# A CHARACTERISTIC OF SPECTRAL ENERGY CURVES. —A CORRECTION.

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UNDER the above title[1] the writer gave the complete solution of Planck's spectral energy equation in order to obtain the wave-length of the maximum of emission, "$\lambda_{max}$" which is useful in determining the constants entering into this equation.

The object of the present communication is to call attention to several errors in the published solution for "$\lambda_{max}$." The value of "$\alpha$" as it was used in the computations is $\alpha=4.9651$, and in order to avoid confusion with $\alpha=5$ (Wien equation) should have been written $\alpha'$. The first terms should contain the factor $\alpha/\alpha'$. The complete solution is

$$\lambda_{max} = \frac{\alpha(\log \lambda_2 - \log \lambda_1)\lambda_1\lambda_2}{\alpha'(\lambda_2 - \lambda_1)\log e} + \frac{\lambda_1\lambda_2\left[\log\left(1 - e^{-\frac{\alpha'\lambda_m}{\lambda_2}}\right) - \log\left(1 - e^{-\frac{\alpha'\lambda_m}{\lambda_1}}\right)\right]}{\alpha'(\lambda_2 - \lambda_1)\log e}. \quad (1)$$

This follows directly by equating the Planck equation for $E_{\lambda_1}=E_{\lambda_2}$, writing $c_2=\alpha'\lambda_m T$, taking logarithms, and solving for $\lambda_{max}$.

The more cumbersome (second) term previously published was obtained from this equation. In the computations the second term, which enters as a correction factor, is not so complicated as it may seem, for usually when $\lambda_1$ is small, this term may be neglected. Furthermore the correction factor need be computed for only three to five points on the long wave-length side of the spectral energy curve, through which a curve is drawn. From this curve the correction factors for other values of $\lambda_2$ may be read with a greater precision than demanded by the experiments.[2]

[1] Phys. Rev., 29, p. 553, 1909.

[2] See Table I., Jahrb. Radioaktivität und Elektronik, 8, p. 1, 1911.

By expanding[1] log $(1-e^{-k})$ and neglecting higher powers of $e^{-k}$ equation (1) reduces to

$$(2) \qquad \lambda_{max} = \frac{\alpha(\log\lambda_2 - \log\lambda_1)\lambda_1\lambda_2}{\alpha'(\lambda_2-\lambda_1)\log e} + \frac{\lambda_1\lambda_2[e^{-\frac{\alpha'\lambda_m}{\lambda_1}} - e^{-\frac{\alpha'\lambda_m}{\lambda_2}}]}{\alpha'(\lambda_2-\lambda_1)\log e}.$$

This is sufficiently accurate[1] for the experimental data now available, but with each renewed effort a higher accuracy in the observational work is attained, which requires greater refinement in the computations. For example the equations kindly given me by Dr. Buckingham and used in the data published a year ago,[2] were applicable over only a narrow spectral region and hence too arbitrary. However, by computing a series of correction curves for the region of 3 to 5$\mu$ and extrapolating in both directions, it was possible to obtain fairly accurate data as shown[2] in Table I. of the aforesaid paper.

During the past three years more than 80 spectral energy curves have been obtained, under all sorts of conditions. It is hoped that the complete discussion of the instruments and methods used in obtaining these data and of the aforesaid equations employed in the computations, also the applications of the results may be given in the near future. It will be sufficient to add that the Planck equation appears to be valid for the temperature range from 450° to 1530° C. and for the spectral region to 6.5$\mu$, provided the radiating enclosure is "black."

[1] Mr. Dellinger has found that but small errors are introduced by dropping all factors in this expansion except $e^{-\frac{\alpha'\lambda_m}{\lambda_2}}$ which further simplifies the second term of eq. (2). In actual practice, however, the writer prefers to retain the factor $e^{-\frac{\alpha'\lambda_m}{\lambda_1}}$ as given in equation 2, but using it only when $\lambda_1$ and $\lambda_2$ are close together, *i. e.*, near the maximum of the spectral energy curve where the correction due to this term may amount to .6 per cent.

[2] PHYS. REV., 31, p. 317, 1910.