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A study on spectrophotometers

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formula gave

$$C\alpha = \frac{4mm'}{d^2}$$

with

$$O = \sqrt{\frac{\Sigma \frac{p}{g} r^2}{C}}.$$

In my experiments $O=437^s$, and $\Sigma pr^2=32171\cdot6$ centimetre-grammes, the lever having been made of a geometrical form.

The following numbers represent the potential of an element of the pile—that is to say, the quantity of electricity which would be shed by the pole of that pile upon a sphere of 1 centim. radius; they are expressed in electric units, the unit being the quantity of electricity which, acting upon itself at 1 centim. distance, produces a repulsion equal to 1 gramme.

Voltaic pile	0.03415, circuit open.
Pile (zinc, sulphate of copper, copper)	0.02997, „
„ (zinc, acidulated water, copper, sulphate of copper)	0.03709, „
„ (zinc, salt water, carbon, peroxide of manganese)	0.05282, „
„ (zinc, salt water, platinum, chloride of platinum)	0.05027, „
„ (zinc, acidulated water, carbon, nitric acid)	0.06285, „

These numbers are maxima values, obtained at the moment when the pile had just been charged; but these potentials rapidly grow less as the pile gets older. The sulphate-of-copper pile alone remains for a pretty long time near the given number; but it undergoes variations which may reach one twelfth of its value, more or less.—*Comptes Rendus de l'Acad. des Sciences*, Jan. 3, 1881, t. xcii. pp. 32–34.

A STUDY ON SPECTROPHOTOMETERS. BY M. A. CROVA.

The comparison of two spectra proceeding from two different sources of light is easily obtained by covering half the slit of a photometric spectroscope with a small rectangular prism, of which the edge cuts the slit normally into two parts. One half receives one of the lights directly, the other by total reflection the other light placed laterally. In this case the slit must be horizontal; and if the prism is well cut and free from aberration, the clean image of the spectral lines and that of the edge of the prism are obtained simultaneously—the latter appearing as a very fine line separating the two spectra to be compared from one another.

In the most general case Sturm's theorem leads to the conclusion that all the rays which constitute an extremely delicate pencil, reflected or refracted a certain number of times by plane surfaces, meet two indefinitely small straight lines contained in two rectangular planes.

Excepting the case of the minimum of deviation, therefore, a simple prism always gives an aberration which can be represented by that of a cylindrical lens, convergent or divergent according to the case, the axis of which is parallel to the refracting edge; this aberration can be corrected by means of a cylindrical lens suitably arranged. Direct-vision prisms are often affected by an aberration of the same kind, so that clean images can only be obtained in two directions, parallel or perpendicular to the refracting edge, by different degrees of drawing-out of the telescope of the spectroscope*.

I ascertained this aberration by substituting for the slit a reticule formed of two rectangular strokes traced on a coat of silver and illuminated by monochromatic light. I have been able to correct it by intercalating between the dispersing-prism and the telescope a system of two cylindrical lenses, plano-convex and plano-concave, of the same curvature: if the two curved parts are in contact, the system constitutes a medium with parallel faces; on being separated to a suitable distance they operate like a cylindrical lens whose focal length, variable at pleasure, can be calculated as a function of the distance between the two lenses.

The employment of prisms with total reflection introduces, into the polarized ray which they reflect, a difference of phase between the two principal components, and gives at the emergence an elliptically polarized ray. I have measured this difference of phase in the apparatus I use; the ellipticity produced by it may detract from the accuracy of the photometric measurements obtained by means of a rotating Nicol. This elliptical polarization by total reflection can be completely suppressed by substituting for the simple prism two prisms with total reflection, superposed, in contact, whose two right sections are rectangular, or a single prism suitably cut, producing the effect of the two prisms of which I have just spoken.

With this disposition, the slit may be placed vertical, which is more convenient. After the two total reflections undergone by the light in this prism, the plane of polarization has rotated 90° , and all difference of phase between the two principal components has vanished, the reflected ray preserves the rectilinear polarization.

These principles can be utilized in the construction of spectrophotometers, and, I expect, will permit more rigorous measurements to be obtained.—*Comptes Rendus de l'Académie des Sciences*, 1881, No. 1, t. xcii. pp. 36, 37.

* A prism affected with such an aberration would give images of the solar protuberances sharp in one direction only; the measurements of their heights might therefore be affected with an error if the aberration of the prism were not suitably corrected.