Comments and Communications

Titanium and Zirconium in Bloom of *Gymnodinium brevis* Davis

In October and November, 1952, there was an outbreak of "red tide" in the neighborhood of Sanibel Island on the west coast of Florida. The M/V *Alaska,* U.S. Fish and Wildlife Service, Gulf Fishery Investigations, was dispatched to the scene of the outbreak under the direction of E. L. Arnold, Jr., with instructions to collect water samples and to make detailed hydrographic and biological observations.

Numerous water samples were taken from the dense bloom of the naked dinoflagellate *Gymnodinium brevis* Davis. In January, 1953, a sample of this water with other samples from Lake Okeechobee, Florida, surface in central Gulf of Mexico, and a tidal lagoon, Galveston Island, were sent to the Geochemistry and Petrology Branch of the Geological Survey for spectrographic analysis.

As a result of the analysis, it was found that titanium was peculiar to the red-tide water at a concentration of 0.01–0.1% of total solids (33,700 ppm), and zirconium at 0.001–0.01% total solids (33,700 ppm). These elements did not appear in the other samples.

The largest contributor to the nonoceanic component of the neritic waters of the Sanibel Island region is Lake Okeechobee and the analysis of this water showed the presence of Ca, Na, Mg, Si, Sr, K, Al, Sn, Fe, Ba, Ni, B, Pb, Cu, Mn, Cr, and Ag, but not Ti and Zr. It is likely that Ti and Zr are normally present in the sea water in traces beyond the sensitivity of the analytical method, but in this case were concentrated by the organisms of the mass bloom. The standard sensitivities given for the spectrographic method (semi-quantitative) are for zirconium 0.001%, and for titanium 0.001%.

These elements will be studied as nutritional trace elements in the cultural studies of dinoflagellates now in progress in this laboratory.

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Secondary School Education

The letter of Anton Postl (Science, 117, 567 [1953]) gives some excellent reasons why students should take more science and mathematics in secondary schools. But we are also faced with problems other than the question of students selecting these courses or being required to take them. Too often neglected in such discussions is the teacher's ability to make the study of science and mathematics alive and worthwhile when more than half of the youngsters in the classroom plan to enter non-technical fields. Then dull courses are frequently the result except for students whose scientific aptitudes stimulate an interest which no indifferent teacher or wrong kind of text-book can diminish.

Making physics and mathematics interesting does not mean, as some specialists seem to think, diluting the material to a point where little remains but a historical and general treatment of these subjects. Two recent books (*1, 2*) on college physics for the non-technical student show that this is not the case. Texts of this kind should be written for secondary schools as well, to replace some of the books now in use and which are hardly better than catalogs of mechanical and electrical gadgets. High school seniors and college freshman wearily struggle with co-ordinates, variable velocities, derivatives and theories of light transmission without being made aware how these mathematical and physical concepts have influenced the mind of man. There must be a real meaning, even for high school students, in the famous statement of Whitehead (*3*) that "the issue of the combined labors of these four men (Galileo, Newton, Descartes and Huyghens) has some right to be considered as the greatest single intellectual success which mankind has achieved."

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Occurrence of Alkaloids in Dioscorea[1]

During the course of screening many plant species for steroidal sapogenins we have also applied to the samples qualitative tests for groups of other constituents, among them alkaloids. In 141 samples of Dioscorea tubers native to North, Central, and South America, and to the West Indies, no test for alkaloid was obtained. Of 42 samples native to the rest of the world, 7 contained alkaloid.

