crops, modes of handling, costs of fertilization, and largeness of population per unit area, make the book a thesaurus of its kind.

The author, like the reviewer whose educational studies in China ran contemporaneously with these agricultural ones, was impressed with the extent of resources still unused in the very regions whose overcrowded condition has been so common a theme of lugubrious comment. Scattered through the volume there are economic points of the most vital pith that should serve as an antidote to the pessimistic Jeremiads so current in these days and so commonly floating on very shallow waters. The following quotation from the final chapter on Japan, p. 425, must suffice to indicate the tenor of the author's outlook on future possibilities:

> In 1907 there were in the [Japanese] Empire some 5,814,362 households of farmers tilling 15,201,969 acres and feeding 3,522,877 additional households, or 51,742,398 people. This is an average of 3.4 people to the acre of cultivated land, each farmer's household tilling an average of 2.6 acres.
>
> The lands yet to be reclaimed are being put under cultivation rapidly, the amount improved in 1907 being 64,448 acres. If the new lands to be reclaimed can be made as productive as those now in use there should be opportunity for an increase in population to the extent of about 35,000,000 without changing the present ratio of 3.4 people to the acre of cultivated land.
>
> While the remaining lands to be reclaimed are not as inherently productive as those now in use, improvements in management will more than compensate for this, and the Empire is certain to quite double its present maintenance capacity and provide for at least a hundred million people with many more comforts of home and more satisfaction for the common people than they now enjoy.

The soul of the book lies in its appreciative delineation of methods that have sufficed for the maintenance through many centuries of perhaps the highest average productivity ever attained by great peoples, and its chief lesson lies in the realization of this by simple domestic means. The style of the book is excellent and the two hundred and forty odd half tones effectively illustrate the text.

That this should be the last contribution of one who has written so much and so well is a source of inexpressible regret.

T. C. CHAMBERLIN

SCIENTIFIC JOURNALS AND ARTICLES

THE closing (October) number of volume 12 of the *Transactions of the American Mathematical Society* contains the following papers:

W. A. Manning: "On the limit of the degree of primitive groups."

G. A. Miller: "Isomorphisms of a group whose order is a power of a prime."

John Eiesland: "On minimal lines and congruences in four-dimensional space."

G. C. Evans: "Volterra's integral equation of the second kind, with discontinuous kernel. Second paper."

E. J. Wilczynski: "One-parameter families and nets of plane curves."

Also: "Notes and errata, volumes 10 and 11."

THE December number (volume 18, number 3) of the *Bulletin of the American Mathematical Society* contains: "A generalization of Lindelöf's theorems on the catenary," by Oskar Bolza; "A note on the theory of summable integrals," by S. Chapman; "Irreducible homogeneous linear groups of order p^m and degree p or p^2," by W. B. Fite; Report on "Graduate work in mathematics in universities and in other institutions of like grade in the United States," by the American committee of the International Commission on the Teaching of Mathematics; "Shorter Notices": Holton's Shop Mathematics, by C. N. Haskins; Timerding's Die Mathematik in den physikalischen Lehrbüchern, and Siddons and Vassall's Practical Measurements, by E. W. Ponzer; Hosmer's Azimuth, by E. B. Wilson; "Eisenhart's Differential Geometry," by G. A. Bliss; "Note on collineation groups," by H. H. Mitchell; "Notes"; "New Publications."

THE January number of the *Bulletin* contains: Report of the October meeting of the society, by F. N. Cole; Report of the October meeting of the San Francisco Section, by T. M. Putnam; "The Carlsruhe meeting of the German Mathematical Society," by Virgil Snyder;

"A new proof of the existence theorem for implicit functions," by G. A. Bliss; "On a set of kernels whose determinants form a Sturmian sequence," by H. Bateman; "On the cubes of determinants of the second, third and higher orders," by R. E. Moritz; "Note on the maximal cyclic subgroups of a group of order p^m," by G. A. Miller; "An expression for the general term of a recurring series," by Tsuruichi Hayashi; "Shorter Notices": Lebon's Biographie et Bibliographie of Emile Picard and Paul Appell, by J. W. Young; Vermeintliche Beweise des Fermatschen Satzes, from the *Archiv der Mathematik und Physik*, and Lind's Ueber das letzte Fermatsche Theorem, by Joseph Lipke; Slaught and Lennes's Solid Geometry, by F. W. Owens, Hawkes, Luby and Touton's First Course in Algebra, by J. V. McKelvey; "Corrections"; "Notes"; "New Publications."

WHEAT RUSTS AND SUNSPOTS

IN looking over a copy of the *Journal of the Agri-Horticultural Society of Western India* for April to June, 1906, I was interested to notice, on page 165, an article with the above caption, by G. N. Sahasrabudhe, of the College of Agriculture at Poona. The author refers to a report in the *Proceedings* of the Australian Wheat Conferences of periodicity in the occurrence of *Puccinia graminis* in Australia. The years of the most severe attacks, it is stated, were 1867, 1878 and 1889, making a period of eleven years between every two maximum years. The writer goes on to state that this cycle suggested to some members of the conference that it had some relation with the various phases through which the fungus has to go, but quotes from Surgeon-Major D. Prain the statement that "the periodicity is not due to any inherent property of the fungus, but must, as seems to be the belief in Chili, be due to the recurrence of conditions favorable for its development."[1] I quote the following paragraph entire:

> We have trustworthy records of rust attacks in Australia from 1867. In that year it was almost general and caused immense loss in South Australia. This is the minimum year of the sun-spot cycle (1867–78). The year 1878 was one of the worst years for rust in Victoria, and in South Australia it prevailed over a large area that year; that also was the minimum year of the sun-spot cycle. In South Australia 1880 was the year when a considerable area was affected; and it was the year when the sun-spot area was very small. The seasons 1882–1888 seem to have been very free from rust; and that was the maximum period of the sun-spot cycle (1879–1889). In 1889 it was almost general and caused great loss in South Australia, Victoria, New South Wales and Tasmania; and that was the minimum year of the sun-spots. This clearly proves that the attack of the pest is most severe when the sun-spot area is the smallest, and from the theory of the sun-spots it does not seem unnatural. It is well known that the changes in sun-spots are closely related to the changes in the atmospheric pressure and consequently in the rainfall; and experience shows that the development of the fungus is dependent to a great extent on the atmospheric conditions and rainfall. The opinions of the farmers put forward in the Second and Third Conferences indicate the same thing. Rust is usually most prevalent in seasons when the rainfall is excessive, especially during October and November.[2] When close, damp, muggy weather sets in, the rust is certain to appear (indicating diminution in pressure). A dry cold season in Queensland is inimical to rust. The year 1889, which was a very rusty one, was marked in New South Wales by frequent thunderstorms at the time the wheat was in bloom. The colder districts were in that year less rusty than others.

The author states that when he thought the matter over, especially the remark by Dr. Prain, he thought there must be some relation between this eleven-year cycle and the Brookner's cycle of sunspots, which is also of eleven years, and that when he began to compare the two cycles closely, he was "almost convinced" that there must be some relation between sunspots and the growth of the *Puccinia* fungus. This relationship, he concludes, may "throw a great light on the life history of the fungus and also we may be able to foretell the years in which the rust attacks will

[1] Agri. Ledger, No. 16 of 1897, p. 9.

[2] Proc. of II. Con., 17, 49.