until certain other unprovable results of intuition are brought into play. Exactly what an external object consists of aside from its being a projection of an internal idea is not shown. And if the world as we conceive it is merely a projection of that which is wholly mental, then why so much struggling to prove the geometrical character of the world as we geometrize it? Or on the other hand, why such a certainty of its arithmetic as we arithmetize it?

The definition given by C. S. Peirce for mathematics has not been surpassed : " The study of ideal constructions (often applicable to real problems), and the discovery thereby of relations between the parts of these constructions before unknown." This implies the rôle of logic and of intuition in the architecture of this vast structure. And in a projection of two figures is A the projection of B, or B of A? Is the world framed according to the architecture or the architecture according to the world? Qui sait !

JAMES BYRNIE SHAW.

Taschenbuch für Mathematiker und Physiker. 1909. Von
FELIX AUERBACH. Leipzig, Teubner. 1909. xliv +
450 pp. 6 Marks.

THIS little pocket manual initiates a series of year books to be issued by the firm publishing it. They are to be congratulated upon their enterprise in furnishing the mathematical public what it has long needed. The engineer has his Trautwine, Kent, Kidder, or Foster, but so far the mathematician has had only collections of integrals, or small collections of trigonometric formulas. This volume, on thin but opaque paper, with typography which is delightfully clear, contains not only an excellent summary of the whole field of mathematics, but also a resumé of mechanics, physics, and physical chemistry. One is much surprised and pleased at the amount of valuable material compressed into so small a space, yet so easily found. The chief formulas and definitions are to be found here for arithmetic, algebra, group theory, combinatory analysis, determinants, series, differential calculus, integral calculus, definite integrals, calculus of variations, differential equations, transformation groups, functions of a real variable, functions of a complex variable, gamma function, elliptic integrals and functions ; principles of geometry, topology, planimetry, stereometry, goniometry, plane trigonometry, spherical trigonometry ; coordinate

geometry, lines in a plane, general plane curves, conics, cubics, general space geometry, algebraic surfaces, families of surfaces, quadrics, twisted curves ; line geometry, transformations in a plane ; differential geometry of the plane and of space; probabilities, errors, numerical calculations, graphics, vector analysis and quaternions. The other headings mentioned are equally fully treated. Many topics have a place assigned for future exposition. In a few years this small encyclopedia will be almost a necessity for student, teacher, and investigator.

The book is illustrated with a portrait of Lord Kelvin, and his biography opens the introduction. The properly " yearbook " topics are a calendar, astronomical data, lists of journals and proceedings and transactions of learned societies, new books, necrology for 1908, lists of teachers of mathematics and physics in Germany. The errors in the book are few, so far as the reviewer noticed in his reading; those existing are noticeable at once and doubtless will disappear in the next volume.

JAMES BYRNIE SHAW.

Statistique Mathématique. Par H. LAURENT. Paris, Octave
    Doin, 1908.   vi + 272 + xii pp.

THE author states that, for him, the object of mathematical statistics is to indicate and investigate methods of making good observations, when the point in question is to make numerical estimates concerning matters which interest economists. He has thus limited his purposes to matters which relate to specific applications. This fact may account, in part, for the entire omission of that important body of mathematical statistics which has been developed in close connection with applications to biology. However, these methods have been applied by others to problems of economics.*

It is well stated in the preface that it is a very common error to suppose that those who direct statistical investigations do not need to know mathematics. The author remarks that official statistics are not good, in general, because those who direct statistical investigations are not prepared for the work, and that if it is not necessary to exact of the statistician that he have a command of universal science, it is necessary, at least, that he should have surveyed the field of scientific knowledge.

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* See Yule, *Journal of the Royal Statistical Society*, vol. 60, pp. 812–854.
Norton, Statistical Studies in the New York Money Market.