splitless injection of microgram or submicrogram samples into capillary columns. Briefly, volatile solvent is separated on a small packed precolumn and then the less volatile sample is transferred by heating the precolumn into a cooled section of the capillary column. Heating this section produces sharp peaks without tailing. A modification enabled a solid deposited on a wire spiral to be transferred to the capillary column in a similar way. The cooling device for the section of the column was very ingenious and the problem of injecting small steroid samples on to capillary columns seems to be solved.

N. G. McTaggart (British Petroleum Research) described the use of molecular sieves 10X and 13X for the type separation of hydrocarbons. Total aromatics and each carbon number separated into paraffins and naphthenes could be determined on feedstocks boiling up to 185° C. This paper was a fascinating account of the development from the initial idea of a method of analysis of enormous importance to the petroleum industry.

C. R. L. Harbourn (British Petroleum Chemicals Research) described a method of expressing retention data used in his laboratory and suggested (diffidently) that it might have a wider use. Briefly he gave each normal paraffin an "index" of NX100 (as in the Kovats system) but interposed the retention times between each pair of adjacent paraffins on a linear instead of a log scale. This meant that although the resulting index was useless for thermodynamical calculations, or derivation of functional group characteristic increments (which is possible with the Kovats index), nevertheless a straight line could be drawn on the chromatogram itself and the position of any peak, the index of which was known, could be instantly read off.

HAEMOGLOBIN

A Ghost Laid

from our Molecular Biology Correspondent

SOME ten years ago Takashima and Lumry reported a curious observation on the oxygenation of haemoglobin which has since had its share in bedevilling research in this area. What they reported was the existence of two maxima in the curve of dielectric increment against degree of oxygenation. These occurred at 25 and 75 per cent saturation, and amounted to a four-fold increase in the magnitude of the parameter. These results were always puzzling, not least because, with the sigmoidal oxygen uptake curve, the deoxygenated and fully saturated forms must preponderate in a partially oxygenated mixture.

More than a year ago Hanss and Banerjee attempted to repeat this work, but could find no change of dielectric increment with oxygenation, and suggested possible sources of artefacts in the earlier work. A further reinvestigation of the problem has now been published (Schlecht, Vogel and Mayer, *Biopolymers*, **6**, 1717; 1968), which concurs with the principal result of Hanss and Banerjee that there are no maxima in the dielectric increment-oxygenation profile. Using improved apparatus, capable of higher precision than previously achieved in such measurements, Schlecht *et al.* found that the dielectric increment of oxyhaemoglobin is some 10 per cent larger than that of deoxyhaemoglobin (a difference too small to be detected by the others), and that the value changes linearly as oxygenation proceeds. Similar behaviour is found in all three species which have been investigated, namely equine and human adult and foetal haemoglobins. Schlecht *et al.* have also, in an attempt to trace the origins of the phantom maxima, repeated the measurements with the original apparatus of Takashima and Lumry. The precision was an order of magnitude or more lower, and gave the dielectric increment only with an error of 30 per cent, but within these limits no maxima were again observed. Thus, while the explanation of the original observations remains obscure, it is satisfactory that this irksome ghost has at last been finally laid.

In a companion paper from the same laboratory, von Casimir *et al.* (*ibid.*, 1705) have measured the dielectric properties of oxy and deoxyhaemoglobin in various conditions. The dielectric dispersion of a protein is sensitive to the magnitude of the hydration shell of immobilized water on each molecule; a small difference in relaxation frequency of the two derivatives is found, but this can be explained in terms of the hydration of the oxygenation-linked protons which are released, and the new ionized groups which they leave behind.

A remote consequence of these dielectric data is pointed out by Minton and Libby (*Proc. US Nat. Acad. Sci.*, **61**, 1191; 1968), under a title which refers to the possibility of direct interaction between the haem groups of haemoglobin. The anxious reader fumbling with trembling fingers for the right page may be reassured, however: the authors find for no interaction. The skittle which they erect and resoundingly hurl down on the very same page is the possibility of a dispersion interaction, resulting from an unprecedentedly high polarizability in the haem plane, which they calculate would have a substantial effect on the dielectric constant. Their own results and the more precise ones of von Casimir *et al.* dispose of this possibility.

PHOTOBIOLOGY

Plants Respond to Light

from a Correspondent

EFFECTS of light on the behaviour of plants, and some of the associated techniques were the basis of a meeting of the Photobiology Group held at the Department of Horticulture, University of Reading, on March 27 and 28.

The importance of the pigment phytochrome, which mediates many of the morphogenetic responses of plants to light, was stressed in several papers. Responses promoted by phytochrome are usually stimulated by short doses of red light and reversed by far-red; however, the relationship between the amount of the active form of phytochrome as measured by spectrophotometry and the response of the plant are frequently obscure, and such "phytochrome paradoxes" were discussed by D. T. Clarkson (Agricultural Research Council, Letcombe). Furthermore, with prolonged exposures to high intensity light, far-red may also elicit morphogenetic responses and is, then, frequently more effective than red light; blue light may also be highly effective in such conditions. The photoreceptors involved in these responses were discussed by R. E. M. Grill and M. R. Turner (University