

SHORTER NOTICES

Puzzles and Curious Problems, By H. E. Dudeney. London, Thos. Nelson and Sons, 1932. 195 pp.

Alte und Neue Mathematische Spiele. Eine Einführung in die Unterhaltungsmathematik. By G. Kowalewski. Leipzig and Berlin, Teubner, 1930. vi+145 pp.

Dudeney died in 1930 and the first of the volumes under review was prepared, from papers he had left behind, by his wife, the well known English novelist. A biographical sketch is given in the preface. For many years he was the famous inventor of mathematical recreations for *Tit-Bits*, *Weekly Dispatch*, *Daily News*, and the *Strand Magazine*, and he published four attractively written and ingenious volumes: *The Canterbury Puzzles* (1907; second ed., 1909), *Amusements in Mathematics* (1917), *Modern Puzzles and How to Solve Them* (1926), and *The World's Best Word Puzzles* (1926). Dudeney is also the author of the article on magic squares in the last edition of the *Encyclopaedia Britannica*.

In the present volume there are 365 problems classified under the headings: arithmetic and algebraic problems, geometric problems, moving counter problems, unicursal and route problems, combination and group problems, magic square, measuring, weighing, and packing problems, etc. *Solutions* occupy pages 127-189. There is a good index.

The work of Kowalewski is something of a very different character, and is filled with material of strong appeal for the mathematician. The motto for the book, quoted from a letter of Goethe to Schiller, is highly appropriate. It is: "Übrigens ist nur alles verhasst, was mich bloss belehrt, ohne meine Tätigkeit zu vermehren oder zu beleben." Kowalewski's single previous publication in this field was his pamphlet on the *Boss Puzzle und Verwandte Spiele* (Leipzig, 1921)*, but while at the University of Prague (1912-19), he gave lectures on mathematical recreations. In America the Boss puzzle is familiar as the fifteen puzzle, through papers of Johnson, Story, and Frazer; a detailed historical account of the problem is given in the monumental work of Ahrens (*Mathematische Unterhaltungen und Spiele*, 2d ed., Leipzig, vol. 2, 1918, Chapter 19).

Kowalewski's little book contains five chapters, the first (p. 1-20) of which is entitled *The colored cubes of Major MacMahon*. Here, as elsewhere, there is scarcely any reference to the literature of the subject, no hint as to where MacMahon discussed the problem. Hence it may be noted that the Major's paper *On the thirty cubes constructed with six coloured squares* was published in the *Proceedings of the London Mathematical Society* ((1), vol. 24 (1893), pp. 145-155). The statement of the problem, involving rotations of cubes, would take too much space. It is merely to be noted that two solutions of MacMahon's problem are set forth, a notable relation between them is indi-

* *Mathematica Delectans. Ausgewählte Kapitel aus der Mathematik der Spiele in gemeinverständlicher Darstellung*, Heft 1.

cated, a new game with MacMahon cubes is formulated and solved, and a new form of the cube game, involving hemispheres, is given.

The second chapter (p. 21-35), entitled *The mysterious grid or the thought reader*, seems to be a new mathematical game involving the binary scale of notation.

In the third chapter (pp. 35-61) on *The game of nim or fantan or three heaps*, it is noted that the mathematical theory of the game, and its name nim, were first given by C. L. Bouton, of Harvard University, in *Annals of Mathematics*, 1901, and it is remarked that "die weitgehendste Verallgemeinerung des Nimspieles verdanken wir dem berühmten amerikanischen Mathematiker E. H. Moore." This was published in the *Annals*, 1910. In both of these discussions the binary scale is employed. Most of the chapter is taken up with the discussion of modifications of the conditions of the game and with consideration of the relation of the discussion to that of Bouton and Moore.

The long fourth chapter (pp. 61-125) on *Puzzles of arrangement*, deals with a variety of problems, such as the Boss-puzzle, Sir Wm. R. Hamilton's dodecagon game (*Quarterly Journal of Mathematics*, vol. 5 (1862)), and a new kind of closed knight's move. The last chapter sets forth different forms of solitaire playing.

This valuable book notably supplements such works in English as those of Ball and MacMahon, and lives up to its motto throughout. Moreover the style of presentation is, for the most part, very pleasantly informal.

R. C. ARCHIBALD

Einführung in die theoretische Physik. In three volumes. By Clemens Schaefer.

Volume 3, Part 1: *Elektrodynamik und Optik*. Berlin and Leipzig, de Gruyter, 1932. 918 pp.

A perusal of Professor Schaefer's admirable account of the classical electrodynamics and optics is like a visit to an old friend who is familiar with the great achievements of the past and can describe many modern discoveries in well-chosen language.

The first three chapters deal with static electric and magnetic fields and steady electric currents. The account of electromagnetic theory begins in Chapter IV, which contains a formulation of the laws for non-stationary processes. This is followed by a study of quasi-stationary currents and of electromagnetic waves in insulators and conductors. There is an admirable account of the optics of perfectly transparent media in which the phenomena of reflection are beautifully illustrated by diagrams indicating the flow of energy in the two media for the cases of partial and total reflection.

The chapter on the optics of crystals, supplemented by one on geometrical optics and diffraction, provides a clear elementary introduction to crystal theory.

There is a good presentation of the theory of electrons and dispersion which contains a brief account of its recent application by Larmor, Appleton, Nichols, and others to explain the striking fact that the range of the long waves of wireless telegraphy has a marked minimum for a wave-length of 200 m. The thermodynamical theory of radiation is well presented and the chapter on relativity closes with a sketch of the general theory, which the author regards as not yet fully established by the astronomical tests.

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