fell rather flat. Participants displayed a studied dissociation from genetic engineering; and in the absence of Jensen or any of his followers, discussion of the hereditary element in intelligence was cool (in spite of the presence of activists handing out leaflets and seeking signatures for petitions). Only the Green Revolution—the doctrine of high yielding monoculture farming as the only salvation for the developing countries—sparked a really lively discussion. Some referred to the impairment of the genetic pool and the risk of disease inherent in monoculture methods; others went so far as to suggest that Borlaug's work on the development of high yielding seed strains, for which he was awarded a Nobel prize, was all part of a capitalist plot to dominate world grain markets. Most participants, however, were happy to return to less controversial sessions—on genetic polymorphisms in the mouse or the behavioural genetics of *Drosophila*.

JUVENILE HORMONE

Hypothesis of Action

from our Insect Physiology Correspondent

IT is well established that the activity of natural juvenile hormone, or of the various "mimics" of juvenile hormone, when introduced experimentally into the insect, is largely determined by the rate of hormone breakdown. In the case of the natural hormone, breakdown consists of (1) hydrolysis of the terminal ester linkage by an esterase to form a carboxylic acid and (2) cleavage of the epoxide ring by an epoxide hydrase to form a dihydroxy derivative. Both these types of endproduct are known to be inactive. Slade and Wilkinson (*Science*, **181**, 672; 1973) have now obtained enzyme preparations from the alimentary canal of the army worm caterpillar *Prodenia eridania* and they show that the breakdown of juvenile hormone by these preparations is inhibited by various juvenile hormone mimics. It is perhaps not surprising that the epoxide hydrase activity is inhibited particularly by compounds with epoxide groups, and the esterase by compounds with terminal ester linkages.

The authors infer from these observations that compounds of this type are not in fact reproducing the activity of the juvenile hormone, but are merely inhibiting the breakdown of the hormone already present in the organism. They describe the more usual interpretation as "a case of mistaken identity". They find their interpretation attractive because the apparent absence of any common structural features has been difficult to rationalize in terms of their interaction with a specific hormone receptor. Some years ago W. S. Bowers put forward a somewhat similar view, to the effect that synergists and mimics of juvenile hormone activity act by inhibiting the metabolic breakdown of ecdysone and thus upsetting the hormone balance.

Biologists, on the other hand, regard the action of the juvenile hormone as being the result of gene switching. They are familiar with the fact that very striking switches of this kind can be brought about by widely different chemicals, just as very different chemical substances may have identical odours or tastes. Slade and Wilkinson are not impressed by the fact that juvenile hormone mimics are effective in insects deprived of their source of juvenile hormone by removal of the corpora allata.

GEODESY

World Triangulation

from a Correspondent

ONE of the aims of geodesy is to unite the triangulation systems of the world into a single, homogeneous network, and the current state of progress towards this objective was reviewed at an international symposium on computational methods in geometrical geodesy held at the University of Oxford from September 3 to 7. The two main themes that were considered were the methods of combining satellite observations with terrestrial measurements in order to provide the necessary transcontinental and intercontinental connexions, and the solution of the resulting very large systems of normal equations.

R. J. Anderle (Naval Weapons Laboratory, Dahlgren) described how Doppler satellite observations have been used to determine the positions of thirty-seven points distributed over the Earth's surface, with a standard error of about 2.5 m and with an estimated scale error of 1 in 10^6. From these Doppler positions the datum shifts required to transform the latitudes, longitudes and heights of points referred to the twenty-six separate national or continental triangulation origins into three-dimensional coordinates in a global geocentric reference system have also been obtained.

The results are compatible with, but somewhat superior to, those given by a similar exercise using camera observations of the PAGEOS balloon satellite. Doppler and camera observations are, however, not the only methods of using satellites, and F. J. Lerch (Goddard Space Flight Center, Greenbelt) and J. S. Reece (Computer Sciences Corporation, Falls Church) gave details of a proposed method of combining camera observations, dynamic satellite observations (including electronic, laser and optical tracking data), gravity measurements and long measured base lines on the Earth to produce a geocentric system of station coordinates, together with spherical harmonic coefficients for the geopotential.

Networks of this type give rise to very large sets of linear equations, of order 7,000 or more, and although the numerical solution of such systems no longer constitutes a mathematical problem, it is a topic of continuing interest to geodesists, for, in addition to the numerical values of the unknowns, the solution must also provide information on the accuracy with which these values have been determined, on the accuracy of the observations, and on the stability of the system. These requirements generally demand the inversion of the matrix and the determination of at least the maximum and minimum eigenvalues; the practical aspects of such determinations were discussed in con-

Test-tube Replicase

WHEN the RNA bacteriophage Qβ infects *Escherichia coli*, its genetic material acts as messenger RNA and, among other proteins translated, is the R protein which is the phage's contribution to the enzyme replicase. Three proteins, provided by the host, complete the active enzyme. Replicase is an RNA-dependent RNA polymerase and is required for the reproduction of the virus.

Phage proteins are synthesized when Qβ RNA is added to an *E. coli* cell-free system and presumably include R protein, but until the work of Happe and Jockusch, described in *Nature New Biology* next Wednesday (October 3), active enzyme had not been demonstrated in the cell-free mixture. These authors think this is because replicase must be inhibited by the large amount of Qβ RNA added as messenger and, before attempting to show its ability to act in RNA replication, they have first isolated the enzyme from the protein synthesis mixture.

During cell-free protein synthesis R chains are produced which are not incorporated into complete enzyme. In fact, only about 4% of R molecules form active replicase. Once formed, however, the *in vitro* enzyme resembles the native one in all ways tested. It has the same sedimentation coefficient, contains all three host subunits, can use poly (rC) or Qβ RNA as template and has roughly the same specific activity as the *in vivo* enzyme.

This communication describes one further step in the attempt to reconstruct the replication of Qβ in cell-free conditions.