

## BOOK REVIEWS

*X-Ray Technology. The Production, Measurement and Applications of X-Rays*, by H. M. Terrill, Ph.D., and C. T. Ulrey, Ph.D. D. Van Nostrand Company, Inc., New York, 1930.

For the student whose linguistic capacity is limited to English, there has hitherto been no satisfactory textbook on X-rays except an elementary treatise like Robertson's "X-Rays and X-Ray Apparatus" or the chapters in the various handbooks of Radiology. These are concerned chiefly with descriptions of the construction and usage of commercial apparatus. On the other hand, books like Ledoux-Lebard and Dauvillier's "La Physique des Rayons X" and the chapters on the technical aspects of radiology in the great German systems, have been a little too difficult of understanding for the man who is not a trained physicist. This gap the authors of the work under consideration have endeavored to fill and in many ways they have been successful. As the authors state, the treatment has been from the standpoint of what might be called X-ray engineering.

After an introductory chapter on the properties of moving electrons, which follows the conventional lines of the subject, there is a very interesting discussion of the principles and technical details of the construction of X-ray tubes. A good deal of information is furnished on the practical methods of manufacture of the commercial types of tubes with suggestions for future useful development. The question of protection of the patients and operators is discussed and the method of estimating by exposure of films the amount of scattered radiation given; but it would have been well to have printed in detail the recent recommendations of the German and American committees which have been studying the question of protection. The phrase that "there is much evidence that X-rays in small amounts may have a stimulating effect" should be changed to read: "There is little evidence that X-rays in small amounts have a stimulating effect." While the use of vacuum tube rectification is developing, the engineering problems are by no means settled, and it is scarcely correct to say that "in Europe tube rectifying apparatus is a standard equipment." It is correct that there are many advantages in such tube rectification in the avoidance of moving parts, lack of noise and so on, but for high voltages the

engineering problems involved in using 60 cycle current are not yet all solved and for heavy duty and high voltages the mechanical rectifying apparatus is still extremely satisfactory. After all, the problem, both in radiography and therapy is the production of a tube which will stand up for a reasonable period under large amperage or high voltage. The present mechanical rectifying apparatus will deliver more watts than any commercial tube can stand, and as with 60 cycles no condenser of a size which can be commercially employed will give a smooth current, the advantages up to the present are largely illusory. There is but little difference to the patient whether he is treated with a mechanically rectified current at eight milliamperes and 200,000 volts or with a kenotron rectification at four milliamperes and 200,000 volts. The whole matter is a question of tube life and commercial stability of the apparatus, not one of wave form, however valuable for research purposes complete wave rectification with enough condenser capacity to smooth out fluctuations may be. Those who have worked with such an apparatus need no information as to the difficulties of controlling surges, the dangers of large condensers, and the highly destructive action of the continuous current on X-ray tubes, together with other practical considerations. That the authors fully realize these points is shown in their discussion.

The section on voltage and current measurements is very good and the writers point out that at present there is no apparatus for the accurate determination of voltage any better than the old sphere spark-gap, poor as that is. The spectroscopic determination of the minimum wave length as a basis for voltage estimation is still in the laboratory stage.

The chapter on biological measurements is also filled with interesting and practical information which illustrates extremely well the difficulties of such measurements for those who have not the equipment of a physical laboratory and an expert physicist to make the determinations; and while the authors say in their conclusions that "there is no reason at present why biological methods should supplant ionization methods for estimation of dosage in therapy," there is still a reason why such biological methods are valuable, and that is that there is no good commercial apparatus of reasonable price and rugged construction which will give correct readings of X-ray intensity in biological units; and after all, the human being is a biological complex.

The final chapters on radiography both of metals and patients and that of X-ray crystal analysis are too condensed to be of great value

though interesting and informing for the physician who desires to keep himself in touch with recent developments in the physics of X-rays.

While, then, this book makes no claim to be a practical guide to radiology it touches upon many matters which are not in any other work in English, and it should therefore prove very valuable as an intermediary between a conventional textbook on radiographic and radiation therapeutic practice and the catalogues and instructions from manufacturers.

