has concluded: "The opinion that in many plants the stimulus of various growth-regulating substances continues for various periods of time is probably based on (1) the continuing activity of the abnormal meristems; and/or (2) the development, long after treatment, of dormant buds injured (while growing) before dormancy. New tissues and organs formed after treatment are not affected."

Taken all together, the present information suggests that distinctions must be made between (*a*) persistence of 2,4-D in plant tissues, and (*b*) delay in visible expression of effects of 2,4-D.

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## Concept of Complementarities

In the interest of accuracy and fairness, the following remarks aim to correct erroneous impressions given by the historical introduction to the interesting paper of A. M. Schechtman and T. Nishihara in SCIENCE, April 7, 1950.

Four years prior to the publication of the paper of Breinl and Haurowitz (1930), I had advanced the concept of antibodies as units complementary to their antigens in addresses before the American Chemical Society and elsewhere. In these talks a coin was used to illustrate the antigen surface, and a piece of tin foil pressed against it formed the specific reverse pattern, illustrating the specific antibody. I pointed out that the top surface of the foil, away from the coin, formed a duplicate of the coin surface, illustrating reproduction at the molecular or near-molecular level of structure. Since some years of public and private discussion developed no objection or alternative view of antibody formation, I sent a paper to an American scientific journal briefly outlining the view. After some consideration, the paper was rejected. It was then sent to another American journal, whose editor, to justify his refusal to publish it, showed me the letter of a prominent "referee," who wrote "there are an infinite number of similar speculations possible." The paper, entitled "Some Intracellular Aspects of Life and Disease," was finally sent to *Protoplasma*, which published it (1931, **14**, 296), with illustrations much like those of Schechtman and Nishihara, except that the latter include the later, more detailed concepts of Linus Pauling.

My *Protoplasma* paper was reviewed in an editorial by Stephen Miall in *Chemistry and Industry* (London, 1932), in which he used the apt engineering term "template" (or templet) to describe the function of the antigen. This term, as well as the coin-foil analogy mentioned above, has become common usage.

Furthermore, "the possibility of applying concept of complementariness to the more general problem of specificity in biological synthesis" had been suggested long before the references quoted by Schechtman and Nishihara; e.g., in a paper by J. Alexander and C. B. Bridges on "Some Physico-chemical Concepts of Life, Mutation, and Evolution" in Vol. II of *Colloid Chemistry* (1928), where still earlier views of Leonard Troland on catalysis are in part reprinted (see also Alexander and Bridges, *Science*, 1929, **70**, 508). Much of the earlier work, with its bearing on embryonic differentiation, is given in *Life, Its Nature and Origin* (1948), by J. Alexander.

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Mr. Alexander's comments on the origin of the idea of complementariness as applied to antigen-antibody relationships will be of interest to persons concerned with the evolution of this line of thought. Our paper (*Science*, 1950, **111**, 357) is not, nor was it meant to be, a comprehensive review; the introductory statement concerning the literature was condensed and presented as a minimal background necessary for the exposition of the experiments described. Nevertheless, several recent review papers by Haurowitz, Pauling, and Tyler (references 4, 10, and 12, respectively) were selected for mention to provide more extensive guides to the literature than was possible in the paper. The references provided by Mr. Alexander will doubtless be a welcome addition for future reviewers who may wish to decide whether the essentials of the idea of molecular complementariness as applied to biological synthesis are rightly attributed to Breinl and Haurowitz.

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## Our Flat Planet

Nearly 25 years ago, in Spokane, Washington, a highly reputable and very opinionated local businessman issued a defiant challenge to the entire region in which he lived. His local reputation, he felt, had been endangered by several public arguments in which he stoutly and steadfastly maintained, against all opposition and contradictory to much evidence, that the earth was flat. His challenge to the community was climaxed by an ultimatum published in the forum columns of the leading local newspaper, the *Spokesman-Review*. In effect, his ultimatum told his critics to either "prove they were right or shut up." To back his arguments, he announced in the column that he was placing $1,000 on deposit in the Old National Bank of Spokane and would pay it to any person who could prove that the earth was round.

As long as his mind had to be convinced that the earth was round, his $1,000 remained entirely safe, and the money remained on deposit in the bank for a number of years. Then he triumphantly announced, again in the forum column of the same newspaper, that—having given everyone a chance to submit proof that the earth was round and everyone having failed—he felt deeply grateful that he had been able to prove so conclusively to the entire world that the earth was flat.

