regard. The schools seem to have met the new arrangements with cordiality and good spirit.—*Harvard Alumni Bulletin.*

SCIENTIFIC BOOKS

Reports to the Local Government Board on Public Health and Medical Subjects (New Series, No. 53). Further Reports (No. 4) on Flies as Carriers of Infection. Pp. 48. Bacon Street, E., London, Darling and Son, Limited. 1911.

This latest number of this very valuable series of reports on flies as carriers of infection includes four articles of cosmopolitan interest: Dr. Copeman, Mr. Howlett and Mr. Merriman report upon an experimental investigation in the range of flight of flies; Mr. Austen presents a memorandum on the result of examinations of flies from Postwick Village and refuse deposit; Dr. Nicoll discusses the part played by flies in the dispersal of the eggs of parasitic worms, and Dr. Graham-Smith gives further observations on the ways in which artificially infected flies carry and distribute pathogenic and other bacteria.

The investigation on the range of flight of flies, by Dr. Copeman, Mr. Howlett and Mr. Merriman, is of great importance and is one which is very difficult to carry to a practical conclusion. Its value in deciding, in practical anti-fly work, the distance from a given point to which it is necessary to carry the abolition of possible breeding places is fundamental. It necessitates the use of a method of marking flies which will not interfere with their normal habits, and can at the best indicate only certainties of observation. It is shown in this report that marked flies in the series of observations were recovered at distances varying from 400 yards to 1,408 yards from the point where they were marked, thus indicating a flight of more than three quarters of a mile. The writer of this notice, in his recently published book "The House Fly —Disease Carrier," brought together all of the previously recorded observations on this point, but was unable to find any substantial records of distances equal to this. While it is true that the probabilities strongly favor a more extended flight, these observations nevertheless record the longest scientifically observed flight and indicate that for at least three quarters of a mile around a given point breeding places must be treated or abolished if the nuisance and danger of the house fly are to be avoided. It should be stated that, in the text on page 8, a distance of 1,700 yards is indicated, but this does not appear in the table. Accepting 1,700 yards, the observed limit of distribution reaches nearly a mile. The authors note that the direction of the prevailing wind is an important factor, and that the time of the distribution observations was forty-eight hours.

Dr. Nicoll, in his consideration of the part played by flies in the dispersal of the eggs of parasitic worms, shows that flies may convey such eggs from excrement to food in two ways, namely, on the external surface of the body and in the intestine. The latter mode occurs only where the eggs are of small size (under 0.05 mm. in diameter). Larger eggs may be carried on the external surface, but these are usually removed by the fly within a short time. Others which are taken into the intestine may remain there for two days or longer, and may remain alive and subsequently cause infection. The eggs of the following parasitic worms have been shown experimentally to be capable of being carried by *Musca domestica: Tænia solium, Tænia serrata, Tænia marginata, Hymenolepis nana, Dipylidium caninum, Dibothriocephalus latus* (?), *Oxyuris vermicularis, Trichuris* (*Trichocephalus*) *trichiurus,* both internally and externally; *Necator americanus, Ankylostoma caninum, Sclerostomum equinum, Ascaris megalocephala, Toxascaris limbata* (=*Ascaris canis* e. p.), *Hymenolepis diminuta* externally only. No Trematode parasites have as yet been experimented with in this investigation.

Dr. Graham-Smith concludes that both house flies and blow-flies are capable of infecting fluids, such as milk and syrup, on which they feed and into which they fall. In the case of the house fly, infected with certain micro-organisms (*B. prodigiosus* and *B. anthracis*), gross infection may be produced in

milk for at least three days, and a smaller degree of infection for ten days or even longer. At the same time he shows that blow-flies produce gross infection for six to nine days with non-spore-bearing micro-organisms and some degree of infection for three or four weeks. The investigator thinks that it is probable, at any rate in the later stages, that infection is mainly due either to direct infection with the crop contents vomited through the proboscis, or to direct infection by means of the limbs which have been reinfected with vomited material.

These experiments were so conducted as to afford no information as to the extent to which house flies bred from larvæ fed on naturally infected excreta and similar materials are apt themselves to be infected.

L. O. HOWARD

Lectures on Fundamental Concepts of Algebra and Geometry. By J. W. YOUNG. Prepared for publication with the cooperation of W. W. DENTON, with a note on the growth of algebraic symbolism by W. G. MITCHELL. Pp. vii + 247. New York, The Macmillan Company. 1911.

While the teacher of secondary mathematics finds a large amount of English literature on the teaching of his subject he looks in vain for much that is well adapted to give him a deep insight into the fundamental theory of the subjects with which he has to deal. The English language contains no encyclopedia on elementary mathematics like Weber and Wellstein's "Enzyklopädie der Elementarmathematik," or like the new Italian encyclopedia which is being prepared. It has no histories like Cantor's or even like Tropfke's. It has no periodical like *L'Enseignement Mathématique,* and no large mathematical encyclopedias like the great works which are now being published in German and in French.

Although the small size of the book under review precludes any hopes that we might have here a work to which the teacher of secondary mathematics may turn for an answer to most of his questions, yet he will find here an unusually clear exposition of a large number of things relating to the logical foundation of algebra and geometry. The brevity of the exposition will doubtless be welcomed by many who are looking for a first general survey of some basic matters, and it is to be hoped that they may become sufficiently interested to pursue the thoughts further, as they are encouraged to do by a fair number of references.

The book is modern in spirit, and, to a large extent also, in subject matter. Considerable attention is given to historical settings but the logical element receives the greatest emphasis. It opens up view points which are of great interest even if they may not always be acceptable to the reader. From the nature of the case many of the questions treated are such as to give rise to different views, but their fundamental importance justifies inquiries even if these do not always receive a complete answer. One of the most important lessons for the young mathematician to learn is a keen realization of the narrow limits of the explored parts of mathematics as compared with those regions which invite our inquiry and baffle our efforts.

The contents of the volume can be readily inferred, in the main, from its title. After a brief consideration of Euclid's elements and non-euclidean geometry, the author considers the logical significance of definitions, axioms and postulates, the consistency, independence and categoricalness of a set of assumptions. This is followed by a consideration of the fundamental notions of class, correspondence and group, and the development of the concepts of real and complex numbers. It is pointed out that from the abstract point of view algebra and geometry are identical in the sense that each includes the other, and that this explains the interrelations between these subjects.

On page 194 the author repeats a historical error which is very wide spread in mathematical literature, as regards the early use of the term function for integral power of a variable. This error seems to have been started by d'Alembert and it has been re-