### The "Bleeding" of Cut Trees in Spring.

ON Saturday, March 15, at noon, several twigs were torn off a sycamore but no "bleeding" took place at the time or so far as I know on Sunday, but on Monday morning at 8.30 (say 44 hours after the injury) what were at first taken to be raindrops were visible on each of the 8 or 10 wounded surfaces. As there had been no rain and the liquid was slightly sweet, it was evidently sap, but the strange part is that it happened so long after the injury and that it was not repeated to-day (Tuesday), 72 hours afterwards.

The only explanation appears to be the fact that on Monday up to the time of the "bleeding" taking place the sky was overcast, but when it was going on the sun was shining brightly on the wounded surfaces.

Did the sunshine stimulate the flow of sap and so start the "bleeding"? As a matter of fact it was shining when the twigs were broken off, but no "bleeding" then took place.

A drop fell from each injured surface, say, once in each 3 or 5 minutes (not timed), and the total amount of sap estimated by the marks of the residue left after evaporation on a glass roof beneath the tree was, say, 1 or 2 fluid ounces from the 8 or 10 exposed surfaces. C. W. FOLKARD.

30 Eyot Gardens, London, W.6,
March 18.

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MR. C. W. FOLKARD raises a topic of general interest, which is perhaps worth brief discussion, as though the phenomena are well known they raise many problems which are still very obscure. He asks whether the sunlight upon the twigs stimulates the flow of sap; probably all that can safely be said in reply is that the sap flow is chiefly due to root activity and that the sunlight may well be effective by raising the temperature of the soil.

There are many points that are puzzling in connexion with the flow of sap; besides sycamore the birch shows the same phenomenon, but Dr. J. Parkin, with whom the writer is in correspondence on the subject, states that he has not noticed its occurrence in other common English trees. The vine of course is a noted example of a greenhouse plant showing the phenomenon; during last year many gallons of sap were collected from vines in Leeds, in order to enable a complete examination to be made of the substances present in solution in the sap.

It happens that at present Mr. T. Swarbrick has been making observations upon the natural healing of woody branches cut each month, and as a result it is possible to give from his notes some precise data as to the date upon which bleeding in sycamores was noticed. On February 12, sycamore branches were cut and no bleeding from them occurred. On March 4, with snow on the ground and on the branches, the branches began to drip immediately they were cut. These cuts were still bleeding on March 11, when fresh cuts on other branches produced so marked a flow that the earlier cuts were re-examined. The branches cut on February 12 did not bleed at all, so that in the intervening weeks the cut surfaces had blocked. On March 12, 500 c.c. of liquid were collected from a few cut branches. This liquid contained no reducing sugars before inversion, but polarimetric observations before and after inversion show that it contains some 1·3 per cent. of cane sugar. The juice has very faint catalase and oxidase reaction, but an exceedingly vigorous peroxidase reaction; it also contains diastase capable of hydrolysing starch solution under antiseptic conditions.

The same two enzymes, peroxidase and catalase, have been found in vine sap by Mr. Wormall (Dept. of Physiology, Leeds, unpublished observation) and in the "wood-sap" of healthy trees by E. Ph. Votchal (Moscow, 1916, J.C.S. Abstr., vol. 126, i., 251, 1924).

In view of the cold weather during this period, March 4-11, in Leeds (snow on the ground and hard frosts nearly every night) it is difficult to account for this sudden activity of exudation.

Furthermore, the metabolic machinery is not readily pictured by which cane sugar, without any reducing sugar, becomes suddenly available in the sap in the wood of a tree which stores much starch in the parenchyma surrounding the wood vessels. Cane sugar without any reducing hexoses is not usually expected from starch, and furthermore, at the temperatures existing at this time, a rapid hydrolysis of starch would scarcely be expected. It is significant, however, that Prof. Lewis and his colleagues have directed attention to the fact that fundamental changes in the carbohydrate metabolism of the leaf seem to occur in the spring in N. America, and to be independent of temperature and of altitude (NATURE, February 2, p. 175). J. H. PRIESTLEY.

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### The Production of Large, Clear, Cubical Crystals of Sodium Chloride.

FOR the past four years the writers have been engaged in the study of the crystallisation of sodium chloride from saturated natural brines under the influence of various factors, particularly the hydrogen-ion concentration of the solution.

The $P_H$ value of natural Cheshire brine is from 6·9 to 7·1. This value is increased on boiling, owing to the liberation of carbon dioxide. From such alkaline brines, the salt crystallises in octahedral forms. From an acid brine, the salt will crystallise in the form of regular cubes. In both cases the salt is white and opaque.

We find that sodium chloride may be obtained in the form of clear, perfectly transparent cubes by evaporating acidified brine containing a small quantity of a lead salt. Thus, brine containing 0·1 per cent. $H_2SO_4$ and 0·1 per cent. lead nitrate, and maintained at 75° C. in a silica pan, will, in about twelve hours, yield a crop of brilliantly clear cubes, mostly of about 6 mm. diameter. Analysis shows that the crystals formed from brine containing varying amounts of acid and lead always contain about 270 parts of lead per million.

Individual cubes may be selected, and, by suspension in the mother liquor, may be grown by slow crystallisation to form clear cubes of 30 mm. diameter or more. We find, further, that the concentration of lead and acid must exceed certain minimum values before such cubes will form. The minimum acidity is 0·02 per cent. $H_2SO_4$; the minimum lead concentration is 0·006 per cent. $Pb''$. We have successfully used many acids as the source of hydrogen-ion —for example, mineral acids, and lactic, citric, and tartaric acids. Similarly, any source of lead appears to be a satisfactory source of "catalyst"—for example, lead sheet, lead oxides, and lead salts.

These clear cubes closely resemble natural rock salt. Both kinds of crystal were examined by the National Physical Laboratory in October 1921, their report showing that the refractive indices for the lines *c*, *d*, *f*, and *g′* are identical. An X-ray examination by Prof. W. L. Bragg revealed no difference between the internal structure of the two kinds of salt.

The work has been frequently interrupted for more