DISCUSSION

A REPLY TO PROFESSOR WILLEM J. LUYTEN

AS a college administrator, without scientific training, I would not presume to write to SCIENCE about a scientific review of a book or a discussion based upon such a review. Criticism of scientific research and text-books is valuable. It helps to correct errors; it alters false emphases; it serves to avoid misinterpretation. Without free and frank criticism it would be difficult to maintain freedom of thought, speech and research in academic circles.

Only a scientist should answer a scientist. But there is very little science in Professor Luyten's discussion and it is not inappropriate for a layman (so far as science is concerned) to reply to misquotation, misunderstanding, ignorance, innuendo and malice.

If Professor Luyten had confined himself to precise criticism of fact, as in his reference to determination of latitude by angular distance of sun or star, he would have been helpful. This is either so or it isn't. If so, Mr. Bauer will make the correction.

Professor Luyten makes factual criticism of statements referring to (1) the exact distance from the South Pole of the nearest point on the great circle route from Buenos Aires to Melbourne; (2) whether the correction of the variation of the North Star from the celestial pole can properly be termed "small"; (3) the exact date of the equinoxes; (4) the exact rotational speed of the surface of the earth at Hammerfest. These are points of fact to be weighed in the balance by the value of precise statement on the one hand as contrasted with general statements on the other in their importance as complicating or facilitating the ease of teaching. Certainly one "howler," if established, by itself does not condemn a book or series of books.

When he comes to a discussion of Renner's "The Air We Live In" (incorrectly referred to as "The Air-Age We Live In"), Professor Luyten enters the area of misquotation and misunderstanding. Professor Luyten would have the reader believe that Renner had taken the position that "the earth is not 8,000 miles but really 50,000 miles in diameter, the atmosphere ends at 21,000 miles above the solid surface because gravitation stops abruptly at that point. Oxygen and nitrogen cease to exist at altitudes higher than 80 miles, above which one finds only hydrogen and helium. At the top of the atmosphere the particles of air may be many feet apart, perhaps even miles, and the temperature up there is the same as that of interplanetary space—absolute zero. If a man were hauled up to the top of the atmosphere he would explode."

What Renner actually wrote was: "Theoretically, the atmosphere could be 21,000 miles deep because the earth's gravitation has the power to hold captive the tiny particles of air out to that distance. Whether extremely rarefied air actually does extend out to 21,000 miles, we probably shall never know. All we know at present is that the atmosphere is at least 300 miles deep with every evidence pointing to a . . . considerable distance beyond that. . . . The air simply thins out to unbelievable rarefaction." With regard to the oxygen and nitrogen "ceasing to exist," the book merely says: "The lower atmosphere may contain more heavy gases such as argon, and the upper atmosphere may contain more of the light helium. We are, as yet, not sure whether this is true or not."

Professor Renner when confronted with the criticism with regard to the temperature of the outer edge of the atmosphere, made the following statement to me: "Temperature is the measure of heat level; heat is the energy of molecular motion; out at the edge of the atmosphere, beyond the upper warm zone of rarefied gases, where there are practically no molecules of matter, it is reasonable to think that there is practically no heat. Indeed, according to H. Spencer Jones, the British Royal Astronomer, 'the black body temperature of space is only about 3° absolute.'" Whatever the facts may be, they can hardly warrant Professor Luyten's unjust conclusion that "the authors of this elementary school text do not understand the principles of the physical universe."

Professor Luyten further states that Renner-Bauer "appear to confuse the average distance apart between particles with the mean free path, and when they give the pressure exerted by the ocean on a fish at a depth of five miles as 11,458 pounds per square inch, the 8 may be correct but the 4 is certainly wrong." It is difficult to give a straightforward answer to vague innuendo of this type. The figure 11,458 was arrived at by multiplying the height of a column of water of five miles by weight per unit of volume, plus the weight of atmospheric pressure. This is merely a matter of arithmetic. It is indisputable that if a deep-sea fish is hauled quickly to the surface, it explodes. Whether the analogy is happy or not, it would seem to be indisputable that if a man were hauled rapidly up out of his atmosphere, his capillaries would rupture or explode (Latin: *explodere*—to push out) and death from bleeding would doubtless result even if he could be supplied with oxygen.

