new technology to established industrial processes of which it is a part, but into which it does not yet fit in the most efficient or comfortable way" (p. 393). For example, the storage battery was used as a buffer as the new electromechanical dynamo was first being introduced into engineering practice. Schallenberg suggests that a buffer technology often appears during a period of rapid technological change and later is abandoned as the newer technology matures.

JAMES E. BRITTAIN
Department of Social Sciences, Georgia Institute of Technology, Atlanta 30332

Botanical History

Botanical Exploration of Southern Africa. An Illustrated History of Early Botanical Literature on the Cape Flora. Biographical Accounts of the Leading Plant Collectors and Their Activities in Southern Africa from the Days of the East India Company until Modern Times. MARY GUNN and L. E. CODD. Published for the Botanical Research Institute by Balkema, Cape Town, 1981 (U.S. distributor, Merrimack Book Service, Salem, N.H.). xvi, 400 pp., illus. $56. Introductory volume to the *Flora of Southern Africa*.

After four centuries of scientific study of plants, the curtain is beginning to come down on the reconnaissance stages of botanical exploration, even though inventories are still under way (and with a great deal of urgency) in a number of remote tropical regions. Although Cook in the late 18th century inaugurated the age of the modern technical expedition with elaborate logistic support, botanical pioneers such as Clusius and Rauwolf were busy in the field two centuries earlier. The romantic chronicles of the adventures of Cook, Humboldt, Wallace, Spruce, and many others have now been in circulation for over a hundred years, and in addition to republication of original journals there are scholarly reviews on many botanical explorers, such as William Stearn's *Humboldt, Bonpland, Kunth and Tropical American Botany* (Cramer, 1968). However, we do not yet have a definitive worldwide review of the botanical expeditions of the 16th to 19th centuries. This lack may be due in part to the balkanization of the colonial endeavors that provided the great windfall of riches from abroad to the botanical centers of Europe, so that relevant documents are scattered in a number of languages and often hidden in governmental archives. Mary Gunn and L. E. Codd's volume on the botanical exploration of South Africa is of interest because it will make an important contribution to an eventual synthesis of the history of botanical exploration.

South Africa happens to be one of the most interesting theaters of botanical exploration, because of its extremely rich flora and its location astride the sea routes to the Orient that were used in the 16th to 18th centuries. In this book, Gunn and Codd have organized the subject matter into two separate parts: a history of systematic botany as it relates to South Africa up to the time of Linnaeus (about 1750), and a dictionary of all the plant collectors who have worked in South Africa, from Justus Heurnius in 1624 to botanists still active today.

The section on pre-Linnaean botany brings together in a coherent account the history of the interaction between the plant collectors—many of them Dutch or with Dutch connections—in South Africa, colonial administrators, and the professional botanists back in Europe. This section is extensively illustrated with figures of South African plants and titlepages or frontispieces of historically important books. It is unfortunate that many of these illustrations are printed in a flat gray tone.

The dictionary of botanists provides a great wealth of biographical information and should prove of permanent value as a resource for historians of science. For example, over three pages are devoted to J. F. Drège, including a portrait, a handwriting specimen, a detailed itinerary of his botanical travels, and a discussion of the disposition of his specimens. Similarly critical and meticulously documented essays are offered for other leading figures such as Harry Bolus, W. J. Burchell, William Harvey, C. P. Thunberg, and C. L. P. Zeyher. A considerable number of the photographic portraits are published for the first time. For the botanists of German or French extraction, the entries in this book may be the first modern accounts available in English.

Much of the interest of this work resides in the account of the hitherto little-publicized history of the early botanical explorers. The termination of the narrative with Linnaeus seems particularly unfortunate, since it was one of Linnaeus's students, Thunberg, who proved to be the "father" of South African botany with his intrepid plant explorations of 1772–1774 and publication of his classic *Flora Capensis* (1807–1820), the basis for all further botanical work in South Africa. The early cut-off date is partly compensated for by the biographical sketches, but the post-Linnaean botanists are not placed in historical context as was done for their predecessors. The authors have provided a chronological list of collectors up to 1850, so the reader can to some extent construct a chronicle of botanical exploration between 1750 and 1850 by reading the individual dictionary entries, but for a comprehensive view one must still consult other works. Hutchinson (*A Botanist in South Africa*, 1946) provides a useful survey of pertinent literature to 1944, and also an essay on plant collectors that treats Thunberg and Burchell (as well as Hutchinson's own travels) in considerable detail. Lighton (*Cape Floral Kingdom*, 1973), who curiously is not cited by Gunn and Codd, gives a popular account with information on a number of botanists of the 19th and 20th centuries. A very readable account of 20th-century systematic botany in South Africa is provided by Dyer (in A. C. Brown, Ed., *A History of Scientific Endeavour in South Africa*, 1977).