*The Use of the Microscope.* A Handbook for Routine and Research Work, by John Belling. First Ed., published by McGraw-Hill Book Company, Inc., New York, 1930.

Most of those who use the microscope do so with little or no knowledge of the construction of the instrument or of the best conditions for its employment. The amount of damage which the average medical student can inflict on a good microscope in a very short time is astounding. Nor does such a student ever learn anything about the optical principles which are applicable to his instrument for the very simple reason that his teachers are usually as ignorant as himself. In that somewhat more leisurely professional class which teaches biology, there is usually more information concerning the theory and practice of microscopy. A trained student from a biological laboratory does know a good deal about handling his instrument, but it is unnecessary to assume that to use a microscope properly it is essential to know all that is in the book. The diagnosis of tumors and the discovery of casts in the urine or even fairly minute histological studies can be accomplished without being acquainted with the niceties of illumination, fine points about the use of filters, and so on. How many pathologists have ever used a yellow-green light filter or put immersion oil on the top of the condenser so as to get a better image? These practical workers have all developed a certain rule of thumb in the use of their microscopes which is amply sufficient for their particular need. It is only the research worker who is forced to attend to the minutiae of microscopic manipulation. It is curious that much of the refinement in the construction and use of microscopes has been dependent upon the demands of the English amateur, who spent his time in resolving diatoms or studying crystals under polarized light for entertainment rather than for any addition to knowledge. The old English long tube instrument was certainly of imposing size and complexity and these wealthy amateurs were willing to pay the most famous

of the old lense makers, such as Tolles and Powell and Leland, handsome prices for specially made lenses, some of which are fully the equal of the best products of the modern factory. It was an Englishman, the father of Lord Lister, who made one of the most important improvements in the construction of microscope lenses, and who was so far ahead of his time that he drew up certain memoranda as to the production of apochromatic lenses fifty years before Abbe's discoveries were made. As to the possibilities of the new glasses which we owe to German efficiency, many of them were discovered by an English clergyman years before the Germans began their investigations. To the English amateur, also, we owe the use of highly corrected condensers, for the mechanical stage of which the latest model is a return to the old English mechanical stage of the 70's and 80's, and many other details the origin of which has long since been forgotten. The practical German shortened the tube length, making the instrument more compact, and introduced modern machine methods to cheapen the production of lenses, so that the so-called Continental model practically dominates the field today. Thus England and Germany are largely responsible for the modern microscope and its perfection, though two Americans, Tolles and Spencer, have made important contributions in the production of the fine special lenses which of recent years have become of importance in the investigation of the more delicate structures of the cell. Since the study of the mitochondria, Golgi bodies and cytoplasmic granules of various types have assumed importance and, especially since the discovery that the chromosome structure was correlated with heredity, cytologists have found it necessary to use the most powerful lenses and the best illuminating technic. It is to such specialists in minute structure that this book is mainly directed and the illustrative examples are largely taken from botanical material. In fact, one of the chapters is devoted to a list of 100 important objects for study, chiefly drawn from botanical subjects.

An excellent glossary and bibliography are appended. The book should be of the greatest value to those who are making microscopic studies with all the refinements of modern technic.

*Der Krebs des Menschen. Eine Morphogenetische Untersuchung*, by Dr. Eugen Bostroem. Published by George Theime, Leipzig, 1928.

Eugen Bostroem died May 24, 1928, in the seventy-eighth year of his life. He was one of the old-fashioned morphological pathologists

