short-sighted attitude in the original nomenclature; too much stress was laid on the obvious, or shall I say directly perceptible, differences in form and behavior. As the fundamental reasons for specific forms and forces of the material world began to emerge, the older systems of nomenclature began to lose their usefulness in the sense of being utilitarian tools. A bit more of deliberation and less haste might well have laid a foundation for truly comprehensive schemes, which would have allowed for future extension without fundamental revisions for relatively long periods of time. I fully realize that in the early pioneering days of many of the physical sciences in the past century a foresight of quality able to perceive even a fraction of what was to come must be merely wishful thinking. However, at the present time we have at our command vast amounts of information from which we are beginning to untangle a much more fundamental picture of the physical world than appeared possible not so very long ago. We are on the borderline of more and more marvelous revelations unpredictable as yet, but we do have at least a crude pattern of what is around us. On the basis of the information already at hand a concerted effort should be made to effect, over the period of a reasonable number of years, a thorough overhauling of the classification and nomenclature systems of the physical sciences to bring them into closer correlation with each other and to use much more general bases for such a system than has been the practice in the past.

The reason for my feeling so strongly on this matter can be explained rather briefly. It deals primarily with the nature of the scientific education and training we give to our students at the various levels of our educational systems. Consider what a student sees when he opens a brand-new text on any given branch of science to which he eventually comes in the school curriculum. Almost universally the first paragraph states, in one form or another, that the "science of ——— deals with ———," followed by a more or less long list of narrowly defined set of terms used. Relatively few texts admit that several other sciences have contributed and are contributing to the advancement of the particular branch in question. More frequent is the statement that for the proper understanding of the course the student must have had so many "years" of such-and-such sciences. The neophyte is thus rigidly channelled in his manner of thinking at the outset. No wonder that, after several years of training, his mind automatically selects the "physics" way of thinking when he walks into the physics classroom, only to switch to "chemistry" way when he enters the chemical laboratory, etc. Only the exceptionally perceptive students begin to grasp the true interrelation of all scientific bases during their school training years. The majority begin to get the glimmering of this long after they begin their more or less gainful occupation; all too frequently this happens much too late to do them any good. On many occasions I have been on the sidelines of an argument over a problem by physicists and chemists; much heat is frequently generated unnecessarily merely because of lack of mutual understanding at the base.

It is true that generally the scientific curricula call for a fairly diversified selection of courses. However, all too infrequently are there courses available for correlation of the points of view and techniques of the various sciences; when these are available, they are usually at the graduate level and not at an earlier level where they would be of more fundamental good. Certainly it is high time to drop the still-used definitions of, at least, chemistry and physics (those referring to "physical changes" and "chemical changes" and to "changes in form" and "changes in nature" of things). According to these older definitions the workers with the elementary particles of matter should be definitely classified as chemists, rather than physicists, as they are to-day. The dividing line between these two sciences is an outmoded illusion to-day. Similar division and partition lines between other physical sciences are no less tenuous. Isn't it time to realize this fact?

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# SCIENTIFIC BOOKS

## FLIGHT IN AMERICA

*The First Century of Flight in America.* By JEREMIAH MILBANK, JR. 248 pp. Illustrated. Princeton University Press. 1943. $2.75.

THIS is a very good book and it certainly is captivating, once one begins reading it. The title, however, contains two restrictions which may make some reader reluctant to start reading the book at all. Why restrict the subject to the first century, when obviously the last forty years have added so much to our knowledge of flying? Why restrict the subject to America when Europe has done so much for the advancement of the science of flying? Reading the book gives the answer to these two questions.

