Strategy for Vision Studies

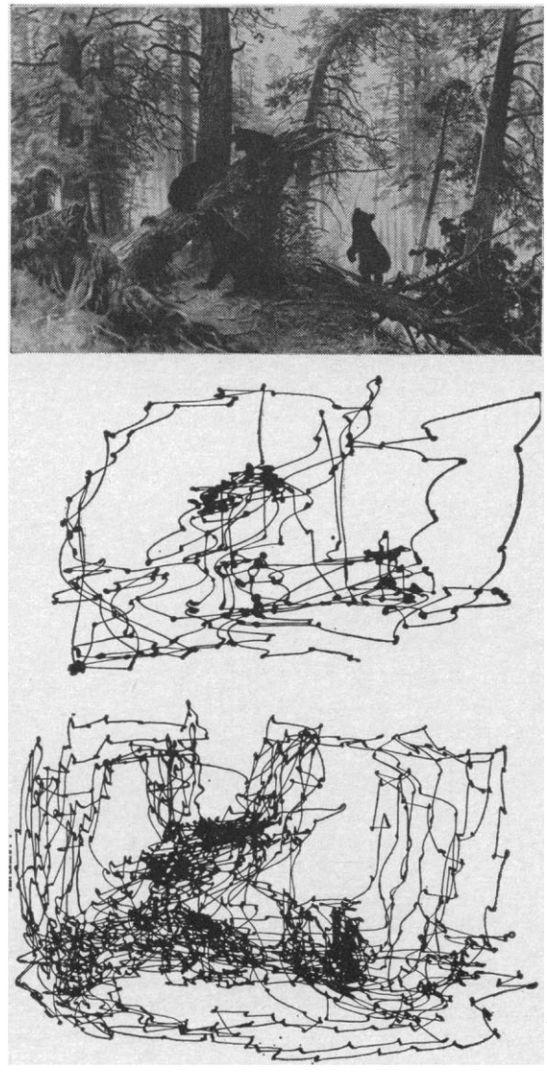
Eye Movements and Vision. ALFRED L. YARBUS. Translated from the Russian edition (Moscow, 1965) by Basil Haigh. Lorrin A. Riggs, Translation Ed. Plenum, New York, 1967. xiv + 222 pp., illus. $17.50.

One of the most interesting chapters in the problem of coding and transmission of sensory information started with the observation that, in vertebrates at least, the messages from the eye to the brain are, in effect, a-c coupled; that is, impulses in the optic nerve fibers occur essentially only at the onset and offset of illumination. This is, however, not reflected in our visual perceptions, which do not seem to contain this kind of time-dependent characteristic. The reconciliation of these conflicting findings has traditionally been sought in the continuously occurring small eye movements which serve to sweep the optical images across receptors and thus permit the on and off retinal units to "do their thing." Early experiments with optically stabilized retinal images (by means of mirrors fitted on contact lenses) did indeed reveal a fading of contours after a few seconds' absence of movement of images across the retina, but a puzzling fact remained: the images spontaneously reappeared.

Yarbus's significant contribution is the development of tightly fitting contact lenses that do not move at all with respect to the eye. As a result, he achieves stabilization good enough and lasting long enough that there is no reappearance of even very bright lights for several minutes. With this technique, given in detail in the first section of the book, Yarbus has now gone on to investigate a variety of stimulus conditions. In what is surely the most important segment of this book, Yarbus describes the appearance of stabilized visual fields of various colors to which are added fields of different colors, stabilized and unstabilized. Some of the results immediately fit in with reasonable expectations on the basis of present knowledge of physiology of retinal function. Others clearly do not, but point to higher cortical operations; they thus constitute exceedingly valuable leads for future research in color perception.

The last half of the book relates to the author's work on eye movements. It covers ground familiar to Western readers, although most of the studies were done in the author's laboratory. The approach, an indigenous mix of psychology and cybernetics, is interesting and obviously productive, but it is not by any means superior to the research strategies with which we are more conversant. The translation does not read smoothly and contains some errors (there is a confusion between the words *subthreshold* and *suprathreshold* on pp. 74–75). However, the results on the appearance of colored stabilized and unstabilized retinal images are essential reading for all workers in the field, and the detailed description of the experimental techniques will be invaluable to those moved by Yarbus's exciting findings to extend his work.

GERALD WESTHEIMER
Department of Physiology, University of California, Berkeley



Some results of a study by A. L. Yarbus of eye movements during perception of complex objects. The lower two panels are records of the eye movements made during a 2-minute and a 30-minute free examination, with both eyes, of the picture in the top panel, I. I. Shishkin's "Morning in the Forest." These and similar recordings showed that neither the most detailed elements (here, the grass and leaves) nor the brightest elements of a picture necessarily attract the most attention. In studies in which both black-and-white and colored reproductions of the same painting were examined, color had no appreciable effect on the distribution of fixation points. [From *Eye Movements and Vision*]

A Somewhat Alien Botany

On Integration in Plants. RUDOLF DOSTÁL. Translated from the Czech edition (Prague, 1959) by Jana Moravkova Kiely. KENNETH V. THIMANN, Ed. Harvard University Press, Cambridge, Mass., 1967. xxiv + 218 pp., illus. $5.95.

