sition to whatever is endeavoring to attack or to overcome it, and the amount of such opposition may be slight or great. "Resistance" properly does not and should not convey the idea of complete exemption or freedom from any infectious agent or from disease in man, animals or plants. An organism may be immune from disease in the sense of distinct injury and not be immune from the infectious agent. It is true that an organism may be immune or resistant only under certain conditions, and we have to recognize the factor of biological variations. The two words "immunity" and "resistance" are not legitimately commutable and should not be used synonymously. The word resistance is too useful in its original meaning for indicating that the force (virus in this case) encounters a clearly evident degree of opposition on the part of the host either to the process of infection or to the injurious effects which might be expected to follow such infection. The word "immune" should be reserved for those cases in which there is no evidence of disease or in which the infectious agent is unable to establish itself in the host.

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VITAMIN A FOR COLOR-BLINDNESS

PUBLICITY given in the press to our report to the Southern Society for Philosophy and Psychology has resulted in a flood of inquiries which make it desirable to summarize our results for the benefit of the scientific public, omitting the study by the junior author (now in process of publication) which led up to the practical work.

(1) We have found it desirable to administer Vitamin A in doses of 25,000 units. Most cases are cleared up in from three to eight weeks by one dose per day.

(2) Administering 50,000 units per day seems to accelerate the cure; but upset some digestive tracts. We suggest to inquirers that they take one dose (25,000 units) after breakfast, and a second dose after dinner. If digestive trouble results, to reduce to one dose per day.

(3) By "clearing up" a case, we mean enabling the patient to pass a standard color-vision test on which he has previously failed. The tests involved are chiefly of the chart type (Stilling, Ishahara, etc.), administered in the naval and air services. Performance on worsted tests, however, are likewise made normal.

(4) We do not know how "permanent" the cures are. That is a matter for further research.

(5) We find, so far, no clear correlation between color-blindness and diet; nor have we definite evidence as to the effects of past infectious disorders.

(6) Color-blindness, of the so-called "red-blind" type, obviously is not the simple "sex-linked Mendelian character" which popular theories have assumed it to be. Apparently, the causes of the condition are complex.

(7) Persons who, when tested, are found to be color-blind, but who have not known it, may now reasonably be suspected of not having been color-blind very long.

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SCIENTIFIC BOOKS

DIMENSION

Dimension Theory. By WITOLD HUREWICZ and HENRY WALLMAN. 165 pp. Princeton University Press. 1941. $3.00.

A DESCRIPTION of a geometrical object has to include a list of properties concerning curvature, convexity, connectedness, etc. First in any such list, however, would have to be a specification whether the object is a solid, a surface or a curve.

If the object is simple, then this basic question concerning its geometric nature can easily be answered. The dimension of a simple object can, for instance, be characterized as the least number of parameters needed to describe its points.[1]

Up to the seventies of the last century all objects of geometry were so simple that their points could be described by parameters and equations. However, with the tremendous extension of the domain of geometry due to Cantor's theory of point sets innumerable entities were introduced which are far beyond the reach of these simple methods. They are defined by joining and intersecting infinitely many cubes and squares, by various successive approximations and limit processes, some even by processes involving infinitely many unspecified choices. Naturally, to most geometrical objects of this enormous domain the classical characterization of dimension in terms of numbers of parameters is completely inapplicable.

[1] *E.g.*, one parameter, t, is sufficient to describe the points of the circle $x = \cos t$, $y = \sin t$. Two parameters, u and v, are needed for the description of the sphere in the usual representation $x = \sin u \cos v$, $y = \sin u \sin v$, $z = \cos u$.

Yet we are as interested in the dimension of the more complex entities as we are in that of simple figures, and we unhesitatingly classify many of them as solids, surfaces or curves.

