root and shoot come from grafting experiments. One of the characteristics of the tobacco plant is the accumulation of an alkaloid, nicotine, in its leaves. A closely related species, the tomato, is normally completely free of this alkaloid. It is comparatively easy to graft a tobacco shoot on to a tomato root, and when this is done the shoot contains no new nicotine. When the reverse graft is carried out, that is, when a tomato shoot is grafted on to a tobacco root, we find that the tomato leaves begin to accumulate nicotine. It would thus appear that nicotine or some essential precursor of it is normally synthesised in the root system and travels to the foliage where it accumulates.

I have mentioned that the root of a plant is obviously dependent on the leaves for its supply of carbohydrate. We can get some idea of what else the root normally obtains from leaves by attempting to grow detached roots in culture. It is now possible to germinate seeds of several plant species under sterile conditions, to remove part of the young roots formed, and to grow these in suitable media. These usually contain certain vitamins as well as sugar and mineral salts. All the species of root so far grown in culture appear to require nicotinic acid, pyridoxin (vitamin B_6), and thiamine (vitamin B_1). Thus it would seem likely that, in intact plants, roots receive their supplies of these vitamins from the shoot. The roots of plants appear to require these vitamins because they are unable to synthesise them for themselves.

I have been discussing, so far, the nutritional relationships of one plant organ with another, but it is likely that the nutritional inter-relationships within an organ are more complex still. It is quite likely that one tissue will differ from another tissue in nutritional requirements even though both these tissues occur within the one plant organ. Just as plant roots can be grown in culture so is it now possible to grow various plant tissues in isolation. This technique of plant tissue culture is one in which there is currently considerable interest. In tissue culture a small homogeneous piece of plant tissue grows not into a definite organ such as a root, but simply into a mass of unorganised cells. Using this technique we can study the gross nutrient requirements of particular tissues. To grow any plant tissue in culture we must supply it with sugar, a number of mineral elements, and several vitamins. However, in most cases, it has also been necessary to add some natural extract. The additives most commonly used have been coconut milk and extracts of various seeds such as corn. Until recently these materials were simply added to tissue culture media without any knowledge of the active compounds contained in them. Coconut milk and corn seed extract are complex mixtures containing sugars, mineral salts, vitamins, etc., but gradually, one by one, these various components were shown not to account for the activity of the extract. The essential compounds in these extracts were, by inference, present in only small quantities. If coconut milk was not added to media, tissues would grow a little by cell expansion; but little or no cell division occurred unless coconut milk was present. Inclusion of coconut milk in the culture medium apparently stimulated cells to divide. These observations led to the concept of plant hormones responsible for the stimulation of cell division. These compounds were recognised and known as kinins or cytokinins, long before the nature of any of the individual compounds was determined.

Before saying anything further about cytokinins I would like to say a little in general about hormones in plants. The concept of hormones has of course come to us from animal physiology. The term "hormone" was applied first to special chemical compounds, produced in specific organs of the animal body, which moved from these organs and had a characteristic effect on tissues remote from the organ producing them. These substances, these hormones, had the task of co-ordinating many of the bodily functions: thus the thyroid gland produced certain characteristic thyroid hormones and the pancreas produced insulin; the adrenal glands and the pituitary glands each produced their own characteristic hormones. The vital role of hormones in the animal body is now well recognised. What is not so well