible chemical processes connecting these stages. The chapter concludes by a (sceptical?) touching of the Gaia hypothesis for a steady state of the living earth. This reviewer shares this scepticism and was looking for support in the form of more solid information on the supposed change in concentration of atmospheric oxygen (peak in the Carbon period, then decreasing for the following 300 million years), but did not succeed – so, he may be wrong. Compared to the latter, this chapter is a relief, but a more proper title would have been 'The evolution of inorganic chemicals on Earth'.

Chapter 10, *The principles of the chemistry of living systems*, describes the essential features of all living systems, in general terms of cellular content and activity, according to the authors. For this reviewer, being an elderly biochemist, the chapter is a tour de force through a 'biochemistry' that has been truncated by its linking to the authors' favoured platform of bio-inorganic chemistry – from which organic chemistry is only regarded as a collection of organic chemicals, at best of minor importance to the osmotic pressure of the cell! Scattered around in the chapter are crude diagrams and a few very detailed figures such as photoreduction of water, although hardly explained and poorly used. Looking at the overwhelming list of supplementary literature, it is incomprehensible to this reader that the topic of photoreduction does not call for a better treatment. Why did the chemical evolution proceed beyond the stage of photooxidation of H_2S? [availability!] Why does photooxidation of water demand a tandem of photoreceptors? [bond energy versus radiation energy!]. And why is there such a close similarity between the electron acceptor chain interconnecting photosystems I and II and the respiratory chain in the mitochondria? [new use of a redox chain!]. Treatment of these topics might have informed more about chemical evolution than a phrase like "we are looking for a logical way in which to describe evolution in terms of chemical units and the variables, composition, space, and time". I shall avoid commenting on the very poor and inconsistent presentation of a few branches from the forest of biochemical compounds, and instead move to the question of exchange of chemical energy. The authors correctly recognise phosphoanhydride bond as a source of potential energy – in part because hydrolysis of this bond is slow. This is repeated several times, but use of structures would have been more helpful to illustrate that the negative charge of the phosphoryl group necessarily creates a high activation energy barrier for a nucleophilic attack from a water molecule. (But structures are not chemical units in this treatment). Later this reviewer was baffled by the statement: "A sugar is a better ... long-term energy store than ATP, which is more useful in energy transfer" (p. 311). Can it be that the authors don't know that an absolute requirement for exploiting the chemical energy of ATP for synthesis is an establishment of a common intermediate such as acyl-AMP? A sugar would not be an obvious choice to boost an intermediate through a synthetic pathway.

Chapter 11, *Early life: anaerobic prokaryotes*, describes processes of element selection, physical and chemical, based on availability in flowing systems cell chemistry. This presentation appeared statically in the sense that the starting points were the composition and metabolism of known anaerobic organisms in a reducing environment. This is sober enough, but this reader missed some bold extrapolations to 'a warm little pond' and to the wide gap – in time – between abiotic and biotic chemistry, as hypothesised by Oparin's coacervates. In particular, it is surprising that a build-up of polymers through condensation reactions in an aqueous environment does not call for a broader discussion on

chemical energy than a few hints to concentration gradients. As usual, the authors relapse onto their philosophical platform of units and variables. In this chapter they stress that the fundamental units, the chemical elements, were the same for both inanimate and animate systems. On the contrary, abundances restricted the composition in inanimate systems while availability was the major restriction on animate systems. Accepting this thought-provoking difference between abundance and availability, it would have been very, very interesting to have a comment on the hypothesis of Panspermia, as formulated by Nobel laureate Francis Crick, to explain life's dependence on elements of rare abundance. As usual, organic chemistry is poorly covered, occasionally truncated to "a metabolic pool of C, H, N, O, and S". In contrast, the readers are assumed to know about inorganic ions such as WS_4^{2-} – I did not! The chapter concludes with a description of the minimal regulation to be present for ensuring conservation and transmission of properties among protocells, but there appeared few hints about adaptations to the ever changing environment.

Chapter 12, *The development of anaerobic organisation: from prokaryotes to eukaryotes*, is a highly readable account on the main characteristics of the different eukaryotes compared to the prokaryotes, covered in the previous chapter. The developments, the specialisation, and the advantages of compartmentalisation are well covered. In particular, this reader found the account of changes in organisation and communication in eukaryotes very stimulating. The authors focus on the importance of calcium ions as a messenger between compartments and the prerequisites for this signal function, i.e. an extremely low intracellular concentration. (But why are we not granted a proper structure of a Ca^{2+} binding site instead of the crude drawing on p. 375?) Of course, we are not allowed to ignore that the prokaryotes continued a most successful evolution, based on a faster reproduction rate rather than a greater survival chance compared to the specialised eukaryotes. The authors, on the contrary, point out the eukaryotic cell dependence on prokaryotic organisms regarding both symbiotic developments such as mitochondria, and a more generalised dependence such as nitrogen fixation.

