

*Die Mathematischen Hilfsmittel des Physikers.* By Dr. Erwin Madelung. Berlin, Julius Springer, 1922. 247 pp.

This book gives a tabular list of the mathematical results needed in theoretical physics. It is very comprehensive, and covers everything that is not of a distinctly special character. The book also contains a second part devoted to formulating the fundamental laws and principles of physics, and discussing their formal aspects very briefly. Originally, this latter was intended merely for the purpose of illustrating the use of some of the mathematics given in the first part, but the author developed it so that it has a certain completeness. In our opinion, this part is coordinate in importance with the first, so that the book is decidedly more than its name implies.

We give a very reduced extract from the table of contents:

*Algebra:* Lineare Gleichungssysteme. Matrizes und Determinanten. Kombinatorik (8 pp.). *Funktionen:* Allgemeine Funktionentheorie. Spezielle Funktionen (35 pp.). *Reihen* (9 pp.). *Differential- und Integralrechnung* (8 pp.). *Differentialgleichungen:* Allgemeines über Differentialgleichungen. Gewöhnliche Differentialgleichungen. Partielle Differentialgleichungen (37 pp.). *Lineare Integralgleichungen* (3 pp.). *Variationsrechnung* (5 pp.). *Transformationen:* Allgemeines über Transformationen. Koordinaten-Systeme und Koordinaten-Transformation. Berührungstransformation (22 pp.). *Vektoranalysis:* Koordinatenfreie Formulierung der Vektoranalysis. Koordinatenmässige Formulierung der Vektoranalysis in  $n$ -dimensionalen Räumen (28 pp.). *Wahrscheinlichkeitsrechnung und einige Physikalische Anwendungen* (10 pp.) *Mechanik:* Prinzipien der Mechanik. Einzelne Massenpunkte. Systeme von Massenpunkten. Starrer Körper. Mechanik der Kontinua (22 pp.). *Elektrizitätslehre* (16 pp.). *Relativitätstheorie:* Lorentztransformation. Elektrodynamik. Dynamik der Masse. Allgemeine Relativitätstheorie (14 pp.). *Thermodynamik:* (including the three laws, "phases", "mass-action", etc. 24 pp.).

The treatment of elliptic functions and integrals is characteristic of the book: periodic properties, Liouville's theorem, etc., are stated without proof; while all the steps of the reduction of the general integral

$$\int F(x, \sqrt{\alpha + \beta x + \gamma x^2 + \delta x^3 + \epsilon x^4}) dx, \quad F \text{ rational}$$

to the three standard forms are given. Apparently the great concentration of the material has made it impossible to state all the restrictions of continuity, etc., in every case (notably in the definition of *analytic function*, which is not satisfactory).

This book will exert a broadening influence on both mathematician and physicist. Although it is intended as a table rather than a textbook, it will lead to a desire for breadth of knowledge.

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