Heading for safer shores?

The Biology of Sea Turtles, Volume II
edited by P. L. Lutz, J. A. Musick & J. Wyneken
CRC Press: 2002. 455 pp. $99.95

N. Mrosovsky

Watching a large turtle emerge from the sea at night to lay its glistening white eggs in the sand is an unforgettable and powerful experience. Sadly, some turtle populations are in serious decline, although others are increasing, leading to debate about whether the risk of extinction has been exaggerated. But biologists and conservationists can all seem to agree on the value of having a better understanding of sea-turtle biology. In the past decade, studies using mitochondrial DNA, satellite tracking and temperature-determined sex ratios have proliferated, as have low-tech beach surveys.

However, too often researchers lack integrative reviews and easy access to carefully archived results. Unrefereed extended abstracts from conferences are often quoted, for want of other sources. The *Marine Turtle Newsletter* has higher standards and sometimes contains important items, but it focuses on alerting readers to developments in their initial stages. So, when the first volume of *The Biology of Sea Turtles* appeared in 1997, it enjoyed considerable success and was frequently cited.

This is now followed by a second volume, which has an emphasis on reproduction (gonadal development, breeding cycles and sex determination). It also covers a variety of other topics, from husbandry to sensory abilities, and includes thoughtful discussions of growth, age at maturity and population trends. A quarter of the contributions to the volume concern not so much biological as historical, cultural, economic and conservation-oriented aspects of the subject.

Although these reviews are likely to be highly cited, most tend to inform rather than illuminate. For example, a useful chapter on anatomy mentions the highly vascular cartilage of the leatherback turtle. The exciting thing about this work, not captured by a mere reference to the original description, was the creative extrapolation from anatomy to physiology, implying some degree of endothermy in the leatherback. Critical evaluation and guidance about which studies are methodologically best, and why, are often lacking. To fulfil their potential, reviews should be more than the sum of their parts.

Editing seems to have been minimal, resulting in some overlap in text and illustrations. Some photographs are reproduced in both colour and black-and-white, several chapters include similar photographs of gonadal structure, and one photograph, which shows the stages of spermatogenesis, appears twice. It has been said that a picture is worth a thousand words. For pictures illustrating the same thing, 500 each at best would be allowable — make that 250 for photographs lacking scales or resolution.

In contrast, the chapter on migrations and satellite tracking would have been enhanced by including some figures. The editors have not attempted any integration, cross-referencing or explanation of discrepancies. For example, one of the better, more synthetic chapters compares life histories with a mitochondrial-DNA phylogeny for the "seven extant species" of sea turtle, but other chapters assume that east Pacific green turtles are a separate species, and so end up with eight.

But despite these problems, *The Biology of Sea Turtles* is one of the best places to start — though not to stop — and both volumes may be recommended to libraries and individuals. ■

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Turning turtle? The risk of extinction may have been exaggerated for some turtle species.

Balancing planets and molecules

Ecological Stoichiometry: The Biology of Elements from Molecules to the Biosphere
by Robert W. Sterner & James J. Elser
Princeton University Press: 2002. 439pp. $75, £52 (hbk); $29.95, £19.95 (pbk)

David W. Schindler

Inspired by the work of Alfred Redfield in the 1950s and 1960s, marine ecologists and geochemists have used stoichiometric principles to guide their studies of nutrient limitation and nutrient cycling in the oceans for almost half a century. Indeed, many of us used 'Redfield ratios' for marine algae as the basis for our work on fresh water throughout the 1970s and 1980s. In those days, 'stoichiometry' was unknown as an ecological principle, although it was widely used by chemists in calculations involving the masses of reactants or products in chemical reactions.

Little thought was given to developing stoichiometric principles, which were tailored exclusively for other ecosystems until the late 1980s. Robert Sterner and James Elser, along with a small group in Scandinavia, were pioneers in developing these new principles for fresh water. More recently, terrestrial ecologists have jumped onto the stoichiometry bandwagon. Despite more than a decade of intensive scientific work and hundreds of studies demonstrating the importance of stoichiometric principles, there has been no synthesis, until now. So I eagerly accepted *Nature*'s invitation to review this book.

I was surprised by the size of the book. I had expected a small volume attuned to ecological considerations that could be read in a couple of evenings, not 380 pages of text in closely spaced, tiny type. The dense type and occasionally complex language render it a difficult read. Those aged over 50 may have to invest in stronger reading glasses, brighter light bulbs, and eyedrops if they want to read the book in less than a week.

The book provides a clear explanation of the authors' own work on freshwater systems and the differences in approach of their competitors, and also briefly covers terrestrial stoichiometry. I hadn't previously thought of applying stoichiometric principles at subcellular or planetary levels, and frankly, after reading about them, I don't think I want to know more. I had also not previously seen the term 'stoichiometry' applied to the coupling of biogeochemical cycles except in connection with limiting nutrients; of course, it fits perfectly.

