plasm. Dr J.-E. Edström and Dr J. Hyde (Karolinska Institute, Stockholm) have studied the transport of ribosomal ribonucleoprotein particles (rRNP) in *Chironomus tentans* salivary gland cells. Flow of ribosomal subunits with time, from inner to outer zones of the cytoplasm, is demonstrable. This occurs independently of mRNA transport, but seems to be dependent on the integrity of the endoplasmic reticulum.

The last part of the meeting was devoted to contributions on the behaviour of eukaryotic RNA polymerases, and on the characteristics of low- and high-molecular weight nuclear RNAs. Progress in the analysis of low-molecular weight nuclear RNAs has been rapid. Dr H. Busch (Baylor College of Medicine, Texas) has isolated seven distinct RNAs, of which one is completely sequenced. Analysis of enzyme digests shows substituted bases, different levels of methylation, and unusual bases which are characteristic of some of these RNAs. All of them are stable, and one is found only in the nucleolus. Their function is not yet known.

Attempts to localize extra-nucleolar RNP structures in electron microscope preparations have met with some success. Dr W. Bernhard has a staining method which is selective for RNP. Granules and filaments are seen in rat liver nuclei, either around or between the chromatin. These structures are very labile and disappear in starved animals. It was suggested that high-molecular weight RNA might be contained in some of them. A class of very slowly-labelled granules can also be demonstrated (Dr M. Fakan, Institute for Cancer Research, Lausanne), which are presumably not involved in the mRNA metabolism of the cell.

The relationship of high-molecular-weight nuclear RNA to mRNA in the cytoplasm was analysed well by Dr G. Spohr and Dr K. Scherrer (Institute for Cancer Research, Lausanne) working on duck erythroblasts. Dr Scherrer has demonstrated the presence of non-degenerate globin sequences in nuclear RNA with a sedimentation value of 50–80S. The true size of these molecules is still unknown, but they may represent nascent structures which break down rapidly within the cell, or when isolated and treated with, say, dimethyl sulphoxide. About 2–4% of the total globin mRNA in the cell is in the nucleus. In the case of the RNA product from Balbiani ring II of chromosome IV in *Chironomus* salivary gland cells there appears to be no cleavage of the large 75S nuclear molecule before it enters the cytoplasm, where its accumulation can be demonstrated (Drs B. Daneholt and R. Tanguay, Karolinska Institute, Stockholm). It is not clear whether the 75S RNA as such enters polysomes, but it is not the only class of high-molecular-weight RNA in the cytoplasm. The half-lives of Balbiani ring RNA and of other mRNAs in these cells differ widely, however, as do residence times within the nucleus, which implies complex and differential control mechanisms.

A general impression from the whole meeting was that there is a productive and increasingly sophisticated interaction between recent methods for visualizing macromolecules in the electron microscope, and the more time-honoured techniques for biochemical analysis. Perhaps it was the realization that this can only continue to develop which led participants to give their enthusiastic support to Dr Bernhard's suggestion that there should be a fourth Nucleolar Workshop in 1975, probably in Bulgaria.

PHOTOBIOLOGY

New Trends in Rio

from a Correspondent

"NEW Trends in Photobiology" was the theme of an international symposium organized by the Institute of Biophysics of the Federal University of Rio de Janeiro from July 15 to 20. This was the first symposium sponsored by the Comité International de Photobiologie held outside Europe and the United States, and it was most appropriately held in Brazil where sunshine is abundant, research in the field is active and the applied consequences of solar radiation could be enormous.

The relevance of photobiological research was summarized in talks by Drs A. Hollaender and R. Setlow (both of Oak Ridge National Laboratory), Professors R. Clayton (Cornell University), G. Porter (Royal Institution, London) and others: (a) biological schemes for solar energy conversion, possibly linked to physical systems; (b) ultraviolet-induced cancer; (c) ultraviolet-induced repair of DNA damage caused by many kinds of ionizing radiations, for example, X rays and γ rays; (d) detection of chemical carcinogenesis effects using sensitive ultraviolet techniques; (e) fast flash photolysis techniques (in the picosecond range) for the recognition of intermediates in such processes as vision, photosynthesis, photosensitization, bioluminescence and photomorphogenesis.

In the cancer field Dr R. Setlow reported on cancers induced by ultraviolet in clones of the fish *Posillia formosa*. Liver or intestine cells of this fish (UV irradiated) caused tumours to develop in fish into which the cells had been injected. The ultraviolet effect could be reversed by photoreactivating the cells before injection. In a similar vein Dr R. Latarjet (Institut du Radium, Orsay) induced cancers in mice by large doses of ultraviolet; the effect could be 50% reversed by caffeine. Dr B. A. Bridges (University of Sussex) mentioned that comparable effects with caffeine had also been seen in cultures of Chinese hamster cells.

The photoenzymatic reversal of photochemical damage in DNA was the subject of much discussion after a review of the topic by Dr C. S. Rupert (University of Texas, Dallas). The report of Dr B. M. Sutherland (University of California, Irvine) showed how a single-minded approach to enzyme isolation can sometimes pay big dividends. She wished to isolate the photoreactivating enzyme from *Escherichia coli* and by suitable genetic engineering produced a mutant which enables her to obtain milligram quantities of the enzyme weekly. With a new assay technique it has been possible to obtain a lot of data on the enzyme which has an, as yet, unidentified chromophoric group—this can be removed and the apoprotein can be reconstituted to 70% of its original activity.

Certain chemicals, such as reductone which is similar to vitamin C, can block light-induced repair in cells which have been exposed to ionizing and other radiations. This was the topic of work being carried out by Drs R. A. Gomes and L. R. Caldas (Federal University of Rio de Janeiro) who also reported a similar effect for caffeine which interestingly interacts with chloramphenicol.

For the protein and membrane chemists there was the contribution of Dr G. Jori (University of Padua) on the ways of probing three-dimensional structure using photo-sensitized oxidation of biomolecules. Specific regions of protein molecules contain several different functional groups which can be easily linked to suitable dyes and mapped. Membrane-bound proteins may be quite susceptible to this approach and it may also show any differences (if they exist) between crystal and solution structures of proteins.

An exciting new approach to understanding the mode of action of the plant morphogenesis pigment, phytochrome, was presented by Drs W. R. Briggs (Harvard University), D. Marme (University of Freiburg) and J. Boisard (University of Rouen). They have shown the far-red absorbing form of the pigment (P_{fr}) is bound to a specific membrane structure whereas the red form (P_r) is not membrane bound. The degree of binding is strictly dependent on the magnesium or calcium concentration and on the *p*H; these properties also make it quite easy to purify the protein-membrane complex. The mode of action of phytochrome depends on the $P_{fr} \rightleftharpoons P_r$ reaction so that these observations open the way for an explanation of phytochrome effects on membranes.