biological weapons treaties should be established. Issues of national sovereignty and corporate privacy pale in comparison to the very real dangers posed by bioweapons. We must also reconsider vaccination policies for diseases once thought to be eradicated, such as smallpox. These are sad conclusions, but it is my hope that Alibek's testimony to a monstrous evil will serve as a clarion call for effective action.

BOOKS: BOTANY

The Powers of Flowers

Peter K. Endress

Flowers are attractive not only because their beauty enlightens our lives but also because we depend on them for so many of our daily needs. And the many important roles flowers play in human cultures provide a myriad of enjoyable routes to follow between biology and the humanities. In *The Rose's Kiss*, botanist Peter Bernhardt weaves accounts of the forms, functions, and ecologies of flowers together with threads from history, folklore, and mythology.

Some books provide first-hand descriptions of science by thoughtful researchers who convey the essence of their fields in simple, entertaining ways. Over the past two centuries, many such books have been written on plant life. Even earlier, when Linnaeus (in *Systema naturae*, 1735) introduced his sexual system for classifying plants, he explained it with metaphors, which in his time were not only amusing but rather shocking. Although today Linnaeus's metaphorical descriptions don't upset our minds, comparisons between the sexual systems of animals and plants remain an attractive topic for researchers and non-biologists alike. And, of course, sexuality in plants is much more complicated than Linnaeus could have known; our current understanding of the phenomena has changed dramatically in the past decade alone. The once-unified natural history of flowers has long since diversified into many sophisticated disciplines, and new connections among them are constantly developing. These advances include the uncovering of exciting new floral fossils from progressively older strata, which give deeper insight into early evolution of flowering plants; the explosive rise of molecular developmental genetics, which unravels how genes regulate flower development; and much recent progress in floral ecology, which studies the behavior of flowers and their pollinators.

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In addition to technical articles on topics ranging from the irises of southern Africa to the pollination ecology of Australian bushes and Kansas prairie flowers, Bernhardt has previously written two popular books of essays about plant life. From the chapter titles, some of which ("The Pig in the Pizza," for example) are poetically enigmatic, one could get the impression that *The Rose's Kiss* is simply another collection of essays, if one more focused on flowers. Once one begins to read through the book, however, it soon becomes clear that *The Rose's Kiss* is much more: it is a comprehensive account on floral biology written for a general audience.

The Rose's Kiss
A Natural History of Flowers
by Peter Bernhardt
Island Press, Washington, DC 1999. 277 pp. $24.95. ISBN 1-55963-564-9.

Scientists have an ever-growing obligation to explain their science in a way that can be understood by the general public as well as the, frequently few, specialists in their field. Bernhardt's book is not only entertaining, it is also a good example of how to teach in a central branch of biology. It is an eye opener for non-biologists, and it may provide professionals with ideas on how to communicate the essence of flower biology.

Night diner. More than a quarter of all bat species feed on flowers. Here a small blossom bat (*Syconycteris australis*) is taking nectar from an Australian *Banksia*'s branch of massed flowers.

The author starts with the roles flowers play in different human cultures and then moves on to biology by considering floral structure and function, generalizing from taxonomically diverse examples. When he turns to pollination biology, Bernhardt is at his best. He has many fascinating stories to tell: the many distinct means by which the ratio of male to female flowers is regulated; the variety of environmental cues that stimulate flowering; how the longevity of flowers correlates with breeding systems and life forms; the differences between "sloppy" and "neat" systems of self-incompatibility (by which plants recognize and reject their own pollen); and the wealth of attractants and rewards for pollinators. Bernhardt ends with speculations on how early flowering plants "stole" animal pollinators from the gymnosperms that were dominant in forests 200 million years ago.

Through his discussions, the author may alleviate concerns that are sometimes expressed in public debates about biotechnologies. He does a good job in emphasizing the natural and common occurrence of clones in plants, for example when he explains how almost every dandelion in a meadow is "a clone of its mother." He notes that natural genetic engineering has been performed for centuries by plant breeders, whose "tricks are based on preserving the genetic 'mistakes' that are usually rejected by natural selection." Bernhardt touches on similar topics when describing the natural plastics of pollen grain walls and the introduction of apogamy (the production of fruits without pollination) in crop plants.

The titular rose recurs throughout the book, as a symbol for flowers in general and as a metaphor for various aspects of our life. Each chapter is introduced with appropriate lines of poetry, excerpts that range from the Wisdom of Solomon, through Albertus Magnus and Shakespeare, to works of living poets. Bernhardt himself becomes poetic at times, with his funny comparisons, rhymes, and alliterations. He simplifies complicated facts and relationships, making them easy to grasp, and he uses comparisons with familiar events and structures from everyday life. Thus he succeeds in conveying a lively and colorful picture of flower biology that reveals the diversity of floral strategies. Bernhardt's instructive text is bolstered by J. Myers's informative drawings.

The Rose's Kiss is an up-to-date, popular overview that is especially perceptive because it is written by an active scientist. Bernhardt follows the theme of the rose from the ancient Greeks who cultivated roses with flowers filled by petals (as reported by Theophrastos), to the present day, and back to the Tertiary (the source of the fossil flowers of *Paleorosa*). His accounts form a well-balanced natural history, a book I recommend to all who love flowers and want to know more about their biology.

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