brought to my notice by B. Ewart White, of 36 Bedford Row, London, W.C.1., in a letter to me dated July 12.

Exception is taken to the statement that E. P. Mumford, who has been completing the Marquesan work under my general supervision, has "no control over the collections made in the Marquesas" by himself and his assistants "nor over the publications resulting from their study," and that "All correspondence pertinent to the original survey" (which Mr. Mumford had been invited to direct, and towards the completion of which through the depression he and others outside of Hawaii had contributed financially) "should be addressed to Bernice P. Bishop Museum, Honolulu."

The facts are that the director of that museum had himself stated in official letters to Mr. White, "I understand perfectly that Mr. Mumford is responsible for checking the remaining taxonomic papers on the material collected by him and his assistants in the Marquesas and Society Islands." Mr. White continues: "the balance of funds on hand to the credit of the Pacific Entomological Survey in Hawaii in 1936 was transferred to me by order of the benefactors in Hawaii and elsewhere, and . . . I, as representative of these and subsequent subscribers, have here in safe keeping the original authorizations from Honolulu referring to the continued use of Pacific Entomological Survey Notes, correspondence, etc., and to the *continuation* of the 'work under the name of the Pacific Entomological Survey.'"

The statement in SCIENCE that the work now being carried on by Mr. Mumford under the auspices of Oxford University is a "new 'Survey' . . . distinct from the survey organized in Hawaii," is misleading. The authors of that statement make no reference to the account in the leading English scientific periodical *'Nature,'* January 29, 1938, of the means by which Mr. Mumford's work was continued at Oxford.

The reference to registration of a Pacific Entomological Survey "with headquarters at Oxford" is equally misleading. In 1936 a custodian of the above-mentioned funds was necessary, and Mr. B. Ewart White consented to serve as a trustee. The name Pacific Entomological Survey was used for the time being to maintain the continuity of the work, as stated above, but the name Pacific Entomological Survey has not been, and will not be, employed in connection with the present phase of the work associated officially with Oxford.

It is to be deplored that attempts to interfere with the progress of this work should be made, even under a misapprehension. The only object in view should be to obtain, and make known, facts which will help in elucidating the problems of the Pacific Islands. It is appreciated by us that the Marquesan collections and certain other material now under the charge of Mr. Mumford will be deposited in the Bernice P. Bishop Museum, when the final results have been obtained. To further this end the Hope Department of Entomology of the University of Oxford, by means of grants from the University for five years from October, 1938, from the Royal Society and the British Association for the Advancement of Science and from benefactors through the trustee, Mr. B. Ewart White, is obtaining from sundry little known islands in the Pacific, new collections which it is hoped will aid in elucidating problems revealed by the Marquesan work that Mr. Mumford has been completing at Oxford.

G. D. HALE CARPENTER,
Hope Professor of Zoology (Entomology) in the University of Oxford

JULY, 1939

SCIENTIFIC BOOKS

ELEMENTARY MATRICES

Elementary Matrices and Some Applications to Dynamics and Differential Equations. By R. A. FRAZER, W. J. DUNCAN and A. R. COLLAR. xvi + 416 pp., 8vo. Cambridge: at the University Press. New York: The Macmillan Company.

TWO of the authors of this beautifully printed volume are members of the Aerodynamics Department of the National Physical Laboratory of England, and the third is professor of aeronautics at Hull.

The book appears to have three main objectives. The first is the development of certain phases of elementary matric theory, the second is the practical solution of differential equations by means of the matric calculus, and the third is the application of these methods to mechanics, in particular to the dynamics of the airplane.

Clearly the book is intended primarily for students of applied mathematics who are not very familiar with modern algebra. Consequently, the elementary treatise on matrices which occupies the first 155 pages is quite lengthy and detailed. The usual theorems are given on quadratic and bilinear forms, latent (characteristic) roots, elementary operations and the elementary divisor theory. Infinite series of matrices are also treated and matrices of differential operators.

