

## HERBICIDES

**Potential Side-effects**

from a Correspondent

THE potential side-effects of herbicides on soil microflora and fauna were the topic of a symposium organized by the Pesticides Group of the Society of Chemical Industry and held in London on November 29. One contribution related to the mesofauna; Mr W. Wilkinson (Jealott's Hill Research Station, ICI Ltd) stressed the difficulty involved in correlating the results of different workers investigating the same herbicide, a point taken up by a later speaker (Dr E. Grossbard, Weed Research Organization) with respect to the soil microflora. Adverse effects, said Mr Wilkinson, should be attributed in many cases to changes in vegetation rather than to direct toxic effects on the mesofauna. Long-term field trials with paraquat at Jealott's Hill showed the different reactions to cultivation of closely related species of cryptostigmatid mites.

Mr Wilkinson stressed the need for experimental standardization, and this view was supported by his colleague, Dr J. R. Anderson, who has worked on the effect of the bipyridylum herbicides, especially paraquat, on soil microflora. Using as parameters several microbial activities including enzymatic reactions, Dr Anderson concluded that the results indicated that microbial processes important in agriculture were not changed significantly, probably because paraquat is readily adsorbed on clay minerals. It is interesting that the actinomycetes are relatively sensitive to paraquat, probably as a result of the release of the herbicide from the decaying organic matter colonized by these organisms, the absence of any inhibitory effect by paraquat on the degradation of carbon-14 labelled plant material in soil and the fact that effects may tend to be more marked at normal rates than at rates ten times greater than normal.

Professor L. J. Audus (Bedford College, London) reported some studies on the effect of ioxynil and its octanoate ester derivative on the nitrification activity of *Nitrosomonas* and *Nitrobacter* and demonstrated that *Nitrobacter* is more sensitive than is *Nitrosomonas*. This is an important finding because in the case of other herbicides *Nitrosomonas* is the more susceptible organism. In pure culture experiments oxygen measurement with an oxygen electrode showed that the octanoate ester is twice as active in inhibiting nitrification as is ioxynil, but in soil perflusate the situation is reversed, suggesting that the toxic ester may be converted back into ioxynil.

Dr Grossbard suggested that the

necessity for research on the effect of herbicides on soil microflora might be questioned because the concentrations required for an adverse effect are frequently well above those used in field application. She illustrated this with examples drawn from the Weed Research Organization and from the literature. This reassuring finding must not lead to complacency because (1) inhibitory effects can occur at field doses under certain conditions; (2) new chemicals, the performance of which cannot be foreseen, require testing; (3) transformation products (metabolites) in the soil may be more toxic than the parent herbicide; and (4) the concentration in contact with microorganisms in the soil may be higher than would be assumed from the concentration applied to the soil surface.

Mr J. A. P. Marsh (Weed Research Organization), in a joint paper with Dr Grossbard on substituted urea herbicides, provided other examples that microbial activities and numbers of microbial propagules are not inhibited by concentrations of less than ten or even a hundred times the normal dose.

**Separate Big-bang for QSOs ?**

THERE is a saying that cosmologists are fermions—no two cosmologists are in the same state at the same time. Nearly all cosmologists, however, agree that the universe is expanding. It was one of the extraordinarily happy coincidences in the history of science that redshifts nicely fitting the hypothesis that the galaxies are receding from us at a rate proportional to their distance were being measured at just the same time that general relativity was predicting that the universe should be unstable against a tendency to expand in that way. Unfortunately general relativity did not predict enough about the details of expansion and for several decades cosmology was a theoretical subject abounding in models of the universe, all of which fitted the facts.

This situation was altered by the discovery in the 1950s that certain objects which had been taken for stars had redshifts so large that, if the hypothesis is adopted that the redshifts reflect the expansion of the universe, the objects must be so far away that (given certain bounds on their size dictated by the rate at which their intensity fluctuates) the fact that they can be seen at all is unexplainable. Moreover, the statistical correlation between redshift and apparent brightness of these quasi-stellar objects is not consistent with the view of the universe derived from observations of galaxies, unless it is assumed that their source and distribution throughout the universe are radically different from those of normal galaxies.

To the many attempts to explain

The action of 3,4-dichloroaniline (DCA)—small amounts are detected when linuron decomposes—on the microflora is similar to that of linuron in some respects, suggesting that its effects are probably attributable to the parent material and not to the presumed metabolite DCA.

Mr P. Quilt (Weed Research Organization), Dr Grossbard and Mr S. J. L. Wright (Bath University of Technology) examined separately the constituents of the formulation of barban. The active ingredient is responsible for the inhibition of mineralization of nitrogen and glucose utilization but it enhances phosphatase activity. The solvent complex has either little effect or greatly stimulates certain activities. 3-Chloroaniline found in barban-treated soil differs in some aspects from barban in its behaviour towards the soil microflora.

The general theme of the meeting was that more fundamental research along guidelines to be agreed was needed but at the present state of knowledge herbicides do not seem to present a serious hazard to the soil microflora and mesofauna.

these facts Le Floch and Lebreton have now added an extremely elegant and simple suggestion which is to be published in next Monday's *Nature Physical Science* (January 10). Their hypothesis is that quasars are taking part in an expansion from a big-bang of their own. This is not a profound physical theory; if it works it will not explain the facts but merely clarify which facts need explanation. They do not mention the physical explanation of the expansion but assume that in the flat space-time of special relativity normal galaxies and quasars are receding but not from the same source. And they assume that for both normal galaxies and quasars the expansion rate is proportional to distance. Their motivation for this is that it is known to be true for nearby galaxies and also that Mattig (*Astr. Nachr.*, **284**, 109; 1958) and Sandage (*Astrophys. J.*, **133**, 355; 1961) have shown that for a wide range of conditions only such expansion laws are satisfactory mathematically.

Le Floch and Lebreton give a geometrical construction the application of which to the observed luminosities and redshifts is capable in principle of determining where in space-time is the point from which the recession of quasars is taking place; that is, when and where the quasars' big-bang occurred. In their article they show that their simple hypothesis explains some of the puzzling features of the statistics of quasars, especially the uncommonly large luminosities of objects with large redshifts.