The Greenian View of Botany

Landmarks of Botanical History. EDWARD LEE GREENE. Frank N. Egerton, Ed. With contributions by Robert P. McIntosh and Rogers McVaugh. Stanford University Press, Stanford, Calif., 1983. In two volumes. x, 1139 pp., illus. $100. A Publication of the Hunt Institute for Botanical Documentation, Carnegie-Mellon University. Part 1, reprint of the 1909 edition.

No individual in western American botany is more enigmatic than Edward Lee Greene, peripatetic clergyman, early disciple and later adversary of Asa Gray, prodigious author, founder of botany at Berkeley, and a major figure on the national scene. That he was colorful, controversial, and wielded great influence upon his contemporaries is unquestioned. But was he the emancipator of western botany from colonial subservience to Europe and Harvard and the outstanding botanical scholar of his time? Or was he merely a pious fraud whose work was fatally flawed by his opposition to evolutionary ideas and whose influence is thus bound in the end to prove transitory?

Greene's *Landmarks of Botanical History*, edited by Frank N. Egerton, has been published through the agency of the Stanford University Press by the Hunt Library. This comprises two parts, the first published by Greene in 1909 and long unavailable, and the second now appearing for the first time. Robert McIntosh has provided a biographical sketch of Greene and Rogers McVaugh an evaluation of his contributions. The editor has furnished valuable but unobtrusive explanatory notes and three appended bibliographies designed to bridge some of the lacunae between the landmarks. The two volumes are tastefully illustrated by portraits of people and plants, the latter mostly from herbals, drawn from the incomparable resources of the Hunt.

McIntosh depicts Greene as a physically rugged, courageous, devout, self-sufficient, independent-minded, even reckless field biologist and classical scholar. He was restive under authority, whether it was that of Linnaeus, the botanical establishment of Kew or Cambridge (Massachusetts), the Methodist or the Episcopal church, the University of California or the Catholic University of America, or even the Smithsonian Institution. No one questions that he was a formidable adversary, with one of the most vitriolic pens in the West, but he was by no means alone in the art of invective and must be judged by the prevalent rhetoric of his time.

In his basically generous evaluation of Greene's contributions, McVaugh credits him with being "in a very real sense . . . the first American botanist to break away from European influence." Although noting the caustic attacks of Katharine Brandegee and Marcus Jones on his botanical work, McVaugh points out that Greene's taxonomy of his "California period" (1881–1895) has won an acceptance rate of something like 70 percent. This was his era of extensive and intensive fieldwork, and he was openly scornful of those who knew western plants only in the herbarium. But after he severed his western roots, returned to the East, and became in fact a "closet botanist" himself, he committed the numerous taxonomic excesses that have tarred his image ever since. Ironically, he demonstrated clearly that when it came to herbarium botany he was no match for Kew or Cambridge. Whether or not he was the captive of special creationism, as commonly believed, or whether he was simply over-eager to be noticed and had his personal vehicles of publication all too readily available will probably always be moot. It was his fate to appear on the botanical scene just as the formulation of international standards of nomenclatural usage were beginning to jell. This afforded him an opportunity to challenge all practices, compromises, and working agreements that infringed upon his highly emotional attachment to a policy of strict and open-ended priority. It is possible that this sprang from his fascination with classical languages and pre-Linnaean authors. At all events, it won him the plaudits of supporters of the so-called American Code, as well as the enmity of others. More important, this interest may have led him also to his preoccupation of later years and arguably his most valuable and enduring legacy—his contribution to the history of botany, now so handsomely revived and extended.

In introducing part 1, Greene makes the sonorous pronouncement, "Botany did not begin with the first books of botany, nor with the men who indited them. . . . The most remote and primitive of botanical writers, of whatever country or language, found a more or less extensive vocabulary of elementary botany in the colloquial speech of all." I found this a suitable introduction to a graduate course and seminar I gave for many years on the history and literature of systematics because it opened the door on folk taxonomy and put successive efforts at systematization into appropriate perspective. It is clear, however, that Greene's real passion was for the pre-Linnaean authors and the classical language of their writings.

This introduction is followed by Greene's highly eclectic choice of significant figures from pre-Linnaean botany, for each of whom he provides a separate and carefully crafted vignette. The rhizotomi, treated briefly, stand for unsophisticated herb lore and folk medicine. Theophrastus of Eresus is extravagantly eulogized as the inheritor and transmitter of all classical Greek knowledge of plants, and hence "the real father of the science." Later Greek authors, Dioscorides included, and the Romans offer no important advancements, in Greene's view. The 16th-century herbalists receive the next accolade, Brunfels and Fuchs for turning to nature for illustration and Hieronymus Tragus (Bock) for greatly improving descriptions. But it is the tragically short-lived Valerius Cordus, "immeasurably the greatest of them all" and "the inventor of the art of phytography," who receives Greene's especial encomium. So much for part 1, the portion published in 1909.

The second and previously unpublished part deals with Italian, French, Swiss, and Flemish herbalists-botanists of the 15th and 16th centuries. The Italian forefathers bear the largely unfamiliar and neglected names of Gaza, Leoniceno, Barbaro, Marcello, Manardo, Brasavolus, Ghini, and Anguillara—the translators and revisers of Theophrastus, Dioscorides, and Pliny. Jean Ruel, a French Renaissance physician, is credited with attempting in his *De Natura Stirpium* (1536) the first comprehensive work on general botany since Theophrastus. The Swiss polymath Conrad Gesner is celebrated not only for his

encyclopedic *Bibliotheca Universalis*, his exceptional knowledge of zoology and botany, and his editing and publishing of the unfinished work of Cordus, but also for his genial personality, which enabled him to transcend the religious controversies of his time.