Fortunately, not many were affected by his reasoning. The only bad feature about this incident lies in the fact that he is a strong religious leader. Some of the children

who have heard his belief paraded before the community may become warped by his crooked thinking. By this means, "cranks" are made.

He really does believe that the earth is flat and probably will until he dies. This man, Warren Latham by name, has never backed down on his untenable claims.

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# *Book Reviews*

***Antibiotics: A Survey of Penicillin, Streptomycin, and Other Antimicrobial Substances from Fungi, Actinomycetes, Bacteria, and Plants,*** Vols. I and II. H. W. Florey, *et al.* New York-London: Oxford Univ. Press, 1949. 1,774 pp. $29.75 the set.

A number of comprehensive reviews of the literature on antibiotics and books concerned with penicillin and streptomycin have appeared during the past five years. In most instances the clinical use of these substances has received major emphasis. The present authors, all members of the famous Oxford team that contributed so much to the successful commercial production of penicillin a decade ago, believe previous writers have neglected the historical foundation of the antibiotics and the interrelationship of the chemical, biological, and clinical approaches. Their survey, as given in Volumes I and II, deals for the most part with laboratory investigations; a third volume, now in preparation, will be entitled "Clinical Application of Antibiotics."

The contents are arranged in eleven parts, with the following captions: "Historical Introduction"; "General Experimental Methods"; "Antibiotics from Fungi"; "Antibiotics from Fungi-Substances other than Penicillin"; "Antibiotics from Actinomycetes"; "Antibiotics from Bacteria"; "Antimicrobial Substances from Lichens, Algae and Seed Plants"; "Penicillin"; "Streptomycin"; "The Action of Antibiotics on Bacteria"; and "Conclusions." The authors, well aware that the rapid accumulation of information in this field precludes publication of an up-to-the-minute reference book, have added an appendix Volume II, which includes a list of the known antibiotics and short summaries of papers not mentioned elsewhere in the text.

There are a number of inaccurate statements in the text and references to procedures now obsolete. These will unquestionably be rectified with the appearance of Volume III. These volumes can be highly recommended to chemists, bacteriologists, and clinicians.

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## Reviewed in Brief

***Research in Medical Science.*** David E. Green and W. Eugene Knox, Eds. New York: Macmillan, 1950. 492 pp. $6.50.

The current medical literature, in contrast to that of former years, is replete with contributions by nonmedically trained investigators. It was firmly believed in days gone by that one must have a medical degree before embarking on a career of research into the mysteries of the disease process. Today specialists in disciplines seemingly far removed from the bedside are making fundamental discoveries in this area. Often their reports are so highly technical that the results of their researches are put into practice without being understood by the clinicians.

The present volume gives in essay form some of the latest developments in medical research. They are nontechnical accounts by outstanding representatives in microbiology, immunochemistry, physiology, and allied disciplines. Some idea as to the variety of subjects covered may be gained from the listing of the first and last titles: "Bacteriophages and Their Action on Host Cells"; "Some Biochemical Problems in Sanitary Engineering"—the former article by a biophysicist, the latter by a sanitary engineer.

The book will be of real value to those working in the basic sciences at medical schools, as well as to scientists in general.

***The Nature of Natural History.*** Marston Bates. New York: Scribners, 1950. 309 pp. $3.50.

This book is a readable survey of general biology, with special emphasis on ecology, which is virtually equivalent to the author's interpretation of the meaning of natural history: "the study of animals and plants . . . of organisms." The first six chapters supply the essential background of classification and a survey of the plant and animal groups, their historical evolution, reproduction, heredity, and development. The next five chapters deal with the relations of individuals to one another and to the environment. There are interesting discussions of biotic communities, partnership and cooperation, parasitism, and individual behavior. The next section deals with the natural history of populations, their behavior, and geographic distribution. Adaptations and the mechanism of evolution are considered in the next two chapters, which are followed by a final group of three chapters: "Natural History and Human Economy"; "The Natural History of Naturalists"; and "Tactics, Strategy, and the Goal," a consideration of the methods of science and natural history in particular. Throughout the book, Marston Bates' broad background and extensive experience in the tropics make his comments illuminating and render his criticisms of the limitations of laboratory science cogent.