examples how by the use of the silver voltameter the E.M.F. of any cell can be found without much difficulty, and with scarcely any special appliances.

XI. "Preliminary Note on the Constant of Electromagnetic Rotation of Light in Bisulphide of Carbon." By Lord Rayleigh, D.C.L. Received June 18, 1884.

In connexion with other work upon current measurement by Mrs. Sidgwick and myself, we have endeavoured to determine the value of this constant, so as to decide between the very discrepant results arrived at by Gordon* and by H. Becquerel.† The method adopted by us was so far similar to that of Gordon that the tube of bisulphide of carbon was placed inside a helix, but the value of the current traversing the helix was determined in a different manner without reference to terrestrial magnetism.

The light employed was that emitted by sodium. When it is remembered that the effect would vary about two parts per thousand in passing from one sodium line to the other, the importance of definiteness in this respect will be obvious.

The number of turns in the helix is 3684, and the insulation was submitted to severe tests.

In carrying out the measurements the principal difficulty encountered was from optical disturbance arising from the communication of heat from the helix to the bisulphide. Not only does the mean temperature of the bisulphide rise somewhat rapidly during a series of experiments, but on account of the tendency of the warmer parts to find their way to the top of the tube, the light is sensibly diverted from its proper course. It is believed that by a modification of the apparatus about to be tried, this source of embarrassment will be materially checked.

The plane of polarisation was determined in some experiments by a Nicol read in two positions, and in others by a double image prism read in four positions. The adjustment of the match between the two parts of the field presented by the half-shade apparatus was facilitated by a device that may be found useful. In addition to the principal helix, the tube was embraced by an auxiliary coil of insulated wire, through which could be led the current from a Leclanché cell. This current was controlled by a reversing key under the hand of the observer, who was thus able to *rock* the plane of polarisation backwards and forwards through a small angle about

* "Phil. Trans.," 1877.

† "Ann. d. Chim.," 1882.

its normal position. The amount of the rocking being suitably chosen, the comparison of the three appearances (two with auxiliary current and one without) serves to exclude some imperfect matches that might otherwise have been allowed to pass.

On fifteen days sets of observations have been taken of the double rotation produced by the reversal of the current in the helix on light which traversed the tube *three* times. The double rotations varied from about 9° to 19°, and the currents from about $\frac{1}{2}$ ampère to 1 ampère. Reduced to correspond with a certain standard current, and corrected for temperature by Bichat's formula to 18° C., the double rotations ranged from 1124·1 minutes to 1132·2 minutes. The mean for 18° C. is 1128·4 minutes; and as this was about the actual mean temperature of the observations, the result is nearly independent of Bichat's formula for the dependence of the effect upon temperature.

Four sets of observations were also taken on light which traversed the tube but once. Multiplied by 3, and reduced to the same temperature and current, the mean of these gives 1127·4 minutes. In this case the current actually used was about $1\frac{1}{2}$ ampère, and the double rotation about 9°.

Taking both series of experiments into account, we may adopt 1128·0 minutes as the sixfold rotation at 18° C. due to the passage of the standard current through the helix.

In C.G.S. measure the value of the standard current is ·09722. The difference of magnetic potentials at points at infinity on the axis of the helix traversed by this current is

$$4\pi \times 3684 \times \cdot 09722.$$

The correcting factor on account of the finite length of the tube is ·99449.

Hence if x be the rotation in minutes at 18° C., corresponding to a difference of potential equal to unity, we have

$$1128\cdot 0 = 6 \times \cdot 09722 \times 4\pi \times 3684 \times \cdot 99449 \times x,$$

whence

$$x = \cdot 042002 \text{ minute}.$$

M. Becquerel gives as his result for 0° C. ·0463 minute. To find the rotation at 18°, this must be multiplied by ·9767 according to Bichat's formula: and as Becquerel's observations were in fact made at about 18°, this reduction does not introduce, but rather removes, an extraneous element. Thus according to Becquerel—

$$x = \cdot 0452 \text{ minute},$$

differing by about 7 per cent. from the value found by us.

The comparison with Gordon is more uncertain, inasmuch as his observations were made on light of the refrangibility of the thallium line. The corrected* result for this light is in circular measure $1{\cdot}5238 \times 10^{-5}$, or ·05238 minute. To pass to sodium we may use a formula given by Becquerel† and Verdet according to which the rotation for different wave-lengths (λ) is proportional to $\mu^2(\mu^2-1)\lambda^{-2}$, μ being the refractive index. At this rate the ·05238 minute for thallium would be ·04163 minute for sodium. The temperature was not directly observed by Gordon, but was estimated to be about 13° C. Assuming this to be correct, the value for 18° would be ·0413 minute, or about 2 per cent. *less* than according to my determinations.

XII. "Certain Points in connexion with the Physiology of Uric Acid." (Supplemental.) By Alfred Baring Garrod, M.D., F.R.S. Received June 19, 1884.

(Abstract.)

One of the objects of the present paper is the correction of an error of interpretation in the author's communication of February 15th, 1883. Another object is to make known certain facts which he has ascertained in seeking to correct the same.

The author hopes, 1st, to give a true explanation of the phenomena previously misinterpreted; 2ndly, to make known some facts hitherto unknown, whence arose the error in question; and 3rdly, to show the existence of certain peculiarities in the urine of herbivorous mammals, with regard to uric acid, which peculiarities the author anticipated, so that he was led to undertake numerous experiments and observations with the object of verifying or disproving such anticipations.

The subject discussed in Part I is the influence of alkaline carbonates upon uric acid. Many experiments are detailed, and, as a result it is found that weak solutions of the alkaline carbonates, when exposed to the air, possess the power of decomposing uric acid in solution, and that oxalic acid and urea are among the products of the decomposition. By the recognition of this fact certain physiological phenomena in relation to the urine can be explained.

Part II is devoted to the demonstration of the action of glycocine (glycocoll) and a few other substances in protecting uric acid from

* Mr. Gordon's result was originally given at double its proper value.

† "Ann. d. Chim.," t. xii, 1877, p. 78.