The book is provided with a good index of persons and subjects. The frontispiece is an interesting old astronomical plate, with figures of Copernicus, Galileo and Kepler, reproduced from the fifth edition of John Wilkins's "Discourse Concerning a New World and Another Planet." The volume is printed on heavy paper, almost like cardboard—a little too inflexible for convenient turning of the pages. It is cordially recommended not only to all chemists but to every student of the history of science.

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Die Vitamine, Kritische Uebersicht der Lehre von den Ergänzungsstoffen. VON RAGNER BERG, leiter des physiologisch-chemischen Laboratoriums auf Weisser Hirsch. (Germany.) Zweite, umgearbeitete Auflage. S. Hirzel, Leipzig, 1927. pp. 714, with subject index, author index and a bibliography of 3,500 titles.

THIS monograph is an able and useful treatise on *nutrition,* with special reference to the vitamines. It is much more than a manual on the vitamines. For example, we have comprehensive and critical chapters on the biological value of the different proteins, on mineral metabolism, on diet as related to growth, on nutritional edema and on pellagra, in addition to shorter sections on sprue, on "Mehlnährschaden" and on "Milchnährschaden." In the chapter on beri-beri and the various forms of polyneuritis the author gives a full and fair account of the data and views of the Japanese investigators who claim that human beriberi is a different, or at least a more complicated, disease than the acute polyneuritis induced in animals by vitamine B free diets. The work of Evans, Sure and others on the so-called fertility vitamine (E) is reviewed in the chapter on "Growth," but Berg does not recognize this work as having demonstrated a new vitamine.

The final chapter includes an extensive table showing the distribution of the vitamines in foods. Here the author deviates from the usage in English nutrition literature in designating the antiarchitic vitamine as "E." In English and American nutrition literature this vitamine is usually given the letter "D," while "E" is being applied to the fertility vitamine of Evans and Sure. This is an unfortunate confusion.

The author is critical, catholic and fair in the treatment of the extensive literature. In the preface he extends special thanks to American investigators for sending him reprints and monographs in the vitamine field. The monograph ranks with the best on the subject.

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SPECIAL ARTICLES

A PRELIMINARY REPORT ON THE STUDY OF THE EMISSION SPECTRA AND SURFACE TENSION ALTERATIONS IN EXPERIMENTAL ANIMAL TUMORS[1]

IN the Emery Laboratory of Experimental Radiology and Roentgenology an earnest effort has been made to study, from the physical and physical-chemical point of view, the initial alterations undergone when a cell is transformed from a state of normality to one of malignancy, and the resulting physical-chemical and biological changes accompanying such manifestations. A portion of the work, that already completed, has proved fruitful and has been reported on numerous occasions by one of the writers and shall not be included in this preliminary announcement which deals entirely with our studies of spectrum analysis and surface tensions.

Knowing the physical nature and modus operandi of the various spontaneous and induced radiations at our disposal, we feel that the true action of radium and roentgen therapy must be accurately studied and controlled to bring about a scientific treatment of the most dreaded disease which the medical and allied professions are called upon to combat.

To the present time, the portion of our researches reported in this communication have been confined almost entirely to the behavior of normal and cancerous tissues which have not been subjected to any form of ray therapy. This is necessary before we are able to study any effect resulting from treatment by radiation.

These investigations have offered results which are of extreme scientific interest and importance.

First, we shall consider the method and scope of our researches in the field of spectroscopy.

All animals used were killed by decapitation to eliminate the possibility of a tissue change due to the prolonged administration of ether anesthesia.

In order that all types of normal tissue occurring in the body might be studied, the heart, peritoneum, lungs, liver and brain from one or more rats were removed, weighed, ignited in a platinum crucible and thoroughly ashed in the flame of a blast lamp. When sufficiently cooled, the sample was again weighed, and the percentage of ash calculated, the ash then being reduced to a homogeneous powder in a chemically clean agate mortar.

In order that each of the organs previously men-

[1] From the Emery Laboratory of Experimental Radiology and Roentgenology, Hahnemann Medical College and Hospital, Philadelphia.

tioned might be studied separately, individual ashes were prepared as just described.

