SCIENTIFIC BOOKS

Calculus of Variations. By GILBERT AMES BLISS. Published for the Mathematical Association of America by the Open Court Publishing Company, Chicago (1925), pp. xiii, 189. Price, $2.00.

WHEN it was announced some time ago that the first number of the Carus Mathematical Monographs was to be written by Professor Bliss on the subject to which he has made so many important contributions, it was felt by some that Professor Bliss had set himself a very difficult task. The main purpose of this series of monographs is the "diffusion of mathematics and formal thought as contributing to exact knowledge and clear thinking, not only for mathematicians and teachers of mathematics, but also for other scientists and the public at large," and it seemed that of all branches of mathematics the Calculus of Variations might easily prove one of the most difficult to present in a popular manner. This must have been, especially, the thought of those who were, like ourselves, introduced to the subject in a physical treatise expounding Hamilton's conception of the proper mode of statement of the laws governing the development of a dynamical system. We can still see in our mind's eye the formidable pages of δ's which seemed to differ in some mysterious way from the mannerly differentials of the preceding and following paragraphs; which had a ghostly superiority since they could never physically be realized; but yet which could be interchanged as to order of procedure with the more homely and familiar time differentiations of the subject. Could it be possible to present this subject in an elementary and straightforward manner, intelligible to the ordinary student of physics, with the usual familiarity with simple differentiation and integration?

There can be no doubt as to the answer in the mind of any one who reads Professor Bliss's book. The exposition is masterly and is as lucid as the best French mathematical treatises. Beginning with an interesting historical introduction, typical problems of the Calculus of Variations are described, such as, for examples, the shortest distance problem, the brachistochrone problem and the problem of the surfaces of revolution of minimum area (the soap film problem). Before taking up the general theory the author adopts the pedagogically sound procedure of treating these special problems in detail and he is able, without ever abandoning the "elementary" viewpoint, to illustrate in these problems the general modes of solution of problems in the Calculus of Variations and to point out the kind of difficulties that may be expected to arise. The presentation is very "modern" and the consistent use of Weierstrass's ingenious concept of a "field of extremals" and of Hilbert's invariant integral makes the theory straightforward and easy.

Jacobi's interesting theorem as to conjugate points here presents no difficulty. The final chapter, headed "A more general theory," is easy reading after the previous chapters dealing with special problems have been mastered and the book ends with some interesting historical remarks and a well-considered and useful list of bibliographical and historical references.

On the whole we think this book an illustration of the truth of Benjamin Franklin's dictum that no theory is difficult if properly and methodically presented. No student of physics of chemistry needs to be told of the importance of the subject-matter, for most physical theories seem incomplete until they can set up a Hamiltonian integral dominating the subject by the fact that its variation must be zero. Or, to give an illustration which will be more appealing to those interested in quantum theory, it may be said that any conservative dynamical system in which the coordinates are q and the momenta p lives in such a way that its life line in its representative (q, p) space is an extremal of the integral $\int \Sigma p \, dq$ where all comparison curves satisfy the equation H = constant (H being the total energy of the system). We heartily recommend Professor Bliss's book either as a text for a short course on the Calculus of Variations or to any serious scientist for private reading. May the succeeding monographs of the series maintain the standard set by this first one!

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THE NORWEGIAN IDENTITY BOOK

AT the International Emigration Congress, held in Rome from May 15 to June 6, 1924, a proposition was introduced by the Norwegian delegate Fjelstad which, if feasible and viable, may go far toward solving the vexed question of the identification of the individual in intranational and international relations. It was devised by Drs. Jon Alfred Mjoen and Jon Bö at the Winderen Laboratory, Christiania, and proposes, in brief, the biological registration of a given population by means of an identity book,[1] so arranged as to include and, for public purposes, replace the ordinary certificates of birth, baptism, vaccination, school attendance, university matriculation and graduation, marriage, tax-payments, life insurance policies, military, naval, police court or prison relations and other personal papers establishing the true status of the individual in society. Its object is to facilitate and obviate bookkeeping in passport offices, courts of justice, at the ballot box or in any other situation

[1] J. A. Mjoen and J. Bö: *Eugenics Rev.*, Lond., 1924, XVI, 183–188.