A prosthetic portion of the mucin molecule is glycuronic acid. In vitamin A deficiency, a failure in the production of mucus can not be due to an inadequacy of protein, but it might be due to an insufficiency of glycuronic acid. There are apparently two sources of glycuronic acid available to the body, namely, endogenous sources synthesized from glycogenic amino-acids and exogenous sources present in food material. Very great importance must be attached to the exogenous sources under those conditions where the body demands glycuronic acid in larger quantities or at a faster rate than can be produced by endogenous metabolism.

In an attempt to throw further light on the mechanism of mucus production, means were instituted to deplete the glycuronic acid of experimental animals. Rabbits were placed on a diet of oatmeal and water. Three times daily, gradually increasing doses of menthol were administered by stomach tube. Menthol is conjugated with glycuronic acid, and the resulting menthol-glycuronate to a large extent is excreted in the urine. As soon as the dosage of menthol increased to the point where it demanded a larger amount of glycuronic acid than could be supplied by either exogenous or endogenous sources, signs of intoxication occurred. Animals surviving from two to four days show upon autopsy ulcerations in the stomach, pylorus, gall bladder, small and large intestine. These ulcers and erosions bear a marked resemblance to those occurring in vitamin A deficiency.

From studies of this sort, the impression has been gained in this laboratory that the fundamental cause of ulcerative and erosive changes in the gastro-intestinal mucosa is due to the presence in the body from any source whatsoever of toxins so constituted that in order for their detoxication they must be conjugated with glycuronic acid. The demands for detoxication evidently take precedence over the demands of mucin production, with the result that when there is a sufficient accumulation of toxins there will follow as sequelae erosion and ulcers in the gastro-intestinal tract. Since the conjugation of glycuronic acid and toxins occurs in the liver any impairment in hepatic function will predispose to an earlier appearance of mucosal damage. It appears that vitamin A is involved somehow in this mechanism. The evidence of Clausen[1] and others that the reserves of vitamin A or its provitamin are nearly, if not entirely, exhausted in septic diseases is not to be explained entirely on the basis of impaired absorption. The fact that it does not seem probable that all the benefit[2] enjoyed by vitamin A deficient animals when fed whole apple is due to vitamin A only is further evidence in this connection. More work is being done along this line and it is hoped that more information will be provided in the near future.

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[1] S. W. Clausen, *Jour. Am. Med. Asn.*, 101: 1384, 1933.
[2] I. A. Manville, A. S. McMinis and F. G. Chuinard, *Food Research*, 1: 121, 1936.

CONCERNING FOSSIL REMAINS OF LEGUMINOUS PLANTS

ONE feature of the symbiotic nitrogen fixation process of the *Leguminosae* which has received little attention is the possibility of finding fossil remains of these plants with patterns of root nodules. Perhaps the survival of nodules through fossilization is not likely, due to the fact that the nodules are vastly more perishable than the root. From the late Cretaceous and early Tertiary times, fossils of leguminous plants have been found but without any mention of the presence or absence of nodules. The very fact that the wide distribution of the *Leguminosae* parallels the age of great mammal development would seem to indicate that these plants have from very early times harbored the bacteria and thus have been active in the fixation of nitrogen. If plant remains with nodules could be found we would have a clue to the early soil-enriching power of these plants.

Knowledge concerning leguminous fossils with special emphasis on nodule formation would be of great interest. The authors would like to get in touch with paleobotanists who have had experience in studying these forms. It is hoped that some one in this field will report his observations.

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MORE ABOUT SCIENTIFIC ENGLISH

IN a recent note[1] Boring has pointed out that the proper use of English in scientific publications is a matter of good taste, good manners; and suggests that the verbosity and circumlocution exemplified by Urbach in a previous paper[2] are to be judged by such standards. With this point of view I agree. The purpose of English in science is to convey as clearly as possible facts and ideas from author to reader. The trouble with such a criterion is that it implies a certain level of taste which is obviously rather rare. If the literary taste of scientists were well developed, notes on scientific English would not be written.

