

KNUTH'S OFTEN OVERLOOKED "HANDBUCH DER BLÜTENBIOLOGIE, III. BAND"

At the turn of the century an exhaustive, if perhaps somewhat uncritical summary of the existing knowledge of floral biology stemmed from the pen of Paul Erich Otto Wilhelm Knuth (1854-1899). Knuth's *HANDBUCH DER BLÜTENBIOLOGIE*, based on Hermann Müller's (1873, 1883) classic work on floral biology, was issued between 1898 and 1905 in five parts comprising three volumes. Band I (Knuth, 1898a) treated floral and insect structure and their relationships to pollination. Band II (Knuth, 1898b, 1899) listed floral biological data for Europe (including the Arctic), whereas Band III (Knuth, 1904, 1905), published posthumously under the editorship of Ernst Loew (with the assistance of Otto Appel), assembled comparable data for extra-European areas. The work concluded with a general review (in Knuth, 1905) of pollination phenomena in the arctic, temperate, and tropic zones. Due to the issuance of the work in instalments over a seven-year period, the over 3900 references, six indices to scientific names mentioned in the bibliographies, two systematic indices of insect visitors, and four general indices were scattered throughout the 2800-odd pages of this monumental work.

The great value of Knuth's contribution, a model of Teutonic thoroughness, was immediately apparent. Several Britons undertook the preparation of an English edition, but the task of completing the translation fell upon James Richard Ainsworth Davis, a prolific author of scientific and agricultural books. Although three volumes eventually appeared in English (Knuth, 1906-1909), the translation remained incomplete. The translation of the third German volume (Knuth, 1904, 1905) was to incorporate all new information available up to the date of publication (Cockerell, 1908); for various reasons the translation was never completed. While all the references in the German edition were assembled in Volume I of the English edition, the latter suffered from the omission of all but one of the numerous indices which were such valuable features of the German edition. It was additionally unfortunate that the volume and part designations of the original edition were not adopted in the translation, which was confusingly renumbered as follows:

KNUTH	GERMAN	KNUTH	ENGLISH
1898a	Bd. I	= 1906	Vol. I
1898b	II/1	= 1908	II
1899	II/2	= 1909	III
1904	III/1	= }	Untranslated
1905	III/2	= }	

Recently while preparing some pollination reports (Schmid, 1969, 1970), we became aware that many writers are apparently unfamiliar with Knuth's Band III (1904, 1905). Although European writers and workers (e.g., Faegri and van der Pijl, 1966; Kugler, 1955; Porsch, 1956; Vogel, 1966) have generally used Knuth's Band III, English-speaking authors (e.g., Baker and Hurd, 1968; Corner, 1964, 1966; Daubenmire, 1959; Meeuse, 1961; Percival, 1965) frequently cite only the *incomplete* English translation (Knuth, 1906-1909). In fact, a lack of awareness of Knuth's Band III has led in some cases to an inadequate appreciation of the diversity of tropical floral biology or to misinterpretations of the general nature of pollination of various groups. For example, there is a prevalent misconception that the *Palmae* are exclusively or predominantly anemophilous (see Schmid, 1970). In concluding that the palms are basically wind-pollinated, Good (1956), Lepesme (1947), Mahabalé (1965), and

others apparently were unfamiliar with Knuth's untranslated volume, which provided extensive, previously unpublished evidence (Knuth, 1904, p. 55-82, 1905, p. 321-322) that the group is in large part insect-pollinated. In his account of the natural history of the *Palmae*, Corner (1966) likewise appears to have been unaware of Knuth's work on this group.

Knuth's Band III lists floral biological data for many tropical plants and provides many previously unpublished observations that Knuth had made mainly during 1898 and 1899 in Java, Japan, California, and elsewhere. Thus unfamiliarity of biologists with this part of the *HANDBUCH* is particularly unfortunate in light of the present concern with and increased emphasis on the tropics.

For a number of reasons Knuth's Band III has been overlooked by many English-speaking biologists. Several factors have promoted the mistaken assumption that a complete translation of the German edition exists, including: (1) Confusion resulting from labelling the English edition as three separate volumes when these actually correspond to the first two volumes of the German edition; (2) No indication in bibliographies of scientific works or in printed catalogs of library holdings that Knuth's Band III was *never* translated into English; (3) A vague preface to the English edition (Knuth, 1906), which did not explicitly state the titles of the five parts of the German edition; (4) Failure by many persons to compare, even superficially, both German and English versions, in part due to resistance to scientific literature written in a foreign language.

Knuth's still indispensable Band III thus deserves wider appreciation and use among English-speaking biologists. The German in this volume is readable and relatively unencumbered. The summarized data and extensive references to the early literature are essential to workers seriously concerned with tropical floral biology. In addition, greater knowledge of this volume might well avoid misconceptions regarding the floral biology of certain taxa.

