The xylem and phloem are adjacent systems of organized tissue which are the chief pathways of vascular transport in the plant. The xylem carries water from the roots through the stem to the leaves, and the phloem distributes nutrients and minerals throughout the plant. Hormone transport has rarely been examined in either xylem or phloem, although there is abundant evidence that substantial quantities of growth substance are to be found in both. Indeed, the xylem and phloem are the only routes by which hormones in the roots of trees and woody shrubs could be moved to the leaves.

Gibberellic acid and cytokinins are known to be produced by roots, and so M. R. Bowen and P. F. Wareing of the University College of Wales, Aberystwyth, have examined the movement of labelled gibberellin and kinetin (a synthetic cytokinin) in the vascular tissues of willow stems (*Planta*, **89**, 108; 1969). The hormones were transported towards the stem apex in both the xylem and phloem, but there was considerable lateral exchange of hormone between the two tissues. The significance of this interchange may lie in the fact that movement in the xylem is rapid but rather haphazard. Phloem transport seems to be rather more finely controlled and so perhaps exchange between the two tissues represents a regulatory or storage mechanism for hormones which takes place as the transport stream moves towards the upper parts of the shoot.

TRANSLATION

Forever Amber

from our Cell Biology Correspondent

The tally of bacterial suppressor mutations which confer the ability to translate amber nonsense codons during protein synthesis has now reached six. In the *Journal of Molecular Biology* (**45**, 545; 1969) Chan and Garen report that the suppressor mutation $Su6^+$ causes the amber codon to be read as leucine. Five other suppressor mutations that have been characterized result in the translation of amber either as serine, glutamine, tyrosine or lysine. Both $Su2^+$ and $Su7^+$ read amber as glutamine but they are quite distinct mutations; $Su7^+$ is in the gene specifying the major glutamine *t*RNA species in *E. coli*, while $Su2^+$ is in the minor glutamine *t*RNA gene (Soll and Berg, *Nature*, **223**, 1340; 1969). It is not surprising that the codons for all these amino-acids (leucine, serine, glutamine, tyrosine and lysine) differ from the amber codon UAG by a single base substitution. Two other amino-acids, glutamic acid and tryptophan, are in this class, but suppressor mutations which cause amber to be translated as glutamic acid or tryptophan have yet to be isolated.

In strains of *E. coli* lacking suppressor mutations, amber (UAG), ochre (UAA) and UGA codons are believed to cause the termination of synthesis of growing polypeptide chains. Direct evidence that the amber codon chain terminates has been obtained by several groups; in the absence of suppressors, genes containing an amber mutation specify only a fragment of the wild type protein. Now Suzuki and Garen (*J. Mol. Biol.*, **45**, 549; 1969) have formally proved that the ochre codon UAA results in premature chain termination during protein synthesis. They have isolated small amino-terminal fragments of the *E. coli* alkaline phosphatase molecule from two amber and two ochre mutant strains. Fingerprint analysis of these fragments shows that they are indeed different lengths of the phosphatase polypeptide chain, and the length of the fragments correlates with the relative positions of the four mutations deduced from genetic mapping.

Because amber codons are more readily suppressed than ochre codons it is usual to argue that ochre rather than amber is the normal chain terminating codon, and Suzuki and Garen's results support this argument. One of their amber mutants maps close to one of their ochre mutants but the ochre mutant produced about twice as much fragment as the amber mutant, indicating that ochre is the more effective chain terminator.

None of these results is at all surprising, of course, although they are important formal demonstrations of accepted theory. What is surprising is that more than one type of fragment is sometimes produced by a single nonsense mutation. Three of the four mutants used produced two fragments, while the fourth mutant produced three species of fragment. Two possible explanations for this unexpected result come to mind. Either one or more codons are ambiguously translated or the alteration of the fragments occurs after they are synthesized, perhaps by removing a variable number of amino-acids from the amino-terminal end of the chain. Suzuki and Garen prefer the second explanation but have still to prove it.

SODIUM CHLORIDE CRYSTALS

Anisotropy of Surface Tension

from our Materials Science Correspondent

It is well established that the surface energy of a monocrystalline solid is a function of the orientation of the plane on which the measurement is made: indirectly, this anisotropy is the origin of the faceting of crystals and indeed of the fact that some crystals cleave. What is much less familiar is the notion that surface tension (which is intimately related to surface energy) can be anisotropic with respect to direction in a crystalline plane. Unambiguous evidence of this form of anisotropy has been published recently by Asselmeyer and Mecke (*Z. Angew. Phys.*, **28**, 53; 1969). They prepared cleavage surfaces of artificially grown sodium chloride crystals and measured surface tension by means of the classic sessile drop technique, using mercury as the reference liquid. The contact angle was measured as a function of azimuth in the cleavage plane. Exceptional care was taken to test the technique and identify sources of error, and there can be no doubt that the results are significant.

It turned out that in certain circumstances the plot of contact angle against azimuth over the 45° range between [100] and [110] showed no fewer than six precisely reproducible maxima. The contact angles were very sensitive to humidity and reproducible anisotropy was found only for low humidities. Annealing of the cleaved samples destroyed all trace of anisotropy. The anisotropy is thus not an intrinsic property of a smooth crystallographic surface: on the contrary, Asselmeyer and Mecke attribute it to a postulated roughness of the cleavage "plane", which they take to be largely made up of microfacets of