

It will be noted that in general the exponential relation between Y and S is satisfied. When S=0 the soil complex is wholly saturated with exchangeable calcium for which the observed value is 0.19 inch per hour; but the calculated values (values of the constant 'a') are far less and they increase from sodium to potassium.

The constant 'a' seems to increase with the atomic weight while the constant 'b' decreases in the same order.

The effect of the three ions in decreasing the rate of percolation in calcium soil thus is as:



which is also the order of increasing ionic radius.

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### INCLINED EXTINCTION IN THE HYPERSTHENES OF CHARNOCKITES

DR. P. K. GHOSH has summarised the views put forward to explain oblique extinction observed in the hypersthene of Charnockites, and inclines to the view of K. K. Sen Gupta that the oblique extinction is due to the persistence of original amphibolic cleavages in the hypersthene.<sup>1</sup>

Mr. M. S. Sadasiviah, Lecturer in Geology, Central College, has made detailed statistical studies of oblique extinction observed in about a 100 mineral grains of the hypersthene occurring in the Charnockites of Halagur. Three lines of statistical investigation have been instituted to study the oblique extinction; (1) the pleochroic scheme of the several mineral grains, (2) the optic figures and (3) the calculated angles with the aid of certain Crystallo-optic formulæ.

The pleochroic scheme of the hypersthene of Halagur is X = pink, Y = brownish-yellow and Z = bluish-green. The principal sections of

$$\text{Cot } 2\gamma = \frac{(\cos \mu \cos \nu - \sin \mu \sin \nu \cos^2 v) + (\sin \mu \sin \nu) \sin^2 \phi}{[\cos v \sin (\mu + \nu)] \cos \phi - [\sin \nu \sin (\mu - \nu)] \sin \phi}$$

the mineral grains have, therefore, the pleochroic scheme, XZ = pink to bluish-green, XY = pink to brownish-yellow and YZ = brownish-yellow to bluish-green. XZ sections give optic normal figures, YZ give  $\text{BX}_{ac}$  figures, and XY,  $\text{BX}_0$  figures. XZ and YZ sections give straight extinction, but, when the pleochroic shades depart from this scheme, oblique extinction results, the angles varying from 0° to a maximum of 26°, the maximum angle being observed on a section giving an uncentred optic axis figure. Since the optic orientation of hypersthene is XZ//010, and X is perpendicular to 100, the sections giving optic axis figures (centred or uncentred) are either domes or pyramids. Since hypersthene, like other Orthorhombic minerals with prismatic cleavages, give straight extinction in the 010-100 zone, symmetrical extinction in the 001-100 and 001-010 zones, and oblique extinction in all other zones,<sup>2</sup> theoretical extinction angles were calculated for the 001-100 and

001-010 zones with the aid of the Rosenbusch-Wulffing formula.<sup>3</sup>

$$\text{Tan } 2\gamma = \frac{\cos \phi [\tan (V + \Gamma) - \tan (\Gamma - V)]}{1 - \cos^2 \phi \tan (V + \Gamma) \tan (\Gamma - V)}$$

The theoretical angles were calculated for the acute prismatic angle both of pyroxenic and amphibolic cleavages.

Inclination of face to (001) = $\phi$	$\gamma = 45^\circ 52'$ Pyroxene Cl.	$\gamma = 28^\circ$ Amphibole Cl.
0°	45° 52'	28°
10°	45° 45'	27° 47½'
20°	45° 45'	27° 47'
30°	43° 44'	25° 58'
40°	41° 44½'	24° 10'
50°	36° 53½'	21° 36'
60°	31° 46'	18° 1½'
70°	24° 22'	13° 11½'
80°	13° 45½'	7° 3'
90°	0°	0°

Since the maximum extinction angle observed in the hypersthene of Halagur is 26° and the average angles are 11°-13°, the maximum extinction observed should be on a dome face having an inclination of 70° to 001 (if the cleavage observed is pyroxenic) or a dome face inclined to 001 at 30° (if the cleavage were amphibolic). The indices of these hypothetical faces were calculated by Neumann's Gnomonic Method<sup>4</sup> and were found to be (011), (101), (041) and (401). But neither of these domes occur in amblystegite, the variety of hypersthene observed in Charnockites.

Therefore resort was made to the Ferro-Brandavo formula for calculating extinction angles on the pyramids (111) and (232), occurring in amblystegite (Fig. 1-Stereographic Projection with facial poles and their calculated extinction angles). The Ferro-Brandavo formula is,

