

fed from one part of the wave to another and, when passing through an assembly of spins, a correctly shaped pulse may propagate without change of shape, but with a changed velocity. This pulse can be viewed as a collective mode of the system, but Professor Stevens questioned whether it could be investigated by a Green function method.

Another recurrent theme in the conference was the question of the utility and range of validity of Fermi liquid theory, and of the quasiparticle concept in general. A. J. Leggett (University of Sussex) stressed the non-trivial nature of Landau's theory with reference to spin-echo experiments in liquid  $^3\text{He}$ . He also mentioned the possibility of combining the theory with the BCS theory to give an account of weak coupling superconductors. G. Rickayzen (University of Kent) pointed out the breakdown of the quasiparticle concept in superconductors with strong electron-phonon coupling. S. Engelsberg (Imperial College, London) discussed the deviations from simple Fermi liquid theory which arise in nearly ferromagnetic systems owing to the effect of persistent spin fluctuations. In the case of a ferromagnetic metal, D. M. Edwards (Imperial College, London) pointed out that spin waves cannot be treated rigorously as a collective mode in phenomenological Fermi liquid theory.

#### CELL PHYSIOLOGY

### Essential Element

from a Correspondent

CALCIUM and cellular function was the subject of a symposium arranged by the Biological Council Co-ordinating Committee for Symposia on Drug Action at Imperial College, London, on March 24 and 25. It covered some seemingly unrelated topics—conduction in nerve and muscle, release and action of hormones—all of which share a common need for calcium at the molecular level.

During the first day there was much discussion on the calcium pump. W. Hasselbach (Max-Planck Institut, Heidelberg) and H. J. Schatzmann (University of Bern) showed how both sarcoplasmic vesicles and resealed red cells can transport calcium ions against a concentration gradient. A magnesium activated ATPase is required, and the pump transports two calcium ions per ATP hydrolysed in muscle, and one calcium per ATP in red cells.

Calcium is critical in the release of hormone from secretory granules. Describing excitation-secretion coupling in chromaffin cells, P. Banks (University of Sheffield) explained how inhibition of the sodium pump can evoke a secretory response. The rise in internal sodium is thought to have a direct effect on calcium permeability, causing a rapid influx of calcium. This then promotes secretion. E. K. Matthews (University of Cambridge) described another type of excitation-secretion coupling in pancreas and adeno-hypophysis. Here the signal to secrete is no longer neuronal as in the medulla or neurohypophysis, but is relayed by a change in concentration of key compounds in the surrounding medium. An increase in the concentration of glucose will promote electrical activity and insulin secretion in isolated  $\beta$ -cells and here, as in the adeno-hypophysis, the secretory response is increased by calcium and blocked by magnesium. The site of

calcium action is still speculative, but any ion that lowers the viscosity of the cell sap would promote Brownian motion of the hormone-containing granules, and this could hasten their journey to the cell surface. Here a divalent cation could be of further help in exocytosis, by lowering the zeta potentials of the two membranes. A. M. Woodin (University of Oxford) introduced leucocidin-treated leucocytes as a simplified system in which to study protein secretion. The toxin stimulates two interrelated processes, extrusion of granular protein and uptake of calcium and phosphate ions. He suggested that the toxin acts on the sodium/potassium pump at the cell surface, and that uptake of calcium phosphate takes place directly into vesicles vacated by the protein during exocytosis. Triphosphoinositide may be the membrane component responsible for trapping calcium ions during this process.

Calcium is equally important at the other end of the hormone story—the reaction with target organs. H. Rasmussen (University of Pennsylvania, Philadelphia) expanded on the thesis that calcium, as well as cyclic AMP, is a universal second messenger. In two quite different systems, the action of adrenalin on heart muscle and parathyroid hormone on renal tubules, the hormone promotes calcium permeability and adenylyl cyclase activity. This raises the cellular level of both calcium and cyclic AMP. In the resulting chain of events, gluconeogenesis is promoted by activation of two enzymes, phosphorylase b kinase kinase (by cyclic AMP) and phosphorylase b kinase (by calcium). The calcium-activated step comes later, and so this is a key control point, and without calcium neither hormone can provoke the normal physiological response.

#### GAS CHROMATOGRAPHY

### Analytical Advances

from a Correspondent

WHEN the Gas Chromatography Discussion Group of the Institute of Petroleum held an informal symposium at the Royal Institution, London, on March 28, C. E. R. Jones (Vinyl Products Ltd) reported the first results of a pyrolysis correlation programme which clearly demonstrates the need for standardization in this rather brutal method of analysis of polymers. The full results of this first programme should give valuable indications of where standardization is most needed, and it has already demonstrated that we are a very long way from being able to publish reproducible pyrograms.

D. R. Deans (ICI, Billingham) discussed the design and testing of gas chromatographs from the customers' point of view. His principal contention on design was that a chromatograph is better if it is designed for one particular purpose. The many so-called "research chromatographs" are necessarily compromises which perform none of their numerous different functions completely efficiently and some very inefficiently. He also described briefly two methods of testing flame ionization detectors for linearity. No detector tested gave a linear response over much of its range. Plotted as response against weight being burnt per unit time, even the best detectors gave an undulating line instead of one parallel to the weight axis.

P. S. H. Kuppens of the Technische Hogeschool, Eindhoven, described practical devices developed for