Rudolf Dostál is a distinguished Czechoslovakian plant physiologist whose work, although not widely known in the Western world, has been influential in certain restricted fields. For example, my own Ph.D. thesis, completed 25 years ago, was based in part on the observation by Dostál and Hosek that potentially reproductive shoots in *Circaea* reverted to the vegetative state under the influence of exogenous auxin. In 1959 Dostál wrote a monograph entitled *O Celistvosti Rostliny*, published by the State Agricultural Publishing House in Prague. The book under review is a translation of that work which has been carefully edited, somewhat updated, and critically annotated by Kenneth Thimann. We owe deep thanks

to all concerned, for the volume furnishes a unique glimpse into the scientific thoughts, prejudices, and fancies of a provocative and versatile botanist.

This is a book completely without graphs or tables, but studded with many simple sketches of plants showing morphological and growth responses to surgery, chemical treatments, and environmental stimuli. The absence of "hard" data makes some of the conclusions difficult or impossible to accept, but does increase the readability and charm of the author's message. Thimann has wisely protected the reader against some of the unwarranted conclusions by carefully placed and worded footnotes (*Dostál:* In the phloem as a whole, the flow of organic substances can take place in opposite directions at the same time. *Thimann footnote:* Probably not the case in individual sieve tubes). Yet other dubious points have been permitted to remain unchallenged, and some misinformation is therefore bound to be communicated. This is not overly serious, for the main effect of this work will certainly be to stimulate productive adventures into plant morphogenesis, even if such adventures disprove some of Dostál's cherished ideas.

Dostál is a convinced Michurinist, or at least writes like one. In this post-Stalin era, such views come as a bit of a shock. Thimann handles them gently, almost paternalistically. When Dostál writes, "There is no reason to doubt that during transplantation [that is, grafting] the transformation of both partners is so deep that not only do they themselves show new characteristics in their individual lives, but even their seeds may be affected and transmit new characteristics," Thimann responds with this footnote: "Most Western workers think there is grave reason." Period and end of transmission. What else, in fact, could Thimann have done? Summarized all of modern genetics? It simply wasn't worth doing. If you do read this book, I am sure you will agree that part of its value lies in its delineation of the thinking of a productive biologist, perhaps representative of many of his colleagues, whose basic assumptions and articles of faith are sometimes very different from our own.

Anyone who has enjoyed the late Edmund Sinnott's *Plant Morphogenesis* is bound to want to read Dostál, both for contrast and for supplementation. For those who have little background in this field, I would suggest that they read Dostál and, as an antidote to at least parts of his treatment, Sinnott or a similar work.

We need more intercultural experiences of this kind. I hope Thimann's initiative will be followed.

ARTHUR W. GALSTON
Department of Biology,
Yale University,
New Haven, Connecticut

On Reading Sign

Tracks. E. A. R. ENNION and N. TINBERGEN. Oxford University Press, New York, 1967. 63 pp., illus. $4.25.

We have a number of books illustrating animal tracks—by Brunner, Mason, Murie, Seton, and others—drawn in flat black and white or photographed from plaster casts. Here is a different treatment—superb photographs of fresh tracks, in sand or mud or snow, sparkling in the early morning sun and nicely accentuated by contrasting shadows.

This little gem is itself a good example of serendipity; the materials were gathered as opportunity afforded in the course of other investigations. Both authors are well-known British naturalists, and their subjects are familiar members of the English fauna. The remarkable photographs, by Tinbergen, are delightfully supplemented by Ennion's lively drawings, sometimes superimposed over the photograph of the tracks, showing the animals in the act of making their telltale sign. The pictures constitute the text, and the brief legends aid in interpreting the action.

Like the detectives of fiction, outdoorsmen and naturalists are given to reconstructing past activities from the fragmentary evidence that remains. A deep footprint here, a few feather marks there, some scratches in the sand or an unusually long gait recorded in the snow may be all that is left to record a scene from some wildlife drama. Across these pages move snakes and toads, herons and goshawks, hedgehogs, badgers, polecats, and sandfleas. A woodmouse hastens over the ripple marks on a sandy shore. A cormorant, striding across the mud, pauses to stretch its wings to dry. A weevil, toiling up a steep slope, is thwarted as the dew evaporates and the sand collapses. An oystercatcher, foraging along the strand, takes off at right angles as the wind shifts. A fox, having caught and partly devoured a rabbit, caches the remains and covers them with grasses. A pair of shelduck escort their nine ducklings from the dunes to the safety of an estuary. Foxes apparently were particularly apt subjects. The final pages show the spoor of vast herds of wildebeeste and zebra on the Serengeti plains.

This small book, attractively produced, represents the ultimate in nature interpretation, in "reading sign" of past

A natterjack (*Bufo calamita*) traverses a sand dune. [From *Tracks*]