but there were never any indications of growth or cell division.

There has been but a single claim for isolation of this species. Kutscher identified one of his pure cultures as *Sp. volutans* Ehbg., but his identification was questioned by Migula.[7] According to Migula, the organism isolated by Kutscher should be designated as *Sp. giganteum* (Kutscher) Migula. This has caused considerable confusion since many workers employed Kutscher's organism in their studies on the cytology and physiology of bacteria, and referred to the organism as *Sp. volutans*. The illustrations by these workers bear little or no resemblance to the true *Sp. volutans* Ehbg. There seems, therefore, no reason to believe that this species has yet been isolated.

A cytological study of the several species has been completed and will be published elsewhere. The pure cultures have been deposited in the American Type Culture Collection.

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OXIDATION OF SULFANILIC AND ARSANILIC COMPOUNDS BY NASCENT HYDROGEN PEROXIDE

OTTENBERG and Fox[1] have reported that colored products appeared following ultra-violet irradiation of dilute solutions of sulfanilamide. The blue-violet products seemed of particular interest. Fox, Cline and Ottenberg[2] as well as Rimington and Hemmings[3] emphasized that the formation of the blue derivative involves an oxidation of sulfanilamide, since the presence of oxygen is necessary for the formation of the blue-colored irradiation product.

Oxidation of sulfanilamide by chemical means to a blue product had not been accomplished, when Fox, Cline and Ottenberg published their article.[2] In the meantime I[4] have reported that, under certain experimental conditions, solutions of sulfanilamide treated with oxygen form hydrogen peroxide and a blue-violet compound which is reversibly reducible and oxidizable. The hypothesis was advanced that the formation of this blue-colored substance may be due to the influence of nascent H_2O_2. In further experiments being published in detail elsewhere it was found that nascent hydrogen peroxide as formed on autoxidation of hydrazine solutions (Gilbert,[5] Schales[6]), in presence of cupric ions oxidizes sulfanilamide promptly to blue-violet derivatives. These substances are reversibly reducible and oxidizable, and, when freshly formed, extractable with amyl and butyl alcohols and other organic solvents. They are comparatively stable in those solvents but unstable in water, losing extractability and changing color.

Among related compounds studied arsanilic acid behaves in a manner comparable with sulfanilamide. The blue-violet butyl alcoholic extracts obtained from sulfanilamide and arsanilate showed an absorption spectrum practically identical in shape (maximum absorption at about 590 mμ). The identity of the two blue compounds is probable. It would be expected that if these compounds had retained their characteristic side-chains there would be a greater difference in the absorption spectra. If the oxidation products are identical the side-chains must have been lost. It is suggested that therapeutically or toxically active derivatives formed *in vivo* also may lack the characteristic side-chains of the original substance.

Rosenthal and Bauer[7] recently published in this journal the extremely interesting observations that on oxidation of sulfanilamide by means of ultra-violet irradiation or ferric chloride and hydrogen peroxide the sulfonamide group is split off. My studies of the spectroscopical behavior of the blue oxidation products obtained from sulfanilamide and from atoxyl lead to a similar conclusion.

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SCIENTIFIC BOOKS

THE CALCULUS

Introduction to the Calculus. By ARNOLD DRESDEN. xii + 428 pp. New York: Henry Holt and Company. 1940. $3.40.

THIS book, as its title indicates, is designed as an introduction to the calculus, presumably for students of sophomore age. It is particularly noteworthy, inasmuch as it is the first serious attempt among American text-books to introduce the subject in a rigorous and logical manner. The first two chapters, about sixty pages, of the book, are devoted to the essentials of the

[7] W. Migula, "System der Bakterien." Jena, 1900.

[1] R. Ottenberg and Ch. L. Fox, Jr., *Proc. Soc. Exp. Biol. and Med.*, 38: 479–481, 1938.

[2] Ch. L. Fox, Jr., J. E. Cline and R. Ottenberg, *Jour. Pharmacol. and Exp. Therap.*, 66: 99–106, 1939.

[3] Cl. Rimington and A. W. Hemmings, *Biochem. Jour.*, 33: 960–977, 1939.

