students alike; it hits the mark and certainly will fill the need, considering the Papuan paucity of such literature.

The authors provide a general discussion of beetle natural history as an introduction covering such topics as occurrence, size and diversity, biology and life history, ecology and economic importance, biogeography, body structures, and classification. This treatment is quite general but much of it is derived specifically from New Guinea examples or events, especially biogeography. The key to common families found in New Guinea is partially adapted from Crowson's world key to beetles. Following the key is an annotated list of families thought by the authors to represent 90% of what beginners might find. Each family is characterized structurally and behaviorally, and their natural history is given in general. Common New Guinea genera are listed at the close of each family section. Illustrations, some in color, or photographs (black and white) are provided to represent each of the 46 families covered by the text.

One and a half pages are devoted to collection and preservation of beetle specimens; it is noted too that collecting can be a "stimulating and satisfying hobby" as well as being scientifically oriented. The list of references covers papers cited and is also bibliographic for New Guinea and neighboring areas, but lists only 43 authors/ 67 papers, for a fauna of over 25,000 species. A glossary of structural, ecological and taxonomic terms is provided and all scientific names are indexed.

The pros: Beginners now have a single source with which to begin study of the New Guinea beetle fauna and the book is handy to carry into the field. The illustrations are ample and provide the important "geshtalt" necessary to recognize families in the field. The key is complex enough to do the job but simple enough to keep the user interested. The color plates provide a sample of what might be expected of an exotic combination of species such as that of New Guinea. The annotations for each family provide enough natural history data to entice the beginner to more study.

The cons: As in all works of this sort, the temptation to abridge was not overcome, thus not all beetle groups of New Guinea were covered in text or in the key. Hence the book is useless to any but the rank beginner who will not likely come across a missing family for about a week of collecting, and when one of these families is discovered and the handbook found to be wanting, the beginner will become discouraged and not use the book again. I have seen this happen often in introductory entomology classes with other such books. Not enough sophisticated data are given regarding New Guinea to capture the scientific market. The illustrations (including color plates) are flat and rough and specimen "lighting" totally inconsistent, e.g., Fig. 8 was anteriorly lit, Fig. 9 left lit, Fig. 3 right lit. The photos of Plates 5–10 are even worse. This inconsistency leaves the user without good impressions of sculpture and shape. It is apparent the illustrator(s) have talent but they need lessons on proper use of light.

In summary, I regard this book as only a beginning, perhaps a beginning for some young coleopterist who will eventually produce a useful contribution like that of Arnett's "A Manual for Identification of the Beetles of the United States." If this is the result, the book is more than worth its price.

TERRY L. ERWIN
National Museum of Natural History
Smithsonian Institution
Washington, DC 20560

QUALITY CONTROL, AN IDEA BOOK FOR FRUIT FLY WORKERS. E. F. Boller and D. L. Chambers, eds. SROP/WPRS Bulletin 1977/5. Published by the International Organization for Biological Control. 162 pp. $3.00

"Quality control" immediately suggests a treatise on industrial economics and marketing. Do not be deceived! The subtitle, "An idea book for fruit fly workers", should catch the eye and the imagination. Indeed, it is the imagination and ingenuity of dedicated fruit fly workers around the world which created the concepts and techniques of quality control found in this concise, first-of-a-kind book on measuring performance of mass-reared (or laboratory-reared) insects. Drs. Boller and Chambers, leading pioneers in the development of insect quality control concepts and techniques, continue their leadership with this book. Their objectives were to present current methodologies, identify the state of the art, and develop an organized framework for considering and implementing quality control to the extent presently possible. They have been successful!

The techniques were developed principally for mass rearing fruitflies for use in sterile insect technique (SIT) pest management programs. The world-wide interest in fruitfly SIT, and in quality control, is demonstrated by the number of contributing scientists, 47 in all. But, lest one think that the text is exclusively for fruitfly workers, the introduction and first section effectively embrace all insect-rearing schemes, especially those designed for mass production.