Chapter 13, *The coming of dioxygen: unicellular organisms*, describes early evolutionary changes in chemistry after the advent of molecular oxygen, focussing on other possibilities for energy capture, depletion of soluble iron salts, new uses of ions of zinc and copper, and new demands for protection against reactive oxygen species. I shall avoid persevering about the particular structure of molecular oxygen (see my comments to chapter 4), but it would have been appropriate to stress that a prerequisite for using oxygen as an oxidator of organic compounds is to use metal ions as a mediator, because only they are able to catalyse one-electron transfer into the oxygen molecule. It is also to be hoped that readers remember from chapter 9 that the concentration of oxygen in the ocean (thanks to enormous amounts of Fe^{2+} salts) was kept at a very low level for nearly 10^9 years after the initiation of photosynthesis from water – giving time for evolutionary adjustments to molecular oxygen. And as already commented (also chapter 9), the authors ignore minor changes in the atmospheric oxygen concentration during the last 2–300 million years – but this is probably of some importance. But apart from this, it is a highly readable account of the changing inorganic environment and the consequences for early unicellular organisms. Thus the authors' hypothesis regarding the influence of oxygen on membrane components as well as on changing of availability of metal ions makes fascinating reading.

Chapter 14, *The coming of multicellular organisms*, examines the organisation necessary to maintain multicellular organisms. It is made clear that new developments in metabolism should be regarded as 'add on' to the older metabolic patterns. In this connection we find a generalised description of possible regulatory patterns, as expressed by electrolyte messengers (such as Ca^{2+} and Zn^{2+}) or organic messengers (such as neurotransmitters and hormones). Regarding flow of matter and energy, there is an interesting account of the differences between plants and animals regarding their interface with the environment. As already detailed in chapter 13, evolution is related more to changes in availability of chemical elements than to random mutations in the DNA. In particular, the authors stress that it was the generation of markedly increased copper and zinc, together with the loss of iron supplies, which forced the evolution of multicellular plant and animal life. Accepting this, it remains a mystery to this reviewer that evolution should direct plant morphology according to the numbers of the Fibonacci series as boldly mentioned on p. 442. There is also an attempt to deal with the interesting phenomenon of programmed cell death, but no mentioning of telomeres – why? There is even an attempt to relate massive extinction of organisms to changes in concentration of molecular oxygen – somewhat surprising for this reader, who has been more conscious of reduced availability of water and a lowering of temperature due to continental drift. Finally, it should be mentioned that the chapter contains a lot of valuable tables and figures – so many, in fact, that a listing of these in the beginning of the chapter (and the other chapters as well) would have been more useful than a mere repeat of the list of content.

Chapter 15, *The evolution of man and his chemistry*, contains an essay on … on everything. That includes a summary of endocrine regulation, brain function, connections used in the British National Grid power supply, management of the oil industry, and of course internet communication – concluding with a summary of pollution of the atmosphere, the water, and the soil! This reader normally welcomes a general account of man's industry in a historical perspective, but would it not have been relevant with some comments on the very different technological demands (temperature and fuel) dealing with alloys of copper and iron? The chapter also contains a fascinating argumentation for a gap in information between the linear DNA and the adaptive brain – nearly convincing, had it not been for spamming of the same chapter with tables, informing on the ionic composition of brain tissues, sampled from foetus to Alzheimer patients. What do these data tell us?

Chapter 16, *Survey and conclusions*, summarises the authors' ambition: to give an explanatory history of everything in terms of fundamental units, atoms and charge, and fundamental variables, composition, space and time – the latter starting from the Big Bang! Later, derived units and restrictions on variables (such as thermodynamic laws) are reviewed, and finally the properties of living organisms (including the apparent violation of the second law of thermodynamics) are summarised. Then follows the important (but somewhat difficult) description of DNA plus a reading machine as the minimum basis for organisation in and evolution of living systems - certainly not an easy reader!

General conclusion

The preface states that "The aim of this book is to provide graduate students and teachers with knowledge of the connection between physical and biological sciences". Thus Williams and Fraústo da Silva describe the long journey from formless inanimate matter to man, while explaining the nature and the logic of the physico-chemical processes involved. By insisting on rather untraditional definitions of units and variables, this long journey may appear temptingly in a new light to some readers or troublesomely paved with sharp stones to others.

Of special importance is that the authors convincingly develop the idea that it was changes in the geochemical environment that allowed evolution of life to occur, rather than random changes in the DNA molecule.

They absolutely succeed in 'Bringing Chemistry to Life' – in short glimpses also life to chemistry. But who will read the book or buy it? Regarding the latter the book company can probably rely on librarians. Regarding the first, trying to ignore a stiff price of £75.00, I still have my doubts that students and young scientists have a background that enables a reasonable yield in a time they can afford.

