insists that the type of treatment must vary with conditions; he holds up no treatment as a panacea, but points out that any wholly satisfactory treatment must depend on a fundamental understanding of the nature of cancer. He indicates the wide range of medical research, from vitamins to brain potentials, from the inheritance of hæmophilia to the cycle of the virus of swine influenza, through lung worms and earthworms. But would a layman, reading this book, realize what difficulties have been overcome or how much success has been a matter of lucky shots?

One of the most spectacular achievements has been the discovery of the sulphonamide drugs. The difficulty has been to find something that will kill bacteria, once established in the body, without injuring the even more vulnerable host. Specific antisera, one of the natural defences, seemed promising; but, on the whole, they have been disappointing. First it had to be learnt that antisera, to be effective, must contain certain antibodies against the right constituent of the right type of the species of bacteria incriminated. Even now, with these requirements satisfied, it needs statistical analysis to prove the efficacy of sera in the treatment of pneumonia. It might seem possible to make some synthetic chemical with specific actions similar to those of antisera; but our chemistry is not yet advanced enough to solve the secret of these specific actions. So chemists have synthesized drugs in the hope of finding one that is effective; pathologists have tested them on animals and if they seemed successful they have been handed over to physicians to try on human patients. In this process the chemists of the I. G. Farben-Industrie made an azo-dye from *p*-aminobenzene-sulphonamide and handed it to Dr. Domagk to test on animals. Domagk found that the dye protected mice against streptococci. Human beings were then treated with remarkable success. Later it was found that the sulphonamide half of the dye alone was active. The development of this drug has not been based on theory; theories have limped far behind the discovery.

It was Whipple's demonstration that liver is particularly effective in curing anæmia, produced by bleeding, that led Minot to try the use of liver in the treatment of pernicious anæmia. But it seems that the effect on pernicious anæmia is entirely different from that found by Whipple; Minot could not have inferred the amazing cure of pernicious anæmia from Whipple's experiments. It was a lucky shot. As for the shock treatments of schizophrenia, they have much the same theoretical basis as the treatment of a watch by poking with a pin.

This insistence on the importance of appreciation of fundamentals does not imply any underestimate of the value of treatment or of the difficulties that practising physicians and surgeons must overcome. But, without this appreciation, it is not possible to realize the tremendous odds against which the medical man puts up a gallant fight. Mr. Gray's long list of brilliant partial successes may lead people to expect too much, too soon. Could he not have shown how much his front-line fighters are handicapped by lack of supplies and support from the rear in the form of fundamental theories on which treatment can be based?

A few of the faults inevitable in a compilation of this type have crept into the book. Some of the names quoted carry little weight; tuberculin is not a serum; the amounts of vitamin B₁ in meats (p. 45) are incorrect; Prof. J. Mellanby is not "of Oxford".

AN ORIGINAL APPROACH TO THE PROBLEM OF TUMOURS

The Problem of Tumours

The Application of Blastogenic Agents to Ciliates; a Cytoplasmic Hypothesis. By J. C. Mottram. Pp. vii+91. (London: H. K. Lewis and Co., Ltd., 1942.) 7s. 6d. net.

THE first part of this book deals with changes in form and behaviour of ciliates exposed to agents which increase or decrease the viscosity of the cytoplasm. A wide variety of physical and chemical agents cause similar effects, and, apparently, anything which makes the cytoplasm more viscid tends to inhibit complete fission, so that multinucleate cells are formed. Among other agents, the carcinogenic hydrocarbons can produce this result and thus give rise to clones of abnormal cells. Smaller doses have the opposite effect, and cause increased rate of division, but no recognizable abnormality in the daughter cells. A short review of the literature on abnormality in Protozoa is included. The important point is made that once abnormality has been induced, it may be perpetuated in the absence of the inciting agent.

Another point of greater interest is, that only a small proportion of ciliates in a culture react by recognizable abnormality, but that these cells can transmit the tendency to abnormality indefinitely: whether the abnormal cells overgrow or are overgrown by normal cells in mass culture depends on their relative rates of fission.

These and many other experimental observations are adduced by Mottram in support of the contention that the behaviour of these abnormal *Paramecia* is analogous to that of tumour cells in mammals. Having presented these facts, he invites the reader to answer this postulate for himself, but makes it clear that he thinks the answer should be affirmative. The gene mutation theory of cancer is briefly discussed and dismissed by arguments which appear to the reviewer to be feasible but not conclusive. A short account is given of an interesting chance infection of a culture of *Aspidisca* by an unidentified virus, which could be recognized as inclusion bodies in the cytoplasm, and which gave rise to abnormalities in morphology and behaviour similar to those induced by blastogenic agents. Unfortunately, the disease was fatal, and attempts to recover the virus and to infect new cultures failed.

Despite the obviously great differences between unicellular animals and the tissues of mammals, Mottram has assembled a remarkable number of analogous findings in the behaviour of these cells under a wide variety of adverse conditions. He anticipates the criticism "that to draw analogies between the reactions of Protozoa and Metazoan cells is fallacious"; but, whereas these analogies are based on observed facts, some of the assumptions in the postscript are much more open to criticism. However, the author is careful to keep his facts distinct from his theories, and his account of a most original approach to the problem of tumours will be enjoyed by most research workers.

The text is freely illustrated with excellent black and white drawings, and a photographic frontispiece, and there is a bibliography of 103 references.

P. R. PEACOCK.