the limits of the entities which they have discovered and to arrange them according to their resemblances. The methods employed have been principally those of comparative morphology. The relationships within these entities and the intraspecific structure which is conditioned by the ecology of reproduction have been neglected or but little attended to. Either they have been overshadowed by the practical necessity of creating a workable system, or their study has lagged because of the inadequacy or absence of the necessary techniques. In recent years, however, some systematists, augmenting the orthodox methods by others more suitable, have undertaken to analyze these phenomena. They have become interested not so much in the broader relationships which exist between species and between genera, relationships which can be inferred only from observation and on which no experimental attack is possible, but in the more intimate familial relationships of the individuals which comprise a species. By these studies it is hoped that they may peer beyond the end results of speciation and learn more directly its causes and course. They also believe that thereby a more satisfactory arrangement can be devised.

Several terms have been applied to such studies; they have been variously described as the "new" systematics, as biosystematics and as population genetics. These terms are awkward and are not wholly revealing. None has gained more than tentative acceptance despite the need for a term which can be generally applied. I am venturing therefore to propose the term *genonomy* to connote these laws of the blood relationship, coined from the Greek words τὸ γένος (the race or offspring) and ὁ νόμος (the law or ordinance). This term can be used in apposition to the term *taxonomy,* which can be defined as the laws of arrangement and employed to connote what Turrill has termed "alpha" taxonomy. If the need is felt for a more inclusive term to embrace both fields of activity, I suggest that the term *systematics* be used in this broader sense. As employed at present it is somewhat ambiguous, but more or less synonymous with taxonomy. To illustrate concretely by a study in progress: "The Systematics of *Delphinium Hanseni*" would subsume both its taxonomy and its genonomy. The former would embrace the usual studies of arrangement: nomenclature, differentiation and description of the entities and their geographic distribution. The latter would embrace studies entailed by the familial relationships of individuals, such as their breeding structure, intraspecific variation and its distribution, ploidy, the investigation of certain natural hybrids and the relationship of the entities involved in the polyploids and hybrids.

CARL EPLING

UNIVERSITY OF CALIFORNIA

ISOLATION OF INFLUENZA A BY INTRA-ALLANTOIC INOCULATION OF UNTREATED THROAT WASHINGS

WE wish to report that in this laboratory it has been possible to isolate and identify influenza virus A from untreated, unfiltered throat washings by intra-allantoic inoculation of developing chick embryo. The Hirst red cell agglutination-inhibition test was used for identification.

During a current epidemic twenty untreated unfiltered throat washings freshly collected in 20 per cent. normal horse serum saline have yielded four positive agglutinations on the first passage. One of these was verified as Influenza A by the agglutination-inhibition test.

Details of further studies will be published later.

MINNIE THIGPEN
JAMES CROWLEY

INFLUENZA LABORATORY,
DIVISION OF PREVENTABLE DISEASES,
MINNESOTA DEPARTMENT OF HEALTH

SCIENTIFIC BOOKS

NATURALIST AT LARGE

Naturalist at Large. By THOMAS BARBOUR. 314 pp. Little, Brown and Company, Boston. 1943.

WE use the expression "emergent evolution" to designate apparent mutations, which are really due, not to any change in the germ-plasm, but to a new combination of genes, giving a result which may be as wonderful as it is unforeseen. We must suppose that the elements which, coming together in the right manner and proportion, gave us Thomas Barbour, existed in his ancestors, even in those remote ancestors who would now be called savages. We are filled with a sense of wonder and mystery when we think of these early origins, destined to find their highest significance in a future then remote. If we ask what these elements were, we find the answer in Barbour's book. An intense curiosity about the phenomena and significance of animal life, a desire to discover facts hitherto unknown, a very keen sense of the beauty of nature, a remarkable capacity for friendship—all these faculties, separately or in combination, must have served Barbour's ancestors well, but it was a happy chance that brought them together in a single outstanding individual. But even so, nurture had to be added to

