demonstrate that the bulk of the small lymphocytes passing from the nodes and lymph ducts to the blood are not, as was once thought, the results of cell proliferation in the lymph nodes, but are in the main cells which are recirculated from the blood. This topic of lymphocyte recycling is also discussed in the interesting paper of Cronkite *et al.* who describe their experiments on the extracorporeal irradiation of the blood of calves. Hæmopoietic cells also form the materials of study in the papers by Patt and Maloney, and Odartchenko *et al.* who deal with cell population kinetics in the granulocyte and erythrocyte series in the dog, as studied by following the development of cells labelled with H^3-thymidine.

The last two papers in the book are concerned once more with mammalian cell systems. Mendelsohn presents an interesting and useful discussion on the kinetics of cell proliferation in tumours and Fry *et al.* describe the kinetics of proliferation in the epithelial cells of the small intestine.

The book is clearly very much of a mixture, but reads easily and contains a wealth of information including such tit-bits as the statement " Duodenum, jejunum, and ileum are derived from words meaning ' twelve fingers' breadth ', ' empty ' and to ' roll up or twist ' respectively "! This mixture, however, would have been further enriched by contributions from workers using materials other than mammalian cells. It is to be regretted that a symposium on such a basic biological topic should not contain any discussions on cell proliferation patterns in the root and shoot meristems of plants; particularly since techniques utilising radioactive DNA precursors are being increasingly used in such studies. Despite this criticism the book should prove useful to all biologists interested in the kinetics of cell proliferation and the organisation of proliferating tissues, but it has little to offer to the geneticist or cytogeneticist.

H. J. Evans.

REPAIR FROM GENETIC RADIATION DAMAGE. Ed. by F. H. Sobels. Pergamon Press, Oxford. 1963. Pp. x+454. 105s.

Recent work on a wide range of organisms has shown that the amount of mutational damage induced by ionising radiation depends on much more than just the dose and physical properties of the radiation. Not only does the type of germ-cell irradiated and the stage in the mitotic or meiotic cycle have a profound effect, but there also seems to be a period between initiation and fixation of the mutational lesion during which some sort of repair process can take place. These topics of repair and differential radiosensitivity are being intensively studied in a number of laboratories and formed the subject of an international symposium organised by Professor Sobels and held at Leiden in August 1962. This book gives the 24 papers presented, with ensuing discussions.

Most of the papers on differential sensitivity were concerned with *Drosophila*, though events in the mouse, in various plant tissues and in some other organisms also received attention. All these forms showed a marked similarity in the basic pattern of sensitivity, with peaks at first meiotic metaphase and shortly after the completion of meiosis, for instance. There was much less agreement, however, on the probable reasons for the pattern found, though several lines of evidence suggested that oxygen tension differences play an important role. The papers generally were of a high standard; Kaufmann and Gay's contribution, on the uses of autoradiography

and electron microscopy for delving more deeply into these problems, seemed of particular interest in pointing the way towards an eventual solution.

In order to show that there is actual recovery from initial mutational damage, the various other factors which might change the rate of induction of mutations, or intervene between induction and expression, must be shown not to be responsible for the observed effect. Convincing elimination may be very difficult. The clearest evidence for repair comes from work with micro-organisms, represented in this volume by four interesting papers. Repair of ultraviolet damage in phage DNA is discussed by Harm, of ultraviolet induced mutations in bacteria by Witkin and by Doudney and of X-ray induced premutational damage in *Paramecium* by Kimball. A closely related paper by Sobels describes the way in which various pre- and post-treatments modify the mutational response in *Drosophila*, from which a number of interesting conclusions are drawn, for instance that the repair system can be damaged by radiation.

This idea of radiation damage to the repair system would imply that some dose-rate phenomena may arise from repair being more efficient at lower dose-rates of irradiation. But dose-rate changes also alter the length of the irradiation period and often the amount of cell-death, so the situation tends to be rather complex. The latest information on the very striking dose-rate effects in the mouse is described in an absorbing paper by W. L. Russell, who concludes that the lowered mutational yield after chronic irradiation is probably due to repair of premutational damage, with the capacity for repair being greater in oocytes than in spermatogonia. Papers by Muller and colleagues and by Purdom show that the problem in *Drosophila* is whether a dose-rate effect exists at all rather than whether it is due to a repair process; the final answer is clearly still in doubt. Tazima and Kondo reported evidence for two different types of dose-rate dependence in the silkworm, one of which seemed to be connected with repair and the other with germ-cell selection. Research into these dose-rate phenomena is still at a relatively early stage and further work is bound to reveal additional complexities.

The symposium papers end with a masterly summing up by Kimball, bringing out very clearly the relationship between the various subjects discussed and the central problem of the mechanism of radiation mutagenesis. The actual nature of the repair process is still uncertain (though protein synthesis seems to be involved) but one can hope that another symposium in a few years' time will be able to concentrate more on this aspect. This volume is certainly well edited and attractively produced; it can be confidently recommended to all those interested in mutation induction.

A. G. SEARLE.

RADIATION-INDUCED CHROMOSOME ABERRATIONS. Ed. by Sheldon Wolff. Columbia University Press. 1963. Pp. xxi+304. 56s.

In November 1961 a symposium was held in Puerto Rico on the subject of " Biochemical and biophysical mechanisms in the production of radiation-induced chromosome aberrations "; this book is the result. The symposium was virtually a series of discussions rather than papers; they are reproduced almost verbatim, with the minimum of editing. Almost verbatim reports of parliamentary debates are published next day in Hansard; it is a great pity that records of scientific meetings should so often take several hundred times