ment with the work of Mr. A. R. Philip[6] in visualizing the flow pattern in open hearth furnaces.

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April 16.

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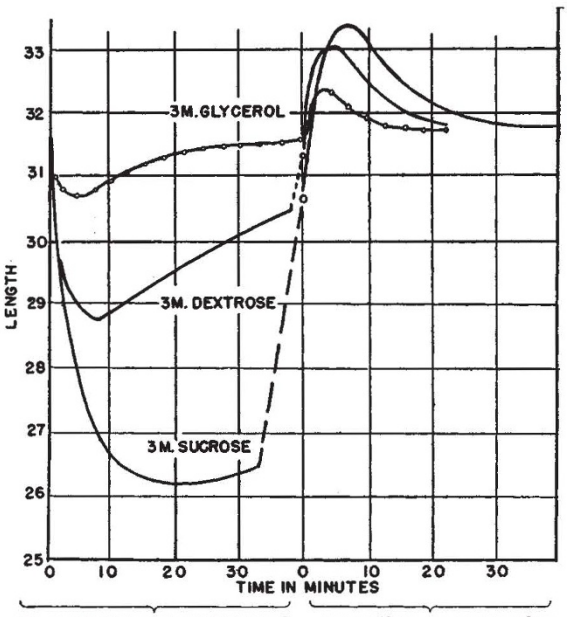
Ionic Exchange and Fibre Contraction

In a communication under the above title, published in *Nature* of May 31, 1947, p. 746, J. L. Mongar and A. Wassermann report some experiments on the de-swelling of calcium alginate fibres in salt solutions. They noted that water-swollen alginate fibres when placed in various alkali-salt solutions first contract and then increase in length. The authors suggest that the contraction results from destruction of calcium ion cross-links between alginate chains as the calcium is replaced by alkali ions. They propose also that plastic flow is mainly responsible for the final swelling effect.

In the course of studies carried out some time ago, we found that water-swollen cellulosic fibres when placed in aqueous salt solutions also contract rapidly at first and then re-swell. The same phenomenon occurs in sugar or glycerol solutions. Some typical observations on water-swollen hydroxyethyl cellulose monofils (0·3 mole hydroxyethyl/glucose unit) are shown in the accompanying graph.

We believe that the contraction is caused by water migrating out of the filament to establish osmotic equilibrium. Eventually, as the solute diffuses into the filament, the osmotic forces are reversed and water flows into the filament, causing an increase in length. It appears to us that the same processes are probably responsible for the shrinking – swelling phenomenon of calcium alginate fibres in salt solutions. If this is true, then considerations of cross-linking and plastic flow are unnecessary.



De-swelling of hydroxyethyl cellulose monofil (0·3 mole hydroxyethyl/glucose unit). Gel monofil dried, then re wet in water

Flory[1], Hermans[2], and others have developed theories which consider swelling as being an osmotic phenomenon. According to these theories, which appear to be applicable in the present case, swelling is related to the entropy of chain configuration, and equilibrium is established when osmotic entropy and entropy of chain configuration are equal (neglecting heat of mixing). If osmotic entropy is changed by adding a solute to the swelling liquid, the swollen structure will shrink. If a solute diffuses into the swollen structure, osmotic entropy changes and swelling will increase. This can be demonstrated quite simply by allowing a cellulose monofil to come to equilibrium with a sugar solution and then placing it in water, as indicated in the graph. Water migrates in to establish equilibrium with sugar molecules in the swollen cellulose structure, increasing its swelling beyond the water-swollen state. As the sugar molecules diffuse out of the gel, it gradually returns to its original water-swollen dimensions.

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April 19.

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The Potato Caterpillar Pest (*Agrotis* spec.) of Tristan da Cunha

The reports of the Norwegian Scientific Expedition to Tristan da Cunha (1937–38) and of the naval authorities who were stationed on the island during the Second World War have directed attention to the fact that the potato crop, on which the islanders depend so much for food, was seriously affected by the ravage of a caterpillar. Before the departure of the recent expedition sent to the islands by a group of South African fishing interests, it was impossible to find out more about this pest.

As members of this expedition, which left Cape Town on January 29 in the M.V. *Pequena*, it was one of our tasks to study the 'potato grub' problem and to try to find a method of control. We were informed by the Rev. C. P. Lawrence and islanders that the pest had only been noticed since the old custom of using kelp (consisting chiefly of *Macrocystis pyrifera*, Ag., and a small amount of *Ecklonia* sp.) as manure for the potato patches was abandoned and sheep manure used instead. If this observation be accurate, it suggests an interesting line of research, for the kelp would seem to render the soil unsuitable for the development of the caterpillar. In the one month available such a line of research could not be followed, but time did permit the testing of the effects of insecticides on the caterpillars.

We found that only one species of insect was responsible for the damage. Dr. A. J. T. Janse of the University of Pretoria, who was kind enough to examine material of the species, has come to the conclusion that the species is not like any that he knows from Europe or South Africa and, therefore, has not been able to name the species.

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