Beiträge zu einzelnen Fragen der höheren Potentialtheorie. Von E. R. NEUMANN. (Preisschriften gekrönt und herausgegeben von der Fürstlich Jablonowskischen Gesellschaft zu Leipzig, No. 41.) Leipzig, Teubner, 1912. xxiv+188 pp.

THIS prize memoir is concerned with the two fundamental problems of the potential theory, viz., the determination of a solution V of Laplace's equation satisfying certain continuity conditions either in the domain inside or in that outside the boundary when, for every boundary point s, either the value of V or the derivative $\partial V/\partial n_s$ along the boundary normal n_s is given (first and second boundary problem, respectively).

For the first problem, the method of Green's function gives

$$V_p = \int f_s \psi_{sp} ds, \tag{1}$$

where f_s is the given boundary value, and ψ_{sp} a function depending on the boundary point s and the variable point p only. The researches of Carl Neumann have suggested the possibility of representing ψ_{sp} as the potential of a mass distribution *on the boundary*

$$\psi_{sp} = \int \Delta_{s\sigma} T_{\sigma p} d\sigma, \tag{2}$$

where $T_{\sigma p} = 1/r_{\sigma p}$ for the three-dimensional and $= \log r_{\sigma p}$ for the two-dimensional problem, and $\Delta_{s\sigma}$ depends only on the two boundary points s and σ. The investigation of this "fundamental mass distribution" $\Delta_{s\sigma}$ is the main object of the memoir under review.

The method is briefly the following: expressing ψ_{sp} by the infinite series furnished by Carl Neumann's method for solving the first boundary problem, this series is divided into two parts. The first consists of a finite number of terms and contains all the singularities of ψ_{sp}, while the second part, consisting of the remainder of the series, has no singularities. It is found that the representation (2) is possible for the second part, but not for the first, which, however, is of sufficient simplicity in itself.

Making $h = 2$ for the three-dimensional and $h = 1$ for the two-dimensional problem, the following formulas are obtained, according as the variable point p is an interior point i or an exterior point e:

$$\psi_{si} = \frac{1}{h\pi}(\gamma_{si} - \gamma_{si}') + \int \Delta_{s\sigma} T_{\sigma i} d\sigma,$$

(3)

$$\psi_{se} = \frac{-1}{h\pi}(\gamma_{se} + \gamma_{se}') + \int \Delta_{s\sigma} T_{\sigma e} d\sigma,$$

where in both cases

$$\gamma_{sp} = \frac{\partial}{\partial n_s} T_{sp}, \quad \gamma'_{sp} = \frac{1}{h\pi} \int \gamma_{\sigma p} \frac{\partial}{\partial n_s} T_{s\sigma} d\sigma. \tag{4}$$

A similar investigation is carried through for the second boundary problem; here the result is somewhat simpler. The author now proceeds to investigate the relation between the fundamental distributions on a surface and its transform by reciprocal radii, and furthermore gives a detailed discussion of the special cases of the circle, sphere, and ellipse. Certain convergence investigations concerning the Neumann-Robin methods conclude the memoir.

T. H. GRONWALL.

Physical and chemical Constants and some mathematical Functions. By G. W. C. KAYE, the National Physical Laboratory, England, and T. H. LABY, professor of physics, Wellington, N. Z. London, Longmans, Green, and Co., 1911. 153 pp.

THE authors have written this book to supply the need for a set of up-to-date English physical and chemical tables of convenient size and moderate price. In comparison with larger works such as those of Landolt, Bornstein, and Meyerhoffer this little book contains more information than its relative size indicates. In fact for class use where one illustration of a given type is good as another this book is ample. For the investigator desiring information of a very particular nature it may not be sufficient.

In most cases a table is accompanied by a brief statement containing definitions and standard formulas. Many references are given both to standard works and to observers for particular measurements. Interpolations and extrapolations are indicated.

The book contains several hundred tables covering subjects in general physics, astronomy, heat, sound, light, electricity,