

common in the older text-books of cellulose as a very stable substance, (1) that cellulose is constitutionally modified by any and every treatment with reagents, and (2) that profound changes affecting the reactivity of its individual groups are determined by treatments which are not marked by change of weight of the cellulose or by visible structural modifications.

It thus follows that surgical cotton-wool or chemical filter-papers, for example, which are often considered as "pure cellulose" and the criteria of purity adopted by various manufacturers, are selected on an empirical basis, and the authors, therefore, attempt to define the "normal standard." Their definition of this as cotton purified from its raw condition by such treatments as attack and remove its non-cellulosic components with the ascertained minimum of action upon the cellulose itself obviously raises difficulties in the verification of the so-called "standard" product. Their conclusions are most valuable as a stimulus to further research, and their statement that "every process of treating the vegetable fibres in the arts produces some constitutional change" shows how necessary is systematic research work organised on a co-operative basis for the continued well-being of all the textile and paper-making trades.

ROBERT H. PICKARD.

*The Year-Book of the Scientific and Learned Societies of Great Britain and Ireland.* Compiled from official sources. Pp. viii + 334. (London: Charles Griffin and Co., Ltd., 1917.) Price 9s.

THE thirty-fourth annual issue of this useful work of reference provides a convenient record of the work done in science, literature, and art during the year 1916-17. Not only are the activities of the scientific societies chronicled, but an account is provided also of the researches carried out by the Meteorological Office, the National Physical Laboratory, the Royal Observatory at Greenwich, the Geological Survey, Kew Gardens, Rothamsted Experimental Station, and similar organisations of a national character.

The volume is very comprehensive in scope, but in the science sections we miss references to the Society of Glass Technology and to the Illuminating Engineering Society, both of which are active and important.

#### LETTERS TO THE EDITOR.

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#### Cotton-growing Statistics.

THE article on the above subject in NATURE of April 11 was welcome to me as directing attention to very important economic possibilities which lie behind the making of precise reports and reasoned forecasts concerning the state of all crops, by means

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of the Plant-Development-Curve method which I devised during my service in Egypt. With your permission, however, I would like to point out that the writer of the article was under a misapprehension in thinking that the recent Egyptian data he mentioned were adverse to this new method.

Although it is true that the paper cited from the *Agricultural Journal of Egypt* (vol. vii.) states that "the object of (1) was to study the life-history of the various types of cotton in the different parts of the country and to ascertain whether it was possible to estimate the yield of the crop several weeks before the cotton was ready for picking," yet the absence of further comment is obviously due merely to a certain looseness of structure in the paper in question, whereby a summary of results obtained under the stated purpose of this section "(1)" is given somewhat irrelevantly as follows on p. 52:—"The above observations seem to point to the fact that watering experiments on the cotton crop are most necessary; for if the flowering curve could be maintained (*sic*) during the whole of July instead of dropping considerably in the middle of the month, there should be a considerable increase in the yield of the crop."

Any decision as to the real result of this section of the paper in its declared object must therefore be taken from the data themselves, which are published in the form of plant-development curves.

So far as the prediction of bolling from flowering is concerned, with a seven-week interval between, the satisfactory nature of the results may be seen at a glance by those who care to consult the paper in question (although each curve represents the behaviour of only a single observation row of only fifty plants, instead of being the mean of at least five such rows of one hundred plants). In thus comparing the flowering and bolling curves, the reader should discard the first weekly ordinate in every bolling curve as there published, since the counting of the bolls was not started soon enough, and this ordinate, therefore, includes earlier bolls from the second, and even the third, antecedent week, which naturally spoils the similarity. On placing the curves in superposition with a seven-week shift, these new data (*e.g.* Fig. 9 and Fig. 11) then illustrate most satisfactorily the points which I have discussed in detail in "Analyses of Agricultural Yield" (Phil. Trans. Roy. Soc., B. 327, 333, 352), and specially demonstrated by Fig. 17 in part iii. of the "Analyses," such as the incidence of hot days, waterings, and boll-worm in affecting the shedding.

As regards the forecasting of the flowering itself by the growth-curve, the data under discussion have no significance. The daily fluctuation of flowering of cotton in Egypt is not predicted by main-stem growth measurements made later than June 1 (see Fig. 10 in my "Development and Properties of Raw Cotton"), owing to the four weeks' duration of this predetermination period, and to other causes which I discussed on p. 182 *et ante* of part iii. of the "Analyses." Since the growth-curves in vol. vii. of the *Agricultural Journal of Egypt* only began on May 28, they are effectively not for this purpose growth-curves at all. In any case, the growth should be measured daily, and not merely once a fortnight.

W. LAWRENCE BALLS.

St. James's Square, Manchester, April 16.

DR. BALLS's comments on the short article on "Cotton-growing Statistics" in the issue of NATURE for April 11 opens up a wide and interesting feature in scientific research, viz. the value of observed data and their interpretation.