Scientific phraseology has, however, become so stereotyped that it is possible to single out for general attention and abhorrence specific and often re-

[1] SCIENCE, 84: 457–459, 1936.
[2] *Ibid.*, 390–391.

peated crimes against good English. Run your eye down a page or two of scientific writing and observe the recurrence of "thus." Strike it out everywhere, or almost everywhere, and notice the improvement. It is as if the writer is afraid that the connection of his ideas is not plain, and so "thuses" his way laboriously from sentence to sentence. Even commoner is "case." If you examine our current works on biology, you will find that they deal not with plants or animals but with their "cases." You will read that "in the case of Rhizopus the mycelium is aseptate," which means presumably that "the mycelium of Rhizopus is aseptate." A case is really a chance or event (aside from its specialized legal and medical uses), and is rarely needed in the sentences where it occurs. It may be entirely eliminated, or replaced by "organism," "species," "experiment" or whatever was really meant. Such a lack of precision and organization of thought is pardonable in rapid speech, but regrettable in writing.

Aside from the matter of taste, there are certain rules of grammar and syntax which, after all, deserve some respect. That clumsy and ubiquitous phrase quoted by Urbach, "due to the fact that," is not only verbose but, as commonly used, ungrammatical; "due" is not a conjunction. Why these five words should replace, incorrectly, the single perfectly respectable word "because" is a mystery, except perhaps to the journalists who invented the trick.

It is somewhat invidious to quote the mistakes of others, but a sentence like the following (which is not exceptional) illustrates the reality and the seriousness of the need for some attention to English: (The individual) "may disappear wholly from the community, as in *the case of the chestnut, due to blight,* though *this* is relatively rare." (Italics are mine.) The "case of a chestnut" should be the spiny fruit, though it is difficult to conceive how it can be "due to blight." Whether blight, chestnuts or the disappearance of chestnuts is rare is left to the imagination—or taste—of the reader.

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SCIENTIFIC BOOKS

THE PAPERS OF SIR WILLIAM HARDY

Collected Scientific Papers of Sir William Bate Hardy. Published under the auspices of the Colloid Committee of the Faraday Society. Cambridge University Press, 1936. 922 pp. $18.00.

THE "Collected Scientific Papers of Sir William Bate Hardy" are especially important for an era in which subjects for scientific research tend more and more to be determined by administrators or their committees and less and less by the unhampered imagination of the scientist. Sir William Hardy's first paper in 1891 was "On some Points in the Histology and Development of *Myriothela phrygia.*" In his last papers in 1933–34 he was still concerned with the problems of biology. Meanwhile, interested in systems characteristic of living matter, he concerned himself first with the chemistry of the proteins, then with the physical properties of films and of the boundary state. Although constantly employing the methods of physics and chemistry he was never an "applied scientist." Rather his inquisitive mind found new fields for exact investigation at the interface between biology, physics and chemistry.

Biologists often require for the solution of their problems a physics and a chemistry which has not yet been completely developed. As a consequence not only are advances made as a result of applications of physics and chemistry to biology, but biologists contribute innumerable new concepts, substances and principles to physics and chemistry. Often a Helmholtz or a Hardy contributes first to physiology and then to physics.

The first ten of the collected scientific papers of Sir William Hardy are concerned with morphology. The eleventh published in 1894 was a "Note on the Oxidising Powers of different Regions of the Spectrum in Relation to the Bactericidal Action of Light and Air." The bactericidal action of light having been demonstrated to be the peculiar property of light of short wave-length, Hardy characteristically investigated the relation of this phenomenon to the presence of some oxidizing substance acted upon by the blue and violet portion of the spectrum. For Hardy an observation was always a stimulus to the investigation of the underlying mechanism.

In 1899 appeared the last of the morphological papers: "On the Structure of Cell Protoplasm." Precisely because he was trained as a morphologist Hardy was in an admirable position to conclude "that the various fixing reagents are coagulants of organic colloids and that they produce precipitates which have a certain figure or structure" (p. 250). "Reagents which have any action at all confer a structure upon the colloidal matter which differs in most cases in kind, in some cases in degree, from the initial structure. Hence it is inferred that the structure seen in cells after fixation is due to an unknown extent to the action of the fixing reagents" (p. 291–292).

The conclusion that the structure of the living cell could only be deduced from the structure of dead mat-