cally in a clockwise direction. This illusion seems more frequently observable when one is tired.

One might explain the illusion by the persistence of small lateral eye muscle movements adjusting the eyeball to the forward movement of the train, so that when the train stops, and the rhythmic eye muscle motion persists, the landscape appears to move in the opposite direction to that which was the case when the train was in motion.

On the other hand, perceptive factors may be involved. If one goes to the rear of the train and watches the landscape continually recede as the train progresses forward, there will be a similar illusory reversal when the train stops. That is, the landscape instead of continually receding will now appear to be rolling toward the stationary observer. This illusion may be due to rhythmic persistence of the activity of muscles of accommodation.

It may be that these factors are important in the etiology of motion sickness.[2] In the case of the vestibular apparatus, there is no rhythmic muscular action involved. However, it is a common experience to continue to feel a ship's motion after one comes ashore. This raises the question as to whether or not the optical illusions noted in connection with a moving train may not involve persistence of the temporarily established receiving pattern, in addition to the possibility of involving persistence of rhythmic and adaptive muscular activity.

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# SCIENTIFIC BOOKS

## SYSTEMATICS

*Systematics and the Origin of Species.* By ERNST MAYR. Columbia University Press. 334 pp. 29 figures. 1942. $4.00.

WITHIN recent years there has been manifest in the writings of taxonomists an altered position which has been called "the new systematics," although the only novelty manifest is in the approach to the subject. The present work is by one of the adherents of this movement, who says in his preface that animal taxonomy has undergone a revolution almost as fundamental as that which occurred in genetics after the rediscovery of Mendel's laws. While one may doubt the accuracy of the statement no one can question that a new view-point dominates the field. Undoubtedly the efforts of the early taxonomists to apply names to organisms that would permanently designate them has given way to the recognition that no two organisms are ever exactly alike and that accordingly any common name is very unlike in its value in different groups. This uncertainty is indeed recognized by the author, for he says: "There is no uniform point of view among taxonomists, in fact in regard to many of these questions there may not even be a majority opinion." In seeking for an explanation of this state of affairs he says that it is not yet clear, but he goes on to point out the need for a full knowledge of the group as a prime necessity for an agreement. He makes it clear that ornithology has reached such a stage of advancement that less than 2 per cent. of the bird species of the world remain unknown, and that therefore bird classification occupies a very favorable position for future developments. Indeed the attitude of the author is one which makes for a much better understanding of the relations of living things. For him not only is taxonomy important, but also genetics, ecology and paleontology contribute toward this end. Taxonomy takes on a larger and larger aspect and brings more and more of these problems into a common biological relationship.

In this book we find a discussion of these problems with many illustrative references, particularly to birds. The author is appreciative of the contribution made by genetics, although he recognizes the peculiar approach which it makes to the subject. The geneticist seeks an understanding of the mechanism of the "biological atoms" in their movements and changes, while the taxonomist deals with groups of organisms in their relation to the environment and to each other. Each side has its own peculiar characteristics of physical and biological factors, and taxonomy is busy selecting between the products of genetic action. The result is that there are nowhere two populations which are identical, if a fine enough analysis is made. This leads directly to the smallest group, the subspecies, and in turn to the species, genus, family, order and class. Since it is with groups that the author primarily deals it is important to find out how he regards them. At once it may be said that he has no conception of a fixed and invariable relation. He regards the species as a dynamic concept, which differs in range and character with the degree of knowledge of the group. He is at pains to point out the growing number of polytypic species as the years pass and more knowledge accumulates. At the same time he realizes the large subjective element in the consideration and the difference in the regard of the systematist and the evolutionist for the same group. For the systematist

[2] Indeed, if a large mirror is before the observer in the situation described in the first paragraph, so that the passing landscape may be seen in reverse motion to that noted from the window, the observer may become uncomfortable or even nauseated by looking alternately through the window and then in the mirror.

the species is a "practical device," a necessary conception for reducing the endless variety of forms to some system; for the student of evolution it is merely a "passing stage in the stream of evolution." He wishes to know how it came into being and whither it leads.

