

A Laboratory Breed

The Beagle as an Experimental Dog. ALLEN C. ANDERSEN and LORAIN S. GOOD, Eds. Iowa State University Press, Ames, 1970. xiv, 616 pp., illus., + plates. \$17.50.

The dog has long been a favorite animal in medical research, partly because of its size and docility but also because of the availability of large numbers of stray and unwanted dogs at low cost. In recent years stray animals have become less desirable because the increasing sophistication of modern research demands animals with known genetic constitutions, health records, and previous experiences. Thus there have been moves both to develop a new breed of "laboratory dogs" and to standardize one of the known breeds, the beagle. The chief advantages of the beagle are its relative hardiness and short hair, which make for easy care, and an extreme degree of nonaggressiveness which makes these dogs easy to handle with a minimum amount of human socialization and previous training.

The present book is an excellent reference volume for anyone starting and maintaining a dog research colony. It owes much to the experience with the large beagle colony maintained for many years by the Atomic Energy Commission at the University of California at Davis and used for radiation research. Many of the authors have been associated with this project, and their papers emphasize the kind of information that is useful in radiation studies. There are many new data, for example on fetal growth and postnatal organ weights.

The limitation of the book is that many of the papers summarize general information on dogs rather than specific information on the beagle, sometimes because information is not available for the beagle, but sometimes even when it is. For example, the paper on genetics could have listed the known genes in beagles and their variability as well as presented general information about genetics.

However useful the beagle may be, to adopt this breed as "the laboratory dog" in the same way that the albino rat has been used as "the organism" in psychological research, would be a serious error in research technique, for it would throw away the chief unique advantage of dogs, namely their genetic variation. While there is considerable within-breed variation in certain characteristics (our figures average at least 12 percent of the total

variance), there is at least twice as much between-breed variance available. Far from being the "typical dog," the beagle is a very peculiar animal in certain respects, as in its nonaggressiveness.

The best overall solution of the problem of making available the genetic variation of dogs in animals with known experimental backgrounds would be to establish national centers of canine research comparable to the national primate centers, where a reasonable variety of pure breeds of dogs and their hybrids could be maintained both for intramural research and to supply extramural research and teaching institutions. There should be at least three such centers, located at convenient points around the country.

Although dogs, because of their peculiar carnivore physiology, are not as suitable for certain kinds of medical research as primates, they are in other respects superior, showing a degree of genetic variation comparable to that in man, as the wild primates certainly do not, and developing a social relationship with man which makes them far easier to handle. Furthermore, the kind of research that could be done in these centers would be welcome and useful to dog breeders and owners. Scientifically, the dog is still a poorly known animal, in spite of its close association with man for some 10,000 years.

J. P. SCOTT

*Center for Research on Social Behavior,
Bowling Green State University,
Bowling Green, Ohio*

Non-Darkness

Daylight and Its Spectrum. S. T. HENDERSON. Elsevier, New York, 1970. x, 278 pp., illus. \$15.75.

The expectations aroused in the reviewer by the attractive cover of this book were chilled by the first words of the preface, in which the author explains that the material in the book was accumulated when he was chairman of a British Standards Institution technical committee with a charter to revise an old and little-used specification for artificial daylight. In spite of this first encounter, the reviewer found that the book does give a very interesting account of the history of the topic as well as current observations of many technical aspects of daylight. An extensive bibliography of work cited is given.

The literature on daylight is reviewed chronologically starting in 1879. It is therefore necessary for a person seeking reliable and currently useful information to look at the later portions of each chapter. Nevertheless, to a person with general interest in learning something about the nature of daylight these historical results are of real interest. This reviewer was impressed by the number and variability of phenomena that come under the topic of daylight and by the fact that in most research tasks that involve evaluation of the influence of daylight or the action of the atmosphere on the transmission of radiation the experimentalist had better measure the relevant fluxes rather than rely on computations based on "standard results."

ADEN B. MEINEL

*Optical Sciences Center,
University of Arizona, Tucson*

Size and Distance

Psychophysical Analysis of Visual Space. JOHN C. BAIRD. Pergamon, New York, 1970. viii, 324 pp., illus. \$10.50. International Series of Monographs in Experimental Psychology, vol. 9.

This is a highly specialized book on the problem of size constancy in visual perception. If the retinal image of an object is the basis of its perception, how can its physical size be perceived when its distance from the eye varies? There is no satisfactory answer, and the puzzle provides one of the worst muddles in scientific psychology. For, although we seem to see the actual sizes of ordinary surrounding things quite well, experiments in the laboratory under controlled conditions do not explain this common observation and do not even verify it. Should we accept common observation or the laboratory results?

The author is an experimentalist. He scorns "philosophy" and stays within the limits of the strict and methodical investigations of this problem. He surveys the experimental literature, which has become very large, and classifies it by methods. He admires psychophysical measurement, and his chapters are full of graphs. This makes the book dull reading for all but those who specialize in psychophysics. He admits at the outset that the experimental method "loses much, if not all, meaning when forced to match the conditions accompanying man's daily experience" (p. 6). He

nevertheless has the scientist's faith that only the isolation and control of variables will yield trustworthy data. The book is useful, therefore, in showing the anomalies, puzzles, and complexities of the existing data on the perception of size and distance.

