Studies in this sphere have been in progress for a number of years at the Hebrew University in Jerusalem, and Dr Moshe Shilo has reviewed recently the current state of knowledge (*Bacteriol. Proc.*, **31**, 180; 1967). The Jerusalem school selected the halophilic chrysomonad *Prymnesium parvum* as a model system, because it is an alga which produces an exotoxin complex responsible for high fish mortality in Europe. Toxic effects include haemolysis, disturbance of gill permeability and cytopathogenicity; other less well defined toxic components induce numerous pharmacological activities in nerve and muscle preparations. The toxins are formed during late exponential and stationary phases of growth, and light is essential for their production (heterotrophically grown cultures in the dark are non-toxic). One of the most interesting and intensively investigated *Prymnesium* toxins is ichthyotoxin. This toxin requires a divalent cation co-factor and its activity is stimulated by polyamines such as spermine. These co-factors do not function additively and ichthyotoxin activity is the resultant of their complex interaction. Ichthyotoxin induces marked and rapid changes in gill permeability and sensitizes fish to many other non-specific poisons. This toxin has many of the properties of surface active agents and anionic detergents clearly simulate its action. The activated toxin is considered to form a polymolecular micelle and thereby resembles plant saponins.

Prymnesium is killed by very low levels of ammonia and other weak electrolytes including acetic acid, and this sensitivity has provided the basis of control measures under field conditions. The electrolyte activity is *p*H-dependent, which suggests that undissociated molecules and not ions are involved in the killing of the alga. Shilo proposes that osmotic imbalance is established in the alga by the retention of undissociated electrolyte molecules and that this leads to lysis and death. It is significant that other halophilic micro-organisms such as luminous marine bacteria also are sensitive to weak electrolytes and this sensitivity may be a general feature of cells which develop under conditions of extreme osmotic stress.

Ultraviolet Light and Cell Growth

from our Cytogenetics Correspondent

It is well known that ultraviolet light can cause damage to nucleic acids and that in some cases this damage can be repaired in visible light. Ultraviolet light also prevents cell division and growth, but the physiological basis of this effect and whether it too can be repaired is less well understood. Employing a microbeam of ultraviolet light, Brown and Zirkle (*Photochem. Photobiol.*, **6**, 817; 1967) attempted to characterize precisely what is damaged when cell division is halted. A beam 8μ in diameter was focused onto the cytoplasm of cultured axolotl cells approaching metaphase. By varying the wavelength of the light, an action spectrum for the arrest of chromosome movement at anaphase and mitotic spindle destruction was drawn up. The most effective ultraviolet wavelength in arresting both these processes was found to be 277·5 mμ, and the action spectrum follows fairly closely the ultraviolet absorption spectrum of proteins containing tyrosine and tryptophan. So it is possible that some protein in the cytoplasm is damaged by the microbeam and this results in an impairment of function of the nearby mitotic spindle. Could the protein be an enzyme essential for spindle integrity? The action spectrum fits quite well the spectrum for inactivation for at least one enzyme, aldolase, so enzyme damage is a clear possibility.

The mitotic spindle has much in common with the sub-units of flagella. Earlier this year Hipkiss reported in *Radiation Botany* (**7**, 347; 1967) that when the unicellular alga *Chlamydomonas* was irradiated with sub-lethal doses of ultraviolet the flagella immediately become detached from the cell. Probably structural proteins at the base of the flagella are damaged causing the latter to break off from the cell.

The effect of near ultraviolet (365 mμ) on growth of *Ginkgo* pollen culture and human HeLa cells has been investigated by Klein and Edsall (*Photochem. Photobiol.*, **6**, 841; 1967). They find this wavelength most effective in repressing growth of both cell types. Repression of the HeLa cells can be reversed by a period of darkness, but only if it is longer than 15 minutes within an hour-long dark–ultraviolet light cycle. Green light also repressed growth of the two cell types; this cannot be reversed by dark but can be reversed by red light. Other differences between near ultraviolet and green light inhibition are that in both cell cultures ultraviolet light inhibits the early phases of growth while green light inhibits the later phases; and in onion roots Wolff, Fives and Klein (*Bull. Torrey Bot. Club*, **94**, 411; 1967) report that near ultraviolet light slows down the prophase stage of mitosis but green light slows the anaphase stage.

To complicate matters, however, Klein, in earlier publications this year, showed that near ultraviolet light can reverse the effect of ultraviolet light at 254 mμ on leaf fall in *Coleus* plants (*Ann. N.Y. Acad. Sci.*, **144**, 146; 1967). Also, in a number of other plant systems, including the *Ginkgo* pollen cultures, the repression of growth by ultraviolet light at 254 mμ can be reversed by blue light (*Amer. J. Bot.*, **54**, 904; 1967). So far there are no adequate explanations for any of these findings. In the plant systems investigated it is likely that ultraviolet light accomplishes some of its effects through damaging internal auxin (growth hormone) functions. Only a fuller investigation of the effect of light of different wavelengths on proteins, enzyme function and nucleic acid metabolism will reveal more positive answers.

Polymerase Activity and Dissociation

from our Molecular Biology Correspondent

An interesting example of the control of enzymic activity by an association–dissociation equilibrium is provided by the important enzyme, DNA-dependent RNA polymerase. This is a large protein with a sedimentation coefficient, under the usual conditions of preparation, of about 24*S*. It has been shown that the enzyme will dissociate in response to changes in ionic strength or *p*H. Smith *et al.* (*Biochemistry*, **6**, 3057; 1967) have now examined the effect of the template on the association equilibrium; for this purpose it is necessary to use a small template and not a high molecular weight DNA, which would be large compared with the enzyme itself and would contain many initiation sites. Using oligomers of deoxycytidylic and adenylic acids, the authors have made the interesting discovery