

Hudler is cautious in his advice on collecting for the pot — a topic that is emotive among collectors and conservationists, on grounds other than safety. Now practical guidance is available in the United Kingdom from the *Code of Conduct for Mushroom Collectors* issued by English Nature in September.

Hallucinogenic mushrooms, and, in particular, the experiences of Gordon Wasson and Timothy Leary, are given a high profile. But more about the religious aspects of fungi could have been expected from the title, for example the involvement in early Christianity posited for them in John Allegro's books.

Hudler covers the various symbiotic and parasitic relationships of fungi with other plants, the diseases fungi can cause in insects, and wood decay. But I missed a sense of the magnitude of fungal diversity, its role in global ecology, and potential contribution to improvements in agricultural production. Biocontrol is discussed, especially with reference to the gypsy moth in North America whose caterpillars are attacked by *Entomophaga maimaiga*, but what of the pioneering work on whitefly control in UK glasshouses using *Verticillium lecanii*, and recent field trials of *Metarrhizium anisopliae* in locust control in Africa?

The negative image of taxonomy is perpetuated by the use of some obsolete names. And why were the *Cladonia* and *Boletus* figures not identified? Hudler sees molecular approaches as the taxonomic panacea, but I find that view short-sighted. Around 1,800 new fungi are described each year, and some 100 sequences are added annually; the molecular knowledge gap is increasing exponentially.

Fungi lend themselves to illustrations that captivate. The half-tones and line drawings are of variable quality, but supplemented by eight pages of colour plates, mainly of macromycetes; regrettably none have scales. Sadly he passed up the opportunity to provide an entrée into the amazing beauty revealed by modern microscopy of the microfungi responsible for so much of the magic and mischief of the title.

This book prompts reflection on the nature of a world without fungi. Imagine if trees had not been able to expand from tropical to temperate and boreal regions, if wood never decayed, forest productivity dropped, there were no penicillins or cephalosporins, no food for numerous insects and other invertebrates, no lichen cover on the ground in the tundra, no mushrooms or bread to eat, no alcoholic drinks, and no human or plant fungal diseases.

Mycology suffers as an orphan in botanical science. It is a major discipline submerged in largely foreign terrain — departments and courses dealing with organisms of a different kingdom — and starved of appropriate texts. Hudler's book, in the tradition of Ernest Large's *Advance of the Fungi* (Jonathan Cape,

1940), fulfils its claim "to remind us just how vulnerable we are to the oft-neglected fungus-world". It deserves to be read by biologists at large, and merits a place in Christmas stockings and on student reading lists. □

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Twisted strands

A History of Molecular Biology
by Michel Morange
Harvard University Press: 1998. 342 pp.
\$39.95, £24.95

DNA Pioneers and Their Legacy
by Ulf Lagerkvist
Yale University Press: 1998. 184 pp. \$20,
£15.95
Sydney Brenner

Although molecular biology is still a relatively young science, it has already inspired a considerable corpus of historical writing. First, there is Horace Judson's account of the early days of molecular biology, *The Eighth Day of Creation*, and Robert Olby's account of the work that preceded the discovery of the structure of DNA, *The Path to the Double Helix*. Then there are all the memoirs and autobiographies written by the main participants, beginning, of course, with James Watson's *The Double Helix*.

Historians are inclined to distrust the personal memoir, which, in their view, relies too much on memory and is seen only from one point of view. They heed the message of Ryunosuke Akutagawa's story *Rashomon* (1915; better known through the later film), where different witnesses testify about a rape and murder, each, including the dead man himself, giving a different account of the same events. The scientific literature itself is not a very useful source as, in historical terms, most papers are constructs, deconstructing the historical events themselves, to reassemble them in a document written in a standard style and shaped by whatever journal editors and their referees happen to think is scientifically appropriate at the time.

Michel Morange is a biochemist who has written a history of molecular biology that also includes a history of genetic engineering, taking up the story more or less where Judson leaves off. He also wants to place more emphasis on the role of biochemistry, and to give the French School (as he calls it) a greater role in the history of the subject than has been ascribed to it by British and US writers. He throws interesting light on why the subject developed so slowly in France. Apart from the obstacles posed by a gerontocracy largely of biochemists, there was the legacy of conservative French biology which never quite accepted Darwin and the theory of natural selection. This is curiously French; their Cartesian views of the world had no

place for a theory in which nature behaved as an Anglo-Saxon empiricist.

Although he accepted it intellectually, Jacques Monod remained uncomfortable with Darwinian theory. In his book, *Chance and Necessity*, which brought the new ideas of biology to the French public, Monod thought that nature should have a *project*, that is, he wanted the finished product to exist somewhere so that natural selection could achieve it. It was also the French who proposed replacing the term teleology with teleonomy — a wolf in sheep's clothing with a sheep in sheep's clothing. I am happy to say that neither are much used today.

Morange also wishes to press on historians of molecular biology the importance of the distinction made by François Jacob and Monod between structural and regulatory genes. The distinction is, of course, much older than the 1960s, except that nobody could do anything about it until all the basic concepts of molecular biology had been established. Morange's account of the history of genetic engineering and of the developments that followed shows how molecular biology went from a highly intellectualized subject to one that became technologized and began to interact with the world outside. The heroes of the past are replaced by the managers and bureaucrats of today.

Ulf Lagerkvist also believes that it is important to explain science and scientists to the public and he thinks this is best done through a combination of history and personal memoir. He, too, moves biochemistry to the centre of the stage, and his history starts far back in the history of chemistry. But in other ways his book is very different. Miescher, the discoverer of DNA, is given a central role in the story. I knew that in 1895 Edmund Wilson wrote in his book, *The Cell in Development and Heredity*, that chromatin and its main component, nuclein, was the physical carrier of heredity, but I did not know that Miescher rejected this and entertained the absurd idea that inheritance was mediated by enantiomeric forms of protein molecules.

The book culminates with an account of the life and work of Arthur Kornberg, whose work on DNA polymerase is much admired by the author. The book has a certain charm to it, and it is interesting to have another Rashomonic view of the history where Watson and Crick do not occupy all of the stage and where the names of Luria, Delbrück and other members of the phage school do not even appear in the index.

Lagerkvist, like others of his generation, laments the fact that the students of today are not interested in the background of their science. Perhaps only the old read history, because the past is more familiar; the young are interested only in creating the future. □
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