In the preparation of the pathologic ashes, the tumors were removed from the decapitated animals, freed from any undesirable portion and ashed in exactly the same manner as were the normal tissues. A portion of each tumor used was reserved for microscopic verification.

Preliminary work with the spectrograph disclosed a striking difference of intensity of certain lines common to the spectra of the normal and the pathologic ashes, and showed that this difference varied with the time which elapsed between the striking of the arc and the exposure of the plate. To study this variation, and to make the conditions of the experiments as uniform as possible, the following procedure was adopted.

An uncored carbon was drilled with a one-sixteenth inch drill to a uniform depth of three-sixteenth inch. The carbon, so drilled, was placed in a small arc lamp and allowed to burn for three minutes, at the end of which time a spectrogram of the carbon was taken. The hole was then filled with the ash to be tested, the arc struck and a series of exposures made without interrupting the current.

To insure exposures of equal lengths and equal intervals between successive exposures, a pendulum bob was swung between the arc and the slit of the spectrograph, the photographic plate being moved while the light was intercepted by the bob.

Twelve exposures were made on each plate, each exposure being 1.8 seconds, and the interval between exposures 0.2 second.

As the dispersion of the quartz spectrograph used in the above experiments was too small to admit of reliable determinations of wavelengths, recourse was had to a larger instrument. With this, using panchromatic plates, the linear distance between $\lambda = 5300$ and $\lambda = 2900$ A.U. was 16 cm. The distances between the lines were measured with a photomeasuring micrometer, and the wavelengths read from a large dispersion curve plotted with points obtained from the arc lines of copper.

Measurements extended from $\lambda = 2680$ to $\lambda = 4979$ A.U. These values check very closely with the wavelengths of sodium as found in Kayser and Runge tables of wavelengths.

In practically all cases of the normal tissue ash, the sodium lines, which were of feeble intensity in the first exposure, disappeared after the third or fourth exposure; the rest of the spectrum persisted until the ash had been consumed.

With neoplastic tissue ash, the sodium lines in the first exposure were very intense. In most cases, some of the lines of other elements present were very faint, but generally appeared intense in the third or fourth exposure. The intensity of the sodium lines remained constant until all the ash was consumed.

Due to the present limited spectroscopic equipment of the Emery Laboratory, we have been unable, to the present time, to substantiate any other possible variations aside from the excess sodium content of neoplastic tissue, but with increased facilities we hope to be able to detect, by means of further study of the emission spectra, absorption spectra and the spark spectra of the vapors given off during the preparation of the ashes, any and all variations which have occurred during the malignant cell change, and the alterations brought about under the influence of radiation.

Spectrograms of many different normal and pathologic ashes have been made, using for the pathologic ashes many of the known and recognized strains of experimental animal tumors, as well as spontaneous tumors received from the Wistar Institute of Anatomy and Biology. For the normal tissue ashes, all possible variations of rats—sex, age and breed—were employed.

An interesting verification of the above finding was made by titrating with N/100 sulphuric acid solutions made from the normal and neoplastic tissue ashes. The amount of acid found necessary to neutralize the alkali of the neoplastic tissue was more than double that for the normal tissue ash.

For the study of surface tension, tissues from normal rats—tumors and irradiated tumors—were employed, always using a portion of the same tissues which were at the same time prepared for spectrum analysis.

In preparing the material (normal or pathologic tissues) for the surface tension determinations, a weighed amount of tissue was agitated at a uniform rate with ten times its weight of double-distilled water in an alkali-free glass tube and shaking machine, designed and constructed for the purpose.

At the end of thirty minutes shaking, the tube contents are transferred to an alkali-free glass tube, well sealed, and allowed to stand for five minutes.

After the initial separation has taken place, the supernatant liquid is withdrawn and placed in Pyrex glass tubes and centrifuged at a high speed for ten minutes.

The material freed from insoluble particles, is transferred to alkali-free glass containers, sealed, labeled, and is then ready for the tests.

For the determinations the du Noüy surface tension apparatus was employed, the ring being flamed between succesive readings.

Our results obtained from tissues prepared as just described, were as follows:

(1) The dynamic surface tension of solutions of normal tissue is, in general, lower than that of solutions of pathologic tissue (carcinoma and sarcoma) prepared at the same time.