Coming to the book Professor Luyten referred to as "Human Geography and the Air Age" by Renner (correct title "Human Geography in the Air Age"), we reach a stage in the discussion which is unworthy

of a true scientist. Professor Luyten does not confine himself to the book which he is discussing. He goes out of bounds both intellectually and in matters of good taste. He refers to the author as a "great self-confessed genius" and makes it appear that "amateurs in the State Departments" is a quotation from the book in question. I have never heard Professor Renner confess himself a genius and the quotation does not appear in the book referred to. No mention is made in the book of ending all future troubles in the Balkans by giving Italy the entire Dalmatian coast. Nor is there any reference to massacres in Jugo-Slavia. Professor Renner claims to be a geographer. I know of no claim made by him as "economist, historian, political scientist, linguist and transportation expert" except that which would be made by any educated and cultured gentleman like Professor Renner. There is no statement in the book that "the British built the Suez Canal." It does state on page 18: "The British performed some continental surgery and made a bottleneck at Suez" which a fair-minded man could see might refer to the recent reconstruction of the Canal and the construction of the naval base at Alexandria.

Professor Luyten states that "to find a person who claims to be a geographer, economist, . . . stating that the Rhine Valley lies in Austria is quite a record." A good record, I should think; for the Rhine forms the border between old Austria and Switzerland for many miles.

Professor Luyten continues his departure from science and uses the method of innuendo when he states that Professor Renner "speaks feelingly about illiteracy when referring to people who do not agree with him." I find nowhere in the book that the author calls any one illiterate and certainly not because of disagreement with him. He does include a statement regarding geographical illiteracy in a quotation from the United States Commissioner of Education.

One other example of the unscientific and unfair quality of the discussion of Professor Willem Luyten is his reference to Professor Renner as "Herr Doktor." This is malicious. Professor Renner's ancestors fought in the American Revolution and he is listed in the first families of New York. Such a statement might be made in a smear campaign. It has no place in a scientific discussion.

Professor Luyten further states that the book makes reference to the General Staff as composed of "admirals, generals and similar elderly people." I can find no such statement. It does not represent Professor Renner as I know him. Indeed, I have seen a letter to Professor Renner from an Army general on the General Staff which reads: "I have completed your splendid book, 'Human Geography in the Air Age,' and want to congratulate you. I am personally urging my officers to secure copies of the book." I am able further to state that the relations between Professor Renner and the Army and the General Staff have been more cordial than Professor Luyten may suspect.

As I read the book I can find nothing that gives the impression of superiority, criticism or tragedy which Professor Luyten seems to have received from it. By means of this low form of criticism, Professor Luyten seeks to implant in the reader the suspicion that Professor Renner is anti-British, using such statements as "hated British." Quite in contrast to this, the book actually refers to "our relatives, the British." Out of whole cloth Professor Luyten invents the statement: "Mr. Renner is wont to complain about the fact that the British control all but one of the bottlenecks between oceans." What the author does say is: "Britain not only held these ocean gateways, but developed an immense navy to enforce complete control over them. This was the famous 'Pax Britannia' which gave freedom of the seas to the world for over a hundred years." No reasonable person could find any complaining in that statement.

Another malevolent statement by Professor Luyten is as follows: "The real tragedy lies in that these books come dressed up with copious references to the Civil Aeronautics Administration which will be mistaken by many still less-informed people as indication of approval by the C.A.A." This is only one additional blow below the belt struck by Professor Luyten in order to create a doubt in the mind of the reader. It seems to me that he implies that Dr. Wood, being a professor of psychology, is unfitted to participate in a project preparing books on aviation education in elementary and secondary schools; that the books were written without the cooperation of the Civil Aeronautics Administration; that the authors are "uninformed"; that the books are not yet in use "but that if they should be adopted in many schools" it would be unfortunate. The facts are: Dr. Wood is Professor of Collegiate Educational Research in Columbia University (unfortunately for us, not in Teachers College) and long a student of public school problems; the entire twenty books were based on research projects initiated and partially financed by the Civil Aeronautics Administration; (the books plainly state that they were prepared with the cooperation of the Civil Aeronautics Administration); the authors were selected because of special competence; and, as for the possibility of the books being adopted for use in schools, nearly a half million of them have been in use for some time and they are being called for as fast as they can be printed.

