



Woven warning: detail from the Bayeux tapestry showing Harold I being told of comet Halley. The eleventh- or twelfth-century tapestry in Bayeux, France depicts the Norman conquest of England.

Charles Darwin and, perhaps influenced by his views, which favoured slow evolutionary processes for explaining the development of life, the catastrophism of Newton and Halley was all but ignored until fairly recently.

In the past few decades, comet and asteroid collisions have once again been recognized as important processes in rearranging the surfaces of the planets and their satellites and abruptly changing the evolution of life on Earth. There is a growing consensus in the astronomical community that comet collisions with Earth may have laid down much of the thin layer of carbon-based molecules and water that allowed the formation of life 3,500 million years ago.

Subsequent cometary collisions may have caused mass extinctions, allowing only the most adaptable species to evolve further. We mammals may owe our pre-eminent position on Earth to a series of cometary collisions that eliminated our stronger, but less adaptable, competition — including the dinosaurs.

This book is not a general history of comets. Rather than focusing on the development of ideas about their motions or physical characteristics, the author is concerned primarily with the perception of comets throughout history. It is a scholarly, well-illustrated and accurate work. Nearly half the volume is devoted to footnotes and references, however, which leaves the reader with the annoying task of continually having to leaf back and forth between the two halves.

European and English perceptions of comets during the seventeenth and eighteenth centuries are emphasized. Little mention is made of other cultures — that of China, for example — that actively observed and recorded comets. But within the confines of the subject area presented, the author does a fine job. The book should make an important contribution to the history of astronomy. □

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Getting down to business

The Scientist as Consultant: Building New Career Opportunities

by Carl J. Sindermann and Thomas K.

Sawyer

Plenum: 1997. Pp. 341. \$29.95, £18.15

William Bains

'Consulting' is famously identified with someone who steals your watch to tell you the time and, in this era of 'downsizing', has become almost synonymous with 'unemployed'. An exception to both calumnies is the technical consultant, especially the scientist. These are people who provide their expertise to many clients for a fee. But this book is not aimed at them, but rather at people who wonder whether consultancy is a career for them. Whether the career is right for you or not, the book is an excellent guide to help you decide.

What is a scientific consultant? The authors wrestle with this, and arrive at "a technically trained entrepreneur who makes available for a stated price his expertise, data, data analysis, evaluation and recommendations relevant to a client's needs", a catch-all they admit is unsatisfactory. They also emphasize the need for professional ethics as a consultant, citing a quaintly pre-1980s definition of a professional as one "who maintains a loyalty to a code of ethics that transcends his or her loyalty to the rest of the organisation" or to themselves, a tenet which, if adhered to by major consultancies, would send several of them bankrupt.

But above all the consultant is a business person, and consulting is a business. Consultants must be interested in the processes of both business and science. This means accepting the value of lawyers and accountants as advisers, sending off bills promptly and harassing clients who refuse to pay them, and 'selling'. Most scientists are unused to selling anything except ideas and, if you are not keen to try, then consultancy is not for you. Most consultancies fail, the authors believe, because of lack of aptitude for and interest in business. Squaring this with the Sisyphean task of keeping technically current requires real entrepreneurship. Scientific consulting is not just 'a job'.

The authors describe a rewarding career path from paid hobbyist to professional manager, which you can join or leave at will. They examine what sort of people might flourish in consultancy and why, how to escape from it, what the future is, and how people change, succeed or fail. They also give substantial detail on what consultants actually do. (The section on managing scientists is excellent — a 'must' for department heads as well as industrial managers.) The book is

stuffed with useful comments and guidance, including a very honest (if rather short) section on the downside of consulting. Consultants will enjoy putting names to the list of "clients from hell".

My only serious disagreement is with the authors' perception of big consultancy companies. Graduate entry to a large consultancy is not a viable route to a career in scientific consulting. Scientists are the drudges in such organizations, and do not rise to the top without radically altered goals; the leader of the 'science division' in one such consultancy publicly commented early in his post that research and development were a waste of money. Nor can they leave to set up on their own, as the competition clauses in their employment contracts will prevent them from competing as a consultant with their erstwhile employer. The route to scientific consultancy is clearly science first, consultancy later.

