Lectures Read Before the Royal Society (Johnson Reprint Corp., New York, 1965. 322 pp., $35) by Nehemiah Grew, with a new introduction by Conway Zirkle, and **The Reverend John Clayton: A Person with a Scientific Mind—His Scientific Writings and Other Related Papers** (published for the Virginia Historical Society by University of Virginia Press, Charlottesville, 1965. 244 pp., $6.50) by Edmund Berkeley and Dorothy Smith Berkeley.

Grew (1641–1712; F.R.S., 1671) and Clayton (1657–1725; F.R.S., 1688) shared a like concern with Nature in her many forms, despite the fact that their respective contributions affected the growth of science to an unequal degree. Yet Grew, the pioneering professional, and Clayton, the enthusiastic amateur, represent the far ends of the spectrum of the work carried on by the Royal Society of London, the first modern scientific institution.

In his informative account of Grew's contributions, Conway Zirkle notes that he "may be described as the first microscopist who limited his investigations to the anatomy of plants, or he might just as accurately be classified as the first botanist who used the microscope for studying plant morphology" (in the introduction, p. ix). Despite its title, Grew's major publication was not confined to anatomy in the narrower sense. Rather, like his modern counterpart, the electron microscopist, he attempted to learn all he could of plant life through his chosen instrument. This led him from gross morphology to microscopic anatomy, with excursions into the then-unexplored fields of plant physiology and chemistry. As a pioneer in these areas, he was unable to benefit from the contributions (and errors!) of predecessors. Thus, although it is easy to find flaws in his work, we must not forget that Grew was trying to answer questions that contemporary investigators admit to be far from simple.

It is a wonder that Grew, who was faced with two serious limitations—the lack of proper equipment and a precise terminology—went as far as he did. Thanks to his gift for experimental procedure, he devised sectioning techniques that rerouted plant anatomy away from a concern with organs and toward cellular structure. By using a shrewd combination of observational data and conjecture, Grew phrased the question of sexual reproduction (pp. 171 to 173) in such a way that it became, in the hands of others, subject to experimental confirmation. If he was prone to "explain" plant behavior and various responses such as tropisms by an outmoded chemistry and by analogies with animal behavior, he nevertheless set future scientists on the track of explaining growth, not in static anatomical terms, but in terms of the biochemical dynamics of a living organism. His program, he wrote, was "to examine . . . not only all the Parts, but Kinds of Vegetables, and comparatively, to observe divers of the same size, shape, motion, age, sap, quality, power . . . which may also agree, in some one or more particulars, as to their Interiour Structure" (p. 9).

It was Grew's curiosity and demand for empirical data that led to his contact with Clayton. The former, following the custom of the time, issued a set of queries regarding the drugs and other natural productions of America. Clayton replied in an open letter to Grew, which was posthumously printed in the *Philosophical Transactions* (1739) and is reprinted in the present volume (pp. 21 to 39). Clayton's correspondence is, in fact, his major scientific claim for, despite his once-famous research on coal gas (pp. 138 to 140), his studies of the avifauna of the Virginia Coastlands (pp. 93 to 104), and his various agricultural proposals (pp. 78 to 90), his few published papers failed to open up new avenues of inquiry.

But, as the Berkeleys emphasize, Clayton's activities did much to popularize science and to alert the skeptical to its practical applications. The biographical sketch preceding the edition of Clayton's writings (pp. xvii to lxiii), a bibliography, and an index make the present volume a valuable guide for scholars to use in reassessing the accomplishments of other forgotten amateurs who, like Clayton, tend to be overshadowed by luminaries of Grew's stature.

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Vegetational Changes in the Sonoran Desert

Nothing in nature, we are reminded, is more certain than change. Change in vegetation not only affects its utility to man, but may indicate other conditions of great importance to him, for example, climatic trends, habitat deterioration, and the effects of his own behavior. Yet few of us are taught to understand the significance of such change, or even to observe it.

