serious defect that references and authorities are imperfectly given, so that the work reads like a book meant to be used in cramming men for examinations and not like a real introduction to the subject. Dr. Ernest Playfair has performed the difficult task of translation admirably.

HIGHER DYNAMICS FOR ENGINEERS.

A Treatise on Dynamics, with Examples and Exercises. By Prof. A. Gray, F.R.S., and Dr. J. G. Gray. Pp. xvi + 626. (London : Macmillan and Co., Ltd., 1911.) Price 10s. net.

THE preface to this book states that it is intended "to provide a discussion of higher dynamics suitable to students of engineering, physics, or astronomy." It is doubtful whether it would be a good book for intending students of astronomy, but it will be useful both to physicists and to students of applied mathematics as supplementing other treatises, and is an excellent book for an engineer whose mathematical equipment is sufficient to follow the reasoning.

Examples of problems which occur in engineering or are of special interest to engineers appear early, and continue right through the book; in addition to those included in the majority of treatises (including trajectories in resisting media) may be mentioned resistances of water to ships, steering of ships, brakes of trains, motion of wheeled vehicles, and dynamics of self-propelled vehicles. The conditions which contributed to the Salisbury accident of 1906 are fully discussed, and although there is a misprint in the figure used in this discussion, and a misprint of $\tan^{-1}$ for $\sin^{-1}$, the results, both algebraic and arithmetic, are correct. The reasons why a blacksmith uses small and large hammers for different purposes (p. 399) do not appear in most treatises on dynamics!

Although elementary dynamical questions like the above are clearly and fully discussed, elliptic integrals are introduced where thought to be practically useful (as in the pendulum), and there is a clear and full discussion of three-dimensional rigid dynamical problems, mainly of a practical nature. The change in the ordinary figure (art. 9) by which the usual right-handed screw notation is made consistent with the traditional forms of Euler's and kindred three-dimensional equations will commend itself equally to teachers and students of dynamics, though the figure might with advantage have been repeated in the later chapters. The principle of this article is claimed in the preface to be comparatively new, but seems not to differ from that practically used by the standard treatise of Routh. The principle is, however, expressed clearly and made good use of in the chapter on gyrostats, which should be specially useful to engineering students as giving a clear and practical explanation of a subject generally regarded as difficult. The discussions of gyrostatic control of the rolling of ships, the monorail, the gyrostatic action of turbine-driven steamers, and other questions are very full, while examples, such as those on self-steering torpedoes and on the effect of the rotation of the

earth on the aiming of artillery, give practical illustrations of the value of the higher parts of the subject. The gyrostats in Thomson and Tait § 345, x., are reproduced, and partially discussed; but the discussion is not quite full enough, and it may be remarked that the azimuthal equilibrium in case 3 is said to be made stable by rotation, which is contrary to Thomson and Tait's result, and seems to be incorrect.

Lagrange's equations, though foreshadowed early in the treatise (p. 112), are not introduced seriously until chapter x.; they might have been of assistance to students in the two preceding chapters, in which tops, gyrostats, motion about a point under no forces, and motion of hoops are discussed, but the authors certainly do very well without the aid of these equations. Chapter x., which gives the transformations of Hamilton and Appell of the general equations, will be more useful to students of physics than to engineers or engineering students; but in all the rest of the book except in chapter v., which deals with orbits, the needs of engineering take a prominent place. Chapter v., which is presumably written for the astronomer, scarcely differs sufficiently from the traditional treatment to be of much use to him, although some little-known theorems by G. W. Hill and others are included in it.

A rather easy chapter on some quite simple statical properties comes as a surprise at the end of the book, following the advanced chapters on rigid dynamics, and is scarcely in keeping with the character of what precedes. But the general arrangement and presentation of the subject is likely to be most useful to all engineering students of sufficient mathematical capacity, and to many students of physics and of applied mathematics.

There are a few misprints, in addition to those noted above, but none which could not be readily corrected. A little revision of pp. 392 and 393, and a re-wording of the second line of p. 137 might be useful in subsequent editions. The results of the examples, so far as the reviewer has verified them, seem to be correct.

APPLIED MICROBIOLOGY.

Einführung in die Mykologie der Genussmittel und in die Gärungsphysiologie. By Prof. Alex. Kossowicz. Pp. viii + 211 + 2 plates. (Berlin : Gebrüder Borntraeger, 1911.) Price 6 marks.

THIS work, a companion volume to the author's "Mycology of Foodstuffs," deals with those adjuncts of the table the use of which, although not strictly necessary, and classed, and for the most part taxed, as luxurious, has become so firmly established that few of us are sufficiently Spartan entirely to avoid it. Fermented beverages, both alcoholic and (reputedly) non-alcoholic, vinegar, mustard (of the French variety), vanilla, cocoa, coffee, tea, and the post-prandial cigar are all submitted to processes of fermentation at one stage or other of their progress towards that culmination of perfection which delights the connoisseur. It is with the organisms concerned,