sisted momentarily, detaching themselves from the stream and drifting eastward from the path of the discharge as if carried by the wind. This phenomenon was observed at several points along the discharge, and was also witnessed by my son, Howard F. Allard, who was observing the lightning beside me. A portion of the path of the discharge, at and below these points, was also indicated by a train of sparks persisting momentarily after the streak had gone. Although I have made it a special point to observe the electrical displays of storms since a child, this phenomenon has never presented itself to me before.

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SCIENTIFIC BOOKS

MAN AND HIS ENVIRONMENT

Deserts on the March. By PAUL B. SEARS. University of Oklahoma Press. 1935, $2.50.

IN the small compass of 231 pages of easy reading, Professor Sears gives an integrated picture of the relation of man to his environment as seen through the eye of a trained ecologist and publicist, who brings science, experience and history to bear on the interpretation of this relationship. He pictures the continents before disturbed by man, and then step by step through the centuries with population increase, land cultivation, destruction of natural forest or plant cover, bringing on erosion by wind and water, dust storms and floods with destruction of life and property.

Against a background of what has taken place in China, India and Egypt, he presents the picture of the course of events in the North American Continent due to the destruction of our forests, the wasting of our soils, the destruction of the food resources of our streams, lakes and oceans. Looking at these events from the view-point of the naturalist, he views man and his affairs not only as causes, but as reacted upon for good or ill by the changes he brings about. A wealth of scientific fact is presented as an aid in understanding the deeper causes and meaning of the intricate phenomena involved in man's relation to nature. Technical language is avoided.

The book will be of intense interest to men of affairs everywhere, as well as to scientists. The citizens of the world must enlarge their thinking to rightly understand their relation to the environment in which they live and upon which their welfare and that of future generations depends. This book will help greatly to that end.

The writer is an ecologist in the broader use of that term. In his own words the book, speaking broadly, is "an attempt to interpret the relations and adjustments of man as they appear to the ecologist, with due regard for the many intangibles which enter the human setting. If these chapters have told their story the importance of ecology to plant and animal industry and to any program of land utilization, should be obvious." I may add that the social value of such training is also obvious.

A. F. WOODS

CYRUS GUERNSEY PRINGLE

Life and Work of Cyrus Guernsey Pringle. By HELEN BURNS DAVIS. Burlington, Vermont. Paper, 756 pp., 2 portr. For sale at the Pringle Herbarium, Williams Science Hall, University of Vermont; price $1.50. 1936.

THIS book is a useful and appropriate memorial to a great botanical explorer. The title may be somewhat misleading; the work is not at all the usual biography. It is, indeed, prefaced by a brief account of Pringle's life; but the bulk of it consists of transcripts from his diaries, comprising every passage relating to his travels and his collecting in Mexico from 1885 to 1909, and of two lists of his collections, one arranged systematically and one by numbers, both giving determinations of his specimens and recording their presence or absence in the herbaria which contain the first three sets—his own at the University of Vermont, the Gray Herbarium and the United States National Herbarium. In addition, there is a partial bibliography of his published writings, reprints of some of them from "Garden and Forest" and indices of persons and places mentioned and of plant names.

Pringle ranks among the foremost botanical collectors. A man of singular uprightness and conscientiousness, he spared no effort toward the perfecting of his work, and in his many journeys to Mexico acquired a knowledge of its flora which enabled him to collect with unusual intelligence. His sets were not only of high technical quality, they were actually of selected material, containing a large proportion of novelties and species otherwise of particular interest. They found a ready market; they are represented in nearly all the great herbaria of the world. They have, in consequence, great reference value in addition to their intrinsic scientific worth; they are classic in their field. Therefore a book like this, which enables one readily to place any given number and to obtain the complete itineraries and other collateral information often much to be desired in regard to any collection so important, is very welcome to the taxonomist. The compiler has done her work faithfully and well. One feels that Pringle himself, who earnestly desired to be serviceable to science, would have chosen just this useful sort of memorial.

Scarcely less welcome are the glimpses of Pringle's highly individual personality and the sidelights on his methods of work which the diaries afford. One can only regret that his early journeys to the Pacific states in 1880–1884 and the brief visits to Cuba in his last active years could not have been included.