By restricting his subject to this hemisphere, although he obviously can not stick too closely to this rule, the author cuts off some technical details which may not interest the average reader as much as the palpitating tale of flight progress in this country. By

cutting off the last forty years of flight, the author makes it possible to present in a single 250-page book a rather complete story of the first and second stages of flying, leaving off the third, which is well known to most of us. What gives a dramatic touch to this work is the fact that the author presents a complete cycle, a cycle going from dawn to dawn. The book starts when the echoes of a new discovery reach the American shores. A new light is coming from the East and the Americans are prompt to discover the tremendous possibilities of what they hear and what is just starting to be shown in the Western Hemisphere. When the first great free balloon floats over our continent, the people see endless possibilities for the future. An ocean which took weeks or months to cross will soon be crossed in hours. Gigantic balloons or grotesque assemblies of balloons are put on paper and one marvels at the endless possibilities of the creations of fantasy. That is the bright morning. During the noon hours a dozen of professionals make money, exhibiting their art from city to city, from town to town. They still talk about crossing the Atlantic and take patents on fantastic inventions. That is their noon hour, but soon some realistic newspapers begin asking what it is all about. What has the free balloon brought for trade and commerce? What are the promises it has kept? It has made people "air-minded." It has helped to understand the atmosphere. It has posed important physiological problems, but it has not added a bit to general prosperity. Resentment grows. The inventors answer with more fantastic claims. That is the dark age of the cycle. Then, at the end of the century, new hope appears. An American shows a little one-man dirigible with which he can fly around at will—inside a theater. He demonstrates his invention in many cities and news comes from abroad of larger dirigibles which fly in the open, even if there is a little wind. At the very turn of the century the Brazilian, Santos Dumont, flies his gasoline-powered dirigible around the Eiffel Tower; and the German, Lillienthal, glides down from little mountains piloting his motorless plane apparently at will like a bird. One sees the dawn of a new era. The author does not mention the Wright brothers, but the reader knows they are at work in their little secret shop and soon the sun will rise over Kitty Hawk and the first man-carrying, machine-powered airplane is going to fly. The cycle is closed, and that is as far as the author brings us. By means of two artificial looking restrictions the author has carved out a field small enough to be presented in one book and comprehensive enough to give a fine picture of the beginning of aviation.

The book is nicely printed. On the cover we see a golden free balloon on a silver gray background. The picture is an artistic interpretation of the real thing, and the features, as far as given by the artist, are correct to the last detail.

Unless, however, we are looking only for the literary value of the book we are disappointed by the fly-leaf. The free balloon picture given here is artistic, perhaps? Probably not. Art does not require the negation of science and the perspective, certainly a part of art, is all wrong. Technically, too, this balloon is incomprehensible. The net reaches lower than the top of the suspension ropes which obviously should lead to the bottom of the net and not stop in mid-air above the lower edge of the net. This is, of course, a detail, but it makes us suspect that the author is not interested in the technique of the construction of the free balloon. For the first half of the book scarcely a single engineering question is raised and yet flying is surely an engineering problem. In the introduction the author expresses his intention to treat problems of technology only as far as they apply to the basic features of aircraft. He mentions, indeed, very few of these features and no attempt is made to explain the importance of the appendix. The art of ballooning is not described. The author's statement that a balloon entering cold air will need reduction of weight in order to maintain altitude is in opposition to the facts and shows definitively that the author is not at all interested in the fundamental problems of aerostatics. The book would gain immeasurably if the elements of aerostatics and engineering were given more attention.

In his description of the flights made in 1783, we would like the author to give more credit to the Montgolfier brothers. They not only produced the first paper bag to rise within a room after having been held over an open fire, but they made also the first large-scale experiment on June 5, 1783, with their 105-foot circumference hot-air balloon and again it was a Montgolfière (hot-air free balloon) which first brought men (Pilâtre de Rozier and the Marquis d'Arlandes) in the air for a 9,000-yard journey. This was November 21, ten days before the hydrogen balloon flight by Charles. The balloon which Charles had launched on August 27 was not manned, and the Montgolfier brothers had already made their initial experiment of June 5 with their large unmanned balloon. Another point of history seems doubtful: Milbank relates that Muzio Muzzi exhibited his model of a flying machine to "the Royal Family" at Florence in the year, 1839, when, as a matter of fact, Florence became capital of the Sardinian (later Italian) kingdom only after the last grand duke Leopold had been expelled in 1859.

