he points out two items of particular interest to those who treat patients with radioactive iodine. The first is that single doses of ionizing radiations from I^{131} have produced malignant thyroid neoplasms in rats but have failed to do this in mice, resulting instead in tumorous enlargements of the anterior lobe of the hypophysis. We may wonder whether man will turn out to be affected by I^{131} like the rat or the mouse. The second point is that as far as the capacity to collect and bind iodine in thyroid cancers is concerned, man and the experimental animal are similar. Since most cancers of the thyroid gland in man and the experimental animal "have lost much of their ability to collect iodine compared to that of the normal thyroid gland, it seems reasonable to conclude that quite similar explanations may exist for these functional changes of thyroid gland carcinogenesis in both animals and man."

The latest theories regarding the electronic structure and carcinogenic activity of aromatic molecules is nicely presented by Pullman and Pullman. In their latest thinking they are able to include the metabolic reactivity of carcinogenic hydrocarbons in their general theory by postulating a special reactivity of the K region with cell constituents. Since the L region is rather inactive, and the K region is tied up thus in cell attachment, metabolic attack occurs at still a different locus on the molecule, the M region.

> "This conception establishes a bridge between the chemical and the metabolic reactivity of carcinogenic hydrocarbons, and enables us to include them both in a homogenous theory."

Some aspects of carcinogenesis by Rondoni include an interesting comparison of the neoplastic transformation of the cell with a process of protein denaturation. Since denaturation brings about a change in the shape of the protein molecule, and there is generally an increase in asymmetry, there is also an increase of reactivity of certain groups, such as the sulfhydryl groups of cysteine, and the phenolic groups of tyrosine, owing to the unmasking of these groups by the uncoiling of the chains. The denatured proteins can not be crystallized because of the disorganization of the internal structure. Here, therefore, are some of the changes, which may equally occur in the proteins of the cell subjected to malignant transformation. An increase of entropy takes place in the process of denaturation just as it most probably does in carcinogenesis.

A masterly review of all that is known about pulmonary tumors in experimental animals is given by Shimkin. Reading this review emphasized for me the great difference between human lung cancer and the pulmonary tumors in experimental animals.

The oxidative metabolism of neoplastic tissues is discussed in a superb review by Weinhouse. Beginning with the concepts of Warburg based on the observations that aerobically, glycolysis was on the average seven times as high in tumor slices as in non-growing tissues, and the mistaken concept that a disturbance of respiration was the cause of aerobic glycolysis, he traces the development of present theory. For example, because of the high aerobic glycolysis the decrease in glycolysis due to oxygen is lower percentagewise in tumors than in most normal tissues. For this reason a low Pasteur effect has been mistakenly attributed to cancer cells. The misconception was corrected by the observations that the Myerhof Quotient for tumor tissue was by and large the same as for normal tissues. He concludes that:

> "It is evident from the foregoing discussions that there is little in favor of the Warburg hypothesis. The high glycolysis of tumor tissue, whatever its cause, does not appear to be due to a radically altered respiratory metabolism—whether of electrons or carbon. It is possible, of course, that certain tumors, low in certain enzymes or cofactors of respiration, may have a 'bottleneck' in electron transport which might conceivably tend to raise the level of lactic acid accumulation. We have already seen that many are low in pyridine nucleotides and cytochromes. On the other hand, we have no idea as yet what constitutes an optimal content of enzymes or coenzymes for the proper functioning of an intact cell. There is no good basis for the assumption that a tissue containing a small amount of a coenzyme or exhibiting a low assay value for a particular enzyme has a necessarily impaired metabolism. At any rate, it is difficult to see how any such effects can play an important part in the high glycolysis of the large bulk of tumors of the most varied origins, which have a moderate to high rate of oxygen consumption and hence have no apparent difficulty in transferring electrons."
>
> "It seems to the author that a proper understanding of the high glycolysis of neoplastic tissue will require a knowledge of the factors which regulate and control cellular metabolism. Unfortunately, we have little knowledge of any sort as yet concerning how metabolic processes are regulated in cells. It is assumed that many aspects of carbohydrate and lipid metabolism are controlled or directed by various hormones—particularly those of the pancreas, pituitary, thyroid and adrenal glands. That these substances may not exert the same effects on metabolism in tumors as they do in the non-neoplastic tissues of the host may be considered an intriguing possibility. Unfortunately, we are faced with the fact that we still have no idea how any single hormone affects a particular enzymatic reaction. Until we learn more concerning the metabolic sites of action of hormones, it is impossible to do more than speculate concerning their possible regulatory role in cells."

The third volume is a worthy successor to its outstanding predecessors.

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Tungsten. Its History, Geology, Ore-Dressing, Metallurgy, Chemistry, Analysis, Applications and Economics. BY K. C. LI, M.E., A.R.S.M., Chairman and Chief Engineer, Wah Chang Mining Corporation, and CHUNG YU WANG, M.I.M.M., A.I.M.E., Director of Research, Wah Chang Corporation. American Chemical Society Monograph No. 94. Third Edition. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1955. xx + 506 pp. 16 x 23.5 cm. Price $14.00.

The demand for a revision of the second edition of "tungsten" by Li and Wang, published in 1943, is due, at least in part, to a sustained and growing recognition of the importance of the high melting refractory metals in modern technology. The operation of many electrical and electronic devices depends on the properties, such as high melting points and low vapor pressures, of critical metallic components. Tungsten, by virtue of having the highest melting point of the group and the associated properties, occupies a unique position in this field; its processing and its uses are in many respects typical of the refractory group as a whole.

K. C. Li played a major role in the discovery of tungsten ore deposits in China and his interest in its geology and ore processing are reflected in the emphasis on these topics. The chapter on geology comprises almost a quarter of the text and is an authoritative description of all important deposits, their location and geology. The chapter on ore dressing describes the use of gravity, flotation and other processes in the concentration of tungsten values and also describes in detail the methods of ore treatment used in several typical tungsten milling plants. The literature is well covered by citations of patents and technical papers.

The preparation of tungsten metal powder is discussed under three headings; the decomposition of tungsten ore, the purification of tungstic oxide and the production of tungsten powder. The processing of tungsten powder into wire is described. The manufacture of tungsten carbide and of sintered carbide composits is described, as is the production of ferrotungsten. Chapters on the chemistry of the metal and on analytical procedures are comparatively brief but are adequate.

The industrial applications of tungsten are discussed mainly in terms of the composition of a large number of proprietary alloys and materials. The economics of tungsten are discussed in a separate chapter and in appendices.

The authors are to be commended for an extensive bibliography, particularly of the patent literature. The general format of the book is in keeping with the high standards of the ACS monograph series. It is a text that deserves a place in the library of all geologists and metallurgists interested in tungsten and its alloys.

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