nature, or the results might have been insignificant. Says Barbour: "I knew Professor Henry Fairfield Osborn, the president of the Zoological Society, because one of his sons was a schoolmate of mine. To me, a shy fifteen-year-older in those days, he seemed very awesome, but one Saturday afternoon he did something which enriched my life more than he ever realized. On this occasion he sat down beside me in the train going back from the Bronx to Grand Central Station. He asked me what I had been reading and then said: 'There are four great books for boys who like natural history.' And he named them: Wallace's 'Malay Archipelago,' Belt's 'The Naturalist in Nicaragua,' Bates's book on the Amazon, and Hudson's on the La Plata region. Well, I read them in this order. Wallace's book, coming first, made the greatest impression; I read it over and over again until I knew it almost by heart. And my desire to see the Dutch East Indies became so all-consuming that I must have seemed a veritable monomaniac to my parents."

Barbour thus stepped into Wallace's shoes, for in many respects the two men were very much alike. I think especially of their delight in the beauty and variety of nature, for although they wrote no poems, they had to the full the feeling which inspires the best poetry.

The book is divided into three parts—(1) The Making of a Naturalist; (2) The Sedentary Naturalist; (3) The Leisurely Naturalist—with also a couple of appendices. Each chapter deals with some special topic, the result being more interesting than a strictly chronological narrative. There is a very good chapter on Mr. Justice Holmes, of whom it is said:

> I still believe that had Justice Holmes known as much about science as he knew about philosophy, ethics, logistics or history, he would have been forced to admit that there are certain categories of facts for which science holds no key. And this is where the deist, the humble soul who makes no parade of his religious belief, feels positive that he has something quite tangible, which the atheist has not. Justices Holmes was completely happy and satisfied but, in regard to science, he was extraordinarily trusting and uninformed. With all his learning, with all his vast and mature scholarship which gave him that superb beauty of utterance, of imagery, and of apt quotation which decorated the ornate loveliness of his literary style, Mr. Holmes still had his blind spot.

But Barbour concludes: "Justices Holmes was one of the greatest men I ever knew well—if not the very greatest."

Barbour's life work has been in and for the Museum of Comparative Zoology at Harvard, where he has been the successor of Louis and Alexander Agassiz. He describes the growth of the museum and the work of his associates, and tells some strange tales of earlier days. "You see, my thesis is that working in a museum used to make people odd. Of course, that's not the case of my colleagues or me. As one of my daughters said of us, 'You don't have to be crazy, but it certainly helps.' "

There is much to be said about the Barro Colorado Island Laboratory in the Panama Canal. Barbour says that if ten friends of his were asked to speculate on the best job he had ever done, nine would agree that it was the help given to the Barro Colorado Laboratory. However this may be, the service rendered was very great, and although, under the stress of war, the laboratory is now closed, the work will continue in days of peace, presumably for centuries to come, and will be a source of inspiration to many generations of naturalists.

> Probably few spots in the world have provided more intellectual thrills or satisfied more intellectual curiosity than has Barro Colorado Island. Every naturalist, be he high-school teacher or independent investigator or college professor of biology, craves a chance to see a tropical rain forest, if only for once in his life, and many who have had their first chance on Barro Colorado Island have returned there again and again. . . .
>
> I don't know whether I shall ever see Barro Colorado again, but I certainly hope that I may, if only to sail by it through the Canal in the month of March, when the guayacan trees lift their lofty heads above the forest top, each as glittering as a golden dome, while the purple Jacarandas, the pale pink alemendros and the Palo Santo with flowers as crimson as arterial blood make a scene of incomparable splendor [pp. 206, 207].

The chapter "In Retrospect" is an attempt at self-analysis, as objective as he can make it. He says: "This year, in the midst of a war-torn world, I have been thinking hard about the whole question which every elderly person in an administrative capacity has been pondering—as to whether or not he is pulling his weight in the boat at times like this. Or should I shut the museum up and walk away from it for the duration? . . . Well, the stars have shone for me in the form of some lines recently written by my friend, Dr. Albert Eide Parr, the distinguished new director of the American Museum of Natural History in New York." Parr's statement concludes with these words:

> The effort of our physical victory may also prove wasted if in the meantime we have lost on the spiritual front. And I do not propose to apologize for having sufficient faith in our ultimate victory to consider the continued growth and development of the cultural and educational institutions to be one of the most essential duties which can be borne in our nation to-day, second only to the duty of those defending our right to have the civilization we want. At least that is the conviction in which I myself carry on.

