equation (14) and unroll the cone which projects this curve from the origin, on the xz-plane, the curve into which (c) goes will satisfy (10) and hence will rotate into a surface of constant positive curvature. Hence *the curves of 4-space which rotate by* (7) *into surfaces of constant positive curvature are obtained by tracing on the xz-plane curves* (c) *which rotate by* (7) *into surfaces of constant positive curvature, and then rolling the xz-plane into a cone with vertex at the origin. The curves into which the curves* (c) *go are those sought.* Of course to obtain curves which cut the path curves orthogonally the above cones must be such that each of their tangent planes cuts a pair of completely perpendicular planes in lines. Curves which generate surfaces of constant negative curvature are obtained in a similar manner.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

SHORTER NOTICES.

The Mystery of Space. A study of the hyperspace movement in the light of the evolution of new psychic faculties, and an inquiry into the genesis and essential nature of space. By ROBERT T. BROWNE. New York, E. P. Dutton and Company, 1919. 8vo. 395 pp. $4.00.

THIS book is a mixture of cosmogony, psychology, and geometry; heralded in a recent flyer as "an epoch-making work."

With the cosmogony and psychology we can have little to do. Anyone obviously has a perfect right to philosophize about the universe and the true nature of space as much as he pleases and to dress his philosophy in Greek nomenclature to give it a scientific aspect if he chooses. But the reader may be pardoned if he is tempted to compare the periodic wanderings of Mr. Browne's "monopyknon," from chaos through seven stages of "pyknosis" before emerging into physical being, and thence through sentient, mental, and spiritual stages back to chaos again, with Goethe's story of the Homunculus; and to assert that the one is as mediaeval in character as the other was intended to be. Nor can one deny to the author the right to hold and to defend, if he can, the theory that humanity will one day develop to the point where, through the agency of the pineal gland and the pituitary body, intuition will supersede intellect and mathematics will cease to be useful or, if needed, will be known intuitively to the infants of that millennium. If a common mortal finds difficulty in following the arguments in support of this theory, it is probably because he has regarded his pineal gland and pituitary body, if conscious of them at all, as rudimentary rather than embryonic, and so has failed to cultivate their latent powers, as Mr. Browne would have us believe clairvoyants, and their like, do.

But with geometry the case is somewhat different. The author's profound apology to mathematicians for his temerity in entering this field indicates that he was conscious of his lack of training for the work he essayed to do. That he attempted to prepare for it by reading about non-euclidean geometry and hyperspace, is shown by a more or less detailed reproduction of the history of non-euclidean geometry from the earliest attempts to prove Euclid's parallel postulate to the present time; by numerous quotations from various writers on non-euclidean geometry and hyperspace; and by an appendix containing a bibliography of over one hundred articles and books. That he failed to digest this material is shown by the persistent confusion of non-euclidean geometry with hyperspace, and by his supposition that these subjects were invented by mathematicians for the purpose of explaining the real nature of space. Of course he must refute these spurious explanations in order to introduce his own idea of space. Naturally he can offer no proof that real space is not non-euclidean in character or that it has exactly three dimensions, for he scorns basic axioms and takes mathematicians to task for deifying the definition. One wonders why he did not seize upon hyperbolic geometry as a coup de maître in support of his theory that real space is finite, limited, and surrounded by chaos, or "spacelessness." The best he can do, however, is to assert the absurdity of all geometrical conceptions, other than the classical euclidean, styling them "superfœtated hypotheses" or "mathetic divertisements." It is apparently an easy and interesting game for Mr. Browne to tilt rhetorical lances at non-euclidean geometry and the fourth dimension and he indulges frequently in this sport throughout the book. But this is a dangerous game for one who apologizes upon entering it and exhibits throughout a lack of knowledge of the objects at which he aims his lances, and our author must not expect to fare better at it than did his prototype who mistook the windmills for something other than they were.

L. WAYLAND DOWLING.

Junior High School Mathematics, Books 1 and 2. By E. H. TAYLOR and FISKE ALLEN. New York, Henry Holt and Company, 1919.

To one who has followed the trend of mathematical education during the last ten or fifteen years, it is apparent that the voluminous discussion on coordination of elementary mathematics is beginning to bear fruit. Recent elementary texts like the one under discussion show very clearly that teachers and authors now have a definite aim in view. The two most notable features of these modern texts are, first, the early introduction of geometric ideas and constructions without formal demonstrations, and second, the socializing of elementary mathematics by interesting the pupil in everyday activities which require computations and geometric constructions.

The text under review is a modern coordinated treatment of arithmetic, algebra and geometry for use in the seventh and eighth grades. Book 1 contains first a review of the fundamental operations of arithmetic with numerous problems in keeping accounts and simple business transactions. This is followed by a study of the formula as an introduction to literal arithmetic and algebra; percentage and its simpler practical applications; measurement of lines and angles; triangles and other constructions with ruler and compasses; parallel lines, quadrilaterals and polygons; and the mensuration of areas. The arrangement of subject matter is excellent, and the problem material covers a very extensive range of useful applications.

Book 2 continues the three lines of work begun in the first volume, viz., arithmetic, algebra and geometry. Algebra is approached through the formula and the use of letters to shorten statements in words; the square root of numbers is found arithmetically and also graphically by using the Pythagorean theorem; ratio and proportion are also treated both arithmetically and geometrically; this is followed by the mensuration of simple solids with numerous concrete problems; explanation of the negative; problems involving simple