BOOKS: MOLECULAR BIOLOGY

A Fruitful Fungus

David E. A. Catcheside

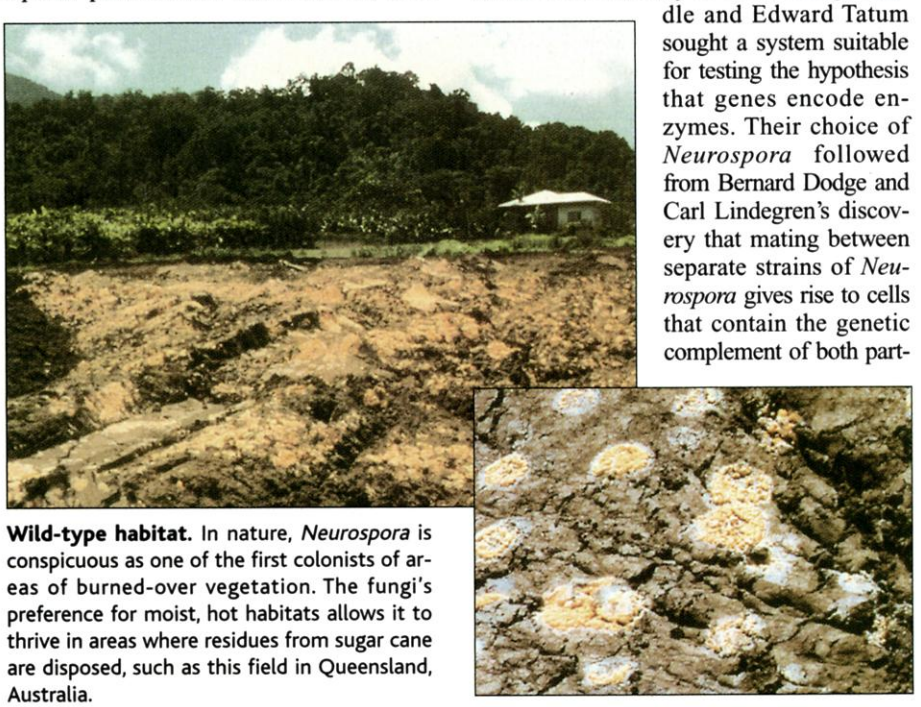
"The proper study of mankind is man." Time has flawed Alexander Pope's aphorism not only by the evolution of acceptable word usage but more fundamentally by the realization that the processes of life are broadly shared among organisms. Speedy progress toward understanding such processes is critically dependent on the appropriate choice of experimental systems. Ethical and practical considerations also constrain the occasions when *Homo sapiens* provides the best material, even when the goal is knowledge that will allow control of human disease. The filamentous Ascomycete fungus *Neurospora crassa*, which shares the complex cell architecture of eukaryotes with humans, is one of an elite group of species that have enabled major advances in our understanding of life's processes. This group includes the fruit fly *Drosophila*, the plants maize and *Arabidopsis*, the nematode worm, the mouse, yeast, and the gut bacterium *Escherichia coli* and its parasite phage lambda. Each of these species has characteristics and life styles that adapt them exceptionally well for laboratory manipulation.

In this book, Rowland Davis, a noted *Neurospora* researcher at the University of California, Irvine, provides a thorough, up-to-date, authoritative, and tightly written summary of the intricacies of *Neurospora* biology and the field's many contributions to our understanding of biological processes. Each of the 14 chapters is extensively referenced and profusely illustrated with photographs, diagrams, and maps. For researchers new to *Neurospora*, the final chapter offers a guide to genetic, biochemical, and molecular methodologies to domesticate and manipulate this well-tempered organism.

Neurospora Contributions of a Model Organism
by Rowland H. Davis
Oxford University Press, New York, 2000. 345 pp. $110. ISBN 0-19-512236-4.

The first calculated use of *Neurospora* was at Stanford University in 1940. George Beadle and Edward Tatum sought a system suitable for testing the hypothesis that genes encode enzymes. Their choice of *Neurospora* followed from Bernard Dodge and Carl Lindegren's discovery that mating between separate strains of *Neurospora* gives rise to cells that contain the genetic complement of both partners. These cells then undergo divisions that generate a set of eight spores, each containing one set of parental genes. Where the parental strains differ genetically with respect to any one character, four of the spores are like one parent and four are like the other. Dodge and Lindegren found 4:4 segregation of genes that affected form or color. Taking advantage of *Neurospora*'s ability to grow on a chemically defined medium, Beadle and Tatum isolated a large set of mutants each of which grew only when single additional nutrients were included in the culture medium. In every case, these nutritional mutants showed the 4:4 segregation known for genes. This research marked the beginning of molecular biology. It laid the foundation for direct demonstration that genes encode enzymes, provided the means for dissecting the intricacies of cell metabolism, and was rewarded with a Nobel Prize in medicine. *Neurospora* remained the organism of choice for molecular biology for at least a decade. However, the subsequent discovery of genetic processes in bacteria (which have simpler, prokaryote cell architecture) and in their viruses provided much swifter routes to understanding the core processes of life common to eukaryotes and prokaryotes. Therefore, *Neurospora* moved from center stage.

Davis's book is particularly timely because funds have been committed, since its publication, to complete the sequencing of the *Neurospora* genome. This development promises a renaissance in the relevance of the organism to advancing science. Annotation of a genome sequence in any species depends heavily on the recognition of homology with genes already characterized in other species. Large tracts of coding sequence from a variety of species currently have unknown function. In many cases, this DNA represents essential genes in which the mutants needed to characterize function will be lethal. In *Neurospora*, this problem can be circumvented with clever tools that take advantage of peculiarities of its life style. *Neurospora* cells can contain many nuclei, which may vary in their genetic constitution. By tuning the ratio between normal nuclei and nuclei in which the chosen sequence of unknown function is disrupted, the function of a gene can be deduced from the behavior of cells with mostly mutant nuclei that barely survive. The species that first enabled the dissection of gene function is, thus, well placed to provide the best tools for completing the catalog of genes essential for normal life in all eukaryotes.



Wild-type habitat. In nature, *Neurospora* is conspicuous as one of the first colonists of areas of burned-over vegetation. The fungi's preference for moist, hot habitats allows it to thrive in areas where residues from sugar cane are disposed, such as this field in Queensland, Australia.

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BROWSINGS

The *Neurospora* Compendium. Chromosomal Loci. *David D. Perkins, Alan Radford, Matthew S. Sachs.* Academic Press, San Diego, CA, 2000. 335 pp. $84.95, £56.95. ISBN 0-12-550751-8.

The authors present a list of all known *Neurospora* mutations together with their phenotypic characterizations, locations (when known), and other information that researchers working on any fungal model systems will find useful.

To Vote or Not to Vote. The Merits and Limits of Rational Choice Theory. *André Blais.* University of Pittsburgh Press, Pittsburgh, PA, 2000. 208 pp. $45. ISBN 0-8229-4129-5. Paper, $19.95. ISBN 0-8229-5734-5.

What makes people decide to vote? Using data from many countries, Blais concludes that rational choice theory offers a valid but very incomplete explanation of voter turnout.

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