The writer has been seeking for several years to obtain absolute single electrode potentials by an electrostatic method. The final apparatus, in brief, consisted of a glass or quartz flask covered on the outside with metal which is connected to a Dolezalek electrometer. The flask contained the electrolyte and from the change of potential of the metal outside was determined the potential acquired by the electrolyte when the earthed electrode was dipped into the electrolyte.

Observations with zinc and zinc sulphate, copper and copper sulphate, silver and silver nitrate, with glass and quartz flasks, and silver and aluminum films on the outside, all gave values for the absolute single potentials which are consistent among themselves and are about 0.2 volt higher than Billitzer's values, *i. e.*, approximately 0.5 volt lower than the values found in recent tables. Errors from leakage and from conduction through quartz or glass were easily detected and corrected. Volta effects were proved to be zero by the substitution of mercury for the electrolyte.

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SOME APPLICATIONS OF SIMPSON'S RULE IN INTEGRATING PERIODIC FUNCTIONS.[1]

BY FREDERICK BEDELL AND RALPH BOWN.

IF a quantity, x, varies as the time-integral of a second quantity, y (illustrated by the case of magnetic flux and electromotive force), that is, $x \propto \int y dt$, successive values of x may be determined from successive values of y, by plotting y as a curve and determining the areas between any initial ordinate and successive ordinates y_1, y_2, y_3, etc.

If these successive ordinates are taken at equal time-intervals and the curve for y is assumed to be made up of arcs of parabolas, the whole area is made up of a number of parabolic trapezettes, the areas of which can be accurately and easily determined by Simpson's Rule. This becomes most simple when y is periodically positive and negative, as in case of alternating electro-motive forces and fluxes, the negative half-waves being a repetition of the positive. In this case, applying Simpson's Rule, we have values of x in two series, thus: *First series*, $x_0 = 0$, $x_2 = y_0 + 4y_1 + y_2$, $x_4 = x_2 + y_2 + 4y_3 + y_4$, $x_6 = x_4 + y_4 + 4y_5 + y_6$, etc., to which must be added a constant C_1; *second series*, $x_1 = 0$, $x_3 = y_1 + 4y_2 + y_3$, $x_5 = x_3 + y_3 + 4y_4 + y_5$, $x_7 = x_5 + y_5 + 4y_6 + y_7$, etc., to which must be added a constant C_2. The constant to be added in each series is the mean value of two values of x, as found in that series, the time interval between which is one-half period. Thus, if values of y are given every 10° (where 360° is one period) and x is determined for this same interval, $C_1 = (y_0 + y_{18}) \div 2$, and $C_2 = (y_1 + y_{19}) \div 2$.

To test the method, y was assumed to be a sine function with values taken every 30° from a table; values of x determined by Simpson's Rule, as described above, were found accurate in this case to a twenty fifth of one per cent.

[1] Abstract of a paper presented at the New York meeting of the Physical Society, October 31, 1914.

As another test, values of y were taken every 10° from the equation

$$y = 1000 \sin x + 333 \sin 3x(x - 10°) + 100 \sin 5(x - 15°) + 50 \sin 13x.$$

Corresponding values of x, determined by the above rule, varied not more than a sixth of one per cent. from the values determined by tables. For curves even more irregular, it is believed the method will give results sufficiently accurate for most purposes and usually more accurate than can be otherwise obtained. For a fuller discussion, references and a comparison with other methods, see a paper about to be published by the authors entitled "Derivation of Wave-form of Flux from Wave-form of Electromotive Force," Electric Journal, 1915.

Cornell University.

The Electric Resolution of the Series Lines in the Mercury Spectrum.[1]

By Georg Wendt and Reinhard A. Wetzel.

The transverse Stark effect was obtained in canal rays with electric fields measuring from 50,000 to 90,000 volts per centimeter.

In the sharp subordinate series of mercury triplets the following lines were investigated: λ2,925; 2,894; 2,752; 2,576; 2,464Å. The photograms obtained show no appreciable splitting or displacement of the lines with these fields under the dispersion at our disposal.

In the diffuse subordinate series of mercury triplets we investigated the following: λ3,132; 3,024; 2,967; 2,803; 2,699; 2,652; 2,534; 2,482Å. With the exception of λ2,967 all show splitting and displacements due to the action of the electric field. Quantitatively the effect is not the same upon each member of the triplet. It is largest upon the first, smaller upon the second, and smallest upon the third component of the triplet. The effect also increases rapidly with the increasing term numbers of the series.

Results.—(1) A confirmation of Stark's series laws for the electric effect—viz., there is a difference between sharp and diffuse subordinate series, there is an increase of the effect with increase of term number; (2) A confirmation of the fact that for the different elements the nature and magnitude of the electric effect upon series lines of the same term number is not a function of their atomic weights but first and foremost a characteristic of the chemical element (its valence electrons). The photograms show this fact even more beautifully than those obtained by Stark and Kirschbaum.

The above investigation was made at the Physical Institute of the Technical High School at Aachen, Germany, during July, 1914. Thanks are due Prof. Stark for the privileges of the laboratory. His rich experience and thoughtful suggestion also served us during the entire work.

[1] Abstract of a paper presented at the New York meeting of the Physical Society, October 31, 1914.