who had dominated the teaching of pathological anatomy since the time of Virchow. He was interested not only in human pathology but also in the veterinary aspect of the science and published many papers on the etiology and morphology of the actinomycotic group of diseases. The monograph under review appeared shortly after his death. It reflects many of the attitudes of the older generation. He valued morphology above everything and was suspicious of the results of experiments. In this regard he clears the ground instantly by saying that nothing has done more harm to the true study of tumors than the extraordinary over-valuation of the results of the experimental investigation of tumors and the uncritical transfer to human pathology of the information gained from the study of the various inoculable tumors in animals which biologically and fundamentally differ from human cancer. This is indeed an echo of the past and goes well with the original denial of von Hansemann that tumors in rats and mice were tumors at all. Bostroem's next step is to deny that the epithelium of a carcinoma of the skin is capable of growth, but rather that the increase in size of such a tumor is due entirely to the activities of the "omnipotent mesenchyme of the blood capillaries which forms the cancer cells." This goes back to Virchow's original view that cancer cells were formed from connective tissue. Bostroem fortifies this thesis with various morphological examples showing that around all neoplasms there exists an active proliferating capillary wall and he believes that he can trace the cells of skin epitheliomata to the adventitial cells of the capillaries. In this he entirely overlooks the work of many experimentalists, such as Mottram, Russ, Prime, Stevenson and others, who showed that animal tumors growing *in vitro* send out prolongations of the tumors into the surrounding medium, and that such prolongations, when transplanted in animals, reproduced the original growth exactly; and he also overlooks such work as Carrel's in cultivating through many generations the connective tissue cells of the Crocker rat sarcoma 10. The proof that these cells carry the tumor quality is obtained very simply by inoculating some of the transplants back into a rat, where the tumor with the characteristics of rat 10 grows at the point of inoculation.

Bostroem finds himself in some difficulty in regard to metastases but explains them by saying that they are due to the same stimulating tumor products acting on the tissue, thus causing the growth of the capillaries and change of mesenchyme into tumor cells at the new site. If he had seen, as the reviewer has, a double tumor of the same breast,

one solid carcinoma and one adenocarcinoma, each metastasizing into the same lymph node and keeping its morphological characteristics unchanged, he might have been in more difficulty, for why should the exact morphology of the primary tumor be reproduced at a distance? Unquestionably the influence of the connective tissue in shaping the growth of the tumors and their metastases has been somewhat lost sight of in the current view of the strictly local origin of carcinoma in the epithelium, but that Bostroem makes his point is extremely doubtful.

Even concerning tar cancer in mice he states that the "tissue of these cancers develops not in pre-existing completely developed epithelium but from the indifferent vascular germinal tissue" and that the response of a local irritation is rather an evidence of a general disease of the organism. There is only one step therefore to the statement on page 162 that the formation of tumors is an expression by the tissues of the metabolic disturbance deeply hidden in the organism and that cancer is merely an expression of a general disease of the body, the striking symptom of which is the formation of tumors. Further than this the general change in the body is produced by an enterogenous toxin. He describes cultural experiments on feces of cancer patients in which certain organisms have been isolated which he holds responsible for the appearance of the tumors elsewhere in the body and even cites a single case in which a vaccine made up from such organisms benefited the patient. It is evident that this monograph will add nothing to the deservedly great reputation which Bostroem has in the past enjoyed as a student and teacher of morphological pathology.

*Radium and Cancer (Curietherapy)*, by Duncan C. L. Fitzwilliams.

Published by William Wood & Co., New York, 1930.

The history of the use of radium in the therapy of cancer is a curious one. The first applications, as might be expected, were made by the French, who early introduced, under the leadership of Dominici, the use of heavy filtration and other technical methods. This work was carried on and developed, chiefly in America, though certain German clinics added greatly to our knowledge of the technic and the therapeutic value of radium or mesothorium rays in the treatment of cancer of the cervix. At the beginning of the War, this work was stopped and the interest in therapeutic use of gamma rays was transferred to America, where again further developments were made in technic. Of late the most important contributions have come from France, where Re-

gaud and his school have developed the use of high filtration introduced by Dominici and have added the notion that the employment of small quantities of highly filtered radium over a long period of time results in better effects than a larger quantity less highly screened for a short period. America has again swung away from the insertion of unshielded glass capillaries, as introduced by Stephenson, Duane, and Janeway, and in its present attitude is much influenced by the work of Regaud. In the last three or four years the English have suddenly taken up the use of radium on a large scale, supplying radium to various institutional centers from a large supply purchased through popular subscription and governmental aid, with the result that a number of books have recently appeared from the English workers giving the technic of application and indicating the results which may be expected. On the whole the English writers have been very conservative in their views, influenced perhaps by Howard Pinch's careful work in London. This small volume on Curitherapy gives the personal experience of a London hospital worker who found that with small quantities of radium and primitive technic, poor results were obtained, but with the use of larger amounts, higher filtration and more prolonged treatment, the end results were much more encouraging.