Throughout the text, computational methods are featured and many numerical problems are worked out in detail. Much attention is given to rapid methods of calculation by means of machines. For example, more than twenty pages are devoted to methods for calculating the reciprocal of a matrix, and one specimen calculation of the reciprocal of a sixth order matrix is given with some elements computed to the ninth deci-

mal place. The solution of linear systems of algebraic equations is treated from the same standpoint, specimen solutions exhibiting methods which reduce labor to a minimum. Methods involving matrices are used to obtain dominant roots of algebraic equations of higher degree. Here the methods are interesting, but the results are not spectacular from the standpoint of the saving of labor.

After the four introductory chapters comes the treatment of differential equations and systems of differential equations by matric methods. While these methods are not essentially new, it is probably correct to say that this book takes more pains than any previous one to develop the theory in an elementary manner, and by means of many specimen problems to bring the methods within the range of the great number of workers who use differential equations in a practical way.

One interesting point in the matric method is its connection with the operational calculus of Heaviside. Some of the successful but unreasonable empirical methods which so delighted Heaviside appear quite reasonable and rigorous from the matric approach.

Next come chapters on kinematics and dynamics of systems, and systems with linear dynamical equations. The treatment is conventional, except that matric methods are used wherever possible, mainly in the solution of the differential equations involved, and that most of the problems relate to aerodynamics.

Chapter X is a collection of problems, each of considerable intrinsic interest, which are worked out in detail and with the expenditure of considerable labor. These problems are: (1) Oscillations of a triple pendulum. (2) Torsional oscillations of a uniform cantilever. (3) Torsional oscillations of a multi-cylinder engine. (4) Flexural oscillations of a tapered beam. (5) Symmetrical vibrations of an annular membrane. (6) A system with two equal frequencies. (7) The static twist of an aeroplane wing under aerodynamical load. (8) The oscillations of a wing in an airstream.

The remaining three chapters are devoted to the dynamics of the airplane, and in them some problems of considerable difficulty and practical importance are worked out by the techniques discussed earlier. The phenomena of ankylosis (or "sticking" of a degree of freedom), and flutter are treated at length with numerical problems and graphic interpretation of results. The last chapter is on pitching oscillations of a frictionally constrained aerofoil.

Judged by American and Continental standards, the book is verbose and somewhat nationalistic in referring to other authors. But clearly the book was written in the hope of converting many applied mathematicians to the use of more elegant and powerful mathematical tools, and it is so skilfully and attractively designed for this purpose that one should judge it from no other angle.

C. C. MACDUFFEE

UNIVERSITY OF WISCONSIN

SOCIETIES AND MEETINGS

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE[1]

IN response to the kind invitation of the University of Liège, the French Association for the Advancement of Science met from July 17 to 22 for the third time in Belgium; the previous meetings were at Liège in 1924 and at Brussels in 1932.

The International Water Exhibition at Liège which marked the inauguration of the Albert Canal gave the meeting a special interest. Professor C. Fabry, president of the French Association, presided over the meeting, and Professor Dehalu, *administrateur-inspecteur* of the University of Liège, was president of the local committee.

The opening ceremony toook place on July 17 in the hall of the university. Professor Dehalu expressed his pleasure at receiving the Association at Liège for the second time, and Senator Buisseret, speaking on behalf of the burgomaster, welcomed the members of the congress. Professor C. D. Ellis, Wheatstone professor of physics at King's College, London, representing the British Association, and Dr. C. Romaña, representing the Argentine Association for the Advancement of Science, brought messages of good will for the success of the meeting. Professor Fabry, after having expressed the thanks of the association to the local committee at Liège, delivered his presidential address, on interstellar space.

Professor Fabry showed how a profound study of the light of the stars has enabled us to detect, in interstellar space, matter in a state of extreme rarefaction (1 kgm, nearly in a volume equal to that of the earth). In addition to matter, there exists also in interstellar space energy in the form of radiation emitted by the stars. These results have demonstrated the fruitfulness of collaboration of diverse scientific disciplines and of pure and applied science. Such collaboration is also the object of the French Association and of similar bodies.

The scientific meetings were held in the magnificent Institutes of Civil Engineering and Chemistry of the University of Liège at Val Benoît on July 17 and the following days. July 19 was devoted to an excursion on the Albert Canal and to a visit to a colliery at Beeringen. July 21, the day of the national fête of

[1] From *Nature*.