

belidae, Ratardidae, Dudgeoneidae, Epipyropidae and Limacodidae, Malay. Nat. J. 40: 1-166). While the family represents a well defined monophyletic group, there is no widely accepted supergeneric classification for the world fauna. Use of the signum in relating genera may have merit, but caution should be exercised since the congruence of this character with other morphological and/or behavioral characters has not been examined in a phylogenetic (cladistic) context.

Chapters 5-9 deal with parasitic Hymenoptera associated with South-east Asian Limacodidae. The chapters on Ichneumonidae, Braconidae, and Chalcidoidea, constituting nearly a fourth of the book, have keys to the parasitoids, with scanning electron micrographs and line drawings of the former two families. I found chapter 5 very informative in its division of the life styles of ichneumonid wasps by taxonomic groups. Chapters 10 and 11 summarize dipteran parasitoids in the Tachinidae, Sarcophagidae, and Bombyliidae, and chapter 12 reviews hemipteran predators. Chapter 13, a half page description of a pyralid cocoon predator, *Ectomyelois ceratoniae* (Zeller), would have been better summarized in the introductory matter or mentioned with other predators. Reviews of classical biological control, fungal pathogens, viruses, and chemical control of limacodids are presented in the final four chapters.

Although the book is full of important life history information and literature citations, several important references on limacodid life histories are not included. In the 60th anniversary since the passing of Harrison G. Dyar (1866-1929), it seems appropriate to mention his contribution to this subject. Even though Dyar described the early stages of primarily Nearctic species, many of these taxa have obvious phylogenetic connections with the Asian fauna. Reference to Dyar's work would have added support to statements on the origin of non-stinging, smooth ("gelatine") types of caterpillars from those with stinging scoli. Dyar recognized the ancestral plan of Limacodidae as possessing two rows of scoli, and hypothesized two independently derived lineages of smooth larvae (Dyar, H. G. 1899, The life-histories of the New York slug caterpillars, J. N.Y. Entomol. Soc. 7: 234-253, pls. 6-8). Each of these lineages possess rows or rudiments of scoli in the first instar that are lost in later instars.

While I applaud the information on rearing methods, there is no mention of obtaining life-history data by capturing adult females and inducing oviposition. This is a viable alternative, particularly since most if not all limacodids can be reared on palm without previous knowledge of the host owing to their polyphagous nature. This procedure, used by Dyar, is practical for associating adults with larvae and obtaining good series of both.

Appendix 1 is a list of host plants of South-east Asian limacodids mentioned in the text. Unfortunately, this information is not indexed, making it difficult to find the species of limacodids associated with each plant.

The price of this book may be prohibitive to those with only a casual interest in Limacodidae or without an economic stake in the subject. However, since the work represents a significant contribution to our knowledge of the early stages, behavior, and systematics of Limacodidae, it is indispensable for the serious student.

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THE GUILD HANDBOOK OF SCIENTIFIC ILLUSTRATION, edited by Elaine R. S. Hodges, 1989. xv + 575 pp. Van Nostrand Reinhold, 115 Fifth Avenue, New York, New York 10003. 22 x 29 cm, hardcover. \$79.95.

In 1968 U.S. natural science illustrators organized themselves professionally; since then, the Guild has brought to a formerly disconnected occupation a unity of strength and purpose. The *Guild Handbook of Scientific Illustration* is one very tangible result of this union, its high-tone pages bringing together in one volume the wide variety of principles

and procedures that define the field of natural science illustration (practiced by scientific illustrators dedicated to biological and medical subjects).

In five major parts, 30 chapters introduce the reader first to the "Basics:" steps in the process of illustration, outfitting the studio, materials, and the play of light on subjects. "Rendering Techniques" follow: an in-depth survey of the use of media from simple line and ink to complex color applications. The majority of the text consists of 11 chapters covering the special problems and approaches to the principal "Subject Matter:" plants, fossils and extinct vertebrates, invertebrates (including insects), fishes, amphibians and reptiles, birds, mammals, animals in their habitats, humans and their artifacts, and medical subjects. Several advanced topics follow in "Beyond Basics:" using the microscope, charts and diagrams, cartography, copy photography, and the printing process. Finally, the "Business of Scientific Illustration" is given attention, where copyright law, making contracts and operating a free-lance business are discussed. Included are a Bibliography and Appendix with names of sources of supplies and other compact information.

The voluminous text is generally well written by 45 motivated and capable authors and is fully illustrated with over 600 clean, instructive figures in black and white and color. The matter discussed is immense in depth and diversity, requiring and receiving a masterful editing job by Hodges.

It is hard to find fault in a work obviously so lovingly and meticulously produced. I would, perforce, comment on a few minor imperfections, mostly trivial, which mar only slightly an otherwise superior technical publication:

1. While the somewhat varied approaches taken by authors to accommodate the quirks of their disciplines are highly appropriate, they allowed for some redundancy (e.g., where techniques overlap) and at least one contradiction (sans serif lettering advocated by Allen on p. 500, the contrary by Lynch on p. 459).

2. I find some bothersome pedantries and truisms, the most common being the oft repeated statement that taking classes in this or that discipline of biology makes one a better illustrator. I think that many items in the lists of instruments and materials in Part 3 are part of any studio; mention of such items as magnifiers, rulers, a camera, French curves, etc., could give way to more discussion of things peculiar to the subjects at hand. It does not seem necessary to say, on p. 394, right column: "The illustrator may be called upon to work on a wide range of subjects in a variety of settings." Or on p. 376, middle column: "There is considerable variety in the field of illustrating mammals."