In "Concepts and Approaches", the editors define quality for mass-reared insects as, "... the degree to which a product meets the requirements of the objective or expected function," and provides an excellent schematic example of a hierarchy of quality components, with examples of second and third order interrelationships.

The section includes a review of the concepts of industry-oriented quality control, and effectively outlines the planning and implementation of these concepts in the mass rearing of insects. Fortunately, the organizational and economic aspects of quality control are given only cursory attention; more management orientation would only detract from the "idea book for workers" concept.

The remainder of the text is divided into 4 major sections. Each section or subsection has an introduction that characterizes a population and/or individual quality component, and presents pertinent biological information on the fruitfly. Ideas for assessing quality are presented as specific tests or techniques; each is developed using the following format: Description and Objectives; Materials and Methods; Variables, Design, and Analysis of the Experiment; Possible Modifications and Expansion of the Technique; Limitations; Selected references.

It is the rigidity of this format in coordinating more than 60 ideas that makes "Quality Control" an excellent bench manual for insect colonizers.

The remaining sections are "Measuring Overall Performance"; "Measuring Individual Performance Traits"; "Monitoring Production Characteristics"; "Measuring Adaptation"; and "Implementation of Quality Control."

I found it difficult to accept the fact that the section on "Monitoring Production", was at the end of the book when its value lies in implementation at the beginning of a program. I recognize that in present practice this is an exception, not a rule, but it's time to emphasize the economic and practical aspects of implementing quality control in the beginning, and stop asking "What happened?" when the insects fail to respond to program objectives. This is clearly suggested by the editors on p. 1, i.e. "We do believe, though, that development of technologies and concepts, and partic-

ularly awareness of the need for quality control should be that aspect of SIT that is next intensively addressed". Such awareness begins with the founder colony and subsequent production technologies, thus "Monitoring Production" follows logically after "Concepts and Approaches."

"Quality Control, An Idea Book for Fruit Fly Workers" should be a useful reference for anyone rearing insects and/or attempting to characterize differences between wild insect populations. Unfortunately, there will only be a limited number printed. The book is, by the editors' admisson, "a self-critical exercise" but in it bench and administrative entomologists will find a framework of quality control aspects and techniques that has been lacking in insect colonization.

THOMAS M. ODELL
Northeastern Forest Experiment Station
Forest Service, USDA
151 Sanford St.
Hamden, CT 06514

AMERICA'S MASTER OF BEE CULTURE, THE LIFE OF L. L. LANGSTROTH, by Florence Naile. 1976. Cornell University Press, Ithaca, NY. 215 pp. $9.95.

Current interest in honey as a natural food, bees as agents in pollination, beekeeping as a concomitant of conservation, and the study of bees and their husbandry from an aesthetic, as well as a scientific point of view, have won many enthusiasts who can learn much from The Life of Langstroth—America's Master of Bee Culture by Florence Naile, published by The Cornell University Press in 1942. The current edition, with the re-arranged title America's Master of Bee Culture—the Life of L. L. Langstroth by the same publisher in 1976, is a reprint, including errors, of the first.

The foreword, by Roger A. Morse, Professor of Apiculture at Cornell University, helps bring the life of Langstroth into perspective. I prefer to think of the Rev. L. L. Langstroth as standing at the apex of those responsible for the apicultural renaissance in the nineteenth century. He was the right man in the right place at the right time.

The ferment of ideas which culminated in Langstroth's discovery of bee space was strong in Europe and America. Today, hive manufacturers throughout the world observe bee space as a feature of properly constructed bee hives. Hundreds of so-called improved hives were being made on both continents in Langstroth's day, many being patented by beekeepers who failed to appreciate Langstroth's bee space. Langstroth's perception came as a result of detailed study and meticulous experimentation, faithfully recorded in his journal. Nevertheless, he did not present bee space as the outstanding feature of his hive when he applied for patent. Concern over control of the wax moth which decimated colonies during the 1820s to 1850s assumed much importance in the thinking of all beekeepers and Langstroth was no exception. His first point of justification for his hive was that it afforded bees a more thorough protection against the "bee moth." His hive, constructed according to plans submitted to the Commissioner of Patents, was a top opening hive with free-hanging frames, but only once in his application did Langstroth mention that the bee-space around the frame "should be about three-eights of an inch." We now define bee space as having limits of one-quarter and three-eights inch.

