

radiation, and a consequent reduction in the cooling of the air above it. Local and restricted smudging will not prevent the inflow of colder air from the surrounding land where radiation is active.

In England and on the Continent most of the recent suggestions for frost-fighting have been erroneously based on smoke production; but in Canada and the United States, although the reason of the inefficiency of smoke production does not seem to have been realised, the steps actually adopted for frost-fighting have taken the right direction, aiming at orchard heating—that is, actual heating by artificial means the air and the trees in the plantation. It is true that smudging is still used, but with a very different object, the smudge fires being lighted at dawn to prevent the sun's rays from heating too rapidly the frozen blossoms. It appears that the damage usually done by frost is not due to the freezing of the contents of the cells and the disruption of the cell-walls, but to the freezing of the intercellular liquid, the formation of ice here resulting in the abstraction of water from the cells; on thawing, this water is re-absorbed, but only very gradually; and, if the heating be too rapid, much evaporation occurs before the re-absorption is complete, and the cells remain permanently depleted of part of their water. The dehydrating action of freezing water in this case is analogous to that observed by the present writer in the case of clay and other highly hydrated substances, when the liquid in which they are suspended is frozen. But in those cases no re-absorption of the water occurs on thawing.

SPENCER PICKERING.

Time Relations in a Dream.

THE following account of a dream which I had last night, and of which I took some notes, may be of interest. The dream commenced by my, as I thought, hearing a drop fall on the laboratory floor; after a time there was another drop. I then realised that mercury was dropping on the floor from a small split in some rubber tubing in a gas-analysis apparatus. As I became more wakeful and seemed to realise that I must get up to deal with the leak, the drops fell more rapidly until they were coming quite fast at the moment when I definitely awoke. I then realised that the dropping of mercury which I heard in my dream was in reality the ticking of the clock in my room.

The point which interested me, and may, I think, interest you, is that of the time relations of the dream. I went over my memory afterwards with a stop watch—and, of course, it is only one's memory of a dream that one ever has to go upon—with the following results:—

As I dreamed it, the interval between the first two drops seemed to be of the order of five seconds, and the drops seemed to quicken until they were at an estimated rate of about one drop per second.

Now the actual rate of ticking of the clock was one tick every quarter of a second. It is, of course, evident that one's judgment of time in a dream is quite erroneous in the sense that the occurrences as they take place in the dream seem to extend over a much longer time than the actual time of the dream.

On the assumption that each consecutive drop in my dream corresponded with one consecutive tick, it would appear that at the commencement of the dream the time interval between two consecutive ticks was exaggerated about twenty-fold in the dream, and that as I got more nearly awake the degree of exaggeration became reduced to something like four-fold. At a guess, I heard about thirty drops, in which case the dream would have lasted seven to eight seconds.

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There is another possible interpretation, namely, that when I was most soundly asleep only one tick out of twenty came through to my consciousness, and that as I became more wakeful the number increased until one tick in four came through. On the latter theory the dream would have lasted considerably longer than on the former.

Whatever the interpretation, however, it occurred to me that the time records might be of interest, as a dream is rarely so simple or of such a kind as to admit of even the vague degree of measurement which I obtained.

JOSEPH BARCROFT.

Physiological Laboratory, Cambridge, October 14.

International Relations in Science.

A CIRCULAR letter has been addressed, within these last few days, to "Members of the Academies of the Allied Nations and of the United States" by their brethren of the learned societies of the neutral countries. It is an appeal for toleration, even for generosity, an earnest and eloquent protest against a policy which would seek to exclude the present generation of German scholars and men of science from all our scientific and scholarly intercourse.

I cannot say that I have always been on the side of tolerance and reconciliation; but already we have had some little time to think, and this all but cosmopolitan appeal is bound, as it seems to me, to become a factor in the case. It is signed by very many friendly and honoured names; we cannot shut our ears to it, we cannot resolve upon isolation, lest it be isolation indeed.

This is not a matter to be decided for us by the votes of others, but by each man for himself—by all who claim liberty of action and freedom of thought. I am convinced that very many men feel, as I feel, that whatsoever overtures our German-speaking colleagues may make to us on matters scientific should be freely reciprocated. Need we ask what a man has thought or said, or even what he has done, in these last sad years? If he come in the universal name of science let that suffice; let it be granted that he means, now and henceforth, to follow the paths of learning and to walk in the way of peace.

St. Andrews.

D'ARCY W. THOMPSON.

INTERNATIONAL ORGANISATION IN SCIENCE.

AN appeal addressed "to the members of the Academies of the Allied Nations and of the United States of America" and signed by a number of scientific and literary men in neutral countries has been circulated and has already given rise to comments in the Press. It deals mainly with the formation, by the Allied academies, of new international scientific associations which neutral countries are now invited to join. Stripped of its rhetorical clothing, the document is an appeal to let bygones be bygones and to allow science to become again "the great conciliator and benefactor of mankind."

There will be much sympathy with the arguments used, the regrets expressed, and the hopes foreshadowed by our neutral friends, but they have left untouched, and to a great extent misunderstood, the principal considerations which have driven the allied academies to the policy they have adopted. It is only that part of our