Dr. R. SISSINGH. *Measurements concerning the elliptic polarisation of light.*

In the dissertation the method, first used by JAMIN in his careful observations on the light reflected from metals and afterwards several times by QUINCKE, has been as much as possible refined.

The method has been applied to the subjects indicated briefly in the titles of the various chapters.

I. *Method of observation.* The chief changes made in JAMIN's method of measurement by means of BABINET's compensator are:

1. Arrangements to the compensator for the precise adjustment of the various pieces.

2. Combination of the observations in order to eliminate the remaining errors and those arising from faults in the Nicols.

3. Dispositions made in order to cause that the beam of light is always reflected by the same part of mirror and

4. to determine precisely the angle of incidence.

I refer to the original for a description of the means by which a parallel beam was obtained and the principal position of the Nicols were determined. If the principal planes of the wedges of quartz of the compensator are not carefully adjusted by means of the above mentioned mechanism so that they are perpendicular, anomalous phenomena are observed, which are elaborately treated.

The error of the perpendicular positions amounted in the measurements to about 5′.

The errors are completely eliminated by means of the used method of measurement. By means of a flint prism the light of the sun or of the electric arc was developed into a pure spectrum.

The homogeneousness of the beam of light was $^{2}/_{72}$ of the spectrum between B and G, the divergency 2.3′, the accuracy of the

	reflexion from metal mirror	reflexion from flint glass (coeff. of ellipticity 0,08)
determination of the phases	$0.05\frac{\lambda}{4}$	0.005λ
» of the reestablished azimuths . .	6′	3′
angle of incidence. . . .	1′	1′.

The part of the mirror used in the observations was 2.7×0.57 m.m².

2. *Reflexion from silver in air.* The observations made with 3 silver mirrors in order to verify CAUCHY's formulae gave for angles of incidence, corresponding to:

A difference of phase of about	Difference of phase observed—calculated.	Mean.	Ratio of amplit. Observed—calcul.	Mean.
$\frac{3}{8}\lambda$ (Wavelength)	+ 0.016, + 0,013, + 0.013 + 0.003	$+ 0.011\frac{\lambda}{4}$	—2′, +19′, +2′ +1′	+5′
$\frac{1}{4}\lambda$	+ 0.004, — 0.003, + 0.007 — 0.007, + 0 002, + 0.008 + 0.004, + 0.003	$+0.001^{5}\frac{\lambda}{4}$	—4′, —5′, +16′ +0′, —12′, +12′ +2′. —1′	+1′
$\frac{1}{8}\lambda$	+ 0.016, — 0.003, + 0.006	$+ 0.006\frac{\lambda}{4}$	—7.5′, +6′, —6′.5	—3′

These values, especially the reestablished azimuths are in better agreement with the formulae of CAUCHY than those observed by JAMIN and QUINCKE. The formulae of NEUMANN and VOIGT for metallic reflexion give precisely the same nnmerical values for the difference of phase and the ratios of the amplitudes, hence it is impossible to decide experimentally between the rival theories.

3. Also in the case of *reflexion from silver in water* the theory of VOIGT gives the same values as that of CAUCHY.

4. *Reflexion from soft iron.* The formulae of CAUCHY were derived from the electromagnetic theory of light by Prof. H. A. LORENTZ supposing that $\frac{1 + 4\pi\theta_1}{1 + 4\pi\theta_2}$ may be put 1, θ_1 and θ_2 being the components of the magnetic polarization in air and in the metal. In the case of strongly magnetisable metals however this supposition is not allowed. Hence one should expect in the case of iron a deviation from the laws of reflexion. However it appeared, that the reflexion from soft iron is represented by CAUCHY's formulae with the same degree of accuracy in the case of iron as in that of silver.

5. *The variation of optical constants with temperature.* In the electromagnetic theory of light the optical constants of a metal are dependent on its resistance. Now the resistance changes with temperature, hence one should suppose that also the optical constants must vary with temperature.

Observations, however, made at ordinary temperature and up to 120°, gave no evidence as for a variation of the optical constants with temperature [1]).

6. *Influence of a change of the surface of transparent media on the reflexion.* Observations with a prism made by STEINHEIL were undertaken in the first place with a view to test more accurately as had been done till now CAUCHY's reflexion formula; the agreement was very good. However the refractive index, calculated according to CAUCHY's theory from the angle of principal incidence and the principal azimuth, differed no less than 6% from the value determined by the minimum deviation method. This difference pointed to the presence of a surface-layer, formed on the old prism, long out of use. It was found impossible to remove the layer by WAIDELE's process (using heated coalpulver), hence it did not exist of condensed gases. The prism being however recently polished, a satisfactory agreement between the refractive index as calculated from theory and as determined by the refraction was observed.

Remarkable enough CAUCHY's and GREEN's formulae represent fairly well the reflexion from transparent bodies with a transparent surface-layer, the refractive index being calculated from the angle of principal incidence and the principal azimuth. This may be seen from the following table in which the results are entered for angles of incidence corresponding to:

---

1) Cf. ZEEMAN. Communications etc. No. 20.

A difference of phase of nearly.	Observed—Calculated difference of phase according to CAUCHY.	Mean		Observed—Calculated reestablished azimuth according to CAUCHY.	Mean	
		CAUCHY.	GREEN.		CAUCHY.	GREEN.
$\frac{15}{32}\lambda$	—0.013,	—0.013	—0.024	—10′,	—10′	—5′
$\frac{7}{16}\lambda$	—0.007, —0.005;	—0.006	-0.018^5	—2′, +6′,	+2′	+8′
$\frac{3}{8}\lambda$	—0.005, —0.007, —0.003, +0.002;	—0.003	—0.012	—1′.5. —4′, +7′, +6′;	+2′	+7′
$\frac{1}{4}\lambda$	—0.000, —0.000; —0.000, +0.008; +0.010. —0.002, +0.007; —0.003. —0.006, +0.024: —0.000, +0.010;	0.000	0.000	—1′.5, +1′.5; —0′, +2′; +3′. —4′.5, +4′; —2′, —3′, +8′: —0′, —0′;	—0′	0′
$\frac{1}{8}\lambda$	+0.003, —0.001, —0.002, —0.000;	0.000	—0.010	—1′, —1′, —2′, +4′,	+0′	—4′.5
$\frac{1}{16}\lambda$	—0.004, —0.004;	—0.004	—0.022	—6′, —10′;	—8′	—14′.5
$\frac{1}{32}\lambda$	—0.013, —0.009;	0.010^5	-0.032^5	—5′, —4′;	—4′.5	—10′.5