FRESHWATER BIOLOGY

British Riffle Beetles

THE Elminthidae, or riffle beetles, are a family of freshwater beetles in the superfamily Dryopoidea. In the past decade there has been much difference of opinion in the literature over the systematics of the Elminthidae so that British biologists will be glad to have D. G. Holland's new guide to the members of the family found in British rivers and lakes (*A Key to the Larvae, Pupae and Adults of the British Species of Elminthidae*, Freshwater Biological Association (Scientific Publication No. 26), £0.40). This illustration, taken from the key, is of *Limnius volckmari*, the largest common British elminthid which is found under stones in streams and rivers. It ranges in length from 2.85 to 3.20 mm.

CANCER RESEARCH

Chemical Oncogenesis

from a Correspondent

CHASING carcinogens into cells and seeking them out as environmental hazards are recognized as proper occupations for cancer research workers. This and more was learnt at the seventh meeting in the series on principles of clinical and experimental oncology at the British Museum (Natural History) on February 21. Dr P. Brookes (Institute of Cancer Research) presented the viewpoint of experimental carcinogenesis, and Professor R. A. M. Case (Institute of Cancer Research) discussed the epidemiological angle.

Dr Brookes concentrated on a study of the metabolism and mechanism of action of known carcinogens. In addition to such polycyclic hydrocarbons as 1,2,5,6-dimethylbenzanthracene, a wide range of chemical compounds including both synthetic and naturally occurring materials has been shown to be carcinogenic. The variety of such materials makes it difficult to understand the nature of induced malignant change. The alkylating agents have been studied

in great detail both for their carcinogenic and cytotoxic properties, and it seems that alkylation of DNA is the reaction most likely to be correlated with a biological effect such as carcinogenic or mutational change. It has been established that there are several possible products of alkylation of constituents of DNA and to a limited extent it is possible to ascertain which of these are the most significant in relation to a particular biological effect. The innate complexity of mammalian cells, and inadequate knowledge of the arrangement and operation of their genetic materials, are likely to remain barriers to progress for some time.

Dr Brookes said that the study of repair mechanisms had increased understanding of mammalian cell biology and he felt it was significant that patients with xeroderma pigmentosa seem to lack one of the nucleic acid repair enzymes; the inference is that the high incidence of squamous cell carcinoma in these patients is associated with failure to repair damage to the genetic material induced by ultraviolet light.

Professor Case distinguished occupational from recreational hazards and identified β -naphthylamine, exposure to which can lead to bladder cancer, as an example of the first, and smoking as an example of the second. In relation to occupational hazards, epidemiologists could classify hazards as those which are recognized and which are subject to legislation, those which are suspect and which should be the subject of experiments, and unrecognized hazards. Hazards in the second category, in which Professor Case is particularly interested, are in some ways to be thought of as *sub judice* and therefore not appropriate for public discussion. Professor Case illustrated the difficulties encountered in giving advice about carcinogenic hazards and emphasized that success in reducing occupational exposures depends on goodwill at all levels of industry.

GENETICS

Using Somatic Cells

from a Correspondent

SOMATIC cell geneticists face the problem that their tissue culture lines are not naturally haploid. Indeed many cell lines have considerably more chromosomes than the diploid number and, because most of the mutants which one would want to isolate are recessive, the likelihood of inducing mutants with the appropriate mutation in all the gene copies seems slim. And this ignores the even thornier situation which would arise if many structural genes were tandemly duplicated.

One way round this might be to isolate haploid cell lines. This has

already been achieved by Freed and Mezger-Freed in the frog *Rana pipiens* (*Proc. US Nat. Acad. Sci.*, **65**, 337; 1970) although this line seems to have certain disadvantages, not the least of which is that there is very little classical genetics of the frog. Some groups have tried to induce mutants in cell lines; the drug resistant variants isolated so successfully by Littlefield (*Proc. US Nat. Acad. Sci.*, **50**, 568; 1963) have already become standard laboratory reagents for isolating cell-fusion hybrids or tracking chromosome loss, but what are needed most urgently are conditional lethal mutants that are available so abundantly in other fields.

Naha showed in 1969 (*Nature*, **223**, 1380; 1969) that it was possible successfully to isolate temperature sensitive clones from established tissue culture lines, but his observation seems to have gone almost unnoticed. Interest now seems to be picking up, however, and several groups are selecting temperature sensitive cell variants. At the Ontario Cancer Institute Thompson *et al.* have isolated temperature sensitive variants of mouse L cells (and they do not come much more aneuploid than that) by first treating the cells with the mutagen nitrosoguanidine and then either selecting with cytosine arabinoside or ^3H -thymidine to kill those cells which can grow at the non-permissive temperature or simply by plating out the mutagenized cells and testing directly for temperature sensitivity of the clones (*J. Cell Physiol.*, **78**, 431; 1971). By this last method these authors show that out of 1,310 separate clones tested, 18 were temperature sensitive for growth—a staggeringly high frequency of 6×10^{-3} . Thompson *et al.* go on to describe some of the properties of their variants such as their patterns of uptake of ^3H -thymidine, ^3H -uridine and ^3H -leucine and their plating efficiency, and it is clear that a wide range of phenotypes has been isolated.

One awkward fact is the very high rate at which temperature insensitive revertants appear in cultures of the variants; rates as high as 10^{-4} are not uncommon. It remains to be seen therefore just how useful these types of cell will be for biochemical studies and, indeed, in view of the doubts raised by Harris's work (*J. Cell Physiol.*, **78**, 177; 1971) and by others the question arises whether these temperature sensitive variants are structural mutations of the expected kind at all. Why are they found at such a high frequency, and why do they revert so easily? The answers to these questions will no doubt not be easy to obtain, but it is clear that somatic cell genetics is about to enter a new phase where a wealth of phenotypic variants are available for study.