The book has a strong US bias, and 'rest of world' seems to mean not Europe but Africa. That said, non-American readers can easily sidestep the few parochial discussions.

This is a business book, because consultancy is a business. But, like science, the book is full of facts and hard detail, and does include the negative controls of business or scientific failure. It is an excellent guide to a fascinating career choice. □

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Corrections

● Some incorrect star ratings were awarded to *The Colours of Life* by Lionel R. Milgrom in the review in *Nature* **389**, 687; 1997. They should have been "excellent" for range and style, "good" for depth, accuracy and accessibility, and "fair" for up-to-dateness. Our apologies for falsely raising expectations.

● In his review of *Molecular Systematics of Fishes* edited by T. D. Kocher and C. A. Stepien (*Nature* **389**, 30; 1997), John Long says that the book "only covers the largest living group of fishes, the teleostean fishes". The editors have asked us to point out that the book in fact contains a chapter on "Interrelationships of Lamniform sharks" — which are not, of course, teleosts.

● *Tropical Medicine and International Health*, reviewed in this year's New Journals supplement (*Nature* **389**, 145; 1997), resulted from the pooling of four previously existing journals, not three. The title not mentioned is the German *Tropical Medicine and International Health*, whose independent history extends back to 1897. *Antiviral Therapy*, reviewed on page 144 in the same supplement, has since its third issue been published by International Medical Press, not MediTech Media.

Scales of progress

Air-Breathing Fishes: Evolution, Diversity and Adaptation

by Jeffrey B. Graham
Academic: 1997. Pp. 299. \$79.95, £55

Molecular Systematics of Fishes

edited by Thomas D. Kocher and Carol A. Stepien
Academic: 1997. Pp. 314. \$79.95, £57

John Long

Perhaps the greatest step in vertebrate evolution was the transition from fishes dwelling in an aqueous habitat to tetrapods crawling on land. Many scientists tend to think of the complex skeletal and physiological changes that happened during the geologically short time span involved, yet few are aware of the many inherent changes in the evolution of fishes that set the stage for their invasion of a new habitat.

Study of the anatomy and physiological mechanisms of air-breathing in living fishes gives an insight into the environmental factors that may have driven the first fishes into adapting an air-breathing behaviour. In *Air-Breathing Fishes*, Jeffrey B. Graham outlines the complete biology of how and why some fishes breathe air, investigates possible reasons for how such adaptations may have evolved, and revisits the fish-tetrapod transition from a fresh viewpoint.

Today some 49 families of fishes have representative air-breathers, falling broadly into two behavioural categories, the amphibious air-breathers and the aquatic air-breathers. Although lungfishes are commonly known as typical air-breathing fishes, there is also a great diversity of actinopterygian fishes

which can partially respire subaerially. The first two chapters of the book comprehensively cover the environmental factors affecting air-breathing, the terminology involved and the diversity of living air-breathing fishes. The remaining chapters deal with the anatomy and physiology of air-breathing fishes, specifically the anatomy of respiratory organs, circulatory adaptations, aerial and aquatic gas exchange and metabolic mechanisms, cardiorespiratory control, blood respiratory properties and metabolic adaptations. The book is well illustrated with clear diagrams, good photographs of dissected specimens, tissue sections and some scanning electron micrographs. It is written in a clear style, is well referenced and has a good index. It should have wide appeal for all interested in the anatomy of fishes and their physiology.

Molecular Systematics of Fishes is a collection of 17 papers covering the range of new and improved methods for taxonomic investigation using such molecular techniques as polymerase-chain-reaction amplification and DNA sequencing. Such methods are now widely used for comparing populations of living fishes with their neighbours, or for more distant phylogenetic relationships between species in widely distant taxonomic groups. Despite the all-encompassing title, the book only covers the largest living group of fishes, the teleostean fishes. It holds a wealth of valuable information visually well presented by many cladograms and tables. A must for teleost taxonomists and general fans of phylogenetic systematics. □

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From the cover of *Fishes of Chesapeake Bay* by E. O. Murdy, R. S. Birdsong and J. A. Musick. Smithsonian Institution Press, \$49.95, £38.95.

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edited by Steven F. Savitt
CUP, £16.95, \$24.95

A Natural History of Amphibians

by Robert A. Stebbins and Nathan W. Cohen
Princeton University Press, \$19.95, £15