The air in the 64-cu-ft box was saturated with glycol as stated in the paper (Table 1, test 4). In the schoolroom there was a visible fog, as well as evidence of condensation of the glycol on the windows and desks. It will be noticed that the relative humidity was in the optimum range. Having access to all the literature on the subject, we were fully aware that the glycols were most effective at or near saturation. We were also aware, however, that both Puck (*1*) and Robertson *et al.* (*2*) stated that lesser amounts than saturation were germicidal. Finally, our tests show that sufficient glycol was present to greatly increase the rate of precipitation of the organisms. In no instance did we observe any germicidal effect.

The question of the particle size and rate of settling was also anticipated in making our tests. It will be seen from the paper that we used two types of sprayers. With both types, as shown in Tables 1 and 2, the organisms were settled over a period of time. Thus, in the 64-cu-ft box, which was 4 ft high, there were still some organisms in the air, and they were viable 20 min after spraying. Simple calculation using Stokes' law will show that these droplets were 3 μ or less in diameter. Likewise, the particle size of the bacterial clouds in the schoolroom was very small. Assuming the organisms fell a distance of 6–7 ft onto tables containing Petri plates in a period of 45–60 min (Table 2), the diameter of the particle, according to Stokes' law, was less than 3 μ.

In our tests a sampling technique was used that would collect most of the organisms. If we are to assume that Puck's theory and calculations (*3*) are correct, and that a bacterial particle increases in size and weight upon absorbing glycol, then we must use Petri plates or some other means to catch the rapidly precipitating particles. Our tests corroborate Puck's theory that rapid absorption of glycol does occur, as evidenced by the rapid precipitation of the bacterial clouds. However, in the Robertson *et al.* (*4, 5*) crucial experiment wherein they used a 60-l glass-walled chamber, all the organisms in the presence of glycol vapors would have been precipitated in 2.5 min and the air would have been sterile, just as they reported. Their Hollaender-Dallavalle sampler on the outside of the chamber could not have determined the precipitated organisms on the inside of the chamber. Thus, to overcome the obvious error in the above authors' apparatus, we used a 64-cu-ft chamber so that we could place the Petri plates in the chamber and increase the time of settling. Also, some of our tests were made with the electrostatic precipitator to collect the small, as well as the large, particles. The results were the same as on the Petri plates.

In conclusion, we have cited only the literature pertinent to the immediate problem. We have again rechecked our references before writing this letter and find no incorrect quotations. To those versed in the field of aerobiology, sampling of air for microorganisms has been a very difficult problem. It is not surprising, therefore, that the original investigators may have mistaken the rapid precipitation of bacteria for a germicidal effect.

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Book Reviews

Microbiology: General and Applied. William Bowen Sarles *et al.* New York: Harper, 1951. 493 pp. $4.50.

Our increasing awareness of the importance of microorganisms in the fields of industry, food, agriculture, medicine, and public health has created a growing desire for more adequate general information. As a result, many schools now offer a survey course in microbiology. The students entering such a class have widely differing backgrounds and interests and, in most cases, this will be their only formal contact with the subject. An interesting, up-to-date textbook that presents the various aspects of microbiology simply, briefly, and clearly is needed to supplement the class discussions and laboratory experiments. The authors of *Microbiology: General and Applied* have most ably satisfied this need.

Microbiology introduces the reader to the microorganisms: algae, molds, yeasts, bacteria, viruses, higher bacteria, and protozoa. In discussions on the physiology of living cells, the many functions and reactions to environmental influences are explained simply and understandably with a minimum of the chemical formulas that bewilder students with little or no chemistry. There are well-illustrated descriptions of the equipment required for experimentation in the laboratory and the techniques employed in the use of the microscope, the isolation of pure cultures, and the study of growth characteristics. The industrial importance of the various microorganisms producing commercial solvents, fermented beverages, antibiotics, dairy products, and so forth is thoroughly presented; and the essential role of bacteria in soil fertility is lucidly explained. The objectives and methods for the

purification of water and the treatment and disposal of sewage appear with discussions on the microorganisms of air, water, and sewage. There is an excellent section on the microbiology of foods, methods of preservation, milk and milk products, quality, and control of contamination. The book contains very adequate chapters on the nature and transmission of the infectious diseases of animals and plants, immunity, and the defenses of the host against disease. A final, brief presentation of the origin and development of microbiology is followed by three appendixes containing classification outlines of microorganisms in general, bacteria (according to Bergey), and yeasts and yeastlike fungi.

