illustrating the use of both frequency sweep and pulse techniques to study compounds containing the hydrogen dichloride, HCl_2^-, ion and its deuterated analogue. The frequency of the signal in a number of compounds was recorded and the relaxation time of the effect measured.

Another paper, which represented a very considerable breakthrough, was given by Dr D. T. Edmonds (University of Oxford) who reported the application of a low-temperature consecutive double-resonance experiment to detect ^{14}N and ^{2}D pure quadrupole resonance. The work on nitrogen was particularly interesting, for this technique seems to give a sensitivity at least two orders of magnitude greater than that obtained by more conventional techniques. This means that the ^{14}N n.q.r. of quite complex molecules such as amino-acids and nucleotides can now be examined. Other papers by Dr M. Read (University of Liége, Belgium) and Dr T. Oja (University of Denver) reported the use of computer averaging and pulse techniques to obtain better spectra. A paper by Professor C. T. O'Kouski (University of California, Berkeley) discussed the prediction of the effect of hydrogen bonding on ^{14}N nuclear quadrupole coupling constants by means of *ab initio* calculations, and the checking of the accuracy of such calculations by experimental n.q.r. measurements. Clearly at least for many systems containing nitrogen, ^{14}N n.q.r. provides a good check for the behaviour of calculated wave functions near the nucleus.

Dr H. G. Fitsky (Bayer AG, Leverkusen, West Germany) discussed the use of ^{35}Cl n.q.r. resonance frequencies as a structural tool in the study of organochlorine compounds. Structure determinations in these compounds, short of full X-ray single crystal studies, have proved notoriously difficult. The possibility of using C-^{35}Cl n.q.r. frequencies to define "chemical shifts" in the same way that proton magnetic resonance has been used to define chemical shifts, and of using these shifts empirically in structural studies, is a very attractive one.

TOXICOLOGY

International Workshop

from a Correspondent

THE Second International Workshop on Toxicology was held at the University of Surrey from September 18 to 22. It was an extremely useful and practical workshop, and there can be little doubt that the ivory towers of academia, at Surrey at least, are well below the clouds. This workshop establishes the Department of Biochemistry, which is headed by Professor D. V. Parke, as a *force majeure* in the field of toxicology in Britain.

The emphasis of the entire conference was on the practical applications of the assessment of risk to biological systems. There is scant evidence that Western man is ingesting a potent hepatocarcinogen, yet much research money is being poured into investigations of this subject. But relatively little money is being spent to further the understanding of the toxicology of drug addiction, and none, other than from the industry itself, is being spent on research into a safer cigarette, this being a field of research in which Britain is far further advanced than any other country.

The difficulties of keeping a perspective in toxicology were discussed, particularly when political pressures are brought to bear on scientists to make decisions without the necessary facts, and without giving them the necessary time to acquire them. This is exemplified by the banning of cyclamates in the United States with such alacrity following the announcement by the Food and Drug Administration.

As expected from a department of biochemistry, there were several useful papers on drug metabolism and chemical carcinogenesis, and on the role that chemistry plays in the better understanding of drug interaction, animal species differences and bio-availability. This latter subject was of great interest in view of recent comments in the medical and pharmaceutical literature concerning the bio-availability of digoxin. The value of short-term against long-term tests was also fully discussed and a plea was made that the former should be pursued as far as possible because they enabled some potentially hazardous compounds to be screened within a prescribed time and financial framework.

It was felt that many valuable basic data on many species and much toxicological material now available within industry should be made publicly available so that background knowledge would be increased to the benefit of all parties.

The symposium was closed by Dr F. A. Fairweather of the Department of Health and Social Security, who is concerned with environmental pollution in its widest sense and who pointed out in a brilliant lecture some of the pitfalls that face a toxicologist, whether he is in an official agency or a commercial organization. He ended with a plea for closer collaboration between the official agencies and industry, a plea which shall not be left unheeded. Well done, Surrey, we look forward to the next meeting.

ANIMAL BEHAVIOUR

Spider Movement

from our Animal Behaviour Correspondent

IF a jumping spider sees a small dark object with one of its four lateral eyes, it will turn its body so that it can scan the object with the two principal eyes at the front of its head. It is known (M. F. Land, *J. Exp. Biol.*, **54**, 119; 1971) that once the stimulus has been detected, the spider will turn by just the right amount even when it has no visual feedback from its movements, that is, the turning system is an "open loop" one. Therefore the size of the turn to be executed has to be specified in advance and the spider stops turning independently of whether the front eyes can actually see the object. This raises the very interesting question of how the size of the turn which the spider is going to make is specified and what are the instructions that are sent to the legs about how to turn and when to stop? In a recent paper, Land discusses some of the possible ways of doing this (J. *Exp. Biol.*, **57**, 15; 1972).

The possibility that the command is simply to turn for a specified length of time, depending on the position of the object, can be discounted by the observation that speed of turning is variable, so that instructions based on duration of a turn would not achieve the observed accuracy. A second possibility, that each pattern of target stimulation on the retina elicits a unique pattern of leg movement, appropriate for bringing the target to the front of the animal, can also be rejected, because the spider can begin a turn with its legs in any position and still turn accurately. A third possibility is that the spider computes, from information derived from the eyes about the position of the stimulus and proprioceptive information from the legs about their initial positions, what the final positions of the legs at the end of the turn should be, and turns until this position has been achieved. This, too, is unlikely as such a mechanism would be ambiguous—the same final leg positions would be specified if the turn were to be 75° or 150°, as one step by all the eight legs takes the spider through an angle of about 75°. Spiders show no evidence of confusing turns of different angles.

The most plausible explanation is that instructions to the legs concern the number of steps (leg movements) which have to be made. The angle through which the animal turns at each step is constant, over a ten-fold range of stepping speeds and an even greater range of inertial loading of the legs. Turning instructions that are specified in terms of a particular number of leg movements would therefore result in accurate turning.