genome, comprising perhaps 1000 gene loci, is concerned with these antigens, and the system controlling switching from one antigenic type to another is amazingly complicated. No doubt, as is often pointed out, such antigenic variation helps the organism to evade the immunological defence system of the human or animal host, though – as mentioned by M. J. Turner on pages 365 and 366 – some of the antigens are not situated on the external surface of the protein molecules and are not recognized by neutralising antibodies. It is hinted that these 'cryptic epitopes' have some other role, not connected directly with immunological evasion. That this is so is perhaps supported by the fact that free-living organisms (e.g. *Paramecium*) also indulge in antigenic variation, though not so extravagantly as *Trypanosoma*. Whatever its biological significance, the trypanosome antigen system, which is far from being fully understood at present, is intensely interesting to molecular biologists, whose work is admirably summarized in this book.

Another topic on which much molecular work has been done recently is that of the circumsporozoite (CS) antigens of malaria parasites, which are discussed by V. & R. S. Nussenzweig. These substances are proteins containing highly repetitive sequences of small groups of amino acids, and are situated on the surface coat of the sporozoites, – the parasite stage which is injected into the blood by mosquito bites. In 1984 the gene for the CS antigen in *Plasmodium falciparum* – the most important human malaria parasite – was cloned and sequenced. This made possible the *in vitro* production of large quantities of antigen, from which it was hoped that a prophylactic vaccine could be developed. Optimists though that with such a vaccine the problem of malaria might be overcome, and *Nature* of 16 August 1984 carried a leading article headed 'Malaria vaccine in sight?'. However, similar forecasts of the elimination of malaria had been made before, e.g. just after the end of the Second World War, when DDT and new anti-malarial drugs (chloroquine) became available. But malaria is still with us, unfortunately. Perhaps this is not surprising: parasites – especially intracellular parasites – would not have evolved and survived were they not well protected from the many and various obstacles which could be placed against them. C. C. Wang (p. 413) states, perhaps rather too sweepingly, 'there has not been a single successful vaccine against any parasitic disease'. Moreover the spread of drug resistance, especially of malaria parasites, is becoming steadily more menacing.

Parasitology is a subject in urgent need of more *basic* biological research. What might be done, if facilities were available, is well illustrated by a chapter by S. Ward on '*Caenorhabditis elegans*: a model for parasitic nematodes'. This worm, which has been the target for intense attention by the molecular biologists, is not a parasite, however. Partly for that reason it is enormously more amenable to genetic and molecular experimentation than the protozoan or helminthic parasites which give us so much trouble.

The book contains a number of excellent accounts of recent researches, though inevitably the amount of information on different parasites varies greatly. Some important pathogens, e.g. *Coccidia* and *Theileria* are not discussed at all, and the existence of plant parasites, some of which like *Striga* cause huge losses of agricultural crops (including maize), is completely ignored. As for classical genetics, D. Walliker contributes a concise account of genetics of malaria parasites, but very little is known about the genetics of other parasites. In *Trypanosoma* the extensive studies of Tait and others on isoenzymes and the evidence for genetic recombination is not mentioned. G. S. Nelson contributes a very readable chapter on 'Zoonoses'.

The book is less comprehensive than its title indicates, but is nevertheless a very useful source of information about current work. It makes one realise the vast extent of topics under the heading of parasitism, about which we still understand very little.

G. H. BEALE
*Institute of Animal Genetics,*
*University of Edinburgh*

*Genetic Effects of Air Pollutants in Forest Tree Populations.* Edited by F. SCHOLZ, H. R. GREGORIUS and D. RUDIN. Springer-Verlag. 1989. 201 pages. Hard cover DM 75. ISBN 3 540 50858 9.

'Waldsterben' or forest decline is clearly of overwhelming importance to foresters and the general public alike. This book looks at the effects that pollution is likely to have on genetic diversity within a species and is therefore of specific importance to forest geneticists.

The book represents a collection of papers presented at a meeting held in Grosshansdorf (Fed. Rep. Germany) in 1987 and organised by three working parties – 'Ecological and Population Genetics', 'Genetic Aspects of Air Pollutants' and 'Biochemical Genetics' – of the International Union of Forest Research Organisations (IUFRO).

The book is divided up into four different chapters, each containing a number of papers. Chapter 1 consists of two additional papers, not presented at the meeting on 'Methods of sampling and genetic analysis'. Both papers are involved in explaining the use of isoenzymes to investigate genetic diversity within polluted populations and recommended ways of tree selection for further investigation in the absence of genetic tests.

Chapters 2 and 3 are entitled 'Variation in response to pollutants' and 'Selection effects of pollutants' respectively (although it is difficult to see any real difference in content and meaning between the two) whilst chapter 4 concentrates on the 'Preservation of genetic resources'.

The papers within the final chapter are by far the most interesting to the general reader, and should be considered essential reading for anybody interested in gene conservation regardless of the reason for that interest, e.g. pollution or commercial exploitation of native stands. Chapters 2 and 3 mainly contain papers of specific studies, including; the effects of certain pollutants on particular species such as $SO_2$ and $O_3$ and also aluminium on Norway spruce: degradation in needle wax in silver fir caused by pollution; and effects on reproductive processes in boreal forests in response to increased acidity, amongst others. Chapter 2 also contains a good literature review of thus-far reported effects of pollutants on forest trees.

The collective conclusion of most of these papers soon becomes clear. Forest trees are long-lived organisms which encounter extraordinarily great environmental heterogeneity in time and space. Consequently, trees are amongst the most genetically diverse of all organisms. Environmental stresses cause shifts in gene frequencies in response to adaptation. If this stress is strong, and is applied suddenly as is the case with air pollution, partial or complete destruction of tree populations will finally occur. There will naturally be variation in response to the effects of the stress (pollution) within populations, but the subsequent genetic impoverishment would have serious consequences for environmental adaptations in future generations especially if other stresses or forms of pollution become apparent. The ability to adapt is undermined due to a reduction in genetic multiplicity. It becomes quite clear that whilst atmospheric pollution remains, the direction for genetic variation can only be down. The only real solution will be a reduction in the levels of atmospheric pollution.

The book is predominately German in the examples it sites but not totally; papers are also presented by authors from Poland, Netherlands, Canada, Italy and USA.

The Editors have been particularly busy; Scholz and Gregorius between them have an input in for 9 of the 11 German-based papers.

The book is a good collection of specific case-studies of air pollutants on genetic diversity with one or two more general chapters. It would act as an excellent reference book (if only for the vast amount of literature cited) for any student of atmospheric pollution, although at nearly £30 for 201 pages I do not anticipate a further depletion of German forests to produce staggering quantities of this book; but do get your library to order one.

S. J. LEE
*Tree Improvement Branch,*
*Forestry Commission,*
*Northern Research Station,*
*Roslin, Midlothian, Scotland*