Physiological optics and the concept of the retinal image are accepted as the basis of perception. The author thinks of space perception as the seeing of the sizes and distances of objects in empty air, which justifies his title. The doctrine of *cues* for the third dimension of space is taken for granted. He is uninfluenced by the recent tendency to think of space perception as the seeing of the layout of surfaces in a terrestrial world as distinguished from the seeing of objects in the sky.

The investigation of the tendency toward invariance in the phenomenal size of objects with varying distance has become a genuine specialty in modern psychophysics. There is a large body of research here surveyed. The reader may judge whether or not any pattern has emerged. If so, it is obscure.

JAMES J. GIBSON

*Graduate Psychology Laboratory,
Cornell University,
Ithaca, New York*

Agricultural Improvement

Outlines of Perennial Crop Breeding in the Tropics. F. P. FERWERDA and F. WIT, Eds. Veenman, Wageningen, The Netherlands, 1969. xvi, 512 pp., illus. Paper, N.fl. 49.50. Landbouwhogeschool Miscellaneous Papers, No. 4 (1969).

Many tropical countries are dependent largely upon agriculture, and perennial crops are often a major source of their income. The number of plant breeders working with tropical perennial crops is small compared with their colleagues in temperate countries, but their contributions have often been immense. The breeding of vigorous, high-yielding, disease-resistant, interspecific hybrids of sugar cane, a crop rather surprisingly not included in the volume under review, has been of the greatest value. The best clonal *Hevea* rubber gives three to four times the yield of the nonselected seedling material of 50 years ago and has permitted the industry to survive in competition with synthetic rubber. However, this measure of success has not been achieved with all crops. Although we

now know a very great deal about the origin and cytogenetics of bananas, we are still only on the threshold of breeding useful commercial cultivars of this crop.

The editors of this volume, which "is intended as a guide to the student and a source of reference to the scientists in the tropics," have brought together contributions from 28 specialists of different nationalities on a wide range of crops. The crops dealt with are agave, avocado, banana, cacao, cinchona, citrus, clove, coconut, coffee, date palm, fig, kapok, kola, mango, nutmeg, oil palm, papaya, pepper, rubber, tea, and tung. In addition to sugar cane, crops omitted include cashew, guava, passion fruit, pineapple, pyrethrum, and vanilla. For each crop information is usually provided on systematics, physiology of development, floral biology, breeding, and possible future developments. The lists of references seem to be adequate and reasonably up to date.

Many perennial tropical crops are very heterogeneous and, although in many cases it is possible to perpetuate the clone by vegetative propagation, the genotype can be improved only by purposeful breeding. The importance of preserving variability in gene banks before some is irretrievably lost should be stressed. Because of their long breeding cycles, genetic improvement of these crops entails long-term projects, often with inevitable changes of staff, particularly in recent years. The published results are often fragmentary and dispersed. The bringing together of the information in this way should be much appreciated by present and future workers in this field.

One of the most important aspects of crop improvement is the breeding of disease-resistant cultivars. The discovery of coffee leaf rust, *Hemileia vastatrix*, earlier this year in Brazil, when it had already invaded a substantial area in eastern Brazil, may well have far-reaching consequences for the political and economic stability on those South and Central American countries which depend largely on coffee, particularly as the New World crop appears to be susceptible to nearly all the races of the rust. Ferwerda, in the chapter on rubber, describes the attempt being made to breed clones resistant to South American leaf blight, *Dothidella ulei*, in Liberia and testing them out in Guatemala, where the disease is endemic. Of the 7542 clones tested, only 1.7 percent exhibited resistance, and the advent of new, ex-

tremely virulent physiological races of the pathogen has added further complications. No reference is made to work of a similar nature which is being carried out by the Rubber Research Institute of Malaya in Trinidad.

The book is well produced and illustrated; it is commendably free of typographical errors. It can be recommended to all who are interested in the improvement of tropical perennial crops. It is sad that Toxopeus, one of the first joint editors, to whom this volume is now dedicated, did not live to see its completion.

J. W. PURSEGLOVE

*East Malling Research Station,
Maidstone, England*

Mechanisms of Inheritance

Genetic Organization. A Comprehensive Treatise. Vol. 1. ERNST W. CASPARI and ARNOLD W. RAVIN, Eds. Academic Press, New York, 1969. xiv, 528 pp., illus. \$29.

Starting with an unusually interesting historical introduction (by L. C. Dunn), this first volume of a set of three deals with the structure of nucleic acids (H. M. Sobell) and chromosomes (J. H. Taylor), genetic transformation and recombination (W. F. Bodmer and A. J. Darlington; S. Emerson), and chromosome pairing (R. F. Grell). The later volumes are to deal with gene action, mutation, and evolution.

The first application of scientific method to the study of the laws of inheritance led to the concept of genes as particulate units of inheritance, normally stable but subject to rare, sudden inheritable changes called mutations, a term borrowed from paleontology. As the history of genetics is traced in Dunn's account, it seems that the most farsighted achievement of the early work was the recognition of the genetic apparatus as a chemical system, requiring the application of physical and chemical methods for its elucidation. Garrod, who was a chemical pathologist studying congenital metabolic disorders in man, aptly referred to these disorders as "inborn errors in metabolism" and introduced the concept that the enzymes of metabolism might be controlled by genes. Avery discovered that pneumococcal transformation was due to a fibrous polymer, deoxyribose nucleic acid, and so opened the way for Watson and Crick to arrive at the molecular structure of