On lines 12 and 15 of page 76, read "but impossibly" instead of "or possibly." On pages 104–105 the use of the indices of $T^m{}_n$ and of the asymmetric tensor $t^m{}_n$ is contrary to that in Eq (11.21).

As for the notation: The arguments on page 7 in favor of x_k instead of x^k and on page 45 for c_a and $h_{\rho a}$ instead of c^a and $h_\rho{}^a$ are not very convincing. This notation leads to atrocities such as $(dx)^k = d(x_k) \neq (dx)_k = g_{ki}(dx)^i$, and it fails to show the correct vector character of the local and world coordinate differentials, which would be better shown by a notation using $dy^a = h_p{}^a dx^p$.

Also, the use of $A_{;k}$ and $A_{,k}$ is hard on the eye. $\nabla_k A$ and $\partial_k A$ would not have required use of a magnifying glass. The tensors on page 23 could then have been written in the easier-to-memorize forms $\partial_{[k}A_{i]}$, $(\frac{1}{2})\,\partial_{[l}\phi_{ik]}$, and $(\frac{1}{6})\partial_{[m}A_{ikl]}$, in which less harm is done when a student inadvertently tries to apply these theorems to tensors lacking the required antisymmetry.

All these little details do not alter the fact that this book is a very welcome and important contribution that deserves wide attention.

FREDERIK J. BELINFANTE

Department of Physics
Purdue University

Bees: Their Vision, Chemical Senses and Language. Karl von Frisch. Ithaca, N. Y.: Cornell Univ. Press, 1950. 119 pp. $3.00.

Professor von Frisch, of the University of Munich, has crystallized in delightfully clear English his 40 years of monumental research in interpreting the senses and language of the honeybee. His book will appeal to scientists, teachers, and laymen. Von Frisch has successfully reduced a complex subject to a clear, easy-reading text. He exemplifies scientists who place clear thinking and perseverance ahead of great physical resources for successful research. Students who expect to enter scientific fields will gain from it a desirable attitude of mind.

Bees are shown to have a sensitivity range between orange-yellow and ultraviolet or to light waves between 650 and 300 mμ. The response of bees to the influence of floral colors and color patterns is clearly demonstrated. They respond more strongly to their olfactory sense and to taste than to color, yet these senses collectively affect their behavior pattern. Bees distinguish between sweet, sour, salt, and bitter, although their threshold of tastes for these differ quite strongly from those of man.

The "language of bees" is shown to involve sensory behavior in respect to color or light quality, odor and taste perception, and the well-known bee dances. The author shows how these dances serve to communicate to other members of the colony that not only is food available in the field, but also what plant species is producing it, in what direction from the hive these plants are to be found, and how far the bees must travel to reach this food source.

The author was able to establish that bees apparently have the faculty of analyzing the polarized light in the sky. When they perceive a point of light from any direction in the sky, they can orient direction just as accurately as when they see the sun. The author discusses in the appendix the structure of the ommatidia in the compound eye in relation to an artificial eye he constructed from triangular pieces of polaroid to simulate the 8 visual cells observed in a bee ommatidium.

Students of bee behavior will recognize the general validity of the basic conclusions drawn from the experiments, for they have all observed many situations that fit this behavior pattern. Von Frisch would be the first to assert that there is much more to learn about the sensory mechanisms and their associations in the now well-established principle that bees have a positive language.

C. L. FARRAR

USDA Division of Bee Culture
University of Wisconsin

Muscular Contraction: A Topic in Molecular Physiology. W. F. H. M. Mommaerts. New York-London: Interscience, 1950. 191 pp. $4.20.

The author of this monograph has presented an account of recent developments in the field of muscle biochemistry, emphasizing description of the actual experimental discoveries and discussion of the immediate interpretations of these discoveries.

The book begins with an outline of muscle metabolism which presents a very clear picture of the history and present status of carbohydrate metabolism and high-energy phosphate bonds in supplying energy for muscular contraction. Subsequent chapters present rather exhaustive accounts of work on the structure, activity, and interrelationships of the muscle proteins. Such topics as the structure of the muscle fibril, molecular sizes and shapes of muscle proteins, and viscosity and birefringence of flow are discussed. Experimental methods and results of the various investigators are described, and interpretations are made both from the data of that investigator alone and from correlation of all work presented in that section of the text.

Although at first glance the book may appear to be a duplication of one or more of the monographs of Szent-Györgyi, there is actually little overlapping. Szent-Györgyi's summaries are chiefly concerned with his own work, whereas this monograph devotes most of its space to the work of others, referring the reader to Szent-Györgyi for details and discussion of the theoretical background of his work.

The book is written so that a person seeking an introduction to the field can obtain it without wading through the pages of detail which will, however, be of great value to those who must for various reasons be more familiar with the latest developments of the problem.

R. C. MILLS

Department of Biochemistry
University of Kansas