BOOKS: MYCOLOGY

The Fascination of Fungi

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Since 1989, over 2000 Cornell undergraduates have queued up for Plant Pathology 201, "Magical Mushrooms, Mischievous Molds"—surely the only plant pathology course sexy-sounding enough to merit notice in *Rolling Stone*. How does Plant Path 201 pull them in? Though the course's topics are provocative, do not underestimate the professor's showmanship; George Hudler can tell a good story.

Magical Mushrooms, Mischievous Molds
by George W. Hudler
Princeton University Press, Princeton, NJ, 1998. 264 pp. $29.95, £22.95. ISBN 0-691-02873-7.

Although estimates of fungal diversity reach 1.5 million species, only 69,000 of these have been described. In Hudler's telling, whether described or not, fungi ooze, stink, metabolize, synthesize, and decompose their way down a path of inebriation, murder, and mayhem. From the huge repertoire of fungal secondary metabolism, some beneficial products have been used medicinally over the millennia. Additional products, especially from among those undescribed species, await discovery and exploitation by modern medicine. Of course, fungi "do" other things less conspicuously. Some are cultivated by insects or people. Some cohabit with other organisms, forming lichens or mycorrhizae, for example, in an assortment of living arrangements that range from commensalism to parasitism. All fungi are absorptive heterotrophs; they live in their food, secreting digestive enzymes. Many are saprotrophs that recycle nutrients—composting plants, plant products, and other organic substrates—as they break complex molecules into simpler ones they can absorb.

Magical Mushrooms, Mischievous Molds covers some of the same ground as the course. It aims to convince the reader—likely a student or teacher, but also the armchair naturalist—that fungi shape human affairs. Hudler puts a human face on the facts by mining the scholarly and popular literature, not forgetting such student-friendly genres as crime, horror, and science fiction. Bob Dylan's bout with histoplasmosis brings home this pulmonary disease with its reservoir of spores in bird and bat droppings (beware of pigeon and starling roosts, a common source for several fungal diseases). Although for many infection results only in imperceptibly mild illness, a serious, progressive lung disease awaits those predisposed by immunosuppression or other factors. The controversy over "yellow rain," reputedly a chemical weapon based on trichothecene toxins that the Soviets deployed in Vietnam, takes on an *X Files* quality ("the truth may only be known if the world is allowed access to the secret files of the old Soviet government"). *Phytophtora infestans* is now identified as a protoctistan and no longer considered a fungus, but the Irish potato famine and the resulting massive Irish immigration to North America are too important to ignore.

Shamanic mushrooms. The fly agaric, *Amanita muscaria*, has been linked by many to the Soma of ancient Hindu worship.

Hudler presents the story through graphic first-person accounts. In a similar vein, readers learn exactly what happens to victims of the several alkaloids in ergot-infested grain: "The cries of those in pain and the shedding of burned-up limbs excited pity; the stench of rotten flesh was unbearable...." Indeed, readers will find themselves transported in time to the laboratories of Alexander Fleming, Albert Hoffman, and Timothy Leary, or into a crowd of ancient Greek celebrants at Eleusis.

Hudler also provides practical advice on protecting your elms from the predations of Dutch elm disease and its bark beetle vectors. ("Wholesale spraying of large trees in urban environments is viewed with disdain by many people, but there is little choice when elm preservation is the objective.") He explains what, exactly, is in Kombucha tea and whether it is good for you. He discusses how to collect fungi for the table; however, readers outside the United States seeking local experts are unlikely to consult the County Cooperative Extension, as suggested. Among the trio of field guides Hudler recommends, all North American, the breadth, practicality, and wacky sixties-style of David Arora's *Mushrooms Demystified* (*1*) endear it to the university students and other beginning collectors of my acquaintance. To supplement such identification aids, more contemplative mushroom hunters might seek out Elio Schaechter's *In the Company of Mushrooms: A Biologist's Tale* (*2*).

The references Hudler provides include many excellent, if sometimes dated, sources (*3*). Missing is any guide to now abundant internet materials (*4*). Given such rich resources, the book could have been more creatively illustrated. *Magical Mushrooms, Mischievous Molds* recounts many stories very engagingly. But other, new stories remain to be told. At this moment, GenBank has accessioned 56,074 fungal sequences (including the entire genome of brewer's and baker's yeast, *Saccharomyces cerevisiae*), and there are ambitious sequencing initiatives under way for the yeast *Candida albicans* (a sometimes pathogenic inhabitant of humans), and for three filamentous ascomycetes: the rice pathogen *Magnaporthe grisea*, and the model genetic systems *Aspergillus nidulans* and *Neurospora crassa*. Although not a panacea, sequence data are transforming our approaches to fungal systematics and diagnostics, and opening new frontiers in fungal evolutionary genetics and studies of host-parasite interactions. The contributions of fungi as tractable eukaryotic research systems are obvious in cell biology textbooks. Fungi have always been both tools and targets in biotechnology, and antifungal drug discovery is now a multibillion dollar effort, incited by the explosively increasing world population of the immunocompromised. These exciting stories await their own places in a popular book.

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References and Notes

1. D. Arora, *Mushrooms Demystified* (Ten Speed, Berkeley, CA, 1986).
2. E. Schaechter, *In the Company of Mushrooms: A Biologist's Tale* (Harvard Univ. Press, Cambridge, MA, 1997).
3. Including: E. C. Large, *Advance of the Fungi* (Jonathan Cape, London, 1958); G. I. Carefoot and E. R Sprott, *Famine on the Wind* (Rand McNally, New York, 1967); D. H. S. Richardson, *The Vanishing Lichens* (David and Charles, Vancouver, BC, Canada, 1975); J. G. Fuller's book on an outbreak of ergotism, *The Day of St. Anthony's Fire* (Hutchinson, New York, 1969); R. G. Wasson, *SOMA–Divine Mushroom of Immortality* (Harcourt Brace Jovanovich, New York, 1968); R. G. Wasson and V. Wasson, *Mushrooms, Russia and History* (Pantheon, New York, 1957).
4. "Mycological Resources on the Internet" provides many links at www.keil.ukans.edu/~fungi/

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