The illustrations both of patients and the diagrams for the insertion of needles are numerous and satisfactory. The whole attitude of the writer is conservative and not especially hopeful except in certain types, such as carcinoma of the face and of the uterus.

The writer's reaction toward surgery in combination with radium is in accord with the general attitude of workers in the field, but for end results reference must be had to the statistical publications from the larger European and American clinics as the writer's use of radium is too recent to draw statistical conclusions. Those who are using radium will find this small volume of practical value as illustrating a great variety of technical methods for application of radio-active substances.

*Medical Research Council. Medical Uses of Radium. Summary of Reports from Research Centres for 1928, Special Report Series No. 144.*

The Medical Research Council continues its valuable reports on the use of radium, drawing its material from the several groups of hospitals which have available considerable quantities of radio-active material. The technic of application is usually given. For cancer of the breast,

while the cases have not yet passed the five year period, a small number of cures have been obtained in inoperable patients, and a larger number in the operable ones.

The statistics for carcinoma of the cervix lead to the conclusion that the best results have hitherto been obtained by the use of the Stockholm technic or some modification of it. The material for the report on carcinoma of the oral region is too limited to permit the drawing of definite conclusions, though a certain number of patients have improved.

Good immediate results are reported from the insertion of needles in carcinoma of the esophagus.

The rectal cases have not been very encouraging. The same is true of the treatment of carcinoma of the bladder and prostate.

Good temporary amelioration is reported on a number of spindle and round cell sarcomata and even in three melanosarcomas.

The pamphlet is frankly intended to be merely a progress report and not to offer definitive conclusions.

*Studies on the Diagnosis and Nature of Cancer*, by various authors, being reprints of special articles from *The Cancer Review*, Wm. Wood & Co., New York.

One of the real accomplishments of the British Empire Cancer Campaign has been the establishment of *The Cancer Review*, a journal of abstracts. This, from its first appearance, has assumed a position as the best survey of the literature of cancer. Not only have the abstracts been excellent, but they have been, in a very high degree, critical. Inasmuch as such criticism has been made by workers of competence in the cancer field, they have formed a valuable criterion of the importance of the papers reviewed and, in not a few instances, have added essential references or additional information which should have been included in original papers.

Not the least important feature of *The Cancer Review* has been a series of reviews of special phases of clinical or experimental cancer research. A number of such surveys have been collected and printed in a small volume of 240 pages under the title of "Diagnosis and Nature of Cancer." Thirteen articles are thus reprinted: eight are concerned with the pathology, early diagnosis and treatment of cancer in specific regions; two concern metabolism of tumors and of the trophoblast. There is a short résumé of what we know concerning heredity in relation to cancer; a review by Major Greenwood of some recent statistical



studies and a long survey of immunity to transplantable tumors by Wm. H. Woglom.

The first paper by Morson is on the early diagnosis and treatment of cancer of the bladder. Its brevity is an evidence of the difficulty of early diagnosis and of the futility of much of our treatment. There is nothing new from the diagnostic side, but as regards treatment, the author's attitude varies considerably from that of many workers in his specialty. He apparently thinks it is impossible to remove a carcinoma at the base of the bladder by surgical methods, and in view of the remarkable work of Beer in this country, it might have been well to have dilated somewhat more on the subject of electro-coagulation. The author seems, on the whole, to favor radium. He speaks of one of the most striking results obtained from radiation as the rapid cessation of hemorrhage, but this cessation may be obtained without opening the bladder and inserting radium, by the suitable application of X-rays.

The suggestion that injection of a two per cent solution of a sodium salt of fluorescein is of benefit in aiding the lethal effects of the radium is based upon the old error, so often repeated, that fluorescent substances act in combination with radiation on the analogy, apparently, that they fluoresce when exposed to light. Of course, this has nothing to do with the situation. The effects of radium and x-ray are almost, if not wholly, electronic, and have nothing to do with fluorescence, which is a molecular phenomenon. If the fluorescein in any way acts as an adjuvant to the radiation, it is solely by its own toxic action being added to the destructive effect of the radiation and not because of any biological symbiosis, so to speak.

