PHYTOCHROME

New Ideas in Eretria

from a Correspondent

IT is now widely accepted that progress towards understanding the regulation of morphogenesis depends increasingly on cooperation between specialists in many different fields. Such cross-fertilization was the keynote of the NATO Advanced Study Institute on phytochrome held in Eretria, Euboea, Greece, between August 29 and September . 17 and organized and directed by Professor K. Mitrakos of the University of Athens.

The problems of the photoregulation of plant metabolism and morphogenesis were intensively discussed by photochemists, plant physiologists and biochemists and the general view was that significant progress can be expected in the very near future. The Advanced Study Institute was chiefly an educational exercise, although many speakers took the opportunity to present new information; further, associated with the institute was a two-day symposium for the presentation of original work.

Opening the symposium, Dr H. A. Borthwick (US Department of Agriculture, Crops Research Division, Beltsville) reminded the audience that the existence of phytochrome as a red/far red photoreversible pigment was postulated about twenty-one years ago to account for a vast mass of physiological data. Great progress has been made since then, particularly in understanding the molecular nature of phytochrome. The latest advances in this area were presented by Professor W. R. Briggs (Harvard University), who has shown that undegraded phytochrome from oats and rye has a molecular weight of 120,000. The previously reported values of between 15,000 and 60,000 were due to degradation of the native molecule by a protease which seems to co-purify with the phytochrome. The 120,000 dalton molecule seems to exist as a dumbbell-shaped structure as deduced by electron microscopy and negative staining; furthermore, there is evidence for an association of two molecules to give a unit with a molecular weight of 240,000 which might exist in significant proportions *in vivo*.

The chemical nature of the photoconversions was discussed in detail by Professor W. Rüdiger (University of Munich), who presented evidence that during the conversion of P_R to P_{FR} a proton is effectively removed from one of the terminal pyrole rings of the bilitriene chromophore. This would probably result in a movement of the protein in the environment of the chromophore so as to neutralize the resultant charge. Evidence for a *cis-trans* isomerization based on circular dichroism studies of purified phytochrome was reported by Dr M. Burke (University of Minnesota) who suggested that, at least at low temperatures, the photoconversions proceed through a pseudoporphyrin conformation. Flash spectroscopy studies on the purified phytochrome of 120,000 daltons by Professor H. Linschitz (Brandeis University) showed that there are separate and parallel pathways between P_R and P_{FR}. The simplest interpretation is that each molecule has two slightly different chromophores which photoconvert through different intermediates.

Consideration of the time courses of the *in vivo* light and dark transformations by *in vivo* spectrophotometry led to considerable discussion—it is now clear that no single model can account for all the available observations. Dr R. Marmé and colleagues (University of Freiburg) presented evidence for two populations of phytochrome with different kinetics of photoconversion in mustard seedlings. Furthermore, the proportions of phytochrome in the two populations, and the rate constants of their phototransformations, varied with the age of the mustard seedlings. The localization of phytochrome within the cell was also studied by this group using polaroid light beams. When the light was polarized parallel to the long axis of *Avena* coleoptiles, 25 per cent more photoreversibility was recorded by spectrophotometry than when the light was polarized normal to the long axis. Marmé and his colleagues have taken this to indicate that the pigment is located in the plasmalemma, and indeed differential centrifugation techniques showed a concentration of phytochrome in the plasmalemma fraction as identified by ability to bind naphthylphthalamic acid. Professor L. Pratt (Vanderbilt University) described an immunochemical technique for the cytochemical localization of phytochrome. Initial results indicated that phytochrome is associated with membrane, as was shown decisively for the alga *Mougeotia* by Professor W. Haupt (University of Erlangen-Nurnberg) by the use of polarized microbeams.

In the final sessions, considerable interest was generated regarding the manner in which phytochrome regulates enzyme activity in plants. The general view was that it is no longer possible to hold to a single model based on the regulation of gene transcription by phytochrome. Professor H. Smith (University of Nottingham) showed that the effects of light on phenylalanine

Nomenclature for Human Chromosome Banding

from a Correspondent

THE rapid developments in using quinacrine fluorescence and various modifications of Giemsa staining to produce specific banding patterns on human chromosomes led to the holding of the IVth Standardization Conference on Human Cytogenetics at Rungis, Paris, from September 2–4. In the tradition of the first three conferences at Denver, London, and Chicago, the aim of the meeting was to try to agree on a standard system for chromosome identification and nomenclature in relation to banding patterns.

The patterns produced by quinacrine fluorescence are to be used as the standard for reference on the basis of the numbering system proposed by Caspersson and his colleagues (*Hereditas*, **67**, 89 ; 1971). This involves a departure from the Denver system; it was agreed that the chromosome trisomic in Down's syndrome as defined by its fluorescent pattern should retain the number 21, although measurement of quinacrine-identified chromosomes shows it to be smaller than 22. The various laboratories represented were able to agree on the major quinacrine bands for each chromosome pair and to relate the Giemsa and reverse-Giemsa bands to the quinacrine bands. Each human chromosome pair can now be identified by its specific banding pattern, an advance which must open the way to a great increase in the precision of future human cytogenetic and linkage studies.

The conference was unable to reach a decision on the optimal method for numbering the bands. Two systems were considered. The first is to number from the centromere outwards for each chromosome arm; the second is a consecutive numbering system for the whole chromosome set starting at the end of the short arm of chromosome number 1. The conference appointed a standing committee (Dr B. Dutrillaux, Dr H. J. Evans, Dr C. E. Ford, Dr F. Ruddle, Dr J. Lindsten, with Dr J. L. Hamerton acting as coordinator) charged with the immediate task of making recommendations on this issue. It is intended that the report of this conference should be published by the National Foundation early in 1972 and it is hoped that it will include the standing committee's recommendations on an internationally acceptable numbering system. Any suggestions or comments should be sent to Dr J. L. Hamerton, Department of Genetics, Children's Hospital of Winnipeg.