(2) The dynamic surface tension of solutions of both normal and neoplastic tissue kept in closed vessels, in general, increases with time.

(3) The rate of increase is *less* for solutions of normal tissue and tissue which has been radiated than for solutions of untreated neoplastic tissue.

(4) The tension reaches a nearly constant value in one to three weeks (depending upon the nature of the solution) which is slightly (one or two dynes) higher than that of distilled water at the same temperature.

(5) The temperature coefficient of the tension is greater than that of distilled water, being larger for solutions of normal than for solutions of neoplastic tissue.

(6) Upon cooling the solutions to the original temperature, the tension is always lower than at a corresponding temperature on the heating curve, an effect which is more pronounced for solutions of normal tissue.

The above results are consistent with the theory that the value of the dynamic surface tension of a solution of tissues is depressed below that of the solvent (distilled water) by the action of the colloidal particles from the tissue and that these particles undergo transformation with time in such a manner that salts are formed which ultimately cause the tension to be elevated slightly above that of distilled water. Due to the presence of excess salts in the solutions of neoplastic tissue, the tensions of such solutions are higher than those of normal tissue, and their rate of increase is more rapid, since the salts tend to coagulate its protein content of the colloidal material.

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AN ATTEMPT TO CORRELATE THE JOULE MAGNETOSTRICTIVE EFFECT AND HYSTERESIS LOSS IN A SERIES OF NICKEL STRIPS

IN a very interesting study of the parallelism of the Joule magnetostrictive effect and the hysteresis loss in nickel as different degrees of tension were applied to the rods, Wwedensky and Simanow[1] found a very striking correlation between the two. This parallelism between magnetostriction and hysteresis loss seems to be borne out by the work of McKeehan and Cioffi,[2] who found that at approximately 81 per cent. of nickel in permalloy no magnetic change in length occurred and also the hysteresis loss was negligible.

In the first paper mentioned, this parallelism was obtained by varying the tension and in the second paper by varying the amount of nickel present.

The author has been studying[3] the magnetic properties of a group of eleven strips of nickel, all cold rolled from the same heat of nickel. These strips were cold rolled to varying thicknesses and thus a series of nickel strips with different degrees of hardness were obtained. If the change in length of these strips for any given field strength and the hysteresis loss are plotted against the hardness values of the same strips, the curves thus obtained ought to show a similarity if the parallelism is a constant for all factors imposed on nickel.

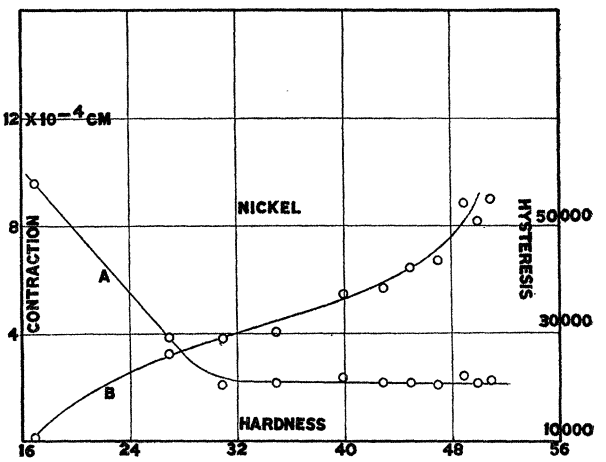

FIG. 1

Curves showing this relation are given in Fig. 1. The values for the changes in length of the various strips were those obtained when a field strength of 57.7 gauss was applied to each one of the specimens of nickel. The same relation would hold for any other field strength. The hysteresis loss per cubic centimeter per cycle is for B_{max} carried to a point of saturation. Curve A presents the relation between the hardness and the contraction of the various strips, while curve B is the corresponding curve for the hysteresis losses.

The results seem to indicate that the hardness factor does not produce a parallelism between hysteresis and magnetostriction.

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[1] Wwedensky and Simanow, *Ztschr. f. Physik*, 38, p. 202, 1926.

[2] McKeehan and Cioffi, *Phys. Rev.*, 28, p. 146, 1926.

[3] Williams, Trans. A. S. S. T., 1926.