the importance of epigenetic inheritance systems comes from the partial failure of the originally ultra-reductionist, gene-centred approach that gave us genomics. It is becoming increasingly clear that the interesting stuff is going on at the level of large gene networks, not of individual genes, partly because there is widespread functional redundancy in the genome. This is why we are seeing an astounding proliferation of 'omics' — after genomics, we have had proteomics, metabolomics and even phenomics, whatever that may mean.

Evolution in Four Dimensions also features a series of fictitious dialogues between the authors and a character named Ifcha Mistabra, which is Aramaic for "the opposite conjecture". This is a time-honoured philosophical device (used in the platonic dialogues, and in David Hume's dialogues on natural religion) for considering possible objections to one's arguments and discussing them in a literary way. Some scientists may feel alienated by this device, but I found it refreshing to read a science book that is a conscious attempt at good literature. I really don't understand why so many of my colleagues equate boredom with seriousness.

The clamour to revise neo-darwinism is becoming so loud that hopefully most practising evolutionary biologists will begin to pay attention. It has been said that science often makes progress not because people change their minds, but because the old ones die off and the new generation is more open to novel ideas. I therefore recommend this and the other books I mentioned on the future of evolutionary theory to the current crop of graduate students, postdocs and young assistant professors. They'll know what to do. ■

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Death and taxas

Insect Diversity Conservation
by Michael J. Samways
Cambridge University Press: 2005. 342 pp.
£30, $55 (pbk); £60, $110 (hbk)

Norman Myers

We really needed this book ten years ago when it would have illuminated an urgent but largely uninvestigated challenge of conservation biology. We have long been aware that the great bulk of the mass extinction currently under way is made up of insects, yet we have had only a meagre grasp of the details.

We have 'guesstimated' that 80% of the roughly 10 million species on the planet are insects. Yet we know so little about them that we haven't even located the main concentrations of insects (although one strong contender is the canopies of tropical forests). We know next to nothing about their natural histories or other key characteristics. And most important, we have only vague clues about their conservation status: how many species should be classified as threatened? Are species being eliminated at rates matching those for mammals and birds — that is, hundreds or even thousands of times faster than before modern humans appeared? All these questions are addressed in this compendious book.

It's true that a few taxa are well documented, notably butterflies (about 20,000 species), ants (8,000), dragonflies (6,000) and tiger beetles (25,000). But these total only some 60,000, and we cannot say how far they serve as indicator species to throw light on the rest. Fortunately, we can gain some insight by drawing on the congruence relationships of insects with plants. If we accept (gulp) that there are at least 300,000 species of plant and 8 million species of insect, that works out at one plant species for every 27 insect species. Crude though this calculation is, it is indicative. Of course, the relationships between plants and insects are greatly varied: a few insect species rely on a single plant species, whereas many link up with dozens of plants.

Some observers may respond that if thousands of insect species are becoming extinct, so what? Do we really need all those creepy-crawlies? This point applies particularly to beetles, which must total several million species, many of them only marginally differentiated in their morphologies. Yet this apparent redundancy may serve some vital function in nature, if only as an evolutionary insurance mechanism. Still more to the point is that insects supply a host of ecosystem services that support the human enterprise. If we were eventually to lose half of all mammal and bird species, as looks entirely possible, that would surely be less damaging than losing half of all insect species with their pollinating services: our agricultural crops could be in trouble within short order. We live in a bug-driven world.

All this is dealt with in splendid detail in this book by Michael Samways, a leading entomologist at Stellenbosch University in South Africa. He starts out with the rationales for insect conservation, then considers such esoteric factors as evolutionary radiation, flight mechanisms, polymorphisms and taxonomic challenges. He reviews insects' roles as keystone organisms, soil modifiers, pollinators, parasitoids and predators, and disease vectors. He considers insect survival in a fast-changing world, assessing such issues as environmental contamination, agricultural encroachment, deforestation, threats from invasive aliens, biological controls, genetic engineering, climate change and future evolution, as well as synergized interactions between these factors. The book concludes with an extended evaluation of conservation strategies, including reserve selection, plant and animal surrogates, phylogenetic considerations, inventorying and monitoring, species restoration, triage conservation (focusing efforts on the top priorities), and biodiversity hotspots as applied to insects.

Samways displays a flair for engaging asides, such as his comment on insects' fecundity: "One gravid aphid, left to reproduce with zero mortality, will, after one year, cover the globe with an aphid layer over 140 km thick."

There are very few insect books of such expansive scope, and this one could be a standard text for years. It will be welcomed by specialists in entomology, biodiversity, mass extinction, evolution and half-a-dozen associated fields. But it is much more than an expert book for experts; it should appeal to everyone interested in the fast-diminishing biodiversity of our planet. All in all, this is an expensive book that is excellent value. ■

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Will these *Membracis* treehoppers join countless other insect species on the road to extinction?