whereas channelled ones could emerge from the back face and be trapped in a second, adjacent crystal. Radioactive ions were found in the second crystal, so channelling was indeed occurring.

D. V. Lang and L. C. Kimerling (Bell Laboratories) introduced a powerful new tool for the study of defect states within the forbidden gap. Deep level transient spectroscopy can detect the activation energy for thermal emission from a defect level to the band edge, the defect concentrations, their spatial profile and the electron and hole capture cross sections. All these parameters are of obvious interest to device manufacturers as well as academic physicists. A voltage pulse fills with charge carriers the defects within the deplection region of a p–n junction. The trapped carriers are then released and cause a capacitance transient whose magnitude and time constant, combined with the device temperature and the width of the depletion region, indicate the above parameters. The technique is also relatively cheap and simple to operate.

Genetical hazards of pollutants

from A. D. Bradshaw

HUMAN beings are rather ambivalent to problems of pollution. On the one hand people can get very worried by them, and yet on the other hand they all too easily dismiss them. It was for this reason that the Genetical Society held a symposium on the subject on July 10–12 during their summer meeting at Lancaster. Eight invited speakers provided an assessment of the current state of knowledge about the genetical effects of pollution.

These effects fall into two distinctive parts—selection and mutation. It was clear that a great deal is now known about the selective effects of pollutants. Indeed, they provide some of the most elegant examples of evolution in action as was shown in the accounts of industrial melanism in moths by L. M. Cook (University of Manchester) and J. A. Bishop (University of Liverpool) and of heavy metal tolerance in plants by A. D. Bradshaw (University of Liverpool). These two examples are remarkably similar in the way they demonstrate the powerful effects of selection in the formation of highly localised adapted populations, particularly in organisms with limited powers of dispersal. In both cases the observed clinal patterns can be correlated with observed values for gene flow and selection.

Although the rapidity of the evolution of insecticide resistance is now well known it is doubtful if many people realise the remarkable rate of appearance over just a few years of resistance to first one new insecticide and then another. This problem was outlined by R. J. Wood (University of Manchester) who showed how much the evolution of insecticide resistance is ruining insect control. The evolution, however, is determined by the availability of appropriate variation as well as by selection, for only some, and not all, species have evolved resistance.

It is easy to appreciate that evolution of resistance to insecticides or heavy metals, being so much a matter of survival or extinction, will be very rapid: one or two years seem to be sufficient for substantial evolutionary change. It was therefore interesting to hear from R. W. Snaydon (University of Reading) that even the quiet fields of Rothamsted Experimental Station can provide examples of equally far reaching and rapid evolution in the grass *Anthoxanthum odoratum*, in response to the different liming and fertiliser treatments of the Park Grass Experiment. Here indeed is an example which shows the very pervasive effects of evolution on all characters of an organism, and the fact that an ordinary meadow can readily generate coefficients of selection as high as 0.5 or more.

By contrast, contributions on the mutational aspects of pollution did not paint quite such a clear picture, not because of lack of importance of the subject or of lack of work, but because of the inherent difficulties of mutation research. C. E. Purdom (Fisheries Laboratory, Lowestoft) described the history of research on the effects of ionising radiation, from the early days when only the linear relationship between mutation and dose was known to the present day when it is realised that the relation is not so simple and that different species including man can show very different patterns of sensitivity.

This theme was taken up by M. F. Lyon (MRC Radiobiology Unit, Harwell) for the particular case of the effects of radiation on mammals. It now seems that repeated small doses give a lower mutation rate than the same total dose given in a single exposure. Since environmental radiation is received almost entirely in small doses or at low rates it may therefore be less hazardous than was previously thought. At the same time the yield of mutation in mice, and guinea-pigs and hamsters, suggests that mutation yield decreases with time after irradiation. All this is comforting to human beings, but there is still, for obvious reasons, no direct evidence.

The last but not least effect of environmental mutagens, particularly chemicals, is to cause chromosome change. There is enormous pressure to produce effective means for testing the effects of new chemicals on human tissue. M. L. O'Riordan and H. J. Evans (Western General Hospital, Edinburgh) showed the value of peripheral blood lymphocytes for this purpose. But the problem is to know how far it is possible to extrapolate from such data to effects on germ cells. Certainly germ cells and embryos in human beings have their own particular properties. E. Alberman (Guys Hospital, London) very effectively brought the symposium to a close with an analysis of the causes of spontaneous abortion in human beings. It is very clear from the relation between foetal death and the presence of chromosomal abnormalities in the foetus, and between mean ovarian X-ray dose and foetal death, that abortion is a process by which human beings get rid of much newly acquired genetic abnormality.

Pacific motions

from Peter J. Smith

DEEP sea sediment cores—unlike rocks from continents, oceanic islands and seamounts—have not generally been used to reconstruct lithospheric plate motions. There are several reasons for this: azimuthal orientations of sediment cores have not usually been available, thereby making it impossible to obtain the complete palaeomagnetic information; cores have often been short, thereby limiting data in time; and there are the usual problems of dating and determining sedimentation rates, especially beyond the well defined continental polarity-time scale. Perhaps even more importantly, the sediments easier to recover are obviously the younger ones within whose span plate motions have been small. Ocean cores have therefore been most useful in polarity studies, in elucidating time-stratigraphic relationships and in determining geomagnetic field properties, although some years ago Sclater and Cox (*Nature*, **226**, 934; 1970) did show that cores can be used to trace palaeolatitude variations given adequate time coverage.

Another attempt to determine plate motions from sediments has now been made by Hammond *et al.* (*Earth planet. Sci. Lett.*, **22**, 22; 1974) using 7 cores from the central equatorial Pacific. Taken together the cones spanned completely the period 0.1—21 million years (Myr) ago, a range determined partly from magnetic and partly from biological data. For the younger sediments, dating was based primarily on comparison with the continental polarity-time scale. Sediments in the range 5–10 Myr were dated by compar-