

Appendices provide a list of the species included, a list of species excluded and synonyms for both groups. The list of synonyms seems very thorough. The bibliography extends to seven pages, and an index and a glossary are provided. The genera included are *Adenocaulon*, *Arnica*, *Cacaliopsis*, *Crocidium*, *Luina*, *Petasites*, *Tetradymia*, *Tussilago*, and, of course, *Senecio*.

As the first volume of a series, the book starts with an introduction to the family, with brief descriptions of historic and economic uses, floral anatomy, biology and pollination, and seed dispersal. A key to the tribes of Asteraceae (formerly Compositae) is provided. Each tribe is illustrated with a full page drawing of the inflorescence of a representative species.

The book is not limited to application in British Columbia. All of the Senecioneae of Alberta appear to be covered at the species level, though there may be some Alberta sub-species or varieties missing, and the descriptions generally reflect greater variation in appearance, especially size, than do the descriptions in Packer's revision of the Flora of Alberta. Two descriptions are given for each plant. One emphasizes the distinctive features of the plant, its habitat, and range, and will mention uses, ease of cultivation, and other interesting points as applicable. The second description is technical, and is generally more detailed than the description given by Packer for the same species.

The book is bound as a paperback 195 × 265 × 10 mm in size; this makes it a little fragile and cumbersome for use in the field. Since the ranges of many species are rather limited, the maps will be helpful, although, as the author cautions, they also represent the distribution of collectors. Because of this, and because they are limited to verified herbarium specimens, they show more limited distributions than actually occur. The maps frequently include distributions in areas adjacent to British Columbia, including parts of Alberta and the Yukon, for species whose distributions just spill over the border, rather than those which are widely distributed. A map of collected areas in British Columbia is included in the introduction.

The clear line drawings should be most helpful in determining species in this often difficult group. They generally show the whole plant, including the root system, usually at time of flowering. Details show the involucre, the mature achenes and pappus, and

sometimes a floret drawn to larger scale. In cases where the distinctions between taxa involve only a part of the plant, two or three subspecies or varieties are covered by a single illustration, with insets showing the differences. Since some of the drawings appear to be of herbarium specimens, mental adaptation may be needed when comparing them with live plants. The inflorescence, in particular, is likely to be distorted due to flattening and the development of achenes during drying. Compare the line drawing of *Senecio vulgaris* with a live specimen for an example.

Some of the taxa included are described as poorly defined; these account for the lack of any distinction in the illustration of *Senecio integerrimus* between var. *exaltatus* and var. *ochroleucus*, and the lack of range map or illustration for *Arnica cordifolia* var. *pumila*. *Arnica chamissonis* ssp. *foliosa* is not illustrated, but is distinguished in the key.

The illustration of *Petasites frigidus* shows leaves for var. *nivalis* and var. *frigidus*, but does not identify the leaf for var. *palmaris*, although it is shown on the plant illustrated. In the illustration of *Senecio canus*, the rays appear to be atypically short for a plant in full flower. The distribution map entitled "Range of *Arnica longifolia* in Alberta and the USA", true to the title, shows no specimens in B.C.; does this mean that no herbarium specimens collected in B.C. were examined? "Range . . . in British Columbia, adjacent Alberta, and adjacent USA" would have been unambiguous, if still confusing. In the key to varieties of *Arnica latifolia* "Small plants 13 dm tall . . ." should evidently read "Small plants 1–3 dm tall . . .". These small errors do not detract from the overall value of the book.

This volume, and the remainder of the series, covering Astereae, Anthemideae, Cichoreae, Cynareae, Eupatorieae, Heliantheae, and Inuleae would undoubtedly be welcome additions to the bookshelves of all students of the family, amateur and professional alike.

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American Arctic Lichens 1. The Macrolichens

By John Thomson. 1984. Columbia University Press, New York. 504 pp., illus. U.S. \$55.00.

