Indeed, it will be speedily ascertained by those who start the course that the experiments indicated require considerably more time than is ordinarily devoted to this branch of botany; however, in this case there is no great objection to superfluity, as it is a simple matter to leave out those experiments considered to be less important. In the circumstances the author was well advised to touch only lightly upon the sensitivity of plants, which is discussed in the last chapter.

The general method of exposition is original, and a certain number of experiments, such as that devised by Dr. F. Blackman for illustrating the dependance of germination upon oxygen supply are additions to the courses generally followed in botanical laboratories. There is overmuch insistence on the correlation of guessing, reasoning, and trying, and perhaps a superabundance of chemical and physical tests. But these are minor matters of opinion, whereas there can be no question that the book is original, vigorous, and stimulating.

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the Year 1911. Edited by Dr. J. Scott Keltie. Pp. lxxii+1412. (London: Macmillan and Co., Ltd., 1911.) Price 10*s.* 6*d.* net.

THIS is the forty-eighth annual issue of a work of reference which has become indispensable to administrators, statesmen, and students of economics and geography. The volume has been thoroughly revised and brought up to date—a preliminary section of additions and corrections including the results of the 1911 census of the United Kingdom. A series of new maps is provided, and these include maps of the new projected railway routes to India; railways, navigable waters, and steamship routes; the new Liberian Boundary, 1909; the northern territory of Australia; and of the Panama Canal from the latest reports of the Isthmian Canal Commission.

Several sections of the book have been greatly improved—those dealing with Turkey, Spain, and China may be mentioned. Altogether this issue of the "Year-Book" will preserve the high reputation the work has secured, and the editor may well be congratulated upon his efforts to maintain the accuracy and usefulness of the volume.

Catalogue of the Serial Publications in the Library of the Manchester Literary and Philosophical Society. Compiled, under the direction of the honorary librarian, C. L. Barnes, by A. P. Hunt. Pp. vi+177. (Manchester: Published by the Society, 1911.) Price 2*s.* 6*d.*

THE object of this catalogue is to make known the wealth of periodical scientific literature in the library of the Manchester Literary and Philosophical Society. The total number of current publications at present received by the society is 810, and they come from all parts of the world and cover every branch of science. The catalogue is excellently arranged, and is provided with an exhaustive index. It should be of great service to members of the society and to others engaged in scientific research.

The Lore of the Honey-Bee. By Tickner Edwardes. Pp. xx+196. (London: Methuen and Co., Ltd., 1911.) Price 1*s.* net.

THE first edition of Mr. Edwardes's book on the bee was reviewed in the issue of NATURE for November 5, 1908 (vol. lxxix., p. 6). This fourth edition is a cheap re-issue of what has already proved a popular work; and, at its present price, such an interesting history of the folk-lore of the bee and account of its activities should become known to a wider circle of readers.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Deformation of Rocks under Tidal Load.

I HAVE read with interest Prof. Milne's letter under the above title in NATURE of July 13, and congratulate him on the promising character of the results. As he himself remarks, the subject theoretically is not a new one. Its geophysical interest lies largely in the possibility of deriving information from the observed phenomena as to the elastic character of the earth's crust. Several difficulties, however, stand in the way of this information. The earliest mathematical treatment of the problem, so far as I am aware, is that by Sir G. H. Darwin, to which Prof. Milne refers. The problem which he actually solved relates to the effect of load on the surface of an elastic solid material which is *homogeneous, isotropic,* and *incompressible.* In ignorance of this solution, I obtained another [1] in 1896—a simple deduction from the important solution by Prof. Boussinesq for material bounded by an infinite plane—which is somewhat more general, in so far as it does not assume incompressibility in the material, but otherwise is subject to the same limitations. In practice, the most important of these limitations are probably the assumptions of homogeneity and isotropy. Very possibly, an expert mathematician familiar with recent developments of the mathematical theory of elasticity might have no serious difficulty in removing these restrictions in part or in whole. For instance, if a solution were obtained for the case where there is a relatively thin superficial layer differing in elastic quality from the remainder, it would immediately throw light on what is to be expected from differences in the surface strata.

The solution derived from Boussinesq's for the homogeneous solid is simple, the formula for the vertical component w of the elastic displacement at a point in the plane of the loaded surface being [2]

$$w = \{(1-\eta)/2\pi n\} \int\int (p/r) d\sigma,$$

where p is the normal pressure over the element $d\sigma$ of surface, situated at a distance r from the point where w is being measured, n denotes the rigidity, and η Poisson's ratio for the material, dw/dx gives the slope measured in the direction of the axis of x, supposed horizontal. We see at once that however complex the distribution of load may be, the slope varies directly as $1-\eta$, and inversely as n. For a given value of n it is 50 per cent. greater when Poisson's ratio is $\frac{1}{4}$—as it approximately is in steel—than when the material is incompressible.

There is, however, another aspect of the case that has to be taken into account. The influence of the tide does not consist solely of the pressure effect. At high-tide we have a large additional quantity of gravitating material, the attraction of which modifies the direction of gravity at the land station. If we compare the readings of a delicate spirit level at mid-tide and at high-water, there is an apparent change of level $\psi_1+\psi_2$, made up of ψ_1 due to the actual slope of the surface carrying the level, and ψ_2 due to the alteration in the direction of local gravity. Under the conditions postulated in my solution of the problem

$$\psi_1/\psi_2 = 2(1-\eta) g\rho a/3n,$$

where g is gravity, a the earth's radius, and ρ its mean density. The ratio varies enormously for values of η and n that exist in known materials. Thus we have, measuring n in grammes weight per sq. cm.,

$$\eta = 0{\cdot}25,\ n = 80\times 10^7,\ \psi_1/\psi_2 = 2 \text{ approximately},$$
$$= 0{\cdot}5,\ n = 11\times 10^7,\ = 11 \ ,,$$

The first thing to be considered is what does the instrument used actually record? Is it ψ_1 or $\psi_1+\psi_2$? In the latter event, unless ψ_2 is relatively negligible, we must

[1] See *Phil. Mag.*, March, 1897, p. 173.
[2] Proc. Physical Society, vol. xv., p. 36, and *Phil. Mag., l.c.*, p 177.