gave a reddish luminescence when shaken in neon and some colorless triboluminescence also.

Longchambon[2] has observed the bands of nitrogen in triboluminescent sugar in air, and Wick,[3] in a thorough investigation of the general phenomena of triboluminescence, finds no triboluminescence of sugar when ground under xylol in a mortar. Both observations would indicate that sugar triboluminescence is mostly due to electric discharge in air. I have observed triboluminescence of sugar broken under various solvents, and additional experiments have led me to the belief that sugar molecules themselves can be excited to luminesce.

If a necco wafer with a wintergreen flavor is broken in a pure hydrogen atmosphere, in a vacuum (some air present, about 0.05 mm Hg) or in 10 to 20 mm neon there is always the greenish flash of light, of about the same intensity as in air. No red excitation of the neon occurs. Necco wafers and lump sugar will also luminesce if broken under water, 95 per cent. alcohol, acetone, toluol and xylol. Indeed, if soaked in alcohol, acetone, toluol or in xylol exhausted with an air pump for 5 minutes, to displace air between the sugar crystals, and then ground in a mortar, a triboluminescence appears in all solvents, brightest in the xylol and toluol and less marked in the acetone. I am therefore of the opinion that true triboluminescence of sugar (*i.e.*, excitation of luminescence in the sugar molecule) can occur as well as electrical discharges in the gas between sugar crystals. The reason the wintergreen-flavored necco wafer is particularly bright is because oil of wintergreen (methyl salicylate) is fluorescent and (1) excited to fluoresce by the triboluminescent light or (2) by electrical discharges when the wafer is broken. In ultra-violet light without the visible (mercury arc and Wood's filter), the wintergreen necco wafer is markedly bluish fluorescent, while lump sugar is practically non-fluorescent. The fluorescence of the wintergreen oil would add itself to the triboluminescence of the sugar when a necco wafer is broken.

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HEPARIN AND THE INHIBITION OF BLOOD-CLOTTING

IN 1936 Fischer,[1] using a purified fibrinogen solution, showed that the clotting of this solution with calcium chloride and thrombokinase was not inhibited by even great concentrations of heparin. Inhibition only occurred after the addition of minute amounts of serium or plasma (fresh or heated to 56° C.). He offered no definite explanation to these experimental results.

Experiments, performed to obtain further information on this process and which are to be published soon, have now shown: (1) The method used by Fischer in purifying the fibrinogen is not very reliable in obtaining a fibrinogen free from prothrombin. A pure prothrombin-free fibrinogen does not clot by the addition of calcium chloride and thrombokinase; (2) solutions containing purified fibrinogen and prothrombin, together with $CaCl_2$, clot readily by the addition of thrombokinase. On this process heparin is without any inhibitory action; (3) plasma and serum contain substances which are necessary for the inhibitory action of heparin.

Heparin alone is thus without any activity against the clotting process, and the activity is due to the presence, together with heparin, of yet unknown substances present in serum and plasma. These experiments thus confirm the recent work of Brinkhous, Smith, Warner and Seegers,[2] and it seems worth while to note such simultaneous and independent, but identical, new results, since this has not happened very often in the history of blood coagulation. The literature concerning this subject is for the most part confused by controversial statements.

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BORON AS A FERTILIZER FOR WESTERN OREGON SOILS

DURING the past decade studies have been conducted by the Oregon Experiment Station Soil Department with the aid of federal Adams funds to determine the value of the so-called minor elements in Oregon soil fertility and plant nutrition. Positive results have been secured with iodine, manganese, copper, zinc and boron. Response from iodine has been secured on Aiken silty clay loam and Deschutes sandy loam. Manganese and zinc have increased yields of certain crops on western Oregon peat. Copper has caused response with soils from the John Day and Illinois Valleys, while boron has been effective on most of the soil types used for alfalfa in northwestern Oregon.

Boron was shown to be essential to normal development of broad beans by Warrington in England in 1923. Boron has been used to control "top sickness" of tobacco, "brown heart" in turnips, "cork spot" in apples, "yellow top" in alfalfa and "crown rot" or "heart rot" of sugar beets, especially on soils of basic reaction. In the Pacific Northwest old soils, leachy soils or those derived from basaltic rocks seem more apt to be deficient in boron. Some unhealthiness in various plants formerly attributed to virus may be due to lack of boron. Soil reaction or lime and moisture

[2] *C. R. Ac. Sc.* 174: 1633, 1922; 176: 691, 1923.
[3] *Jour. Opt. Soc. Amer.*, 27: 275, 1937.
[1] A. Fischer, *Enzymologia*, 1: 81, 1936.
[2] K. M. Brinkhous, H. P. Smith, E. D. Warner and W. H. Seegers, *Am. Jour. Physiol.*, 125: 683, 1939.