One can find at least two possible causes for the small residual depolarization. First, the interaction between the molecules in the liquid may be sufficient to cause both the residual depolarization and the observed broadening of the weak component. Secondly, in the XCl type of molecules, at room temperature a large fraction of the molecules are not in the ground-state but in the degenerate vibrational levels. It is possible that some slight interaction between these modes of vibration may cause the residual depolarization.

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[1] Kohlrausch, K. W. F., "Ramanspektren", 153 (Leipzig, 1943).
[2] Douglas, A. E., and Rank, D. H., *J. Opt. Soc. Amer.*, **38**, 281 (1948).
[3] Cabannes, J., and Rousset, A., *Ann. de Phys.*, **19**, 278 (1933).
[4] Welsh, H. L., Crawford, M. F., and Scott, G. D., *J. Chem. Phys.*, **16**, 97 (1948).
[5] Langseth, A., *Z. Phys.*, **72**, 350 (1931).
[6] Rank, D. H., and Van Horn, J. A., *J. Opt. Soc. Amer.*, **37**, 798 (1947).
[7] Rank, D. H., Sheppard, N., and Szasz, G. J., *J. Chem. Phys.* (in the press).

Tilted-Plate Compensators

W. A. P. FISHER has recently described[1] a tilted-plate compensator which employed a plate of *CR* 39 resin in place of the usual calcite or quartz. This substitution permitted the development of apparatus of large aperture, although the material is not quite uniform and needs to be rather thick, so that the possible effect of lateral displacement must be considered.

I wish to direct attention to the suitability of lepidolite for the construction of tilted-plate compensators of large field. This material, which is a uniaxial variety of mica, cleaves at right angles to the optic axis and is practically colourless in the thicknesses needed for the production of convenient retardations. The use of such cleavage plates avoids the grinding and polishing required in the case of calcite or quartz and also the difficulties associated with the employment of *CR* 39 resin, including that of the possible variation of calibration with time. The axis about which the lepidolite is tilted lies in the plane containing the leading direction for the magnetic vector.

The following experimental results were obtained with white light using a plate of lepidolite the thickness of which was 0·245 mm. The angle of tilt was observed on a dial graduated in units of 1·8° and the readings have been converted to degrees. Values calculated by means of an approximate theoretical formula are included in the table.

Observed path-difference (λ)	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0
Angle of tilt (°)	19·31	27·18	33·93	39·87	45·00	50·04	54·18	58·86
Calculated path-difference (λ)	0·50	0·98	1·50	2·03	2·52	3·04	3·47	3·95

For a plate of thickness t tilted through an angle θ in air, the length of the light path is $t/\cos\varphi$, where $\mu\sin\varphi = \sin\theta$, μ being the refractive index of the material and φ the angle of refraction.

The equivalent path-difference is $(\mu_1-\mu_2)t/\cos\varphi$, μ_1 and μ_2 being the two refractive indices.

$\mu_1^2-\mu_2^2 = K\sin^2\varphi$, K being a constant[2],

$\mu_1-\mu_2 = (K/2\mu)\sin^2\varphi$. $\mu_1+\mu_2 = 2\mu$, very nearly.

The equivalent path-difference

$$= (K/2\mu)(t\sin^2\varphi)/\cos\varphi$$
$$= (K/2\mu)\ \{(t\sin^2\theta)/\mu^2\}\ \{\mu/(\mu^2-\sin^2\theta)^{1/2}\}$$
$$= (At\sin^2\theta)/(\mu^2-\sin^2\theta)^{1/2},\ A \text{ being } K/2\mu^2.$$

Application of the method of least squares to the experimental results above shows that $At = 6{\cdot}939$ or $A = 28{\cdot}32$, and that $\mu^2 = 2{\cdot}389$. These values were used in calculating the results given in the last line of the table.

Muscovite may also be used in the construction of a tilted-plate compensator of limited range. Tilting about the trace of the plane containing the optic axes causes the retardation to increase until it reaches four times the normal value at an inclination of about 70°. Tilting about a perpendicular axis causes a decrease to zero at an inclination of about 35°.

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79 Palmerston Street,
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[1] Fisher, W. A. P., *Nature*, **161**, 848 (1948).
[2] Preston, T., "Theory of Light", 318 (3rd edit., 1901).

Thorium and Uranium Content of the Velence Mountains, Hungary

THERE are few areas in Hungary where the occurrence of thorium and uranium minerals is theoretically possible. We investigated during the summer of 1947 the mountains near Lake Velence near the town of Székesfehérvár in Hungary.

Portable battery-operated Geiger–Müller counting equipments have been constructed at this Institute. One of them served in connexion with headphones for a qualitative search only. It was easily portable in a small case and weighed (including built-in batteries suitable for 400 counting hours, high-voltage supply and headphones) less than 5 kgm. The other counter-set possessed an electromagnetic impulse-counter, a more powerful amplifier, and was supplied by a motor-car starter battery (12 volts, 70 ampere-hours) by means of vibrating alternators. The Geiger–Müller counters were of brass, 45 mm. outer diameter, 1·8 mm. wall thickness and 88 mm. length, and were of the self-quenching type, filled with argon and alcohol vapour.

We observed a considerable γ-activity everywhere in the acid eruptive rocks of the area investigated over an area of about 30 km.², which exceeded the intensity of the cosmic radiation (40 impulses per min.) by a factor of 2–3, when the counter was placed immediately on the rocks.

In one case we drove in a boring about 50 cm. deep into the granite wall. We observed an activity of 260 impulses per min., with the counter in the boring. We evaluated this result quantitatively, taking into account the self-absorption of the γ-radiation within the rock, by calibrating the counter with the γ-radiation of thorium in radioactive equilibrium with its decay-bodies. To do this we placed a known amount of thorium (in equilibrium) at a measured distance from the counter and determined the number of impulses per min. The soft components of the γ-radiation were retarded by the thick wall of the counter and by 2 mm. of lead. Calculation shows that the concentration (c) of the radioactive material per gram rock substance, expressed in 'thorium-γ-equivalents', can be calculated from the following expression, approximately :