

highest cost of evolution, namely the maintenance of polymorphism. The contention that antigen processing and presentation by MHC molecules can be dispensed with in recognition by T cells is doubtful (the implications of the Bjorkman–Wiley structure do not seem to have reached La Jolla). There is a failure to realize how different modes of loading underlie the difference between MHC Class I and Class II molecules and to comprehend the importance of suppression for the control of hypersensitivity. The new ideas about staging in the thymus (the CD4/CD8 double-positive cell as the target of selection) are neglected. Finally, and most seriously, a key idea not mentioned in the book is that by relegating to T cells the job of maintaining self-tolerance, B cells become free to hypermutate.

On the positive side, Cohn and his colleagues were the first to realize the importance of the signals that lymphocytes receive through molecules other than their antigen-binding receptors. Just how important those signals are is evident in recent experiments demonstrating that cloned T-cells become unresponsive if stimulated in their absence. The fact that this book continues to present them in a much over-simplified fashion as a single second signal hardly detracts from the credit. Cohn also got the balance between germ-line and somatic diversification right at an early stage, and the expanded account presented here of the logic of diversification makes interesting reading. But I wonder whether the effort is justified: perhaps it makes more sense to sit back and wait until the astonishing range of diversification mechanisms adopted by different groups of vertebrates has been more fully explored.

I agree with the point of view expressed by Cohn in his introduction (and by Burnet before him), that ideas matter in immunology, perhaps more so than in other branches of biology, and that their most important function is in organizing otherwise incoherent sets of observations. But they need to be used with discretion and flexibility. Cohn criticizes others for their intellectual rigidity over the years, but it seems to me that the account of immunology that is presented here lays Cohn and Langman open to precisely that charge. □

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New in paperback

- *A Passion for Science*, by Lewis Wolpert and Alison Richards (Oxford University Press, £4.95). For review see *Nature* 334, 112 (1988).
- *Who Got Einstein's Office? Eccentricity and Genius at the Institute for Advanced Study*, by Ed Regis (Penguin, £5.99). For review see *Nature* 332, 497 (1988).

Shell show

Tim Halliday

Turtles of the World. By Carl H. Ernst and Roger W. Barbour. *Smithsonian Institution Press*: 1989. Pp. 313. \$45.

SUCH is the rate of decline of turtles and tortoises that we may never have the opportunity to learn more about many of them than is presented in *Turtles of the World*. The pictures shown below are reproduced from the book, which is the first to provide comprehensive coverage of the world's 257 turtle species, a group of reptiles with a 200-million-year history.

Each species is covered under the headings of description, distribution, habitat and natural history. There is considerable variation in the amount of material presented under the last heading, reflecting the fact that the behaviour and ecology of some species have been studied intensively, whereas little is known about others. The species entries are organized taxonomically and the book also includes detailed keys to identification at the levels of family, genus and species.

The most distinctive feature of turtles is the shell which, for most species, provides a protective haven into which the limbs and head can be withdrawn when the animal is threatened. There is considerable variation, however, in its form and protective role. In the softshell turtles, such as *Apalone spinifer* and *Cycloderma frenatum*, the amount of bone in the shell

is greatly reduced, and the main means of defence is to burrow in sand or mud. The head of the Asian big-headed turtle *Platysternon megacephalum* is so large that it cannot be withdrawn into the shell; this species appears to compensate for its greater vulnerability by being nocturnal. The evil-tempered Mexican giant musk turtle *Staurotypus triporcatus* is able to keep its jaws open even when the head is withdrawn, making it a formidable adversary. The shells of many turtles are beautifully patterned and coloured, as in the spotted turtle *Clemmys guttata*.

Turtles face a number of threats. Many species make very good eating, others have been adversely affected by insecticides and herbicides. They frequently suffer heavy casualties on roads and the populations of several species have been severely reduced by the pet trade. Being generally long-lived and slow-breeding, turtles and tortoises are also vulnerable to high levels of hunting. Some are at their most exposed when the young leave the eggs, dig their way out of the earth and find their way to water. Aquatic species have to wait until conditions are wet and the young of the Australian giant snake-necked turtle *Chelodina expansa* have been known to be trapped underground for nearly two years by drought.

Turtles of the World represents an impressive piece of scholarship. For the specialist it will prove to be an invaluable source of information for many years. □

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Platysternon megacephalum



Cycloderma frenatum



Staurotypus triporcatus



Clemmys guttata



Apalone spinifer



Chelodina expansa