material will be best indicated to mathematicians by saying that the Lebesgue integral is nowhere mentioned —a limitation which to the reviewer seems a wise one. As an instance of this material may be mentioned Harald Bohr's simple theorem that $y = \log \Gamma(x)$ is the only "convex" solution of the functional equation $y(x+1) - y(x) = \log x$ such that $y(1) = 0$. This shows the interesting fact that the gamma function, $\Gamma(x)$, is uniquely characterized in the real domain by its well-known functional equation and the condition that $\log \Gamma(x)$ is a convex function.

It is certain that all American mathematicians will feel grateful to the author, Professor Courant, and also to the translator, Professor McShane, for their cooperation in making this excellent text-book immediately available to our mathematical public.

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RADIOACTIVITY

Radioactivité. By MADAME PIERRE CURIE. Paris: Hermann et C^ie^, Editeurs, 6, rue de la Sorbonne. 563 pp., price, 150 Fr., 1935.

FINISHED in 1934 at the death of Madame Marie Curie and seen through the press by Irene Curie-Joliot and Frederic Joliot, this book deals mainly with the classical phenomena of radioactivity. The first part (p. 1–125), serving as a brief introduction into modern physics, has as a sub-title: "Ions, Electrons and X-rays." It contains in some detail the more old-fashioned methods of ionization measurements; modern equipment (counters, Wilson cloud chamber, etc.) are referred to in the second part, but only briefly. The treatment of the many phases of modern physics touched upon is rather sketchy, but references are given in this first part to more extensive texts for the student who wishes to study the different subjects in detail.

The second part of the book is devoted to radioactivity proper. The discovery of the radio elements and the chemical methods of extraction and purification are discussed in some detail. The theory of radioactive transformations is developed and illustrated with examples; the analysis of the decay curves is carried out for the most important cases. The chapters that follow (203–335) are devoted to the discussion of the radioactive radiations and their properties. In these chapters the results of the modern investigations (both experimental and theoretical) are given, but without derivations or any detailed discussion.

Artificial disintegration, the discovery of the neutron, the positron and of artificial radioactivity are briefly discussed (p. 367–389). A few pages (389–401) are given to the discussion of the structure of the atom and the modern theory of radioactive disintegration. The remaining chapters deal with the effects produced by the radiations, the classification of radio elements and their chemistry and a brief discussion of radioactive families. An appendix contains numerical tables useful for the student of radioactivity.

Throughout the book facts and not problems are discussed. A serious handicap for the student and the non-specialist who wants to study the subject is the complete absence of literature or quotations. The book which covers the work done over a period of more than 30 years will be of small value for the beginner, for whom, according to the plan, it is intended because of this serious lack of references. Since derivations are only given for the most elementary formulae, it is necessary to consult the originals to understand the full meaning of the results. This, however, has to be done by using other references, since no quotations are given where, or even when the work was published. An appendix giving the necessary references would enhance the value of the book considerably. A number of excellent photographic plates accompany the discussion of the different subjects.

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SPECIAL ARTICLES

DETECTION OF CRYSTALLINE SILICA IN LUNG TISSUE BY X-RAY DIFFRACTION ANALYSIS

IN the analysis of lung tissue for silica, present chemical methods permit only the estimation of total silica. It is not possible to differentiate between free and combined silica or between crystalline and amorphous silica. When such a differentiation is attempted by the application of petrographic methods to a study of lung ash, the results are frequently unsatisfactory because, first, the silica may react with the alkaline constituents of the ash at the high temperature (500° C.) necessary for the elimination of carbon and, secondly, the particles may be so small that they can not be rigorously identified. It is thus highly desirable to develop a procedure for the study of the inorganic constituents of lung tissue which does not involve the destruction of the organic matter and which may be applied to particles of extremely small size. Our preliminary experiments, which we are now reporting, indicate that such a procedure may be based upon an application of a suitably refined x-ray diffraction technique.