[4] G. Barkan, *Proc. Soc. Exp. Biol. and Med.*, 41: 535–537, 1939.

[5] E. C. Gilbert, *Jour. Am. Chem. Soc.*, 51: 2744–2751, 1929.

[6] O. Schales, *Ber. Dtsch. Chem. Ges.*, 71: 447–460, 1938.

[7] S. M. Rosenthal and H. Bauer, SCIENCE, 91: 2369, 509, May 24, 1940.

theory of point sets and of continuous functions. From that point on the book treats in more or less standard order the usual topics of the differential and integral calculus, with the exception that the proofs are placed on a more rigorous footing. These proofs are not always given in complete detail. They are deliberately curtailed in order to keep the essentials clearly in focus. In some cases the parts omitted are included in the exercises. For example, the derivation of the formula for the derivative of a function of a function, left incomplete in most text-books, is here carried to a point so near completion that the student can fill in the details. The book does not entirely solve the logical difficulties of the teacher resulting from the necessity of a choice in the order of topics. In some cases forward references are necessary. Thus the "Law of the Mean" is used on page 92, while it is proved on page 117.

The topics are concerned mostly with functions of one variable. There is, however, one chapter on double and triple integration. Also, partial differentiation is defined and used (in Chapter 4) to obtain the derivatives of functions defined implicitly. The book ends with two chapters on differential equations.

A problem which confronts the teacher of students who wish to make use of the calculus in the applied sciences is how to introduce the subject of integration early enough. The text under review solves it by introducing problems on inverse differentiation in with those on differentiation. The definite integral is introduced in Chapter 12, in characteristic fashion, with the proof that its defining limit exists for any continuous function! The author admits that the student, meeting the subject for the first time, might wish to omit such a proof. In fact, he points out that the traditional course "can be extracted from the book by omitting the proofs of theorems." In spite of the rigorous point of view, a lively and interesting style is maintained. Witness the term "principle of the flycatcher."

The reviewer regrets that the very useful exact remainder theorem for Taylor's theorem (expressing the remainder as a definite integral) is omitted here as in most standard text-books. He also feels that the utility of the book would be slightly increased if the statement of theorems were italicized.

This book presents the calculus as the teacher would like to present it to his classes, in logical order. We have hitherto assumed in this country that this most pleasant method of lecturing was not the most efficient way of teaching, that maximum enjoyment for the instructor might mean minimum enjoyment for the mediocre student. The author believes otherwise, that the present type of treatment should increase the student's enjoyment as well as his power to use the material. He bases his belief on his own experience as a teacher in this country, and on his acquaintance with young Europeans of the age of American sophomores. It is devoutly to be wished that he is right and that others who use the book will make similar findings.

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IMAGE TRANSMISSION

Television—the Electronics of Image Transmission. By V. K. ZWORYKIN and G. A. MORTON. ix + 646 pp. New York: John Wiley and Sons, Inc. 1940.

THIS book is designed to condense and summarize in a readily accessible form the extensive literature which has already grown up in the field of television. The subject-matter is divided into four main sections. The first part deals with the fundamental processes and phenomena upon which the art of television is based. The second part discusses the general principles of television and the necessary relationships between the optical image and the transmitted radio image. The third portion deals with the individual components of the complete television system as devised in the RCA laboratories, and the fourth portion describes the equipment of the RCA-NBC television project. The first two sections will be of most interest to the general scientific reader, for in these parts are contained all that is necessary for a detailed understanding of the science of television as practiced to-day. The other two sections will be useful to those having an interest in the finer details of the subject.

The authors are to be particularly congratulated upon the extremely clear and concise exposition of the fundamental physical principles which occupy the first five chapters of the book. These chapters cover the emission of electrons from solids, fluorescent materials, electron optics and modern high-vacuum technique in the short space of 150 pages. Most physicists could read these pages with profit.

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REPORTS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

MECHANICAL engineers throughout the United States and Canada are observing this year the sixtieth anniversary of the founding of their professional organization, the American Society of Mechanical Engineers, which to-day has 15,000 members and maintains headquarters in New York City and 71 school sections in va-