Within the limitations noted above, Gunn and Codd have presented an outstanding documentation of botanical history; indeed, the cyclopedia of Malaysian plant collectors by Van Steenis-Kruseman (*Flora Malesiana*, 1950–1974) is the only other reference work of comparable breadth and degree of documen-

Illustration of a dried inflorescence of *Protea neriifolia* from *Exoticorum libri decem* by Charles de l'Ecluse (Clusius). "Clusius provided a full description of the specimen, which he referred to as 'an elegant thistle'. . . . It has the distinction of being the first known botanical object to have reached Europe from South Africa." [From *Botanical Exploration of Southern Africa*]

tation. This handsome volume on South African plant exploration, with the beautiful colored frontispiece drawing of a baobab by Thomas Baines, will surely find a permanent and distinguished place on the bookshelves of both plant systematists and historians of science.

GRADY L. WEBSTER
Department of Botany,
University of California,
Davis 95616

Evolution of an Orogenic Belt

Major Structural Zones and Faults of the Northern Appalachians. Papers from a symposium, Quebec City, May 1979. P. ST.-JULIEN and J. BÉLAND, Eds. Geological Association of Canada, Waterloo, Ontario, 1982. vi, 280 pp., illus. C$29; to association members, C$24. Geological Association of Canada Special Paper 24.

One of the imposing problems of regional geology is the application of the plate tectonic paradigm to crustal evolution in ancient orogenic zones. Recognition of continent-ocean interfaces within polydeformed and metamorphosed orogenic belt rocks is a typical example. This is one of the major considerations of this book. A collection of diverse papers concerning the tectonic evolution of the northern Appalachians, the book is loosely divided into two parts, dealing with tectonostratigraphic zonation and with the boundaries and faults within the belt. The papers are diverse in topic, data base, and overall geological significance. Some, such as an excellent and detailed synthesis of New England by Hall and Robinson and a discussion of the Baie Verte–Brompton line by Williams and St.-Julien, represent a culmination of many years of fieldwork. These, I think, are the major papers in the book.

Several of the other papers deal with documentation and delineation of oceanic crust remnants in various parts of Canada, New England, and the northern U.S. maritimes. Of note here are papers on the Taconian line in western New England by Hatch, the soapstones of Connecticut Valley and New Hampshire by Lyons *et al.*, and ophiolite assemblages in central western Maine by Boudette. Papers by Ruitenberg and McCutcheon and by Fyffe deal with the structural overprint of three orogenic phases and the structural evolution of New Brunswick respectively. Diachronous impingement of irregular continental margins during continent-arc collisional events is discussed by Doolan *et al.* with respect to the Quebec reentrant. Papers on fault zones, such as those by Rast and Dickson, Keppie, and Kennedy *et al.*, once again highlight a developing scenario in which major structural discontinuities are reactivated through time in orogenic belt evolution. A minor comment is perhaps necessary here regarding the use of the term "cataclasite" to refer to mylonite series rocks. Although persistent in North America, this is not current practice elsewhere.

A paper by Haworth and Miller defining the subsurface geometry of ophiolithic rocks at Notre Dame Bay, Newfoundland, by geophysical techniques illustrates the importance of applying all facets of geology and geophysics to define models of tectonic evolution. The key to the book is the interaction of mapped geologic relations, lithofacies variations, structural setting, and mesoscopic structure in the attempt to reconstruct the history of the Caledonides. Controversy will still exist about the significance of some of these documented zones and boundaries, and many questions remain to be answered, but this volume makes a timely contribution to our knowledge of this region of the crust.

In short, the volume will be useful to workers in the northern Appalachians and to people interested in Appalachian tectonics, although it should be pointed out that the editors also provide a brief review of the tectonostratigraphic zonation and the associated orogenies. This enables the uninitiated reader to plunge straight into the individual papers.

DAVID R. GRAY
Department of Geological Sciences,
Virginia Polytechnic Institute and
State University, Blacksburg 24060

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