In the present investigation the lung tissue was hardened in a dilute solution of formaldehyde, dried in vacuo at 70° C., ground to pass a 40-mesh sieve, and dried further to constant weight at 105–110° C. Following a chemical analysis for total silica, according to the method described by Sweany, Porsche and Douglass,[1] very thin samples (0.2–0.3 mm in thickness) were subjected to diffraction analysis. The x-ray beam, collimated by two 0.020-inch pinholes, was supplied by a Philips-Metalix tube with a copper target, operating at 20 ma. under an applied potential of 27KVP. The use of thin specimens necessitated exposure times as long as 14 hours, but it was found that with this type of sample, the large amount of organic material present did not mask the pattern of the inorganic constituents. The effect of the tissue was noted in the scattering near the central spot and in the broad halo 3.6 cm in diameter (5.0 cm plate to specimen distance).

In the case of a lead and zinc miner, who had been exposed to silica dust for 40 years and who died of silicotuberculosis, the chemical analysis of the dry lung tissue showed a silica content of 0.90 per cent. (ash 5.38 per cent.), and the diffraction pattern showed very distinctly the characteristic 3.34 A. U. spacing of quartz. Likewise, the lung tissue (silica 1.02 per cent., ash 13.32 per cent.) of a rock miner, who had been exposed to dust for a period of 18 years and who died 8 years later of silicotuberculosis, gave an x-ray diffraction pattern on which this quartz spacing, in addition to numerous other lines, was clearly discernible. In marked contrast to the above is the case of a 72-year old man who had farmed all his life. The lungs showed multiple healed nodular calcifications. Although the silica content was 0.63 per cent. (ash 13.72 per cent.), there were no pathologic evidences of silicosis. In the x-ray diffraction pattern there were several lines closely resembling those given by a typical tuberculous calcification, but the 3.34 A. U. line of quartz was absent. Hence, we may conclude that quartz was not present in any appreciable quantity and that the silica indicated by the chemical analysis was probably largely derived from silicates. Here, then, is a possible explanation of the fact that no silicotic condition existed, even though the silica content was about six times that of normal lung tissue and three times the amount that usually produces silicosis.

In the study thus far it has been possible to detect quartz in lung tissue containing as small an amount as 0.26 per cent. silica. Further refinements of technique incorporating the application of the recently reported monochromators may permit the detection of even smaller amounts. Quantitative studies based upon the method of Clark and Reynolds,[2] suitably modified to avoid the effects of the organic material, are in progress.

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[1] Sweany, Porsche, Douglass, *Arch. Path.*, 22: 593–633, 1936.

[2] Clark and Reynolds, *Ind. and Eng. Chem., Anal. Ed.*, 8: 36, 1936.

PROLONGED SURVIVAL OF ADRENALECTOMIZED RATS TREATED WITH SERA FROM CUSHING'S DISEASE[1]

IN the latest issue of *Endocrinology* (November, 1937) McQuarrie, Johnson and Ziegler[2] present data on the electrolyte balance in the blood of a patient with Cushing's disease which lends support to the view that this disease is essentially a state of hyperfunction of the adrenal cortex. This evidence upholds the contention of Bauer,[3] held since 1933, that Cushing's disease is primarily the result of a hyperfunction of the adrenal cortex—so much so that he prefers to call the disease "Interrenalismus." Most of those who have written on phases of Cushing's disease have, however, clung to the original hypothesis of Cushing that the primary site of the disease is in the basophil cells of the pituitary.

McQuarrie and his associates demonstrated admirably how Cushing's disease is the direct opposite of Addison's disease from the point of view of clinical signs, electrolyte balance and response to therapeusis. We were independently led to the same conception of the syndrome and have hence treated two patients with Cushing's disease with a regimen of high potassium and low sodium (patients with Addison's disease are given low potassium and high sodium diets) and with x-ray therapy to the adrenals—a treatment to which one of the patients responded in a gratifying manner. Furthermore, it seemed reasonable to suspect the presence of an overabundance of adrenal cortical hormone as being the means by which the syndrome was called forth. Accordingly, under the conditions of experiment outlined below, the sera of the two patients were injected into adrenalectomized rats. The survival periods of these rats were longer than those similarly adrenalectomized and injected with the serum of normal individuals.

It should be pointed out that both patients under discussion showed the classical signs of Cushing's disease. There was obesity of facial, shoulder and trunk distribution, relatively sudden gain of weight of fifty

[1] Aided by grants from the Board of Research of the University of California and the Rockefeller Foundation of New York City.

[2] I. McQuarrie, R. M. Johnson and M. R. Ziegler, *Endocrinology*, 21: 762, 1937.

[3] J. Bauer, *Klin. Wschr.*, 12: 1553, 1933.