The interesting, readable style of *Microbiology* should appeal to all who desire accurate, nontechnical information about microorganisms and their activities. The book is so logically organized and well integrated that there is a feeling of continuity throughout. Key words are printed in bold-faced type that provides a real aid to one learning or reviewing the material. Also, new words are followed by a very brief definition in parentheses (often only one word) that introduces new terminology without interrupting the reader's train of thought. References are made to other books and reviews on specialized subjects rather than to the original articles that few beginners are capable of comprehending.

There has been a real need for just such a book. The authors are to be commended for furnishing microbiologists with this excellent survey of the field.

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Protein and Amino Acid Requirements of Mammals. Anthony A. Albanese, Ed. New York: Academic Press, 1950. 155 pp. $4.00.

Numerous attacks on the problem of elucidating protein and amino acid requirements have been in progress during the past few decades. The present volume summarizes the approaches that have been fruitful and reports the present status of the problem. As with all collaborative publications, it has inherent in it both the strength and weakness of the approach by different authors from different viewpoints to the same broad problem. Careful editing has minimized duplication, however, although it has preserved the disparities that focus attention on the unresolved problems.

Awareness of the role of amino acids in protein composition led to the recognition that protein evaluation, in the nutritional sense, is a greatly diversified problem. As the concept developed, this problem came to be regarded as one involving a limited number of variables—the "essential" amino acids. More recently, amino acid interrelationships as well as vitamin-amino acid interdependence and appreciation of the importance of the "nonessential" amino acids have increased the number of variables with which modern investigation must cope. Moreover, nonchemical factors have pressed for attention to the point where considerations of species, function, and nutritional level strive with factors such as treatment of proteins before ingestion and route of ingestion in an over-all determination of requirements.

All these considerations are presented here in an admirably written series of reports from six individuals who have been among the leaders in the current attacks on this most complex and intriguing problem. Revisions in thinking elicited by their investigations are summarized by Mitchell in "Some Species and Age Differences in Amino Acid Requirements"; by Frost in "Method of Measuring the Nutritive Value of Protein Hydrolysates and Amino Acid Mixtures: The Rat Repletion Method"; by Silber and Porter in "The Laboratory Evaluation of Amino Acid Mixtures and Protein Hydrolysates"; by Chow in "Dietary Proteins and Synthesis of Tissue Proteins"; and by Albanese in "The Protein and Amino Acid Requirements of Man."

This reviewer is struck by the fact that most of the contributors to this volume have participated in one or another of two major cooperative projects that have occupied the attention of workers in the field the past few years. The importance of such cooperative efforts is amply manifest in their contributions to advancing knowledge, as revealed in these monographs. To their sponsors, the U. S. Pharmacopeia, through its Amino Acids Advisory Committee, and the Bureau of Biological Research of Rutgers University, all interested in this field are much indebted.

The book is well printed and bound, and apparently free of typographic errors.

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Human Physiology. Bernardo A. Houssay *et al.*; trans. by Juan T. Lewis and Olive T. Lewis. New York–London: McGraw-Hill, 1951. 1,118 pp. $14.00.

Written by experts for medical students and physicians, this English edition (and revision) of the original 1945 Spanish edition, is a significant contribution to medical education and medical progress in the English-speaking countries. The senior author, Dr. Houssay, a Nobel prize laureate in medicine, has been internationally known for his significant biological investigations for many years. This textbook reveals him and his associates as first-class teachers, by accuracy in facts, clarity of style, excellence of illustrations, and scientific objectivity in judgments and conclusions. Medical students, both graduate and undergraduate, will be aided, guided, and challenged by the references on nearly every page, and at the end of each of the 89 chapters, to pertinent publications on the particular problem discussed.

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