Langstroth's first edition, "Langstroth on the Hive and the Honey-Bee, a Bee Keeper's Manual", Hopkins, Bridgman and Company, Northampton, 1853, stressed the adaptability of the movable frames, but nowhere in this, or in the following 2 editions, is bee space mentioned.

Langstroth's mind was continually alert during the times when he was not laid aside by "head trouble." An example of his alertness appears in the 2nd and 3rd editions of his book, where he stresses the need for upward ventilation of the hive. Langstroth had not determined the need for upward ventilation in the hive at the time he published his first edition, and in the Introduction p. 24 of "America's Master of Bee Culture", top entrances in winter are characterized as a fad. Had the writer consulted Langstroth's second and third editions, it would be perfectly obvious that he considered top entrances to be essential for successful wintering. Beekeepers are rediscovering that truth today.

The statement is made (p.79) "It is evident from these notes that before Langstroth actually used a hive with movable frames, he had foreseen what came later to be called the "long-idea hive . . ." Measurements given by Langstroth in his various hive descriptions fail to give evidence of such foresight. His writing suggests a contraction of interior hive space during non-productive periods, rather than an expansion for the purpose of surplus honey storage. In his 2nd and 3rd editions, Langstroth suggests that honey may be taken from the interior of the main hive, a practice followed in some countries today, but this is from standardized hives. None of Langstroth's hive measurements approach those hives constructed as "long-idea" hives.

A couple of errors, not crucial to a proper interpretation, or a full appreciation of Miss Neale's book, may result in confusion for one seeking a copy of the 3rd edition of Langstroth's book, or for his place of burial. The 3rd edition of Langstroth on the Hive and the Honey Bee was published in 1859 by A. O. Moore and Co., New York. There was a reprint in 1860 by C. M. Saxton, Barker and Co., New York, and another in 1865 by J. B.Lippincott and Co., Philadelphia. The credit (p. 90) is given to Lippincott for having published the 1859 edition. Perhaps as a result of a typographical error, Woodland Cemetery, Dayton, Ohio is given as Woodlawn.

One's thoughts may be diverted from Langstroth to the author by subjective comments regarding fads, referred to previously, and lack of lapidary skill in the inscription on his grave marker (p. 167), but no reader will fail to recognize Langstroth's contributions as fully qualifying him for the appelation Father of American Beekeeping.

After reading America's Master of Bee Culture, one will surely be moved to read what the Prince of Apiarists—the Huber of America wrote in 1853. Fortunately, a reprint of Langstroth on the Hive and the Honey Bee—A Bee Keeper's Manual is available, having been published by the A. I. Root Company, Medina, Ohio, in 1977. In the words of Edouard Bertrand, Swiss author, Langstroth's book is ". . . an admirable book in which the elevation of the thoughts equals the extent of the writer's erudition, as well as the richness of his observations . . . the masterpiece of apicultural literature."

Current interest in the honeybee and its products justifies the re-issue of Naile's book, helping, as it does, to focus interest on Langstroth. This is quite apropos when efforts to perpetuate his memory have been successful in having his home in Oxford, Ohio, listed in the National Register of Historic Places in 1976 and when further plans anticipate its use as a museum and library of apicultural interest. This will not be just an active memorial from Americans for an American. As C. H. J. Gravenhorst, editor the the Deutsche illustrierte Bienenzeitung, wrote following Langstroth's death: "Every beekeeper in the Old and New World, who knows what this grand and noble American apiarian has done for advancing beekeeping, will feel as I do . . .". In 1978 this eulogy might well come from all the continents.

W. A. STEPHEN
34 Orchard Dr.
Worthington, OH 43085