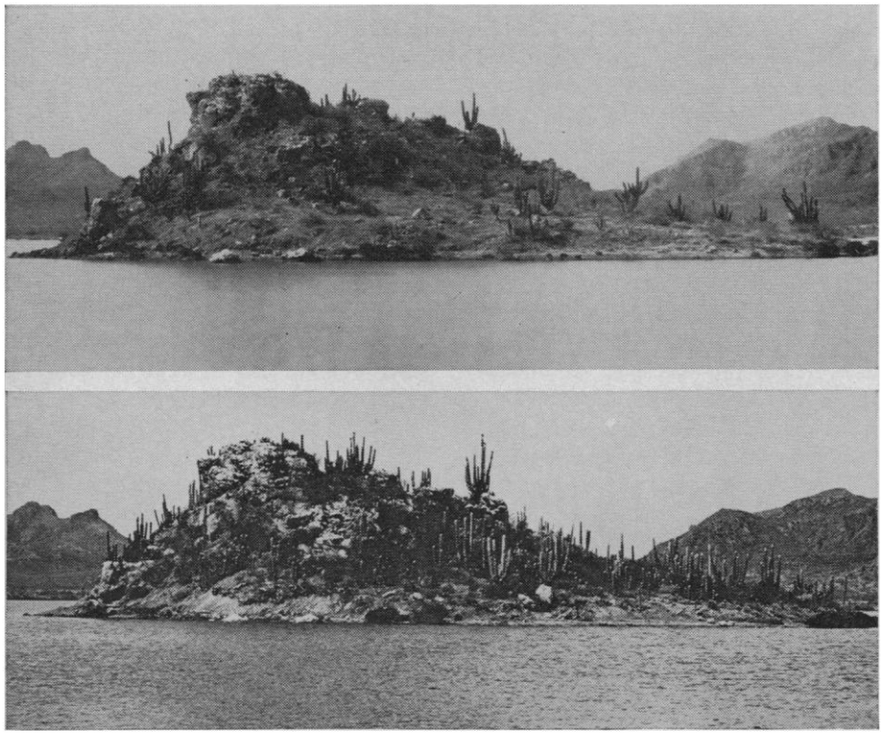
In addition to historical records and on-site study of naturalistic landscape paintings, we now have the more precise methods of micropaleontology and long-interval photography, the method used here. Long-interval photography, effectively employed by the late Homer Shantz and B. L. Turner in *Vegetational Changes in Africa* (1958) and more recently by W. S. Phillips in *Vegetational Changes in the Northern Great Plains* (1963), is applied to the Sonoran Desert region in **The Changing Mile** (University of Arizona Press, Tucson, 1965. 328 pp., $12.50), by J. R. Hastings and R. M. Turner.

This varied region includes not only desert proper but also desert grassland and oak woodland. These three ecosystems, all subject as they are to available moisture and strong insolation as limiting factors, are sensitive indicators of change.

Even so, as the introduction makes clear, the impact of climatic, geological, biotic, and cultural influences is so involved that it is not easy to factor them out. Impressive studies now under way in the Tree Ring, Geochronology, Atmospheric Physics, and Arid Lands laboratories of the University of Arizona are expected to help greatly in resolving these problems.

An analysis of the physical characteristics of the desert habitat and two chapters on early and more recent human influences precede 97 pairs of photographs, taken as nearly as possible from matched sites [see, for example, the illustration on page 920 of the giant cactus, *Pachycereus pringlei* (from Melisas Islands in the bay at Guaymas, Sonora)]. Some of the earlier photographs date back to the 1880's, many to the early 1890's, and the remainder to the present century, especially the 1930's. The recent photographs by the authors were taken during the present decade. Although the quality of reproduction varies, each pair tells a graphic story.

