the history of mathematics in Europe. Problems of a similar sort were studied in the east and west by very different methods with uniformly identical results. The Japanese methods seemed to be painstaking and exquisite in detail, rather than powerful and rigorous as were the European. The "circle principle" similar to the calculus, an equivalent of Horner's method, the value of π, determinants, configurations of circles, ellipses and straight lines on a folding fan, i. e., in the sector of an annulus were among the subjects studied by Japanese mathematicians. In the earlier years, foreign learning was forbidden entrance to Japan. A few pupils studied with teachers of their own choosing. Frequently these teachers kept secret their most precious discoveries or revealed them to their favorite pupils on condition that the information should go no further. Japanese teachers were accustomed for a long time to post problems for solution on the temple doors, frequently using a pupil's name rather than their own.

The "closed door" method of study continued, but with weakening prestige, until the beginning of the nineteenth century, when western learning was freely recognized.

J. V. McKelvey.

Die realistische Weltansicht und die Lehre vom Raume. Von E. Study. (Band 54, Die Wissenschaft, Einzeldarstellungen aus der Naturwissenschaft und Technik). Braunschweig, Friedr. Vieweg und Sohn, 1914. ix + 145 pp.

The purpose of this essay appears very clearly from an announcement by the publishers, according to which the author attempts to show that the question concerning the true nature of space, like others, is a problem of natural science that cannot be answered by "pure reason," as proposed by Kant.

In the theory of the problem of space it is shown that, as in natural sciences in general, nothing can be accomplished without the aid of experience and hypotheses. Of these, so far, only the euclidean hypothesis has gained practical importance, although to the non-euclidean hypotheses must be accorded the same theoretical value (Erkenntniswert).

The first part of the book deals with philosophic questions and is accessible to a generally educated public. The second part requires a fair knowledge of analytic geometry. It is the contention of the author that a sufficient and precise formulation and understanding of the theory of space is impossible without analytic geometry.

Throughout the book Study lives up to his well merited reputation as an acute and competent critic.

In the first chapter the problem of space is presented from the standpoint of realistic philosophy to which the author confesses. It is headed by a motto due to Helmholtz: "Unwürdig eines wissenschaftlich sein wollenden Denkers ist es, wenn er den hypothetischen Ursprung seiner Sätze vergisst." According to this philosophy, space is real and not merely a concept of logic. We conceive space because we live in it, and we are not able to say exactly what it is. To conceive it in a mathematical sense we must make certain hypotheses which are based upon experience.

The second chapter deals with the enemies of realism: the idealists, the positivists and, last but not least, the pragmatists; it may be called a clever satire against these philosophies. Pragmatism in particular is torn to shreds and, according to Study, does not seem to reflect great credit upon the intellectuality of the age and class that conceived it. He speaks of the "gallertartige Konsistenz dieser Quallenphilosophie" (jelly-fish philosophy).

After critizing the idealistic (a priori) conception of space, in the succeeding fourth and fifth chapters the author develops in detail the realistic theory of space. From the data of experience alone (positivism) it is not possible to deduce a system of mathematical concepts, or a system of geometry. What we here may expect from experience and the construction of hypotheses, in particular of the experiment, is not more nor less than in other problems of natural science. In many cases, when making hypotheses, we may not expect a uniform answer from nature. The hypotheses on the nature of empiric space are of exactly the same type as all other hypotheses of the natural sciences. From this standpoint the only admissible hypotheses of natural geometry that may be considered seriously are the euclidean and the so-called non-euclidean geometries. The reason for this is that for these we have sufficient material for induction, while this is not true of certain "artificial" geometries. The different steps in the mathematical treatment of the problem of space from the realistic standpoint are carefully and clearly explained.

Naturally, such a treatment leads to a sharp conflict with the school of "logisticians" and enthusiasts of "axiomatics." This phase of the great problem is considered in the concluding chapter: axiomatics in geometry. It seems to me of great importance and actuality and I should like to advise every young American mathematician to read carefully this clear cut presentation of the issue.

On the tendency to reduce all and everything in mathematics to axiomatics the author has this to say:

"Mit Uebertreibungen dieser Art, die eine etwa als Axiomasis zu bezeichnende wissenschaftliche Modekrankheit darstellen, haben wir es jedoch nicht zu tun. Man muss sie austoben lassen: Gleich allen Moden werden sie von selbst aufhören."

Concerning the comparative value of productive mathematical activities Study makes the following statement:

"Auf die Resultate kommt es vor Allem an, und in zweiter Linie erst steht die Methode für Den, der nicht nur mathematische Philosophie oder philosophische Mathematik treiben, sondern sich schöpferisch betätigen will."

The critical remarks concerning Poincaré's scientific activity, so far as they are of a personal nature, might have been omitted. Poincaré was precisely of the type of mathematicians that were after results; with him the method was of secondary importance.

As a whole, the reading of the book with its vigorous and aggressive style is very refreshing, and nobody that intends to be well informed on the foundations of mathematics should fail to familiarize himself with its contents.

ARNOLD EMCH.

Contribution à l'Étude des Courbes convexes fermées et de certaines Courbes qui s'y rattachent. Par CHARLES JORDAN et RAYMOND FIEDLER. Paris, A. Hermann et Fils, 1912. 77 pp.

As the authors point out, this monograph is an auxiliary of their investigations in geometric probabilities and treats of closed convex curves and some associates that may be conveniently established by the method of tangential polar coordinates.

Such a system in a plane may be defined as follows:

Choose a point as the pole and a straight line through it,