Few, if any, details of stoichiometry seem to have been overlooked by Sterner and Elser, and their book will be a useful reference to me for many years to come. However, the completeness of the book is also its Achilles' heel. Because of its complexity, I would not give this book to undergraduate ecologists to introduce them to the importance of stoichiometry. It is a treatise, not a textbook, and represents a massive amount of work.

The hundreds of references in the bibliography are worth the price of the book alone. I would have liked to see a back-referencing system, adding after each reference the page numbers where it is discussed in the text. Such a feature has helped G. E. Hutchinson's *Treatise on Limnology* endure for many decades. Also, the index could be improved; for example, 'trophic cascade' doesn't appear in the index, despite being discussed several times in the book and being one of the most important areas where stoichiometry has enlightened modern ecology.

The proliferation of books costing US$100 or more has made it almost impossible for most libraries or scientists to buy more than a small proportion of them. This book is a refreshing exception. It is well edited (although I did find a couple of typographical errors), and figures and tables are clearly reproduced, although there are no photographs. Yet it has a price of only $29.95. If future authors want their books to be widely read, they should pay attention to these features. All in all, I consider the book a 'must have' for ecologists, limnologists and biogeochemists, and it is an important reference work for others in the Earth sciences. ■

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Science in culture

Behind the wall

Hans Neubert's murals paint a picture of scientific research in East Germany in the 1950s.

Alison Abbott

In 1961, when German artist Hans Neubert was 30 years old, he jumped one of the last trains to west Berlin before the Berlin Wall shot up and sealed so many fates. He left behind in his native Dresden, seemingly forever, a vast number of portraits and landscapes.

He also left behind an extraordinary cycle of ten oil-on-canvas wall paintings at the Friedrich Löffler Institute, now the Federal Research Centre for Virus Diseases of Animals at Insel Riems, a remote Baltic island north of Greifswald in eastern Germany. Löffler, famous for his 1898 discovery of viruses, founded the institute in 1910, and Neubert's cycle was officially unveiled at its 50th anniversary.

A. ABBOTT

Free speech: Hans Neubert encouraged scientists to discuss the accuracy of his paintings.

Neubert painted the cycle between 1957 and 1960, when Heinz Röhrer was the director of the institute. Röhrer had initially engaged Neubert to paint his family's portrait, but scientist and artist became fascinated by each other's work. Röhrer let Neubert watch, and sketch, one of his early-morning autopsies of a cow, and the idea emerged of a large painting of the scene for the foyer of the institute's main building. Such was its success that Röhrer commissioned the entire cycle, which now covers the foyer, winds up the stairs and finishes in the gallery on the first floor. Neubert's brief was to depict the full range of the institute's scientific work, from taking blood from rabbits to collecting antibodies, and, as shown here, searching for viral particles by electron microscopy.

A devotee of Rembrandt and Titian, Neubert also absorbed more contemporary influences such as realism and expressionism. Precision was second only to composition in Neubert's priorities. He set up an atelier in the spacious entrance hall of the 1940 building and shrouded it with huge white sheets. Neubert encouraged the scientists to visit him at work to discuss the progress and accuracy of his paintings. Older scientists at the institute still remember his struggle to understand exactly how a hand must be placed to make an injection or to draw blood. The result is a social record at many different levels, as well as an artistic gem of its era.

The only clear deviation from scientific reality occurs in the painting shown here of electron microscopists at work — this 1945 electron microscope would have operated in the dark. But Neubert includes two assistants examining electron micrographs on a light box in the far side of the room. Complementary triangles of different-coloured light illuminate the faces of each of the five figures and cast long reflections into the floor. The electron microscope, manufactured by Siemens, was one of only two imported into East Germany, and was a source of immense pride to the institute's scientists. At some 4.6 metres high, the painting reflects the instrument's scale and the intensity of the grouped figures.

Artistic realism didn't necessarily equate to political realism, however, and when the cycle was close to completion, Röhrer needed to have them approved by the East German authorities. The paintings were not subversive: they simply celebrated science. But they did not explicitly celebrate the value of that science for the people, as the authorities expected. So Neubert provided a few drafts of a supposed grande finale, in which smiling peasants watched scientists vaccinating farm animals. "These pleased the authorities, who were then happy to give approval," recalls Neubert. Approval assured, Neubert destroyed the drafts and painted the final theme that had always interested him: an international group of scientists gathered at the institute to exchange ideas and argue their theories. The 50th anniversary in fact provided exactly such an occasion.

When the Berlin Wall came down in 1989, there were calls for the paintings to be destroyed by those who equated Neubert's style with social realism, a construct associated with the Communist regime. But many fought for their preservation. In 1993, Neubert, by now a contented landscape, still-life and portrait painter in Bavaria, visited Riems again with his wife Barbara, the west Berliner for whom he had risked so much more than 30 years before. He was relieved to find that the colours had held firm against the damp air. Thanks to the protection of the scientists at Riems, Neubert's brief interaction with science has proved equally long lasting.

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