and chemical laws throughout the universe, Dr. Spencer Jones consequently infers that the formation of similar large molecules with chainlike structure and of feebly stable molecular groups must be possible wherever living matter is to exist, although the living matter need not necessarily be of a type familiar on Earth. A study of the physical, meteorological and geological conditions and their evolution on the Earth make it evident that the requisites for the existence of life (especially regarding atmospheric composition and temperature) are rather narrowly defined. Spencer Jones, discussing at length all the planets and the principal satellites of the solar system, finds evidence for vegetation on Mars, but no evidence anywhere for animal life. With the possible exception of Mars, the Earth is, he contends, the only planet on which animal life can have developed.

Speculatively the author also takes us beyond the solar system. Considering the nicety of conditions required for the existence of life, may we egotistically assume that we are the only men in the universe, or must we modestly admit that our Earth is but one among innumerable similar satellites to other suns? That, according to the Astronomer Royal, depends very much on how the solar system originated. Many theories have been proposed, but all, on careful examination, have been found wanting. The most promising theory requires such specialized accidental circumstances that our egotism is encouraged. On the other hand, he points out, the immensity of the number of galaxies of stars and the theory of an expanding universe combine to suggest that ours is not a unique world.

"Life on Other Worlds" gives a fairly complete survey of the present state of knowledge on the subject. It is fluently and clearly written. In general, the treatise is not only instructive but entertaining (notably where the fates of would-be rocket exploring-expeditions to the Moon are commented upon) and it is definitely provocative of thought. The reader is left impressed with the quantity of research in numerous fields of science that has been accomplished in an approach to the solution of the problem of life elsewhere in the universe. "Life on Other Worlds" is sincerely recommended to all astronomically and philosophically minded laymen. For the astronomer it will provide an enjoyable "busman's holiday."

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MEDICINE IN AVIATION

Grundriss der Luftfahrtmedizin. By SIEGFRIED RUFF and HUBERTUS STRUGHOLD. viii + 191 pp., 103 figs. Leipzig: Johann Ambrosius Barth, Verlag. 1939.

THE preface to this book is written by Dr. E. Hippke, "Chef des Sanitätswesens der deutschen Luftfahrt." Chapter I reviews the problems which meet the aviator and alpinist as higher and higher altitudes are reached. Chapter II contains an analysis of different factors affecting the organism in high altitude: the low pressure of oxygen, the low temperature, the ultra-violet radiation, etc. A short review of the general physiological and physical background necessary for understanding the special physiology of high altitude is given in the first part of the chapter; later follow descriptions of the effects on organs and functions and of ways for investigating and combating the impairing forces. Problems of practical importance, as acclimatization to high altitude, high altitude tolerance, oxygen administration, etc., are given special consideration. Chapter III deals with acceleration. In this field, new as it is, the Germans are specialists in research and in the application of research. Centrifugal force has been studied both "artificially" by means of great centrifuges and "naturally" in various kinds of diving, "pull-outs," "looping," etc. Air-sickness is considered in this chapter. Chapter IV covers the psychophysiology of aviation, especially sensory physiology. In Chapter V the reasons for accidents in flying are analyzed and devices apt to diminish them described, and in Chapter VI is given a short but inclusive review of the comparative physiology of flying.

The book is offered as a supplementary text for students of medicine and as a source of orientation and information for practical men—aviators, military men, physicians and people interested in the problems of the man in the air force. Most figures, tables, curves, etc., are taken from German sources. An English translation might properly include a supplementary chapter or appendix containing data from American and other sources. A revision of the bibliography along the same lines also would seem advisable.

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CHEMISTRY IN WARFARE

Chemistry in Warfare. By F. A. and M. S. HESSEL and WELLFORD MARTIN. With a foreword by Colonel Crosby Field and a Technical Appendix. New York: Hastings House, 135 Front St. 164 pages; numerous illustrations and diagrams; price, $2.00. 1940.

THIS popular treatment of the subject is clearly and interestingly written. Its purpose is to give the layman a concise and reasonably comprehensive review of the manifold ways in which modern warfare is dependent upon chemistry and the chemist, with such illustrations, diagrams and collateral information as will enable any one to see for himself the significance of chemistry's rôle and the indispensability

of the chemist in any program of preparedness and defense.

The subject-matter is assembled under the following chapter headings: I. The Soldier, II. Man-made Man-killers, III. Machines of Modern Warfare, IV. Crucibles of Death (warfare with toxic chemcials), and V. The Chemical Industry—America's First Line of Defense.