The first thing to say about *American Arctic*

Lichens is that this book is not, as one might expect from the title, just a reissue of Thomson's earlier work, *Lichens of the Alaskan Arctic Slope* (reviewed in *The*

Canadian Field-Naturalist 94: 350-351). Included between its covers are accounts, not only of Alaskan lichens, but of every species of foliose and fruticose lichen known to occur across the northern breadth of North America, with Greenland thrown in for good measure. What is more, most of the 340 species covered are not strictly arctic lichens at all, but boreal or even temperate lichens which just happen to range into the land beyond the trees. Somewhat paradoxically, then, this book with the yankee title is the nearest thing yet to a flora of the macrolichens of interior Canada. Its publication by any standard is an important event in the history of Canadian botany.

American Arctic Lichens opens with a brief introduction to the geology and climate of the North American north, followed by a useful, if somewhat schematic, discussion of lichen distribution and substrate ecology. A preliminary key then guides the user to genus, and is followed by 62 species keys, arranged alphabetically from *Actinogyra* to *Zahlbrucknerella*. Intercalated with these are species accounts providing much pertinent information on the synonymy, morphology, apothecial characters, chemistry, habitat, and distribution of the species included. A North American range map accompanies each account, and for two-thirds of the species black and white illustrations have been prepared.

For whom is this book intended? Apparently the publisher had in mind the amateur — witness the glossy pages, the lush illustrations and the elegant layout. Thomson himself, however, appears to have been writing more for his colleagues in lichenology — who doubtless will not balk, as the amateur will, at his failure to include either an introduction to lichen structure or, for that matter, a glossary of technical terms.

The naturalist will therefore have to accept that, despite appearances, *American Arctic Lichens* is at base a technical guide. In many places, for instance, the keys will simply not work for him. Thus, in order to distinguish *Pannaria* and *Parmeliella* on the one hand from *Lobaria*, *Solorina* and *Peltigera* on the other hand, he is needlessly required to examine spore structure — this in genera whose species are as often as not sterile! No less alienating is Thomson's habitual reliance on lichen chemistry as a source of key characters. True enough it is far easier to advance the absolutes of the microscopist and the biochemist than it is to come to terms with the variability of lichen growth form. Still, even the professional lichenologist could wish that Thomson had worked just a little harder on the preparation of his keys.

Fortunately, Thomson's descriptions of the species are far more serviceable. Notwithstanding that they seldom reveal any real effort to diagnose consistently

for the same characters, they are at least usually adequate to express the main points of difference between related species. It would have been helpful, of course, if the author had taken greater care to emphasize which characters are the diagnostic ones; as it is, the user will often find it necessary to do considerable cross-checking before he is satisfied he knows how species X is supposed to differ from species Y.

Even so, any slack in the descriptions is usually taken up by the splendid illustrations which accompany them. For the naturalist, in fact, the illustrations are the book's major strength. Picture-keying (something naturalists usually excel in!) is therefore a real possibility with *American Arctic Lichens* — as with few other books in the field. Note however that the illustration of "*Peltigera horizontalis*" (p. 337) actually represents *P. elisabethae* (a species not recognized by Thomson), and that "*Cetraria commixta*" (p. 75) is really *C. hepatizon*, a species also illustrated on page 82.

On the negative side again, some mention must be made of the numerous errors and oversights which have inadvertently crept into the pages of this book. So pervasive are these, in fact, that it might be appropriate if the publisher prepared an errata slip for insert with future sales. Taking for example the account of the genus *Cetraria*, it is disturbing to note that thalline measurements have been omitted for about one-third of the nineteen species discussed. Also worrisome is the fact that of the combined 95 spot test reactions which might have been reported for the members of this genus, only 78 are listed: omitted, moreover, are no fewer than fifteen reactions which Thomson elsewhere uses as key characters! Other slips include the following: 1) *Cetraria laevigata*, containing fumarprotocetraric acid, gives a KC-reaction, not a KC+ yellow-to-red one, as reported; 2) *C. commixta*, with alpha-collatolic acid, and 3) *C. fastigiata*, with gyrophoric and hiassic acids, both yield KC+ reactions, not KC-; 4) *C. pinastri* contains usnic acid and so yields not a KC- reaction, as reported, but a KC+ yellow one (which may admittedly be difficult to detect); 5) *C. nigricans*, though stated in the keys to yield a K+ violet reaction in the apothecium, is not known to produce fruiting bodies according to the species account (actually apothecia do occur, but are rare, making this a poor species character at best); and 6) no chemistry at all is listed under *C. tilesii*, though in fact, as mentioned in the keys, that species contains usnic, rangiformic and pinastric acids, and yields a KC+ yellow reaction.