Two steps can be taken to avoid future misunderstanding and confusion. Authors compiling general bibliographies on floral biology should add for clarity and completeness a citation for the third German volume (i.e., Knuth, 1904, 1905) if they wish to cite the English translation of the *HANDBUCH* (i.e., Knuth, 1906-1909). In addition, we recommend that authors add after references to Knuth's work a brief explanatory note that the German edition was never *completely* translated. These concessions to clarity generally have not been adopted by writers, with the notable exception of the Grants (1965, 1968). Suggested abbreviated bibliographic entries might include either:

- (1) Knuth, P. 1898-1905. *Handbuch der Blütenbiologie*. Bde. I-III. Wilhelm Engelmann, Leipzig. [Bde. I-II translated into English by J. R. Ainsworth Davis as the "Handbook of Flower Pollination," Vols. I-III, 1906-1909; Bd. III not translated.]
- or (2) Knuth, P. 1904-1905. *Handbuch der Blütenbiologie*. Bd. III. Ed. by E. Loew. Wilhelm Engelmann, Leipzig. [Never translated.]
- . 1906-1909. *Handbook of Flower Pollination*. Vols. I-III. Trans. by J. R. Ainsworth Davis. Clarendon Press, Oxford. [Translation of Bde. I-II of the German edition.]

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- Corner, E. J. H. 1964. The life of plants. Weidenfeld and Nicolson, London. xi, 314 p., 41 pl.
- . 1966. The natural history of palms. Univ. of California Press, Berkeley. 393 p., 24 pl.
- Daubenmire, R. F. 1959. Plants and environment. 2nd ed. John Wiley & Sons, Inc., New York. xi, 422 p.
- Faegri, K., and L. van der Pijl. 1966. The principles of pollination ecology. Pergamon Press, Oxford. ix, 248 p.
- Good, R. 1956. Features of evolution in the flowering plants. Longmans, Green and Co., London. xv, 405 p.
- Grant, K. A., and V. Grant. 1968. Hummingbirds and their flowers. Columbia Univ. Press, New York. vii, 115 p., 30 pl.
- Grant, V., and K. A. Grant. 1965. Flower pollination in the phlox family. Columbia Univ. Press, New York. xi, 180 p., 3 pl.
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- 1898a. Bd. I. Einleitung und Litteratur. xix, 400 p.
- 1898b. Bd. II. Die bisher in Europa und im arktischen Gebiet gemachten blütenbiologischen Beobachtungen. Tl. 1. Ranunculaceae bis Compositae. 697 p.
1899. Bd. II. *Idem.* Tl. 2. Lobeliaceae bis Gnetaceae. 705 p.
1904. Bd. III. Ed. by E. Loew. Die bisher in ausseuropäischen Gebieten gemachten blütenbiologischen Beobachtungen. Tl. 1. Cycadaceae bis Cornaceae. vi, 570 p.
1905. Bd. III. *Idem.* Tl. 2. Clethraceae bis Compositae. v, 601 p.
- Knuth, P. 1906-1909. Handbook of flower pollination. Vols. I-III. Trans. by J. R. Ainsworth Davis. Clarendon Press, Oxford.
1906. Vol. I. Introduction and literature. xix, 382 p.
1908. Vol. II. Observations on flower pollination made in Europe and the Arctic regions on species belonging to the natural orders Ranunculaceae to Stylidiaceae. viii, 703 p.
1909. Vol. III. *Idem.* Goodenovieae to Cycadeae. iv, 644 p.
- Kugler, H. 1955. Einführung in die Blütenökologie. Gustav Fischer Verlag, Stuttgart. 278 p., 10 pl.
- Lepesme, P. 1947. Les insectes des palmiers. Paul Lechevalier Éditeur, Paris. 903 p.
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- Percival, M. S. 1965. Floral biology. Pergamon Press, Oxford. xv, 243 p.
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A MENSURATION SYMPOSIUM, ALAS

Ecology and its students-practitioners are today (at last) having their bluffs called. Today as never before, the general public cries out "Ecologist, save us!" Western men know now they are part of Nature, not master over her. They know that the world is a closed, finite system. Though Oriental men have long known Man's oneness with Nature, the view of the world as a system—"Spaceship Earth," Buckminster Fuller calls it—is probably new both East and West.

The concept of Spaceship Earth, besides being valid, quantifiable, and amenable to analysis, is a novel and much-needed tool with which ecologists can talk to laymen. With it, ecologists can speak about "the balance of Nature" without being seen by laymen as "birdwatchers and poseypickers."

It appears to me that, for better or for worse, this concept and others which are currently catalyzing the public reaction to ecology and ecologists are the products of non-ecologists. It seems to me that, with a few exceptions, ecologists still find it painfully difficult to talk to each other and nearly impossible to talk with non-ecologists. The few individuals who represent exceptions

are precious to mankind. Perhaps more than any other group of individuals in human history, they hold the key to survival of mankind. No matter their race or nationality, those who understand the way the world works and can explain it to the political decision makers may stand between us and oblivion.

A key to understanding the way the world works, and to a successful manning of Spaceship Earth by its crew, is proper monitoring of the world at work. That in turn implies proper instrumentation and measurement. The crucial role of measurement in good ecology was recognized explicitly in the conception of the Eighth Symposium of the British Ecological Society, held at the University of Reading in March 1967. The proceedings have recently been published under the title *THE MEASUREMENT OF ENVIRONMENTAL FACTORS IN TERRESTRIAL ECOLOGY*, with Prof. R. M. Wadsworth and four colleagues serving as editors.¹

¹ R. M. Wadsworth, editor. 1968. *The measurement of environmental factors in terrestrial ecology*. Blackwell, Oxford (American distributor: F. A. Davis Co., Philadelphia, Penna.). x + 314 pp., illus. \$9.50.