tinuous space hold unchanged for such a discontinuous space. Some operations, however, such as rotation and transformation of coordinates to new axes inclined to the original ones, are possible only in certain cases. The study of the conditions under which such operations are possible, and of the effect of these operations when the conditions are satisfied, forms the main drift of the book.

The most interesting chapters are those which deal with what the author calls *modular* spaces. A modular plane space of modulus m is a square of m^2 points, a point (a, b) of this square representing all points $(a+pm, b+qm)$ of the unlimited arithmetical space, p, q being arbitrary integers. Geometrical properties of the complete unlimited space yield corresponding properties of the fundamental modular square, the coordinates of the original points being replaced by their *congruent* numbers of modulus m.

Transformations of coordinates in such modular spaces lead to the construction of magic squares and abacs.

Graphical methods are given for the solution of diophantine equations, and the last chapter deals with a number of problems, among them the following, originally proposed by Euler; from each of six different regiments six officers of different rank are taken. The problem is to arrange them in a solid square so that in each row and in each column there shall not be two officers of the same rank or of the same regiment. This problem, which was shown to be insoluble by MM. G. and H. Tarry in the case of thirty-six officers, is soluble when there are sixteen, and the reasons for this are here discussed.

Strangely enough, this branch of mathematics, although it might well be classed amongst the purest of the pure, is not without its industrial applications, notably in the weaving of tissues and fabrics.

Altogether, we commend M. Arnoux's book to those interested in the mathematical curiosities of the theory of numbers.

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Contributions to the Study of the Early Development and Imbedding of the Human Ovum. By Dr. T. H. Bryce, Dr. J. H. Teacher, and J. M. M. Kerr. Pp. viii+93; 10 plates. (Glasgow: J. MacLehose and Sons, 1908.) Price 12*s*. 6*d*. net.

IT will be a glad day for the science of embryology when all the details of the sequence of the development of man are described from successive stages of the human ovum and embryo. The chick has, to a great measure, passed from the position that once it occupied, and even the lower mammals cannot be taken as substitutes for human material, when human development is to be rightly studied. Much that is confusing in embryology to-day is the outcome of reading whole pages of the embryonic life-histories of other creatures into the early chapters of human development.

In certain special directions the primates form a group distinguished developmentally from other mammals, and man and the anthropoids differ in some details from the other primates. Our knowledge of the development of man will, therefore, not be ideal until all our stages are accurately described from purely human material. Towards the attaining of this ideal, the description of the Teacher-Bryce ovum materially helps; at the same time, it probably holds out a guarantee for the further extension of our knowledge of the earliest stages of human development, for the material so carefully treated in this case is material that is often neglected.

The Teacher-Bryce ovum is the earliest human ovum yet described—its age is computed at thirteen to fourteen days—and, owing to the care taken in ascertaining the details of its history, this computation may be taken as final.

It is younger, by probably a day, than the well-known ovum of Hubert Peters, described in 1899, although that ovum was originally considered to be no more than three to four days old.

Great care and a wealth of detail have been used in making the account of this ovum as complete as possible, and in order to render the material of more value, a table of all the recorded early human ova has been incorporated for comparative purposes.

The volume in which this ovum is described also contains the description of an early ovarian pregnancy, and this—like the uterine ovum—is the earliest stage that has yet been described.

It is but natural that, in dealing with such material, many new details should come to light, and all the many points of novelty receive very ample discussion and illustration. The whole technic of the work, and especially the many fine illustrations, mark a distinct advance on the ordinary run of English scientific publications, and towards this perfection the authors have to thank the Carnegie Trust for assistance. Dr. Bryce has already demonstrated his specimens at the meetings of scientific societies, and the general features of his early ovum are now well known to embryologists, but the book in which he describes it contains, apart from the mere description, a vast amount of well-assorted detail, got together and presented in most workmanlike fashion.

Graphic Algebra. By Dr. Arthur Schultze. Pp. viii+93. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1908.) Price 4*s*. 6*d*.

IN this text-book the author first gives examples of plotting from physical and statistical data, and the graphing of simple functions of one and two variables. He then proceeds to the main purpose of the book, which is that of solving algebraical equations by the use of squared paper and a few standard curves. Equations up to the fourth degree are fully dealt with, and, in order to facilitate the work, a method is cleverly developed in which the direct graph is replaced by two loci of a simpler nature, the intersections of which give the required roots. Thus a quadratic equation is solved by reading off the intersection of a standard parabola and a straight line; the same parabola is used for all quadratics, and it is only the scale and the position of the line which vary. Instead of the parabola, a rectangular hyperbola may be used. Cubics are dealt with by means of the curve $y=x^3$ and a suitable straight line. Biquadratic equations are solved by the intersection of a circle and the standard parabola or standard hyperbola. In all cases it is shown how to find the imaginary or complex roots, if such exist.

The whole subject is treated in a very concise and interesting manner, and the reader should become fully conversant with the principles of graphing and the nature of algebraical equations. But the special methods, however ingenious, must be regarded rather in the nature of mathematical exercises than as having any very useful practical applications, for such equations occur so seldom outside text-books that when an actual case does arise, simple direct methods of solution are usually to be preferred. This admirable manual concludes with an appendix containing some "statistical data suitable for graphic representation," a short table of squares, cubes, square roots, and reciprocals of numbers, and a collection of answers to the many exercises which are provided throughout the text.