From what has gone before it might be too easy to conclude that *American Arctic Lichens* is a shoddy work of little application to the Canadian naturalist.

Nothing, however, could be further from the truth. As I have already mentioned, this book is the single most important volume ever to appear on the macrolichens of interior Canada. As a repository of essential information on the subject, it will not soon be excelled. The range maps alone — though admittedly deficient in their representation of western collections — contain much valuable data available nowhere else. Used in conjunction with an introductory guide such

as Mason Hale's *How to Know the Lichens* (Wm. C. Brown Co., 1979), there is no reason why this volume should not stimulate the Canadian naturalist community to a new level of appreciation for the macrolichens.

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MISCELLANEOUS

Joseph Le Conte: Gentle Prophet of Evolution

By Lester D. Stephens. 1982. Louisiana State University Press, Baton Rouge. 340 pp., illus. U.S. \$22.50.

Joseph Le Conte (1823-1901) is little remembered today, but in his time he was regarded as a prominent evolutionary philosopher, natural historian, physiologist and geologist. He spent the major portion of his academic career (1869-1901) as a professor at the University of California at Berkeley. The Le Contes were a well-known family in 19th century natural science, Joseph's elder brother John (1818-1891) having been a natural historian, physicist, and twice president of the University of California, while their cousin John Eatton Le Conte (1784-1860) and the latter's son John Lawrence Le Conte (1825-1883) were naturalists and entomologists. John Lawrence was regarded as the foremost American student of Coleoptera of his day.

The author, chairman of the Department of History at the University of Georgia, has written a perceptive account of this significant figure. Stephens points out that Le Conte "began his career when breadth of knowledge was the hallmark of a learned man," but it ended when the modern era of specialization was well under way. As a result, he is not as well known to us as his notable contemporaries Louis Agassiz and Asa Gray. The Le Contes were in comfortable circumstances in their native Georgia before the Civil War. Interestingly, most of Joseph's preparatory training was received at the hands of Alexander Stephens, a college friend of another older brother and later the Vice President of the Confederacy during the Civil War. Both Joseph and his brother won medical degrees at the College of Physicians and Surgeons in New York City, generally regarded in the 1840s as the finest school of its type in the country. Despite some serious doubts as to the quality of the training he had received, Joseph briefly enjoyed a successful medical practice before determining that he preferred a scholarly life. He spent fourteen months studying with Louis Agassiz at Harvard and in the Florida Keys

before embarking on a teaching career in South Carolina in 1852. Save for the Civil War years, when he performed various medical service and chemical functions for the Confederacy, and several years of marking time following the war, he remained a teacher for the rest of his life.

Le Conte was a deeply religious man who had been strongly influenced by Agassiz. He was at first persuaded of the validity of his mentor's ideas on separate creationism. It took time for him to come to terms with evolutionary thought, which he then had to reconcile with his religious views. He ultimately discussed his theistic evolutionism in a book, *Evolution and Its Relation to Religious Thought* (1888), which enjoyed a critical success here and in Europe. Le Conte was essentially a neo-Lamarckian, who in social terms attempted a synthesis of Social and Reform Darwinism. He posited a "higher evolution, inherited from above," which was voluntary, rather than spontaneous. He argued that the object of education should be to "prepare for a worthy life." Inasmuch as there was a mutual relationship between the school, the college, and the university, all educational schemes were environmental tools which should lead to individual, and hence social improvement. Le Conte called for better, but not identical educational and employment opportunities for women, and in general for equivalency, but not equality of the sexes.

Le Conte was the first to write systematically in the subject of physiological optics in this hemisphere, having published the first textbook in the Americas in 1881. He was not, however, sufficiently familiar with developments in Germany, and his text, though successful, was soon out of date. He was a much beloved teacher at Berkeley, and in the field of geology, a compiler and synthesizer, rather than an original investigator. His tendency to universality relegated him to the "second echelon of capable scientists," though he might otherwise have achieved a



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