But for both a definition is desired, but it can only be approximate and must be regarded as a convenience of varying value. As yet it is quite impossible to define "species," for the definition depends upon the degree of our knowledge of the group, but he endeavors to reach it by framing definitions of the "practical species concept," the "morphological concept," the "genetic species concept," the "concept based on sterility" and the "biolo-species definition." From all these we emerge with the definition: "Species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups." Accordingly the test is purely physiological, despite the author's choice of a morphological one. As to the method of origin of a new species it is stated as follows: "A new species develops if a population which has become geographically isolated from its parental species acquires during the period of isolation characters which promote or guarantee reproductive isolation when the external barriers break down." There must therefore exist all degrees of speciation, in which final separation into definite groups is at length attained. A discussion of this question occupies Chapter VII, and non-geographic speciation the following one, with biology of the process forming the substance of the third. We come then to a discussion of the higher categories in evolution, of which the genus is typical. Mayr quotes Thorpe, who defines the genus thus: "A genus is a systematic unit including one species or a group of species of presumably common phylogenetic origin, separated by a decided gap from similar groups." The recognition of this assemblage is regarded as a purely subjective affair, there being no real limits. The book finally ends with a discussion of macro- and micro-evolution factors, where the author reaches the conclusion that "all the available evidence indicates that the origin of the higher categories is a practice which is nothing but an extrapolation of speciation. All the processes and phenomena of macroevolution and the origin of the higher categories can be traced back to intraspecific variation, even though the first steps of such processes are usually very minute."

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## VOLUMETRIC ANALYSIS

*Volumetric Analysis, Vol. I.* I. M. KOLTHOFF and V. A. STENGER. Second revised edition. xv + 309 pp. 31 figs. 15 × 23 cm. New York: Interscience Publishers, Inc. 1942. $4.50.

THIS book is the first of a two-volume set covering the field of volumetric analysis. In revision, it closely follows the organization of the earlier German edition and its English translation. Volume I deals with theoretical principles, and Volume II, now in preparation, is to consider practical principles.

The book capably deals with the underlying theory of acid-base neutralization, oxidation-reduction, complex-formation and precipitation as related to volumetric analysis. In addition, there are general chapters which discuss titration errors, induced reactions, catalysis, mixed crystal formation and coprecipitation, indicators, organic analysis and physical methods of finding the equivalence point. In the revised edition, a large amount of new material has been added to the discussion of redox indicators; and a section has been added covering the rather new field of amperometric or polarimetric titrations. The chapter on organic volumetric methods has been extensively revised; however, it does little more than exemplify the application of the general theory of volumetric analysis to a few typical problems arising in the organic field. Throughout the book new references have been added, and the appendix has been changed to include new data and to take into consideration the activity principle.

The physical make-up of the book is good. The print is large and easy to read, and the binding is attractive.

The volume is highly recommended to any one interested in volumetric analysis, and should be considered an indispensable part of the library of those engaged in the development or improvement of volumetric methods.

## QUANTITATIVE ANALYSIS

*Analytical Chemistry, Vol. II, Quantitative Analysis.* F. P. TREADWELL and W. T. HALL. Ninth English edition. xi + 806 pp. 121 figs. 15 × 23 cm. New York: John Wiley and Sons. 1942. $6.00.

THIS, the quantitative volume of a two-volume set, describes in detail well-known gravimetric and volumetric methods for the ions and common methods of gas analysis.

In this ninth edition, the scope of the book is unchanged from previous editions. In many cases, newer well-tried methods have replaced older ones, and the older methods have been brought up to date.

There has been a significant change in the make-up and arrangement of the book. The sections on gravimetric, volumetric and gas analysis have been divided into chapters, and the section of tables has been enlarged and brought up to date. The chapters in