attained. I believe it was generally stated in the papers which I read that two or three such renewals are usual before the fish concludes his flight and submerges.

Instigated by Mr. Breder, I timed several flights with a stop watch, observing from the bow of the boat, but, though I witnessed several of these transient contacts with the water, my position was not high enough to permit a very clear view of the procedure. My best chance to observe the performance clearly was on my return to the north, when flying over the Caribbean Sea in a Pan-American amphibian plane near the island of Cozumel. It was on February 19. The plane was flying nearly into a light southwest wind at about 1,000 feet above the sea. Groups of flying fish, a dozen or so at a time, kept taking off and flying directly into the wind. Presumably the plane frightened them, for in a few minutes I saw enormous numbers take to the air, almost always nearly under us. The flights usually consisted of three or four hops, separated by the brief periods of sculling described above. The over-all time of the flights varied roughly from 6 to 18 seconds; *i.e.*, the single hops lasted about 3 to 5 seconds. At least once I could clearly see the acceleration of the fish during its brief period of sculling on the surface between hops, and once I distinctly saw the undulating wake of the fish's tail, looking like a row of dots on the surface of the water.

The procedure as described seems to be well established, and is an interesting combination of the efficiency of aquatic propulsion and the low resistance attained by airfoil support.

ALEXANDER FORBES

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PROPULSIVE POWER USED BY FLYING FISH

IN my brief note in SCIENCE for January 24 under the above title, I failed to make proper mention of the excellent articles of Dr. Carl L. Hubbs in this field,[1] in which he described the repeated tail lashings by which flying fish renew their propulsive impetus in the course of a compound flight.

In his articles, however, he fails to describe the apparently intentional tail lowering by which the fish is enabled to "taxi" off for another glide without the immersion of more than the tip of the tail. One would infer that the movement is accomplished by a folding of the pelvic fins, which provide lifting power for the rear portion of the body when they are extended in the air. Such folding gives the downward tilt that dips the tail into the water.

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PRESENT STATUS OF THE "GEOLOGY OF NORTH AMERICA"

WHEN the writer undertook to bring out the "Geology of North America" to be published by Gebrüder Borntträger in Berlin, with Professor Erich Krenkel in Leipzig as general editor, it was his conviction that, owing to his lack of knowledge in many fields to be covered, it would be necessary, in order to make the work authoritative, that the principal chapters should be entrusted to recognized authorities in their respective fields. This has been done to such an extent that some thirty geologists agreed to collaborate, most of whom have responded with splendid contributions.

A few of the older collaborators, however, have found it impossible to find the time to write their chapters. The result of this has been an unfortunate delay leading to the fear that these missing chapters, about half a dozen, may not be delivered.

This fact, together with the advice received by the writer from the Regents of the University of the State of New York that, owing to his advanced age, he should restrict himself to his graptolite work and aim to finish that, made it necessary to turn the completion of the "Geology of North America" over to a younger, energetic and competent scholar. Such has been found in Professor Balk, of Mount Holyoke College, who is well known by his studies of batholiths and structural problems both in the east and west of North America.

It is hoped that younger geologists can be engaged for the lacking chapters. Meanwhile Professor Balk will begin to bring out in separate instalments the chapters already finished, after bringing them up to date, in which arduous task the writer is assisting him.

Some of the lacking chapters are of great importance, and this notice should be considered by energetic geologists as an appeal to assist in the work. So many manuscripts of great scientific value have been already received that it would mean an irreparable loss to science if the work should not be completed along the original lines.

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SCIENTIFIC BOOKS

HISTORY OF SCIENCE

A History of Science, Technology and Philosophy in the 16th and 17th Centuries. By A. WOLF, with the cooperation of F. DANNEMANN and A. ARMITAGE. pp. xxvii + 692, with 316 illustrations. The Macmillan Company, New York, 1935. $7.00.