Unfortunately none of the photographs antedate the cattle industry, although there are a few examples of sites unaffected by it. Yet there is good evidence that climatic trend has been



One of the Melisas Islands in the bay at Guaymas, Sonora, Mexico, as it appeared in 1903 (upper) and 1961 (lower). The giant cactus, *Pachycereus pringlei*, has greatly increased in number during the 58-year period. The census in 1964 was 5836 or more than 8000 cacti per hectare. Such dramatic changes in the landscape of southwestern North America may be related, at least partly, to changes in climate. [University of Arizona Press]

operative. The upward migration of oak and mesquite and the increase of cardon (a giant cactus) on ungrazed areas are consistent with such changes as the northward shift of Atlantic fisheries, glacial retreat in Alaska and Norway, and the incidence of birch disease in Maine.

Whether or not the warming/drying development that is indicated represents a major or minor trend in the long swing of climatic history, it is clear that the advent of modern man catches the desert region at a vulnerable time. This region, despite the more obvious, often more destructive types of exploitation, is a tremendous national asset. The inflow of visitors and permanent residents is proof enough that, like a basket of eggs, it should be handled with care.

The authors deserve great credit, not only for their considerable labor and scientific caution, but for the clarity and interest of their writing. Their work should appeal to the growing number of amateurs who are learning to appreciate the desert region, as well as to those whose concern is more technical.

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Looking Backward at Science Fiction

Of the hundreds of science-fiction anthologies published during the last quarter century, **Future Perfect: American Science Fiction of the Nineteenth Century** (Oxford University Press, New York, 1966. 415 pp., $6.50) is one of the most unusual. The editor, H. Bruce Franklin, associate professor of English at Stanford University, has collected 21 19th-century American science-fiction short stories and novelettes, from Hawthorne's "The Birthmark" (1843) to Stanley Waterloo's "Christmas 200,000 B.C." (1899). The title is misleading, because it gives the impression that the book consists entirely of utopian prophecies. Only a very few stories fall into this classification. The tales are grouped as follows: Hawthorne, Poe, automata, marvelous inventions, medicine men, into the psyche, space travel, and time travel.

Franklin has written an introduction to each group of stories and an introduction to each of the authors. The only volume with which I can compare *Future Perfect* is August Derleth's anthology *Beyond Space and Time* (1950), which included selected science fiction by authors ranging from Plato to Bradbury.

Some of the stories chosen by Franklin, such as Poe's "The Facts in the Case of M. Valdemar" and O'Brien's "The Diamond Lens," are already familiar to the *aficionado*, having been reprinted in other anthologies. Others are so obscure that only a specialist in the literature of this period would know them.

The tales vary widely in content and show that, half a century before the term "science fiction" was coined, a surprising number of authors were turning out imaginative stories of this kind. J. D. Whelpley's "The Atoms of Chladni" (1859) is of interest to the historian of technology, for it contains the only fictional prototype of Edison's phonograph that I have ever seen.

Aside from their interest as literary curiosa, the stories also vary widely in readability. By and large, fiction does not travel well in time. Most of Shakespeare's jokes fall flat today. Only a small fraction of the stories composed centuries ago—an occasional *Odyssey*, or *Sindbad*, or *Don Quixote*—are still readable for enjoyment. A host of other stories that have survived from bygone times are endurable only by graduate students, who mine them for theses. Most of Franklin's stories have the besetting faults of Victorian fiction: wordiness and sentimentality. Some—like S. W. Mitchell's "Was He Dead?"—overcome these shortcomings; others do not.

For instance, Franklin no doubt felt he had to include a story by Edward Bellamy, whose *Looking Backward* made such a stir and furnished the model for so many socialistic utopias. Yet, viewed solely as a storyteller, Bellamy is, in my opinion, one of the dullest influential writers who ever lived, with the possible exception of Proust. However, Bellamy's contribution, "The Blindman's World" (1886), has one point of interest: He gets his hero to Mars by a method much like that by which Edgar Rice Burroughs, a quarter century later, sent John Carter to the Red Planet.