To formulate the intuitive difference between these three classes one can devise a simple experiment whose outcome depends upon the dimension of the object to which it is applied. We cut out from the object a piece surrounding a given point. If the object is a solid we need a saw to accomplish this, and the cutting is along surfaces. If the object is a surface a pair of scissors suffices, and the cuts are along curves. If we deal with a curve we may use a pair of pliers and have to pinch the object in dispersed points. Finally, in a dispersed object no tool is required to perform our experiment, since nothing needs to be dissected. This characterization of dimension leads from n-dimensional to $(n-1)$-dimensional objects. It ends with dispersed sets, naturally called 0-dimensional, and, beyond these, with "nothing," in set theory called the "vacuous set." It is therefore convenient to consider the latter as -1-dimensional. The rigorous definition of dimension, starting with the -1-dimensional vacuum, reads as follows: A space is at most $(n-1)$-dimensional if each point is contained in arbitrarily small neighborhoods with at most $(n-1)$-dimensional boundaries. It is n-dimensional if it is at most n-dimensional without being at most $(n-1)$-dimensional.

During the last two decades an extensive theory has been derived from this definition. The need of an up-to-date exposition of dimension theory has been urgent for some years. Hardly any one is as well qualified to write such a summary as is Witold Hurewicz, who from the time of his Vienna doctoral thesis in 1925 has brilliantly contributed to the development of this branch of modern geometry. His collaborator, Henry Wallman, is noted for recent work in topology.

Their exposition, which is unsurpassed in elegance, covers not only most of the important results of dimension theory, in particular those of recent origin, but also discusses related topological questions. Concise definitions of even the most primitive concepts of topology are to be found in the text or in the alphabetical index at the end. The book can therefore be recommended as an excellent introduction into modern topology.

An introductory chapter outlines the development of the dimension problem and various approaches to its solution. The next chapters develop some of the results obtained before 1928. In several cases (in particular, with regard to the so-called local dimension) the proofs yield stronger statements than the authors actually formulate in their theorems.

Chapter IV contains a new proof of the fact that the n-dimensional space of analytic geometry is n-dimensional in the sense of dimension theory. The last section of this chapter is devoted to spaces of infinitely many dimensions. In the opinion of the reviewer this is a branch of dimension theory promising many important applications in the future since, so far, in the theory of functional spaces and operators dimension theory has received less attention than it deserves.

On the other hand, dimension theory has applied with great advantage functional spaces, as is shown in Chapter V, containing the theorem that each n-dimensional space can be topologically embedded into (*i.e.,* is homeomorphic with a subset of) the $(2n+1)$-dimensional Euclidean space. For instance, each curve (even a curve contained in a space of infinitely many dimensions) can be topologically embedded into our 3-dimensional space, each surface into the 5-dimensional Euclidean space, etc. While it is easy to construct a curve which can not be embedded into the plane, it was difficult to prove the existence of a surface which can not be embedded into the 4-dimensional space, and, in general, of an n-dimensional complex which can not be topologically embedded into the $2n$-dimensional space. That A. Flores' solution of this problem is only mentioned and not reproduced in "Dimension Theory" will be regretted by many a reader of the book, and the same may be said about Pontrjagin's example of two 2-dimensional spaces with a 3-dimensional product. The elaboration of these important examples would have been worth a few additional pages.

Chapter VI discusses mappings of spaces on the n-dimensional sphere and ends with very simple proofs of such classical results as the Jordan theorem for the n-dimensional space generalizing the fact that the 2-dimensional space (*i.e.,* the plane) is disconnected by the omission of the topological image of a 1-dimensional sphere (*i.e.,* a circle). After a short discussion of dimension and measure, a last chapter contains an excellent introduction into homology theory relating topology (and dimension theory) to algebra.

An appendix explains why the authors have restricted the development of dimension theory to separable metric spaces. Extended to still more general spaces the concept of dimension mentioned in this review has some rather strange properties, while the extension of similar definitions, as Wallman recently discovered, leads to almost unbelievable paradoxes.