As a matter of general interest, it may be stated

here that the entire series was produced as a war emergency measure at the urgent request of a prominent government official. The authors' expenses were paid, but these authors waived all royalty rights in the interest of the war effort. The Macmillan Company cooperated by publishing and distributing the books at phenomenally low prices. Teachers College added its contribution by donating the time of staff members, contributing library service and space, workshop and laboratory quarters, and by carrying the cost of conducting courses in Aviation Education. The books were written in ninety days and published in slightly less than sixty days—five months in all—in order to meet the government's deadline. Prices run from 15 cents to 99 cents for sizable cloth-bound volumes. This breaks all previous records for book production and also for hard work. It was necessary, however, in order to meet the war emergency. The emergency was met and the results have been greater even than anticipated. Education can well be proud of the whole accomplishment. To attempt to smear such an effort can serve no good purpose.

It is to be expected that errors will be found. It is proper and useful that scholars should point them out. Professor Renner, and the other authors of the Air-Age Education Series will correct in future editions mistakes of fact, emphasis or taste. Discussion is welcome; but this does not mean that worthy, industrious, patriotic and informed workers should be subjected to malice and abuse.

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SCIENTIFIC BOOKS

ELECTROPHORESIS OF PROTEINS

Electrophoresis of Proteins and the Chemistry of the Cell Surfaces. By HAROLD A. ABRAMSON, LAWRENCE S. MOYER and MANUEL H. GORIN. 328 pp. Reinhold Publishing Corporation. 1942. $6.

ALTHOUGH the discovery of the electrophoresis of protein-coated particles was made as early as the beginning of the nineteenth century, the application of this important method to the study of proteins was limited owing to its lack of resolving power. Recently, Arne Tiselius introduced great improvements in electrophoretic methods using the moving boundary technique. The most important contribution of his method lies in its ability to resolve a soluble mixture of proteins into separate components. In this way, one or more biologically active protein fractions can be identified, and in many cases, it is possible to isolate them as electrically homogeneous individuals. A well-known example is the identification and isolation of antibody as the gamma globulin fraction in the sera of immune animals. More recently, Longsworth has added other important improvements which further increase the resolving power. During the past few years, many biologically active proteins have been examined by electrophoretic analysis with the moving boundary method to determine electrochemical homogeneity and to obtain information which might facilitate chemical isolation. In fact, the method has become one of the powerful tools in many fields of research.

Therefore, there is a timely need for a book on the electrophoresis of proteins. Abramson, Moyer and Gorin have written such a book with the aim of fitting "the needs of investigators in diverse fields, such as biology, chemistry, medicine and physics."

The text may be divided into four parts, the first of which comprises a brief historical background together with an elementary but adequate presentation of the general principles of electrophoretic migration in liquids. It also includes two chapters (5 and 6) dealing with more theoretical discussion which, however, is inconsequential to biologists interested in using electrophoresis as a tool. These chapters are included apparently for physical chemists. In the second part, both the microscopic method and the moving boundary method are described in great detail. The third section of the book deals essentially with the results of electrophoretic studies on proteins and other colloidal substances. Although the list of proteins examined is rather complete, the authors make no distinction in the text as to which of the above-mentioned methods has been employed. The remaining part of the book (Chapter 14) deals briefly with the "Surface Chemistry of Cells."

It is obvious that in a small volume of three hundred and twenty-eight pages, all these topics can not be treated very critically and precisely. This will not be wholly to the liking of the investigators in specialized fields. A few examples may be mentioned. The phrase "follicle stimulation in the male" (p. 274), would be rejected by endocrinologists as meaningless. The lack of clarification of the terms, "iso-ionic point" and "iso-electric point," would meet the disapproval of physical chemists. The omission of important chemical aspects in the discussion of "Antigen, Antibody, and Their Reactions" (Chapter 8) would be questioned by immunologists. To these criticisms, one might add that there are numerous errors in composition and printing. For example, in the text of page 69 a description of the optical arrangement of Svensson is referred to "28a," which actually is an