It is natural that different individuals, according to their training and circumstances, should feel differently about these matters, so also the same individual at different times. But one feels that some of the things done, such as the evacuation of the three great museums at San Diego, which would have contributed greatly to the education of the men in service, has resulted from a feeling of indifference to cultural values on the part of those in authority. Let us hope that in the days to come the better life which we now see through dark glasses may not only restore our civilization but make it far more interesting and serviceable to the average man.

T. D. A. COCKERELL

DESERT MUSEUM,
PALM SPRINGS, CALIF.

DEVELOPMENTS IN SCIENCE

Forward with Science. By ROGERS D. RUSK. Alfred A. Knopf Company. 307 pp. $3.50.

THIS book by Rogers D. Rusk, is intended as a guide to non-scientists, to keep them in touch with the present developments in science and to review for them some of the philosophical implications, as well as to describe the practical consequences of the thought of the past two decades. It is not intended to be a text and therefore fits into the category of the other books explaining science to the layman, such as the familiar ones by Jeans and Eddington.

Dr. Rusk sets forth for the average layman the points of view which have been developed by science in recent times and outlines some of the interesting results. He starts out by explaining the triumphs of modern physical science and discusses the structure of matter and the newly discovered fundamental particles. He then shows us immediately how these particles are used. He devotes one chapter to the electron microscope, another to x-rays, and still others to artificial radio-acitvity and atomic energy. Then Rusk describes cosmic rays and reviews the evidence for the age of the earth. The remainder of the book is devoted to a more philosophical view of the problems posed by modern science. The author explains the difficulties of the mechanistic view and the importance of the development of the wave and probability concepts which form the basic operational philosophy of modern physics. His later chapter headings are suggestive, as "Reaching for the Stars," "Does Nature Make Sense?", "Man Outgrows Mechanism" and "Human Freedom and Destiny."

Finally, toward the end of the book Rusk also considers science and destruction. He attempts to set at ease the minds of those who worry about the destructive forces unleashed by science by reminding them that science provides power and tools for the use of mankind and that it is not the fault of science that some of these tools have been used by misguided persons for destructive purposes.

Dr. Rusk, being himself a physicist, is, of course, thoroughly conversant with his subject and cites extensively the original fundamental and significant experiments. He has clearly explained the rather complex ideas which have been formulated and developed by the leaders of present-day physical thought, such as Heisenberg, de Broglie, Schrodinger and Bohr. Since physics has grown during the past ten years to vast dimensions it is impossible to do justice to all phases of it in a book of this length. One is therefore left with the feeling at the end of many chapters that more should have been added about the subject and that the arguments and treatments are incomplete. Also, in reading the book a physicist would feel that in Dr. Rusk's development of the subject he departs from the classical order of presenting the material. This departure from the traditional presentation tends to give the impression that the author jumps around too much for so broad a field and does not always finish the ideas which he has started to explain. On the other hand, many of the facts in the book are excellent and certainly reflect the current thought in physics. Many of us have felt, as does Dr. Rusk, that the philosophical point of view developed by Jeans and Eddington had gone beyond the true province of science, particularly in Jeans' discussion of determinism and in his famous conclusion that since physics is mathematical, therefore God must be a mathematician. It is most encouraging therefore to hear a fellow physicist point out the difficulties with this point of view and to hear him explain the feelings which have been commonly shared by many of us in this field.

On the whole, Rusk has done a good job, and has presented the subject to the layman in a most interesting and readable book.

S. A. KORFF

NEW YORK UNIVERSITY

SPECIAL ARTICLES

RETARDATION OF RANCIDITY BY SULFHYDRYL COMPOUNDS

BIOLOGICAL antioxidants, as food constituents, are attracting increasing attention. Apart from the tocopherols, which Mattill and his associates first demonstrated as having antioxygenic potency,[1, 2] crude

[1] H. S. Olcott and H. A. Mattill, *Chemical Reviews*, 29: 257, 1941.