A COMPREHENSIVE history of science is badly wanted. To write such a book, to trace the develop-

[1] Papers of Mich. Acad. Sci., Arts and Letters, Vol. 17, 1932; and Smithsonian Reports for 1932, pp. 333–348.

ment of human civilization in its scientific aspects is a gigantic but marvelous task. It has to be done by one man. A group of experts could at best produce a good reference book but not a history. Only one man can, during a lifetime of study, assimilate the materials and experience the history of science so strongly that he feels compelled to recreate it in a broad synthesis. The idea of such a book would be to work out the leading general ideas of the various periods and to follow them up into the various sciences. It would soon be recognized that the same attitudes and trends were responsible for developments in mathematics, physics, biology, in all the sciences. Specialized as the sciences may have been, their essential unity would soon appear. How did the sciences fit into the life of a period, how were they determined by it, how did they affect it? These are vital questions that would have to be discussed.

It may be objected that it is too early to write such a book, that our knowledge of the facts is not sufficient as yet and that infinitely more research has to be done before such a synthesis can be attempted. This may be true, and yet I think that every generation of scientists should see such a book written. In every generation the scientist should pause for a while, should look back into the past of his science, try to determine where he stands and what tasks history has assigned to him. Every generation would look at history with different eyes, but with every generation the picture would become more colorful—it would be stimulating always. History is an instrument of life, and a well-written history of science could not but influence research.

We received Professor Wolf's book with great expectations but were sadly disappointed. The present volume discusses the sixteenth and seventeenth centuries. Other volumes dealing with the eighteenth and nineteenth centuries, with antiquity and the middle ages will follow. It is hard to understand how a historian can begin his narrative in the middle. I can not think of a composer writing the third movement of a symphony first nor of an architect building a house without foundations. It is the same with a historical book. Granted that the Renaissance brought forth new scientific ideas and methods, but it is impossible to understand them if one is not familiar with Greek and medieval science. Leonardo da Vinci can not be understood without Nicolaus Cusanus. After all, Duhem's and Cassirer's studies, not even mentioned in this book, can not be bluntly disregarded. To picture a figure like Paracelsus one has to discuss the background of Greek and Arabic medicine on one side, of German medieval mysticism on the other side. The idea that modern science is the real science, born in the sixteenth and seventeenth centuries, and that what precedes is merely the prehistory of science, the work of forerunners does not hold any longer. There are different ways of investigating nature.

What spoils the whole book is that Professor Wolf adopted the most unfortunate pattern of Dannemann's history of science,[1] splitting up the entire material according to special sciences. After an introductory chapter the book begins with the Copernican revolution, Galileo, scientific academies, scientific instruments, astronomy, Newton, mathematics, then discusses the history of physics, meteorology, chemistry, geology, geography, the biological sciences, medicine, technology, and it finally ends with three chapters on psychology, the social sciences and philosophy.

This classification of sciences was adopted "on grounds of simplicity and orderliness," "to make things clearer than they would be otherwise." The opposite resulted, a complete confusion. Leonardo's work is discussed in fifteen different places scattered all over the book from page 5 to page 544, and the reader does not get the faintest idea of Leonardo's unique personality. Galileo is given a whole chapter, justly so, pages 27–53, but then Santorio is discussed on pages 431–435, Harvey's work on pages 411–415, and yet the point would just have been to show what unites these men, what they have in common in spite of the fact that they worked in different fields. After all, when we have to teach students, our task is not to present them with mere facts that they can find in any encyclopedia, but to show them the links between the facts, to give them a vivid impression of developments and trends.

Due to this unfortunate arrangement Professor Wolf's book is not a history of science but a collection of brief essays on the history of various scientific disciplines. The book will, undoubtedly, appeal to the teachers of science who will very conveniently find materials there for the first lecture of their courses and pictures for lantern slides. The book is profusely and very well illustrated. I would not recommend it to the students. It is not a history and, as a reference book, it is not comprehensive nor accurate enough. In most cases the new literature has not been consulted. To-day one can not discuss the history of the circulation of the blood any longer without mentioning Ibn an-Nafiz. The studies of Ostachowski and Pagel have placed van Helmont in a new light. An utter lack of originality is felt throughout the book. We never know what Professor Wolf really thinks. He piles facts upon facts without digesting them. Whenever

[1] Friedrich Dannemann, "Die Naturwissenschaften in ihrer Entwicklung und in ihrem Zusammenhange," volumes I–IV, 2d edition. Leipzig, 1920–1923.

there are two divergent views on a subject, he usually adopts the old traditional view without telling us why he rejects the new researches.

