in the world war, especially in gas masks. While chlorinous tastes may be removed by the use of ammonia, practically all other tastes and odors generally may be removed by activated carbon. It was introduced to remove odor and taste from water supplies in 1930. By the end of 1932 over 400 plants were using it, and the development of the process and of specialized equipment for its use has grown rapidly in recent years.

The greater part of the book is given to technical accounts and discussion of subjects such as charcoal and activated carbon, physical and chemical properties of activated carbon, experiments in the removal of taste and odor in the laboratory and in the operation of water plants, handling and applying powdered activated carbon and granular carbon in small and large units, dechlorination with carbon, tests and specifications for activated powdered and granular carbon and quantitative phenol determinations and their reliability for evaluating carbon.

Consideration is also given other methods of water purification than that by activated carbon, such as the ammonia-chlorine treatment for sterilization, prevention of chlorinous tastes and superchlorination followed by dechlorination for removal of tastes and odors. Aeration, ozonation, permanganate and bleaching clays are also discussed.

The book is a mine of information on principles, tests and practices in this very important and very recently developed field of sanitary engineering. Its material is well organized, the text is clearly written, the illustrations are clearly labelled and structurally differentiated and the numerous tables are carefully headed and legibly set up. Typographically and in make-up the book is a credit to the publishers. On the whole it is a fitting exemplar to initiate the Engineering Societies Monographs.

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VITAMINS

Vitamins in Theory and Practice. By LESLIE J. HARRIS. The Macmillan Company, New York, 1935.

THE standard books and reports on vitamins are already largely out of date. This in itself would make the book under review a welcome addition. When it is added, however, that besides being up-to-date, the book is delightfully written and that it is authoritative (the author is head of the Nutritional Laboratory at Cambridge), we have a most valuable addition to current vitamin literature.

If an author steers clear of the chemistry of the vitamins—and Dr. Harris barely touches the subject—it is possible to write a "popular" account of these substances without any material sacrifice to even extreme accuracy. In this respect certain aspects of nutrition stand apart from several branches of science. The book before me, an outgrowth of a series of lectures delivered at the Royal Institution, is, within its compass, sufficiently scientific to be of value to every biochemist; and so fascinatingly written that it should appeal to thousands of others.

The first part of the book deals with the history of vitamin discovery. Takaki and Eijkman and Funk and Hopkins and McCollum, among the pioneer hunters, get the credit they so richly deserve. Incidentally, Funk, "the originator of the vitamin theory" and an early worker on the chemistry of Vitamin B, is here for the first time given that commanding position in the development of the subject which rightfully belongs to him. Incidentally, also, we learn that, though Eijkman did his work on beri-beri during the years 1890–1897, it took the Stockholm committee (and the scientific world at large) some 30 years to decide that the Dutchman's contribution was worthy of a Nobel prize.

In the chapter on "How Many Vitamins Are There?" the author very conservatively (and very rightly) limits himself to 6, for the time being. With but one exception (vitamin E)[1] the chemistry of these substances has been incredibly advanced during the last five years. One vitamin (C) has even been synthesized. The structural formulas of three others (A, D, B_1) are reasonably above suspicion. The time seems not far distant when the chemist will no longer find it necessary to have a supplementary chapter on vitamins and other unidentified substances, but will include the vitamins, at least, under such headings as alcohols, sterols, pyrimidines and sugars.

Under vitamin B_1 we find, unfortunately, no mention of Clarke's and Williams's beautiful work on the chemistry of this substance. As for its function, the author stresses the fact that in its absence too much lactic acid accumulates in the body, poisoning the heart muscle and the central nervous system; which implies that vitamin B_1 may be a co-enzyme for lactic acid oxidation.

Harris quotes the U. S. Census Department to the effect that in 1930, 7,000 people died of pellagra in this country. "The explanation is economic, not scientific . . . the food is to blame." In the Southern states, the "pellagrins" (mainly Negroes) subsist largely on maize-meal (corn-meal), molasses and meat (salt pork)—the three m's; and they suffer from dermatitis, diarrhoea and dementia—the three d's.