One thing which makes this book agreeable to read in contradistinction to many other popular engineering books is the perfect mastery of grammar. Not a

single badly constructed sentence is noticeable. Unfortunately, the same can not be said about the author's use of specific words. He speaks about easterly wind currents when he means a westerly wind. Winds, like people, are named after the country or region from which they come and not after the region where they are going. One should not speak about foot pedals any more than one speaks about hand handles. Discovery means something else than invention, although both terms are frequently confused. Last, not least, according to the Oxford dictionary, the one who makes an exhibit (or demonstrates his merchandise) should be called an exhibitor. The word used by Milbank has a rather bad connotation and should not be used about balloons. The illustrations of the book are very interesting and very beautifully printed. This is quite an achievement, since most of them are taken from old books which are always difficult to reproduce. The pictures are printed on special paper. This has restricted their introduction into the book to every sixteenth page, sometimes far away from the text to which they belong. It would therefore be desirable if in a future edition a reference to the text were given with the pictures and/or a reference to the pictures were given in the text.

It would be unfair for the reviewer to pick on certain omissions which one might find in the book. The author is still gathering material and in the introduction he himself hints at the need of a new edition and we hope very much that Milbank will one day find the time to produce a new and enlarged edition. This will be very welcome to all who are interested in the conquest of the atmosphere. The author has done an admirable work in collecting and coordinating material very difficult to get and we all owe him a cordial welcome and sincere thanks.

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## PROTEIN CHEMISTRY

*Advances in Protein Chemistry.* Edited by M. L. ANSON and J. T. EDSALL. Volume I. xi + 341 pp. New York: Academic Press. 1944. $5.50.

THE intimate participation of proteins in the activity of living matter makes the acquisition of knowledge concerning their chemical structure and properties a necessary prerequisite for the understanding of the chemical basis of biological phenomena. Unfortunately, in attempting to secure this knowledge, the protein chemist has been confronted by formidable experimental difficulties. The fact that proteins represent organic molecules of such size and such complexity as to the arrangement of the amino acid residues, precludes the application of most of the known techniques developed in organic chemistry for the elucidation of the chemical structure of simpler molecules. For this reason, the ingenuity of the experimenter has been put to the test most severely to find new lines of attack on the protein problem. These efforts have resulted, in recent years, in the application, to the study of proteins, of a variety of physical techniques such as electrophoresis, sedimentation and x-ray analysis. Notable progress also has been made in the development of methods for the determination of the amino acid composition of proteins. While these new lines of attack have not yielded a solution of the fundamental questions of protein structure, much valuable knowledge has been gained and the way has been prepared for future progress.

In inaugurating the series of volumes on "Advances in Protein Chemistry," Anson and Edsall have set themselves the laudable aim of making available to the chemist and biologist the data on proteins obtained by means of the newer experimental techniques. They also intend to provide "the opportunity to workers in special subjects to present their views in more organized form than is possible in the regular journals, and also to express their personal judgment on problems which are unsettled." The editors express the hope that "as the reviews accumulate, they will provide a useful and comprehensive picture of the changing and growing field of protein chemistry and a stimulus to its further development."

In the selection of papers for the first volume of the series, special emphasis was placed on the role of proteins as components of biological systems. The volume contains eight review articles: "Lipoproteins," by Erwin Chargaff; "Structural Proteins of Cells and Tissues," by Francis O. Schmitt; "Some Contributions of Immunology to the Study of Proteins," by Henry P. Treffers; "The Interaction between the Alkali Earth Cations, Particularly Calcium, and Proteins," by David M. Greenberg; "The Purification and Properties of Certain Protein Hormones," by Bacon F. Chow; "Soybean Protein in Human Nutrition," by Donald S. Payne and L. S. Stuart; "Nucleoproteins," by Jesse P. Greenstein; and "The Proteins of Skeletal Muscle," by Kenneth Bailey.

These contributions are both factual and critical in character and can not fail to stimulate thought and discussion. The comprehensive bibliographies which are provided at the close of each article are most valuable. Indeed, the high caliber of the papers in this first volume of "Advances in Protein Chemistry" gives promise that the series will become a useful addition to the library of everyone interested in the nature and function of proteins.

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