The book is not written for chemical or military experts, and such may find minor flaws here and there but, in the opinion of the reviewer, it fulfils creditably its mission of presenting the subject to the uninitiate in a form which he can assimilate with ease and satisfaction and which will equip him to follow more intelligently the war news of the day. If he is a military man, it will teach him something about chemistry. If he is a chemist, he will gain some useful elementary knowledge of military equipment and tactics.

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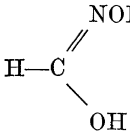
SPECIAL ARTICLES

A NEW CHEMICAL REACTION WITH THE NITROSYL RADICAL NOH[1]

MANY years ago I made the assumption that the nitrosyl radical, NOH, functions as the most important compound as far as the nitrogen in the synthesis of simple naturally occurring, carbon-nitrogen containing material is concerned.[2] It acts as a branching-point, leading to several series of compounds. The most important organic compounds synthesized by sunlight from KNO_2 and methyl alcohol or formaldehyde, which we have analyzed, are formhydroxamic acid,



, and formaldoxime, $CH_2=NOH$.

It was of special biochemical interest and importance to find other reactions involving nitrosyl. It was to be assumed that the strongly paramagnetic radical, NOH, would combine with inserted paramagnetic ethylene groupings which are present in the benzene ring and in many substituted benzene compounds.

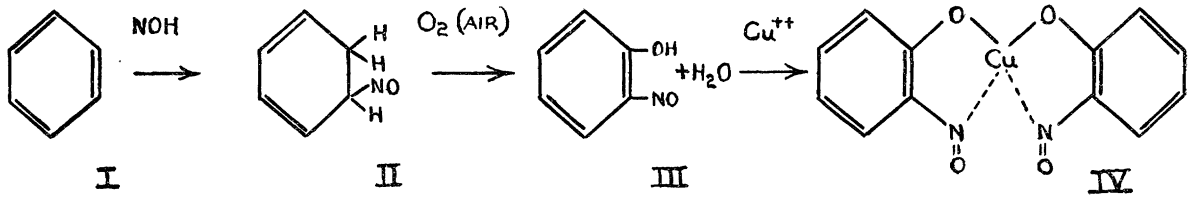
In this publication I will demonstrate that two groups, namely, NO and OH, can be substituted in benzene in a new, amazingly simple way at ordinary temperature. I will further try to elucidate the mechanism of the new chemical reaction with the radical NOH—a chemical process which will have a wide application in chemistry.

Exp. 1

0.5 g freshly prepared yellow cuprous hydroxide, CuOH, is suspended in 200 cc dist. water in which 0.5 g KNO_2 is dissolved (pH 9.9). Purest benzene is added and the solution well stirred. With dilute hydrochloric acid the pH is now adjusted to 2.5 and then 1 cc Merck's superoxol is added. The pale yellowish color changes immediately to pink and becomes deep red after longer stirring. The deep red *o*-nitrosophenol coppersalt (IV) forms *o*-nitrosophenol (III) on acidifying with HCl which can easily be extracted with petrol ether. The petrol ether solution is a beautiful green.

Exp. 2

0.5 g KNO_2 and 1 g cupric nitrate are dissolved in 200 cc dist. water (pH = 5.6). Purest benzene is now added



In my recent experiments with hydroxylamine-hydrochloride, copper ions and benzene,[3] nitrosophenol copper salt (IV) was easily formed by autoxydation of the reaction mixture or still better by adding hydrogen peroxide. This remarkable reaction has since been successfully applied by us to many aromatic hydrocarbons and to a great number of substituted benzene compounds, of which more will be said in another journal.

to the pale green solution and the whole mixture well stirred. On adding 1 cc Merck's superoxol the color remains green but becomes only a little darker. Now 0.5 g iso-ascorbic acid (or vitamin C) is added. The color immediately changes to pink and becomes deep red on further stirring (pH = 3.4), thus forming again *o*-nitrosophenol coppersalt (IV).

Exp. 3

0.5 g freshly prepared cuprous hydroxide is suspended in 200 cc dist. water in which 0.5 g benzene-sulfohydroxamic acid was dissolved (pH = 4.4). Purest benzene is added and the whole mixture well stirred. The pH is now adjusted to 2.9 by adding dilute hydrochloric acid. The solution quickly turns pink by autoxydation. By

[1] Part of the lecture presented at the A.A.A.S. symposium at Gibson Island, Maryland, July 22–26, 1940.

[2] Collected literature of the subject: Oskar Baudisch u. Lars A. Welo; *Chem. Rev.*, Vol. 15, no. 1, 1934.

[3] *Naturwissenschaften*, 27: 768–9, 1939; *Chem. Abstracts*, 34: 1976, 1940.