Production line: for his early work on digestion, Ivan Pavlov collected dogs' gastric secretions.

sitions. Pavlov was acutely aware that his results often varied widely, not just from one animal to another but within the space of a single experiment, in response to a host of often unidentifiable disturbances in the experimental system. Indeed, his later work on conditioned reflexes grew out of his efforts to characterize the role of "psychic" phenomena in producing such perturbations. But it was precisely this variability that enabled Pavlov to select those data that best confirmed his supposition that digestive processes were purposively and selectively regulated, and to explain away any results that contravened the supposition. Pavlov's wishful thinking eventually became apparent, however, particularly when the demonstration by W. M. Bayliss and E. H. Starling of the humoral control of pancreatic secretion raised doubts about his claim to have identified more selective forms of nervous regulation.

Such revelations did not deter the Nobel committee, however, who by that time were considering Pavlov for the prize in physiology or medicine. Initially, his supporters on the committee had cited the theoretical significance of his conclusions as sufficient grounds for awarding him the prize. But as the validity of those conclusions began to be challenged, they instead invoked Pavlov's methodological innovations and his demonstration of the promise of concerted laboratory research for the pursuit of medical knowledge. Pavlov's elevation to the pantheon of Nobel laureates thus rested, in the final analysis, as much on the way that he made manifest the new values and aspirations of collective scientific endeavour as on any specific contribution to scientific knowledge.

Pavlov's achievements are in no way diminished by such scrutiny. On the contrary, by revealing the technical, intellectual, managerial and literary skills that led to the

success of Pavlov's endeavour, Todes broadens our appreciation of the far-reaching contribution that Pavlov made to the development of modern science. Todes has achieved an impressive feat of scholarship, combining meticulous research with analytical clarity, which does full justice to his compelling subject. ■

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A stroll with the moulds

Mr. Bloomfield's Orchard: The Mysterious World of Mushrooms, Molds, and Mycologists

by Nicholas P. Money
Oxford University Press: 2002. 224 pp. \$26

Elio Schaechter

Countless stories can be told about any large group of living things, and fungi are no exception. Fungi are quite familiar to us: we enlist their help in making bread, wine and beer, and are vexed by the disease that they cause in humans, animals and plants. We know them as unicellular yeasts, filamentous moulds and complex-looking mushrooms. Less widely appreciated is their most important pursuit: they are the essential decomposers of vegetable matter. Quite simply, life on Earth would not be possible without the recycling activity of fungi.

Fungi have a wide repertoire of life cycles, a large variety of shapes and structures, and a strong propensity to interact with other organisms in manners benevolent and otherwise. Quite a few of the stories about each of these properties can be found in

Mr. Bloomfield's Orchard. The main topics are the life cycle of moulds and water moulds (oomycetes), aspects of fungal biomechanics, and fungal parasitism of plants and humans.

Nicholas Money gives considerable attention to subjects in his own research area, such as cytoplasmic turgor and the electrical and mechanical properties of hyphae. These lead to some lively examples: stinkhorns that make geodesic domes (*Clathrus*), hyphal filaments that can pierce bullet-proof vests (let alone human skin), spores that trap air bubbles for buoyancy, and moulds that quarry rocks. He also describes in some detail the ingenious strategies for spore dispersal in mushrooms, plant pathogenic moulds and water moulds, and helpfully explains stories that tend to be quite intricate. For instance, the life cycle of certain rust-causing fungi includes four kinds of spore, two separate plant hosts, and three acts of plant penetration.

The contributions and quirks of several notable mycologists also get a mention. In the early 1900s, Reginald Buller did much to explain how fungi, especially mushrooms, disperse their spores. It is now believed that the mechanism involves the formation of a droplet at the base of the spore. By a mechanism that involves changes in surface tension, this 'Buller's drop' helps to catapult the spore away from its native gill with astounding acceleration. Buller, an Englishman transplanted to Winnipeg in Canada, had a distinctive personality. Needing to be dark-adapted to make his observations, Buller used horse blinkers to keep out the light as he walked through the sunshine from his hotel to the university. Money also portrays another colourful mycologist, Curtis Gates Lloyd, who circumvented the risks of peer review by publishing his own journals.

Books on fungi written for the non-specialist are few in number. Pre-eminent in this genre is E. C. Large's *Advance of the Fungi* (Jonathan Cape, 1940). In this much-revered book, Large focused on plant pathogens and described their activities in a lively and informative style that infused the reader with enthusiasm for the subject. Money's book follows this tradition. His writing is accommodating and personal, with occasional chummy asides. He makes no bones about his enthusiasm for the fancy shapes and forms of moulds. He says of yeast: "Only a biochemist can be satisfied with such dull architecture when the grandeur of other fungi can surpass the Palace of Versailles."

Whether one agrees with this view or not, one can enjoy the book for the choice of topics and the clarity of the writing. It can be recommended to all nature lovers, regardless of background, who want to know more about fungi. ■

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Red and green: fungi such as the scarlet elf cup aid nutrient cycling by breaking down vegetation.