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SPECIAL ARTICLES

SURVIVAL OF ASCARIS EGGS AFTER CENTRIFUGING[1]

FERTILIZED eggs of *Ascaris suum* in the uncleaved stage, in the 2-cell stage and in the 4-cell stage of development were exposed to a centrifugal force of approximately 400,000 times the force of gravity for one hour in the ultracentrifuge recently developed by J. W. Beams. The eggs were then removed from the rotor, placed in depression slides and their stratification and stage of development noted and charted by aid of the microscope. They were found stratified into 3 distinct layers: (1) a layer of yolk at the centrifugal pole; (2) a middle clear and apparently homogenous protoplasmic layer; and (3) a layer of fat at the centripetal pole. In some cases the fatty layer was observed to be separated from the rest of the egg.

Twelve hours after the eggs had been centrifuged it was observed that they had lost their stratified condition and some of them had undergone mitosis. After 48 hours at least 90 per cent. of them had divided once. They were observed at intervals under the microscope until they had developed beyond the 8-cell stage, which extended over a period of approximately 3 or 4 days.

In a second set of experiments eggs in the same stages of development as those used in the first were exposed to a centrifugal force of approximately 150,000 times the force of gravity for 4½ days. They were studied in the same manner as those mentioned above. Here also, at least 90 per cent. of the eggs were observed to be alive and to develop at about the same rate as the controls. In still other cases, eggs have undergone cleavage while rotating at 100,000 times gravity.

These results seem to bear directly upon the questions recently discussed by Taylor[2] concerning living and non-living colloidal systems. He states:

> If, therefore, a centrifugal force applied to the ground substance (protoplasm) were sufficiently great, it, too, would suffer a stratification of its colloidal components no less definite than that of its grosser, visible inclusions as effected by ordinary centrifuging. Indeed, in recent times many non-living colloidal systems have been successfully stratified by means of the ultracentrifuge as perfected and employed by Svedberg (1928) and others. But to what extent the living ground substance would endure the rigors of such enormous forces (10,000–100,000 times gravity) and remain living, is, of course, exceedingly problematical. If the basis of protoplasmic organization is molecular—a postulate which now applies to colloidal systems generally—we may reasonably suppose that the living substance physically owes its being to the condition and maintenance of its unique structure. This qualification of the spatial relation of its component parts, once violated by mechanical or other forces sufficient to disrupt that spatial relationship, is thereby relinquished and the living substance disintegrates and dies.

It is of interest to note here that according to Bodine and Boell[3] practically no change in the oxygen consumption of blocked grasshopper eggs occurs after centrifuging at 400,000 times gravity, although such eggs do not recover. We have shown that the protoplasm of Ascaris eggs in the early stages still remains living after being exposed to forces equal to the maximum employed by Svedberg to separate from solution many artificial colloids and native colloids, such as proteins. However, we have been unable to determine whether or not a stratification of the protoplasmic components under such strong centrifugal force has taken place. If such does take place, it is of particular interest, for then the normal spatial relationship of the separate elements can not be of vital importance for the maintenance of life. However, if, as we are inclined to believe, little or no separation or stratification of the components has taken place in this material, they must be held together in a firmer way than those in the colloidal systems examined by Svedberg. In other words, the conditions present in this living colloidal system (protoplasm) seem to be different from those in non-living ones.

We are of the opinion that the killing of cells by the present methods of centrifugation is usually due to mechanical distortion or disruption (prevented in Ascaris eggs by the presence of a very resistant shell) rather than to a disturbance of the spatial relationship of their molecular parts.

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THE SEMIQUINONE OF THE FLAVINE DYES, INCLUDING VITAMIN B_2

SINCE it has been shown that many derivatives of phenazine, such as pyocyanine,[1] α-oxyphenazine[1] and

[1] Aided by grant from the Rockefeller Foundation for Research in cellular biology.

[2] C. V. Taylor, *Physiol. Zool.*, 4: 423, 1931.

[3] J. H. Bodine and E. J. Boell, *Jour. Cell. and Comp. Physiol.*, 7: 455, 1936.

[1] L. Michaelis, *Chem. Reviews*, 16: 243, 1935.