We speak of a function of sets in a space if with each subset of the space (or at least with each subset of a certain kind) a number is associated. Dimension is such a function of sets in a Euclidean space, measure is another one. The book ends with the question as to which properties characterize dimension among all possible functions of sets. It is to be hoped that this remark may, as many other remarks of the book undoubtedly will, stimulate further research in this difficult but really fundamental field of modern geometry.

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CHEMISTRY

Principles of General Chemistry. By STUART R. BRINKLEY. Third edition. x + 703 pp. New York: Macmillan Company. August, 1941. $4.00.

IN comparison with the second edition (1933) of this well-known college text, this new one offers some changes in the order of the topics in the introductory chapters, to render more effective the scientific deductions which follow. In line with modern developments, increasing use is made of physico-chemical concepts in theoretical discussions and in their application to practical industrial processes. A chapter has been added dealing with the nucleus of the atom, artificial radioactivity, transmutation of the elements and nuclear fission. In other respects, also, the work has been brought up to date.

General Chemistry. By HARRY N. HOLMES. Fourth edition. viii + 720 pp. New York: Macmillan Company. June, 1941. $3.75.

OF the many books on general chemistry which have appeared during recent years, few have presented the subject with the charm and allure which characterize this new edition of Dr. Holmes's justly popular text. Simple, straightforward and clear, in its narration and discussions, it is not only easy but also exceptionally interesting reading. The innumerable ways in which chemistry concerns our lives, our industries and our civilization are illustrated by arresting examples. Any student who digests what this book contains will have acquired, in addition to his chemical knowledge, a surprising store of useful information and a pretty good general education.

The new material added to the third edition (1936) concerns the conception of electrovalence, covalence and coordinate covalence, nuclear chemistry, radiation chemistry, colloid chemistry, uranium fission, new achievements with giant cyclotrons, chemotherapeutic advances, etc., as well as the later developments in manufacturing chemistry (synthetic rubber, Nylon, etc.). Each chapter concludes with "Exercises" and "References."

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SOCIETIES AND MEETINGS

THE SECOND LAS CRUCES MEETING OF THE SOUTHWESTERN DIVISION

THE twenty-second annual meeting of the Southwestern Division of the American Association for the Advancement of Science and eight associated societies and institutions was held in Las Cruces, New Mexico, during the week of April 27. The associated societies were the American Association of University Professors, Clearing House for Southwestern Museums, El Paso Archaeological Society, Mathematical Association of America, New Mexico Academy of Science, Society for American Archaeology, State College Biological Society and White Sands National Monument.

Although there were those who felt the meeting should not be held because of the war emergency, the paid registration of ninety seems to have thoroughly proved the wisdom of carrying on. One objection to holding meetings at the present time is that most persons drive and now the rubber situation will keep them home. In answer to this, it is worth noting that about 40 per cent. of the papers presented were the product of teachers and research workers residing at the host institution. This situation is often overlooked, but during the months to come we are going to realize more and more the importance of taking scientific meetings to men and women who for one reason or another rarely have the opportunity of going to a meeting away from home. What is equally important is the necessity of vacations even during war times, and these can frequently be combined with business.

The New Mexico State College of Agriculture and Mechanic Arts, serving as host institution, was aided by the New Mexico State College Experiment Station, the U. S. Bureau of Plant Industry and the White Sands National Monument. The college was founded in 1889 when travel was by way of the "Jornada del Muerto" or by the Santa Fe railroad. It is located at State College, which lies at one corner of a triangle, having sides of three to four miles, the other corners being occupied by Las Cruces and Mesilla. To the east lie the Organ Mountains with one of the most beautifully serrated skylines to be found in North America. The country is rich in tradition and folk lore going back to the days when it was still beyond the United States and was a part of Old Mexico. The museum at Old Mesilla, a village of adobe buildings, is filled with historic articles associated with both the peaceful settlers and the bandits of old, such as Billy the Kid.