One would anticipate from the very structure of vitamin C that it plays a rôle in the oxidation-reduction system of the body; but just how it fits into the scheme of complex systems in the body is highly

[1] In the February number of the *Journal of Biological Chemistry*, Professor Evans and his coworkers report the isolation of an alcohol from wheat germ having the properties of vitamin E.

problematical. The excessive bleeding and the faulty tooth structure are correlated with a lack of the proper function of certain cells. In this chapter, incidentally, we are told the best vitamin story of the year. It would seem that when Szent-Györgyi first isolated and analyzed vitamin C, he came to the conclusion that it was a sugar, but he failed to identify its exact nature; so he gave it the tentative name "Ignose." The editor of the journal to which Szent-Györgyi sent his article "suspected a flavor of levity" and requested the Hungarian to suggest another name. "God-knows," came the prompt reply.

Harris contrasts the action of vitamin D with that of the parathyroids by pointing out that whereas the former helps to keep sufficient calcium and/or phosphorus in the blood by improving their assimilation from the food, the parathyroids draw the calcium out of the bones. In hypervitaminosis there is an excess absorption of calcium and phosphorus, with a consequent excess of Ca and P in blood, and an ultimate over-calcification in the newly forming bone.

The Germans still persist in calling rickets *die englische Krankheit;* which is time that the English people return the compliment by referring to a far more virulent disease now rampant in Germany as *die hitlerische Krankheit.*

The author claims that xerophthalmia, due to a lack of vitamin A, is so common in Ceylon that two thirds of the cases of blindness in children are due directly to it. The night-blindness in grown-ups (common in Newfoundland, Labrador, China, Brazil, etc.) is associated with a lack of this vitamin. The "visual purple," a pigment found in the retina of the eye, is necessary for proper eyesight. A lack of vitamin A in the diet causes this pigment to disappear and to reappear again when vitamin A is supplied. Harris is of the opinion, however, that the most important function of this vitamin is to prevent the cells of the mucous membrane from degenerating. In the absence of vitamin A the cells undergo a metaplasia and the mucous membranes become "dried up." These properties of vitamin A (and, of course, of β-carotene) are related to the "peculiar double-bond system presumed to be present in the molecules of both carotene and vitamin A."

The so-called "anti-infective" property of vitamin A, around which fortunes are being built by unscrupulous promoters, is very properly blasted. Harris's colleague, Dr. Moore, has even shown that people might die from all kinds of infectious diseases despite ample vitamin A reserves!

The relation of sterility in man to vitamin E is still a closed book. Even rat and mice experiments should afford little comfort to Hitler or Mussolini. Extra quantities of vitamin E do *not* increase the fertility beyond the normal limits, despite C.H.A.'s jingle:

> We'll double the birth-rate yet, my dears
> If we all eat vitamin E.
> We can blast the hopes of Maria Stopes
> By taking it with our tea.

The concluding portions of the book are devoted to practical dietetics. Harris very modestly implies that he probably knows more about proper diet than the mother "who ought to know something about babies, her having buried seven." The value of instinct as a guide comes in for some pertinent criticism. When you are rickety or anemic, instinct will hardly lead you to sources of vitamin D or iron. Harris does admit (based on his own experiments) that animals are sometimes able to learn to choose the right food. "The essential is that the food must produce a noticeable immediate effect (or reward) which the animal can experience, and that the food must possess some distinctive odor or taste or appearance by which the animal can recognize it again next time."

Without giving elaborate (and meaningless) specific directions, Harris suggests that the "ideal diet" must include a varied diet; it must contain a daily protein dish (meat, fish, eggs or cheese), it must contain daily fresh fruit or salad (vitamin C), and it must not be milk-sparing. The "ideal infant diet" should be built around milk, supplemented by vitamins D and C (orange juice) and iron.

Such advice can be heeded by the "middle" and "upper" classes. Often, with the best of intentions and with no lack of intelligence, the "lower" classes, with their limited means, find themselves in a hopeless situation. "The fault," writes Harris, very justly, "is not with science, but in the existing maladjustment of our social organization."

Sir John Orr, in an address before the British Association some months ago, claimed that one half of Britain's population could not afford an adequate diet. This nation represents a flower of Western civilization. We can but surmise conditions in China and India.

The scientist points the way, the politician talks nonsense, and the world is where it is.

BENJAMIN HARROW

STRUCTURAL GEOLOGY

Structural Geology, with special reference to economic deposits. By BOHUSLAV STOČES and CHARLES HENRY WHITE.

THE authors of this work are mining engineers and have approached their subject from the point of view of applied geology. This is implied in the subtitle and is expressly stated in the preface. A geologist,