Anders Overgaard Pedersen

Fundamentals of Enzymology. The Cell and Molecular Biology of Catalytic Proteins; Edited by N.C. Price and L. Stevens, Oxford University Press; Oxford, 1999. xviii+478 pp. £ 27.99 (pb). ISBN 0-198-50229-X

It is 10 years since the publication of the last edition of this book. As stated in the publicity "the book gives an all-round view of the field including enzyme purification and characterisation, enzyme structure, enzyme kinetics, the mechanism and control of enzyme action, enzyme folding, how enzymes act in vivo, enzyme synthesis and degradation and clinical and industrial applications of enzymology".

The authors in their Preface question whether a textbook is still a useful tool for the teachers and students of enzymology and answer Yes. My initial concern would be whether the subjects covered in the present text are not so comprehensive that a student would not be better advised to purchase a general textbook of biochemistry. Such texts, in colour, would cost very little more than the present text which, apart from seven structures in colour, is in black and white. A general text on biochemistry would certainly emphasise the importance of enzymes while highlighting the objective of the reaction being catalysed in terms of the general metabolism. Having expressed my concern, I found the text carefully produced and each chapter has a comprehensive list of references at the end. The chapter on 'The purification of enzymes' ends with seven examples including the use of recombinant methods for chymosin. This showed the range of problems that would probably not have been detailed in a more general text.

In the section on the unfolding and folding of enzymes (section 3.6), which is a field of intense activity, the problem of Creutzfeldt–Jakob disease is mentioned but 'prion' is not listed in the index. This chapter has some 285 references.

In the chapter on 'Enzymes in the cell' one sees the difficulties of not encompassing a broader range of cell biology.

Having examined the text more closely I am almost convinced that a text confined to enzymology like the present one is justified. My only rider is that I think that the reader would be well advised to first possess at least an elementary knowledge of biochemistry in toto.

Peter N. Campbell

Booklist No. 156

1. Kinchington, D. and Schinazi, R.F. (eds.) Antiviral Methods and Protocols. Methods in Molecular Medicine. Humana Press; Totowa, 2000. xiv+404 pp. $ 99.50 (hb).
2. Streuli, C.H. and Grant, M.E. (eds.) Extracellular Matrix Protocols. Methods in Molecular Biology. Humana Press; Totowa, 2000. xiv+370 pp. $ 89.50 (hb).
3. Desai, M.A. (ed.) Downstream Processing of Proteins. Methods in Biotechnology. Humana Press; Totowa, 2000. ix+229 pp. $ 89.50 (hb).
4. Barnett, Y.A. and Barnett, C.R. (eds.) Aging. Methods and Protocols. Methods in Molecular Medicine. Humana Press; Totowa, 2000. xiv+385 pp. $ 99.50 (hb).
5. Econs, M.J. (ed.) The Genetics of Osteoporosis and Metabolic Bone Disease. Humana Press; Totowa, 2000. xi+462 pp. $ 145.00 (hb).
6. Freshney, R.I. (ed.) Culture of Animal Cells. A Manual of Basic Technique. Wiley; Chichester, 2000. xxvi+577 pp. £ 51.95 (hb).
7. Wilson, K. and Walker, J. (eds.) Principles and Techniques of Practical Biochemistry. Cambridge University Press; Cambridge, 2000. xviii+784 pp. £ 27.95 (pb).
8. Walther, W. and Stein, U. (eds.) Gene Therapy of Cancer. Methods and Protocols. Methods in Molecular Medicine. Humana Press; Totowa, 2000. xvi+645 pp. $ 99.50 (hb).
9. Tymms, M.J. (ed.) Transcription Factor Protocols. Methods in Molecular Biology. Humana Press; Totowa, 2000. x+306 pp. $ 79.50 (hb).
10. Marsh, M.N. (ed.) Celiac Disease. Methods and Protocols. Methods in Molecular Medicine. Humana Press; Totowa, 2000. xi+288 pp. $ 99.50 (hb).
11. Barbotin, J.-N. and Portais, J.-C. (eds.) NMR in Microbiology. Theory and Applications. Horizon Scientific Press; Norfolk, 2000. xi+500 pp. £ 84.99 (hb).
12. Habib, N.A. (ed.) Hepatocellular Carcinoma. Methods and Protocols. Methods in Molecular Medicine. Humana Press; Totowa, 2000. xiii+302 pp. $ 99.50 (hb).
13. Hammes, G.G. (ed.) Thermodynamics and Kinetics for the Biological Sciences. Wiley; Chichester, 2000. ix+163 pp. £ 32.50 (pb).
14. Taniguchi, N. and Gutteridge, J.M.C. (eds.) Experimental Protocols for Reactive Oxygen and Nitrogen Species. Oxford University Press; Oxford, 2000. xix+337 pp. £ 45.00 (hb).
15. Mark, H.F.L. (ed.) Medical Cytogenetics. Marcel Dekker; New York, 2000. xvii+680 pp. $ 195.00 (hb).
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