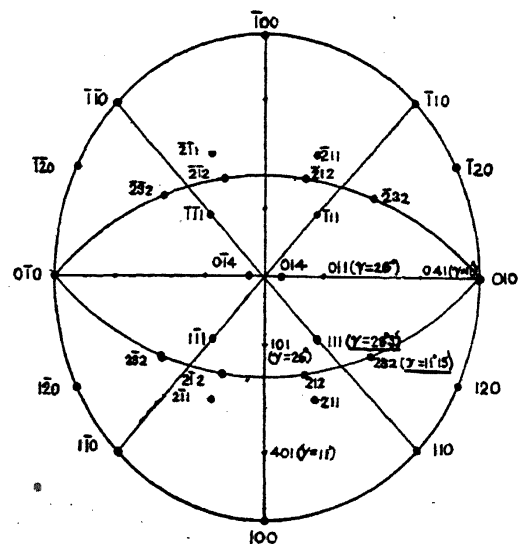


FIG. 1

Calculated Extinction Angles ( $\gamma$ ) in Amblystegite

The value of  $2V$  (optic axial angle) required in this calculation was determined on the Federov's Stage by the method of direct measurement of the optic axial angle by sharp extinction at the emergence of the optic axes, in the  $45^\circ$  position.<sup>5</sup> The value of  $2V$  for the Halagur hypersthene is  $54^\circ 42'$ . The extinction angles calculated by the Ferro-Brandavo formula for (111) and (232) are  $28^\circ 3'$  and  $11^\circ 15'$ , assuming the cleavages to be pyroxenic. Since the calculated values agree closely with the observed values in hypersthene of Halagur ( $26^\circ$  and  $11^\circ-13^\circ$ ), it is hereby inferred that the oblique extinction observed in the hypersthene are on the pyramidal faces and that the cleavages are pyroxenic.

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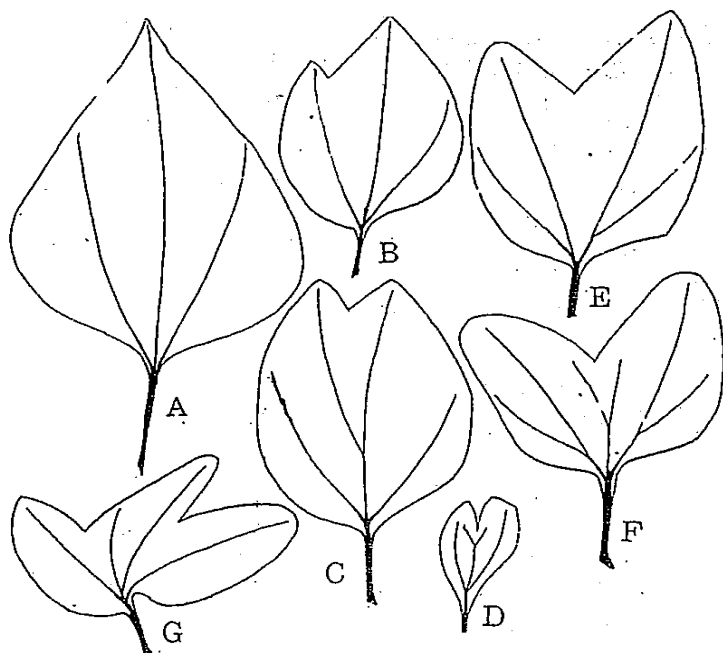
### ANOMALOUS LEAVES OF *HELLANTHUS ANNUUS* LINN. N. O. COMPOSITÆ

The abnormal bilobed opposite leaves (Figs. B-G) differ from the normal leaf. (Fig. A) in shape, size and venation. Out of 323 seedlings only seven had such abnormal leaves, one on each seedling. There was one trilobed leaf; others were bilobed. It was observed that leaving aside the cotyledons third, fourth, fifth, sixth and seventh leaves showed abnormality of one of these types. Either one leaf or both the leaves at a node was found to be abnormal.

The arrangement of the leaves was at first opposite and decussate but later it became alternate. It has been observed that in a plant growing under normal conditions, the change of phyllotaxy begins after about four pairs of opposite leaves have appeared. Out of the seven seedlings described above, four were of that type. The fifth one had the change of phyllotaxy after the first pair of opposite leaves had appeared. In the case of the sixth one alternate leaf intervened between the first and the second pair of opposite leaves. The last one did not agree with those already described. It had two leaves at a node, one at right angles to the other. These intervened with the alternate leaf of the second and the fourth, and the fourth and the sixth nodes.

Similar instances are recorded by Masters,<sup>1</sup> Worsdell,<sup>2</sup> Sabnis,<sup>3</sup> Singh,<sup>4</sup> and Singh and Sinha.<sup>5</sup> The abnormalities recorded in this plant are the presence of three cotyledons

instead of normal two,<sup>6</sup> insertion of leaves and head,<sup>7</sup> leafy growth in the centre of the inflorescence and fasciation of capitula.<sup>8</sup>



The leaves described may be taken as the case of fission of foliar organs. According to the view expressed by Masters<sup>1</sup> "fission is due perhaps as much to the absence or relatively small proportion of cellular as compared with vascular tissue". This view is further supported by Goebel,<sup>9</sup> who has shown that there is a definite relationship between the shape and form of the leaf and its vascular distribution or venation. Hence the present abnormal leaves may be due to the plan of arrangement of the venation.

From the study of venation, phyllotaxy and absence of any sign of union in any part of the leaf, the leaves described may not be taken as the case of fasciation.

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