The author's attention next reverts to Italy in the 16th century. Mattioli, "the Brunfels of Italy," is lauded for his excellent illustrated Italian edition of Dioscorides. The first overt attempt at a classification by "affinities" (primarily indicated by fruit and seed) is credited to Cesalpino, who is thus dubbed "the father of the science of Systematic Botany." Fabius Columna, in search of an ancient remedy to cure his epilepsy, introduced a new scientific precision to the analysis of plant structures. Greene's two Flemish selections, Dodoens and de Lobel, are more familiar than many of his Italian nominees for fame. Because he was a popularizer and a commercially successful author, Dodoens is treated somewhat ambivalently, although he is given credit for considerable progress in the perception of affinities. De Lobel, hailed as "a prophet of the new botany that was to come," was "the first to engage in serious and studied effort to create natural system." But the youthful genius he exhibited in his *Adversaria Nova* was not to be fully realized. Our author accords his prime homage to Joseph Pitton de Tournefort, "whose chief work marked an epoch in the advancement of our science that has not yet had, and probably may never have, a parallel." His accomplishment was to establish a systematic key to plant genera and to "create" genera on so sound a basis and to describe and illustrate them so skillfully that all known plants could be identified and all future discoveries be properly placed.

Although the self-consciously "literary" and measured and discursive Victorian prose is a little difficult to engage at first, I think most readers will regret that the work ends here and that the third part, which was to have dealt with British botanists and would doubtless have been controversial, was never written. We can be grateful that the two completed portions have been made available in such handsome format. Everyone connected with the enterprise is to be congratulated—there is abundant credit to go around.

Edward Lee Greene remains an enigmatic figure.

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An African Ungulate

A Territorial Antelope. The Uganda Waterbuck. C. A. SPINAGE. Academic Press, New York, 1982. xvi, 334 pp., illus. $49.50.

Territoriality was one of the classic mechanisms proposed by V. C. Wynne-Edwards in 1962 to limit the size of populations below the level of their food supplies. With this in mind C. A. Spinage from 1964 to 1967 studied the waterbuck, a territorial antelope in savannah Africa.

Territoriality, well known in birds, is uncommon in temperate-region ungulates. In 1964 little was known about African ungulates, and Spinage's first observations of territoriality were something of a novelty. Now we know that most African antelopes are territorial. However, most recent in-depth studies of ungulates are of nonterritorial species, so this book is still one of the few detailed accounts of a territorial species.

Spinage's aims were to find out whether waterbuck were territorial and if so whether this behavior regulated the population. His main conclusion, at least on the surface, is to reject Wynne-Edwards's thesis because females, not males, determine population levels, and females are not territorial. Females expel younger animals, bringing about dispersal to new areas. Spinage postulates that female aggressive behavior is related to population density and not to food; thus his mechanism of regulation is really one of "self-regulation." His conclusion, however, is hypothetical, for he presents no evidence to support it.

What, then, is the function of territory? Spinage suggests that it is to anchor the male sector to ensure maximum dispersal of the species. Why not abandon territory in favor of cohabitation without aggression? He answers, "To ensure the continuation of a species, selection has produced a sufficiently strong sexual drive that male competition must always result." Therein lies the grounds for the main criticism of this book, for it shows that Spinage's thinking is still that of the old-style "group selectionists." Throughout the book he refers to function in terms of benefit to the population or species, without exploring alternatives of benefit to the individual. But the data are there: only males on territories obtain matings, and those 7 to 9 years old obtain disproportionately more. Still more interesting is that some males tolerate satellite males, the latter obtaining a few matings. The significance of this is overlooked. It would be interesting to know under what conditions satellites are tolerated. The closest relatives to waterbuck are kob and lechwe, both of which have evolved mating "leks." Spinage's observations would suggest that waterbuck are in the early stages of evolving leks.

Spinage's work, done in the 1960's, will be judged in the context of more modern ideas. He is running this gauntlet to make his data available. There are chapters on growth and senescence, reproduction, parturition, population dynamics, food and habitat preferences, and the social organization of females and males. The book ends with a discussion of territorial concepts and function, which is somewhat tortuous and abstruse. Spinage's interpretations may be heretical to some readers, but his observations are valuable.

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Toxicology

Cellular Systems for Toxicity Testing. G. M. WILLIAMS, V. C. DUNKEL, and V. A. RAY, Eds. New York Academy of Sciences, New York, 1983. xii, 484 pp., illus. Cloth or paper, $95. Annals of the New York Academy of Sciences, vol. 407. From a conference, New York, Oct. 1982.

Cellular Systems for Toxicity Testing results from a conference held to examine in detail the most advanced systems for the study of general cytotoxicity, genotoxicity, mutagenesis, and carcinogenesis. In the opinion of this reviewer, the objective was overly ambitious. Despite the breadth of topics covered, however, the book succeeds in conveying an excellent overview of the field and substantial "inside" detail not readily obtainable from periodical literature. Noteworthy are several chapters that begin by giving a historical perspective on the development of the major biological systems used in the field. Included among them are the papers of H. J. Evans, Sheldon Wolff, Michael J. Prival, Ernest H. Y. Chu, and Blumberg *et al.* These papers include valuable accounts of the scientific contributions that have resulted in the armamentarium of cellular systems now available.

The volume begins with a consideration of xenobiotic metabolism and the metabolic properties of in vitro systems. Dunkel contributes a concise introductory paper, "Biological significance of end points." The reports in the following section, on general cytotoxicity, are well done, but the section is rather incom-