A more detailed breakdown of the samples is as follows. Tubers from the Western Hemisphere consisted of 18 identified species and 85 lots of unidentified, many of which would be different species. Those from the rest of the world consisted of 12 identified species and 26 unidentified lots. Abundant alkaloid was found

[1] This work was done as part of a cooperative arrangement between the Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Bureau of Agricultural and Industrial Chemistry, U. S. Department of Agriculture, and the National Institutes of Health, Federal Security Administration.

in *D. dregeana* (Transvaal), *D dumetorum* (Kenya), *D. hispida* (Sumatra), and in three unidentified species (Northern Rhodesia and Transvaal). Some alkaloid was found in *D. elephantipes* (South Africa). Wehmer (Pfanzenstoffe, 1939) mentions three Old World Dioscoreas (*alata, hirsuta,* and *aculeata*) that contain alkaloids. *D. alata* is a well-known valid species, but the names *D. hirsuta* and *D. aculeata* have been applied to several species so that it is impossible to identify the plants to which he refers. In addition, Henry (Alkaloids, 1949) mentions dioscorine in *D. hispida* (*D. triphylla* var. *reticulata*) from the Philippines and Malay Peninsula.

The qualitative testing procedure consisted in extracting the sample with boiling ethanol (70–80%), evaporating, dissolving in water, and filtering. One portion was acidified and tested with Mayer's reagent. Another portion was tested with silicotungstic acid. A confirmatory test was made by making the extract alkaline, extracting with chloroform, extracting the latter with 1% hydrochloric acid, and again using Mayer's reagent and silicotungstic acid.

The above data are offered as evidence that alkaloids probably do not occur in Dioscoreas native to the Western Hemisphere, but that they do occur in some species native to other parts of the world.

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The Conversion of Glycine to Serine by Human Liver Tissue[1]

THE recent report by Nardi (*1*) on the *in vivo* conversion of glycine to serine has prompted us to report some data which have been obtained in the course of investigations in our laboratories. Since this reaction is now well established in animals it is of some interest to report that human liver tissue is also capable of converting glycine to serine.

Human liver slices were incubated with carboxyl-labeled glycine as already described (*2*). The protein obtained was hydrolyzed with 6 *N* HCl and fractionated on Dowex columns (*3*).

The results are summarized as follows:

	μM/100 mg of protein	Specific Activity (counts/min/μM)
Serine	17.6	540
Glycine	39.8	280
Alanine	31.8	25–50

[1] This work was supported by a research grant from the National Cancer Institute of the National Institutes of Health, USPHS and aided in part by a grant from the Oregon division of the American Cancer Society.

Aspartic acid, threonine, glutamic acid, proline, cystine, valine, methionine, isoleucine, and leucine were all recovered with no detectable radioactivity. The counts in alanine were too low to permit accurate determination of its specific activity. There is no doubt, however, that significant radioactivity was present in protein-bound serine, and that its specific activity was appreciably higher than that of protein-bound glycine.

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A Hypothetical Role for 6-8 Thioctic Acid (Lipoic Acid) in Vision

WALD and Brown (*1*) have shown that the bleaching of rhodopsin is accompanied by the liberation of 2 SH groups/molecule of retinene liberated. Similarly, the formation of rhodopsin from retinene and opsin requires the participation of SH groups. It is possible that a disulfide link is formed in the course of rhodopsin synthesis. Wald (*1*) considers it likely that the liberation of these sulfhydryl groups plays an essential role in the initiation of the electrical processes of vision.

These observations seem directly related to Calvin's considerations of the role of 6-8 thioctic acid (lipoic acid protogen) in photosynthesis (*2*). According to Calvin, grana contain 1 molecule of 6-8 thioctic acid/1000 chlorophyll molecules and Calvin feels it likely that the activated chlorophyll molecules transfer their energy to thioctic acid, breaking the —S—S— bond with the initial formation of an $\dot{\mathrm{S}}$ $\dot{\mathrm{S}}$ free radical.

The recent observations of Reed and DeBusk (*3*) on the role of thioctic acid (actually the thiamin complex) in pyruvic acid oxidation are also pertinent. These workers have evidence that the —S—S— group is converted, after an acetyl transfer reaction, to 2 SH groups which are subsequently oxidized by DPN, regenerating the original disulfide linkage.

If Calvin's viewpoint has any validity, then it would appear from a comparative biochemical viewpoint that 6–8 thioctic acid should play a similar role in vision. Rhodopsin should contain one molecule of 6-8