inhibition by catabolites, and lengthy incubation times was economically unsuited to large scale operation.

In an attempt to overcome some of the drawbacks, Ghose (*Biotechnol. Bioeng.*, XI, 239; 1969) has studied continuous enzyme saccharification of cellulose. Spruce pulp was heat treated and milled so as to expose the inner surfaces of cellulose to the enzyme. In place of concentrated cellulase, Ghose has used clarified, four-fold concentrated culture filtrates from *Trichoderma viride* fermentations. Preliminary experiments with this source of enzyme indicated that only slight inactivation was caused by heating to 50° C and by adsorption, the net loss during one hour of exposure being about 13 per cent. Furthermore, enzyme stability and activity were optimum at *p*H values just above 5. Continuous saccharification was carried out in a 5 litre, agitated reactor at 50° C, and to maintain a constant rate of feed a premixed suspension of enzyme and substrate was pumped into the reactor. The feed reservoir was kept cool enough to prevent most hydrolysis.

In a typical continuous experiment using a 5 per cent concentration of substrate, the reactor was run as a batch system for 40 hours, after which the change was made to a continuous flow mode (dilution rate of 0·025 h^{-1}) for a further 210 hours. The feed and effluent streams maintained concentrations of reducing sugar of approximately 0·30 per cent and 3·5 per cent respectively, values that correspond to a substrate conversion equivalent to 64 per cent. A final return to batch operation increased the conversion value to 92 per cent. Conversion rates approaching this latter value were possible too, in a four stage, continuous flow system with a total retention time of 40 hours, that is, similar to the retention time of the single stage reactor. The four stage reactors maintained steady state concentrations of reducing sugar for nearly 100 hours and the system was terminated only by mechanical failures. Clearly refinements in the engineering promise much now that the possibility of maintaining a continuous steady state reaction of a solid substrate has been established.

PATHOLOGY

New Source of Information

from a Correspondent

ACCURATE pathological information about animals has been hard to come by, but the situation should be eased by the establishment of the Registry of Comparative Pathology at the Armed Forces Institute of Pathology, as part of the American Registry of Pathology in Washington. The registry is operated jointly by the Armed Forces Institute of Pathology and Universities Associated for Research and Education in Pathology. Robert Wissler, professor of pathology at the University of Chicago, is principal investigator of the project, which is funded by the National Institutes of Health.

The registry is to be a centre for consultation and an information exchange for scientists interested in animal models of human disease, as well as benefiting other branches of comparative pathology. Categories of animals about which information is to be gathered include primates, domestic animals such as horses and cattle, zoo animals, laboratory animals, fish, birds and to some extent invertebrates. The scope of activity in each case is developing as the needs and desires of the scientific community become apparent.

The AFIP has considerable experience of providing a similar service for human pathology. For many years its pathologists have acted as consultants, prepared study sets, written textbooks and prepared scientific exhibits for research and education. The Registry of Comparative Pathology, by joining with and benefiting from this background, has an opportunity to establish a valuable central clearing house for information. The files of the registry have been programmed into a computer so that questions will receive answers based on all the information in the computer memory and will benefit from the background of all the files of the American Registry of Pathology.

The first issue of a news bulletin will be published next month, describing the activities of the Registry of Comparative Pathology and serving as an information exchange for biomedical scientists. This will be available without charge to scientists throughout the world. Anyone interested can receive the bulletin from the Registrar, Registry of Comparative Pathology, Armed Forces Institute of Pathology, Washington, DC.

An index of animal models of human disease is being prepared with information from many sources including published lists. As a part of this index, "in depth" descriptions of many diseases will be added to the files as the opportunity occurs. Some of these are likely to be published in the news bulletin. Scientists are encouraged to address relevant questions to the registry at any time.

PHYTOCHROME

Axis of Absorption Shifted

from our Plant Physiology Correspondent

SOME of the ways in which light influences plants may be explained if the active form of phytochrome can, in some way, alter the permeability of cell membranes. It is therefore of great interest to know whether phytochrome molecules are associated with cellular membranes and whether or not any discernible change occurs, either in the membrane or in the phytochrome molecule, after photoconversion. Evidence for both of these possibilities has been gained from studies of chloroplast movement in species of the alga *Mougeotia*.

Chloroplasts commonly undergo two types of movement in response to light. The first is called the low intensity movement and allows the chloroplast to absorb maximum light under normal illumination. The second, or high intensity movement, protects the chloroplast from damage in direct sunlight. The green algae *Mougeotia* and *Mesotaenium* are unique in that quite separate photochemical processes seem to control the low intensity and the high intensity movement. In *Mougeotia* the low intensity movement seems to be mediated through the phytochrome system.

Phytochrome is a blue-green chromoprotein which mediates most photomorphogenic responses in plants. It exists in two interconvertible forms, Pr and Pfr. Pr is thought to be inactive but is converted to the active Pfr form by irradiation with red light. Pfr can be converted back to Pr by irradiation with far-red light. If a red light treatment is followed quickly by a far-red treatment and if the period between the