it is the latter which is actually measured.

The Clarke-Freake experiment was made with a Josephson junction consisting of a Pb wire making point contact with a Pb foil, the metal being extremely pure. The wire or the foil could be independently heated and maintained at selected temperatures below the critical temperature of Pb (about 7.19 K). The idea, briefly, is that if the junction critical current is sought by passing an external current across the junction, then a smaller or larger critical current will be needed, depending on whether the applied current is assisted or hindered by the intrinsic supercurrent produced by the temperature difference. Thus by reversing the direction of the applied current and/or reversing the hot and cool contacts, an asymmetry is expected.

To obtain significant differences, the experiment had to be finely adjusted since, assuming a junction resistance of 1 Ω and a typical thermopower of 0.2 $\mu V\ K^{-1}$, a 1 K temperature difference would produce current of only 0.2 μA compared with mean critical current of 1–15 μA. For this reason, measurements were made close to the critical temperature. In this region the critical current decreases very rapidly with temperature and thus permitted a range of values for an approximated constant temperature difference.

The difference between the critical current flowing from wire-to-foil, and that from foil-to-wire, with the temperature difference in either sense, agreed in sign with the theoretical prediction. The magnitudes varied from 8 times less to 7 times greater than the mean value as the junction contact was adjusted, but were largely independent of the mean critical current as expected. One unplained and possibly significant result was that a comparable difference remained even for zero temperature difference.

Less exciting explanations of the observed asymmetry are possible. The critical current–temperature relationship need not be identical for wire-and-foil so that if perhaps the junction critical current is merely the lower of two alternatives, a similar asymmetry would be recorded. This situation could possibly be avoided by devising a symmetrical contact. At its best, the experiment confirms the thermoelectric behaviour assumed by theorists for some years.

BOTANY

On Plant Protoplasts

from a Correspondent

THE First International Symposium on Protoplasts and Fusion of Somatic Plant Cells was held in Versailles between September 11 and 15 under the auspices of the Centre National de la Recherche Scientifique and the Institut National de la Recherche Agronomique. The symposium was particularly useful because it brought together both plant and animal workers concerned with the fusion of cells and allowed an exchange of viewpoints and ideas often missing in many strictly zoological or botanical discussions on the subject. In all, more than 100 researchers from many different disciplines attended.

The central theme which emerged from this symposium is that there is now a great opportunity for using protoplasts to increase the genetic variability of plants. And the need for more work in this connexion using economically important crops such as the cereals was also uppermost in the minds of the participants.

Problems associated with the isolation of protoplasts by the enzymatic degradation of the cell walls of plant tissues and cell and tissue cultures could be critically assessed against the background of reviews of the most recent work on the structure of the primary cell wall by Dr P. Albersheim (University of Colorado), including that of the protein-glycan network by Dr D. T. A. Lamport (Michigan State University). This enabled Dr K. Selby (Lord Rank Research Centre, High Wycombe) to guide aspiring isolaters of protoplasts in their choice of the most suitable cellulases and other enzymes for degrading cell walls. The culture of these naked cells was discussed by many participants and it was clear that there was considerable variation between species in the readiness with which they undergo both regeneration of the cell wall and division. Isolated leaf protoplasts normally regenerate a wall more readily than those isolated from callus or suspension cultures, and both Mr J. H. M. Willison (University of Nottingham) and Dr Rolland (Biologie Cellulaire, Paris) were able to describe the detailed changes in fine structure involved.

It was generally accepted that difficulties still remained in the isolation of protoplasts from certain tissues and in the culture of protoplasts, particularly those from cereals. Most workers were clearly convinced that the chief interest now centres on what can most usefully be done with these naked cells which cannot be done with the usual tissue cultures or suspension culture cells. As discussed by Dr I. Takebe (Institute for Plant Virus Research, Chiba, Japan) and by Dr O. L. Gamborg (NRC, Saskatoon) it is now established in several laboratories that it is possible to regenerate whole plants from single isolated protoplasts of both tobacco and carrot. Interest, therefore, naturally centred on the exploitation of this single cell system, particularly in relation to fusion and somatic

Induction of EBV Antigens

THE aetiological relationship between Epstein-Barr virus—a herpesvirus—and Burkitt's lymphoma and nasopharyngeal carcinoma remains a vexed question. There is, to be sure, ample evidence that infection by Epstein-Barr virus is a concomitant of these two malignancies, but proof that infection by this virus precedes and causes the development of the cancers is still lacking. One thing is certain, however, as DNA hybridization experiments have established, cells from patients with Burkitt's lymphoma and from healthy people may contain Epstein-Barr virus DNA even though it is impossible to detect any evidence of the multiplication of the virus in these cells. And as Sugawara, Mizuno and Osato report in *Nature New Biology* next Wednesday (October 25) such cells probably contain the entire Epstein-Barr virus genome.

Sugawara and his colleagues have worked with three human cell lines, the Raji line from a patient with Burkitt's lymphoma, the P3HR-1 line also from a Burkitt tumour, and the NC-37 from an apparently healthy donor. Only cells of the P3HR-1 produce Epstein-Barr virus and when these cells are grown in media containing IUdR or BUdR the proportion of cells containing viral early antigens and capsid antigens increases many fold; in other words the proportion of cells producing virus increases markedly. Furthermore both Raji cells and NC-37 cells cultivated in the presence of these drugs become positive for both early antigens and capsid antigens of Epstein-Barr virus. And when fresh clones of these cells were exposed to the inducing drugs all became antigen positive.

IUdR and BUdR have, of course, recently been used to induce the expression of latent RNA tumour virus genomes in avian and murine cells. Sugawara *et al.* have now used these drugs to reveal latent Epstein-Barr virus genomes in human cells and, since after exposure to these drugs the human cells are found to contain both early viral antigens and viral capsid antigens, it seems highly likely that the entire Epstein-Barr virus genome is retained in a "repressed" state in Raji and NC-37 cells. Obviously such findings are consistent with the idea that Epstein-Barr virus may have a role in the aetiology of Burkitt's lymphoma, but it must be borne in mind that NC-37 cells were derived from a person without any trace of malignant disease.