Handley's paper on the operative treatment of breast cancer follows the line on which he has been writing for years and emphasizes the advantages of the use in operation of what he calls the diathermic knife. It is very important that experienced operators like Handley are testing the value of this type of instrument, which has been subject to so much propaganda. It is only by comparing large series of cases, one half operated upon by the scalpel and one half by the diathermy knife, for a five-year period, that any conclusion can be reached.

Lockhart-Mummery has a chapter on the early diagnosis of cancer of the colon which, as might be expected from this author's experience, is excellent, completely covering the subject and stressing the importance of disregarding negative x-ray findings.

Kerley has an excellent chapter on the symptomatology and diag-

nosis of carcinoma of the lung. He says that he thinks it is probable that a heavy radiation of the chest with radium would be of benefit, though he acknowledges that deep x-ray is of no value. Thus, the belief in the magic qualities of radium still clouds our therapy.

Wyard's chapter on the diagnosis of cancer of the stomach and St. Clair Thomson's on diseases of the larynx are good short surveys of the subject.

Cannan discusses the glucose metabolism of tumors and wisely avoids any definite conclusions as to the meaning of the complex observations which have been published.

Cockayne surveys the question of heredity. Strange to say, he omits from his bibliography one of the best papers on the subject, that of Wells' (Influence of heredity on occurrence of cancer, *J. A. M. A.* 81:1017-1021 and 1103-1112, 1923). His conclusions will not satisfy the more strenuous members of the genetic group. They are that "there may be an inherited susceptibility to cancer in normal tissues, and in the case of some animals there is already experimental evidence to the effect, but at present it is too scanty and too incomplete for it to be reviewed with advantage. Whether it plays a part in the case of human cancer and, if so, how great a part it plays are questions still problematical and still less ripe for discussion."

Major Greenwood's conclusions, drawn from recent statistical publications, reflect the caution of the well-trained statistician. As regards the alleged increase of cancer, of which so much has been made by the propagandists, he has only to say that there has been no decrease and probably an increase of the real rate of mortality for cancer; but the records of the countries with the most highly-developed systems of vital statistics indicate that this increase is slowing down. "The time is still distant when the data on all civilized countries and subdivisions of these countries will be strictly comparable."

Wegelin gives a good survey of malignant diseases of the thyroid and Cramer collects the facts concerning metabolism of the tropoblast.

Kolodny gives a short résumé of the primary bone tumors which repeats some of the errors of his original monograph (*Supp. I. Surg. Gynec. and Obst., Bone Sarcoma: The Primary Malignant Tumors of Bone and the Giant Cell Tumor. The Surgical Publishing Co. of Chicago, 1927.*)

The volume closes with a long review by Woglom on immunity to transplantable tumors. So much rubbish has been published on this subject that it is a great satisfaction to have the whole question criti-

cally summarized by an expert. His conclusions are that the immunity which is observed against transplanted tumors is the expression of the resultant of the capacity of the host to destroy incompletely adapted cells and the growth vigor of the cells so employed. Thus, a very actively-growing mouse tumor may survive for a month after inoculation into a rat while a less malignant tumor lasts only a few days, but the immunity in this case is absolute; no mouse tumor can continue to grow in the rat indefinitely. From this point on there are all shades of immunity to the same tumor. The given rat tumor may disappear in 100 per cent of instances in one strain of rats whereas another strain of animals may grow 100 per cent and none disappear. In this case it is evident that the tumor is the same, but that its adaptation to the various hosts in which it has been grafted differs. This is what may be called spontaneous immunity. The immunity which is artificially produced by the injection of living cells before the graft is placed in position is effective only for certain types of tumors, and is entirely powerless against an established neoplasm. "There is no evidence, therefore, that a successful therapy is likely from such a procedure."

This survey of the contents shows that the volume should interest not only the clinician who wants a ready résumé to refresh his diagnostic armamentarium, but also contains a mass of information derived from the last twenty years of experimental investigation on animal tumors which will no doubt be of value to the research worker.