THE GOOD EYE

By P. B. TOMLINSON

A visitor to my laboratory, where I do research on the anatomy and morphology of tropical plants, once remarked, "A good deal of nineteenth-century botany going on here." This remark I felt was very complimentary although that was certainly not its intention. It arose, no doubt, from the visitor seeing the modest way in which I work: living plants in various stages of dissection littering the benches, no impressive array of equipment, in fact not much more apparatus than might have been found in a well-equipped botanical laboratory in the later years of the nineteenth century.

But I was unconsciously complimented because nineteenth-century biologists were great observers. They were fortunate in living relatively uncomplicated lives, they were not overburdened by an unwieldy literature, and particularly they were not plagued with textbooks, those formidable fossilizers of misconception. Their major source of information was plants and animals rather than the printed page. They were required to dissect and look in order to understand. Mistakes were made, countless times, but the most patient and painstaking observers were always rewarded by the truth, because they studied the only reliable source: the living organism itself.

One of the pleasures available to the modern research worker, were he aware of it, is the reading of older scientific literature and the appreciation of the way in which ideas and concepts (and also dogmas!) have developed. One thing this reading teaches is that a fact correctly observed is inviolate, something that can not be refuted. Scientists who made these correct observations were those who looked carefully, whereas those who were least successful were those who turned aside from their dissecting trays and microscopes too soon and reached for their pens too early.

Dr. Nehemiah Grew, a seventeenth century physician who may with some justification be referred to as the "Father of Plant Anatomy," stated that the essentials for studies of plant structures were "a good eye, a clear light and a razor with which to cut." Albeit our modem "razors" may be a little more refined than that which Grew used, running from sliding and rotary microtomes to freezing and ultra-microtomes (but let us not despise the razor itself!); our "clear light" may be concentrated and passed through powerful microscopes and may be of wavelengths not comprehended by Grew or even represented by X-rays and electron beams, but all this refinement is worthless without "a good eye." Too often, however, the research worker assumes that modern machinery will do his research for him. He may even develop the lamentable attitude that without costly instruments no research is possible, assuming that all the progress that can be made without them has been accomplished already by nineteenth-century biologists. But new instruments and techniques merely enlarge the scope of our observations, being called into use when older methods fail to give us an answer. And there are innumerable problems which can still be solved with simple equipment or even with no equipment at all. For example, our knowledge of the elementary morphology of the plant, such as can be observed with a hand lens, is still very deficient because we have explored only superficially the rich store of plant life the tropics retain and to which earlier botanists had only limited access.

Innumerable problems can be solved with no equipment at all.

The elementary biology student is a relatively fortunate individual compared with the student of the physical sciences. His instructions can be taken from common and readily-available organisms. He needs no apparatus to demonstrate natural phenomena. It is much easier to dissect the flower of a common weed, whose passing nobody regrets, and perhaps thereby to understand its pollination mechanism, than it is to find both described well in a library of textbooks. Still the student will be worried. How can he be sure that his observations are "right"? He feels that he must go to the textbook for the "right" interpretation. But surely the flower itself will reveal the "right" interpretation if looked at carefully! So the beginning student initially needs neither "a clear light" nor "a razor"—or at least their twentieth-century equivalent. He needs a "good eye" and this is something that biology teaching should develop in him. It is something that is not easily acquired and certainly it is something for which equipment is no substitute.

Continuing to examine plants and animals in just whatsoever way he pleases, the observer with the "good eye" will discover new facts, regardless of whether his laboratory looks old-fashioned or not. After all, research is only the "good eye" without the textbook.