3. Some confusing statements have crept into the text: p. 23, left column: "To this end, adaptations of some traditional drawing media have been developed in some techniques." Also, on p. 264, first sentence: "Invertebrates that are not arthropods do not have jointed legs."

4. I miss discussion on some important issues: Nowhere is perspective or the problem of parallax discussed, yet lighting is given a detailed treatment. Needed is a more unified review of the types of symmetry, axes, planes, and regions in organisms, and terms pertaining thereto. A glossary would be a welcome addition to the next edition.

5. Some authors fail to include mention of those involved in the historical development of their field. While this may be excused by the primarily prosaic purposes of the book and the availability of other works on the history of biological illustration, the omission is definitely to the detriment of the reader, especially when classic examples are not shown.

6. Much of the flavor of the book is towards drawing for taxonomy. I would like to have seen more shift given to the branches of anatomy and behavior (especially regarding insects).

7. The list of suppliers in the index leans heavily toward the eastern U.S.; we out west have many fine outlets too.

8. Some errors bear noting: p. 197, right column: "Plants having roots, stems, leaves, and a vascular system are called gymnosperms." should read "... are called *thallophytes*." The sentence is repeated on p. 199, left column but ends in "angiosperms." also erroneously. In the list of types of specimens given on p. 4, left column, *mounted* specimens are illogically omitted (see #6 below).

As an entomological illustrator myself, I have a bit more to say of the pages dealing

with insects. These are small issues, as those above, the treatment on the whole being excellent.

1. I notice again the lack of acknowledgment of achievements of historical workers. Superb examples date back as far as Hooke's louse and Lyonnet's goat moth larva of the early 18th century. In my opinion the finest entomological illustrator was Hermann Weber. His rendering of homopteran mouthparts are masterpieces of analytical anatomical graphics. Others important in establishing the field were E. O. Detmold, A. J. E. Terzi, and G. Ferris. Some useful and important technical publications might have been cited [Edy, R. 1968, Some illustrations of microsculpture in the Hymenoptera, *Proc. Entomol. Soc. London*, ser. A 43:66f.; King, R. & H. Akai (eds.) 1982, 1984, *Insect ultrastructure*. Vols. 1-2; Catts, E. & J. Young 1959, A chalkboard technique for making illustrations, *Pan-Pac. Ent.* 35:163f.]. A nice little book that teaches much on the art of posturing for live insect illustrations is N. Weaver's *How to draw insects* (Studio Pub., London, 1958).

2. Some additional techniques are: individual sand grains are suggested for propping specimens; a bed of fine silica sand gives an even more versatile matrix for holding specimens in any position. Specimens may also be embedded temporarily in clear gelatin to hold them for drawing. Insect membrane is commonly indicated by light stippling while sclerites are left clear in anatomical works. Precautions for putting away microscope slides are given on p. 261; I would add that the box or tray should be stored so that the slides are flat, with specimen on top, to prevent gravity from tugging at the medium.

3. There are a few mistakes: p. 290, first paragraph of left column: "... a dorsal segment is a tergum or tergite"; . . . , should read, "a dorsal *sclerite* is a tergum or tergite;" p. 289, top of middle column: Myriapoda is a category that *contains* millipedes (*Diplopoda*) and is not synonymous with them; p. 297, center column: carbolic acid or phenol crystals, not naphthalene, are usually added to relaxers to inhibit mold growth. Instructions for calibrating microscope micrometers in the "Eyepiece Scale Value Method" (p. 31), transpose "stage micrometer" for "ocular micrometer (reticle)".

4. Terms that need more explanation are "sclerotized" (used to infer hardness and/or pigmentation); "spines" (as distinct anatomically from setae); "minutens" (unfamiliar to the non-entomologist).

5. Some indefensible or inane statements appear: p. 293, center column: "Tarsal structure is second in importance only to antennal form in many insects . . . for identification to family." And on p. 301, last paragraph: "Because these animals vary so widely in size, appearance, anatomy, and requirements for preservation, the techniques for handling and drawing them also vary."

6. There seems to be a confusion of what is meant by "mounting" and "propping" (p. 260). In entomology a "mounted" specimen is one that has been prepared in some way (on pin, wings spread, etc.). These may need propping as much as an unmounted specimen.

In summary, this fine work is encyclopaedic and copies will no doubt be put on the reference shelf by many librarians. But more than that, it is also a voluptuous handbook, so full of practical data and sound conceptual advice, and beauty as well, that most copies sold will surely never be found far from the illustrator's hand.

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BUTTERFLIES OF NEPAL (CENTRAL HIMALAYA), by Colin Smith. 1989. 352 pp., 355 color figures, 3 maps. Tec Press Service L.P., 487/42 Soi Wattanasilp, Pratunam, Bangkok, Thailand. 15 x 23 cm, hardcover. \$50.00 U.S., plus \$5.00 airmail postage.

The Central Himalaya Mountains have always held a fascination for lepidopterists interested in both temperate and tropical butterflies. At last, we have a field guide to the butterfly fauna of Nepal—and one to match the demands of its incredible diversity.