It certainly was an excellent idea to devote chapters to psychology, the social sciences and philosophy, but philosophy should have been treated in the beginning, not at the end, or, better still, it should have permeated the whole book.

The chapters on technology are very welcome also, but they make you realize that history of technology without economic history is a dead skeleton.

I always feel depressed after reading such a book. A political history, a history of literature or history of art of such composition and standard would be inconceivable to-day. While it is history of science, it is accepted and will probably find a market. It shows that, in spite of all efforts, we are still in the very beginning.

A history of science is still wanted. Professor Wolf's book is not a history, I repeat it. It is at best what Professor L. N. G. Filon, F.R.S., calls it on the jacket, "a mine of useful, yet delightful information."

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OUR ENEMY, THE TERMITE

Our Enemy, the Termite. By THOMAS ELLIOT SNYDER. 8vo, pp. xii plus 196. Frontispiece, 9 plates, 55 text illustrations. Comstock Publishing Company, 1935. $3.00.

I BELIEVE that there is no one in America who could write a better book on the termites than Dr. Snyder. He has worked on the general subject for twenty-six years and, after an excellent training at Columbia and the Yale Forest School, he has been spending his time with striking success as an investigator in the branch of forest insects in the U. S. Bureau of Entomology and Plant Quarantine. He has traveled widely, has made many important scientific discoveries, and has, unlike many scientific men, kept the public needs constantly in view. He has also, again unlike many men of science, learned to write in a very attractive and understandable way. All this makes possible this very interesting and much-needed book.

SCIENCE of March 30, 1934, printed on pages 296 and 297 a review of mine of the big book just then published by the University of California under the chief editorship of C. A. Kofoid, on "Termites and Termite Control." And in this laudatory review I called especial attention to the fact that it was a most worthy object-lesson as a *cooperative* effort, containing chapters by no less than thirty-three authors treating of the different aspects of the economic termite problem. In that truly great book, Dr. Snyder's name occurs as the writer of four chapters and he has published many government bulletins and shorter papers on different sides of the subject. I am very thankful that with all his knowledge—taxonomic, biologic and economic—he has put down in this useful volume, and before it is too late, just what we all want to know and should know.

Man, perhaps the most disturbing ecologic factor in the biologic history of the world, seems, in his rapid advance, apparently to have brought about a situation that has changed a useful group into a destructive one, and the economic side of the termite question has become very important. Almost every one knows about termites now, and recently we may almost say that there has been a termite scare. Just how far this has been due to the exploitation of "Termite Destroyers" I don't know, but conservative scientific men like Dr. Snyder are inclined to think that some exaggeration has been produced in the popular mind. In fact the outlook is by no means so bad as it might be, or as some would wish us to think it. As the author tells us, "With modern stone and steel construction in cities, and more durable foundations for frame buildings, there should be a decrease of termite damage to the woodwork of dwellings."

The book is not only scientifically sound, but it is eminently practical. It lacks the philosophical speculation with which Maeterlinck and many other writers have clothed the termite idea and that of social insects in general, but it devotes many pages to control methods and shows in a vivid way why building and loan associations, insurance companies and banks have been really forced to cooperate in the urging of revised building codes. It is encouraging to know that these revised building codes have been adopted during recent years by many towns and cities, and are now enforced.

But possibly what I have written has placed too much weight on the practical side of the book to please those who think of termites only as wonderful and very mysterious creatures. I hope not, for there are chapters that deal intimately with life histories, social organizations, geographical distribution, guests or inquilines, the disturbance of the balance of nature by man, and so on. And actually the subject of control takes up less than half. And then there is a good glossary and a competent index and the make-up is excellent, and the many illustrations are very apt.

I will not attempt to describe further what is in this admirable treatise. To even enumerate the headings of the chapters would take too much space. But it is a most timely book and it is a most important book. It answers conclusively the questions that many thousands of people wish to ask. No better authority on this subject than this volume can be consulted.

L. O. HOWARD