

FLAVONOIDS OF *THUNBERGIA* *GRANDIFLORA* AND *ASYSTASIA* *TRAVANCORICA*

IN continuation of our earlier work on the flavonoids of *Acanthaceae*¹⁻³ and in view of the isolation of scutellarein and its 7-rhamnoglucoside from *Barleria prionitis*⁴ of this family for the first time, it was considered desirable to examine more members of the family; the flowers of *Thunbergia grandiflora* Roxb. and the leaves and flowers of *Asystasia travancorica* Bedd. collected from Pondicherry have been systematically examined for their flavonoids adopting the well established methods^{5,6} and our results are recorded in brief.

T. grandiflora.—The major flavonoid glycoside isolated from a hot methanolic extract of the flowers of *T. grandiflora* did not have sharp melting, but sintered at about 240°C and decomposed at 320-25°C. It was fairly soluble in water, sparingly soluble in alcohol and acetone and insoluble in ether and benzene. It was laevo rotatory, $[\alpha]_D^{23}$ -92° (1.0%, H₂O). It gave a crystalline acetate, m.p. 232-23°C and a crystalline methyl ether, m.p. 220-22°C. It could not be hydrolysed with 7% H₂SO₄ in 2 hr, but underwent hydrolysis when refluxed with 10% H₂SO₄ in HOAc medium for 5 hr and yielded apigenin and glucuronic acid, which were fully characterised by preparation of derivatives and direct comparison with authentic samples. The glycoside could also be hydrolysed by β -glucuronidase. The UV absorption max. of the glycoside (269, 337 nm) was almost the same as for apigenin and showed no shift of Band II with NaOAc. The i.r. spectrum showed bands at 3410, 1665, 1605, 1495, 1415, 1345, 1295, 1250, 1200, 1170; 1095, 1050, 1030, 830 and 810 cm⁻¹, similar to apigenin. The glycoside methyl ether on hydrolysis (10% H₂SO₄ in HOAc medium, 5 hr) yielded 7-hydroxy-5,4'-dimethoxy flavone, m.p. 261-63°C (no Fe³⁺ colour). From the above data, the compound was identified as apigenin-7-glucuronide. The other flavonoid pigments were identified as luteolin and luteolin-7-glucoside by co-chromatography. The anthocyanin was found to be malvidin-3,5-diglucoside.

A. travancorica.—The flavonoids of the flowers of *A. travancorica* were separated by preparative PC. The chalcone glucoside was identified as isosalipurposide by characteristic colour reactions, R_f in different solvent systems, formation of naringenin and glucose on

acid hydrolysis and co-chromatography with an authentic sample from *Rungia repens*.³ Other flavonoid pigments were identified as apigenin-7-rutinoside and apigenin-7-glucoside. The anthocyanin was found to be delphinidin-3,5-diglucoside.

The leaves of *A. travancorica* contained apigenin-7-glucuronide, isosalipurposide and small quantities of a flavanone.

This is the first record of isolation of a flavone uronide in *Acanthaceae* whose presence is recorded in related families of the *Tubi-florae*.⁷ The flavonoid pattern of *A. travancorica* resembles that of *A. gangetica*⁸ and *R. repens*³ of the same family.

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ON THE NATURE OF THE CONTACT BETWEEN GWALIOR "SILL" AND KAIMUR SANDSTONE AROUND GWALIOR: MADHYA PRADESH

AROUND the City of Gwalior (78° 15'-26° 14') rocks of Gwalior Series of Cuddapah age (Crawford and Crompston, 1970) have been overlaid by Upper Vindhyan formations, viz., Kaimur Sandstone and Rewa Shales and Sandstones (Pascoe, 1963, p. 290). Gwalior Series consists of lower Par Stage and upper Morar Stage, unconformably deposited over Bundelkand Gneiss. Basic igneous rocks occur in Morar Stage at two horizons: the lower, smaller one with a maximum thickness of 25 m, well exposed at about 11 km south-west

of the City of Gwalior and the upper, bigger formation mostly about 170 m thick with very good exposures in the undercliff of the fort-hill near Gwalior and in several other places in the surrounding area, under similar situation. It is with the nature of the contact between the upper igneous formation and the overlying Kaimur Sandstone, that the present paper deals.

Gwalior 'Sill'.—The upper igneous formation has an extensive spread parallel to the bedding plane. It extends for a length of about 80 km from Bitholi in the west to Jhankri in the east, and a width of about 24 km. Towards the western end it is covered by thick layers of Kaimur Sandstone and along the eastern margin by alluvium. Throughout this extent the formation does not seem to thin out; evidently it extends beyond.

These basic rocks have been regarded as dioritic lavas by Dubey (1930) and as volcanics by Mathur (1964) and Crawford and Crompton (1970). Hacket (1871) and Pascoe (1963), however, describe them merely as traps. Verma, Roonwal and Chaku (1970) suggest that they might be intrusives. These basic rocks do not exhibit any structure or texture characteristic of lava flows. Megascopically, the rock is dark grey, compact and medium-grained. In thin sections, the rock is holocrystalline, equigranular to porphyritic and exhibits ophitic and micropegmatitic textures (Fig. 1). It contains plagioclase and augite with accessory magnetite, ilmenite and quartz, the last present only in the upper levels. Secondary hornblende, biotite, chlorite and calcite are also present. Plagioclase is labradorite in composition. The formation is a dolerite *Sill* becoming quartz dolerite in the upper level. Detailed petrological study of the formation is underway.

Contact between Gwalior Sill and Kaimur Sandstone.—A detailed study of the Gwalior Sill and the Kaimur Sandstone has revealed the following facts :

(1) The basic sill has undergone weathering for a depth of about 25 m from its surface. Dark and compact dolerite gradually becomes lighter-coloured and gritty, forming veinlets of kankar due to weathering. Very near the surface, the rock forms soft, yellowish-gray material.

(2) The sill is made of well-developed horizontal jointing, the width between the joint planes getting reduced towards the surface,

from about 2½ m at a depth of 35 m to about 15 cm near the contact. Remarkably well-developed spheroidal weathering occurs between the joint planes. A very good development of spheroidal weathering is seen in the upper surface of the quarry near Ghosipur, worked for dolerite blocks.

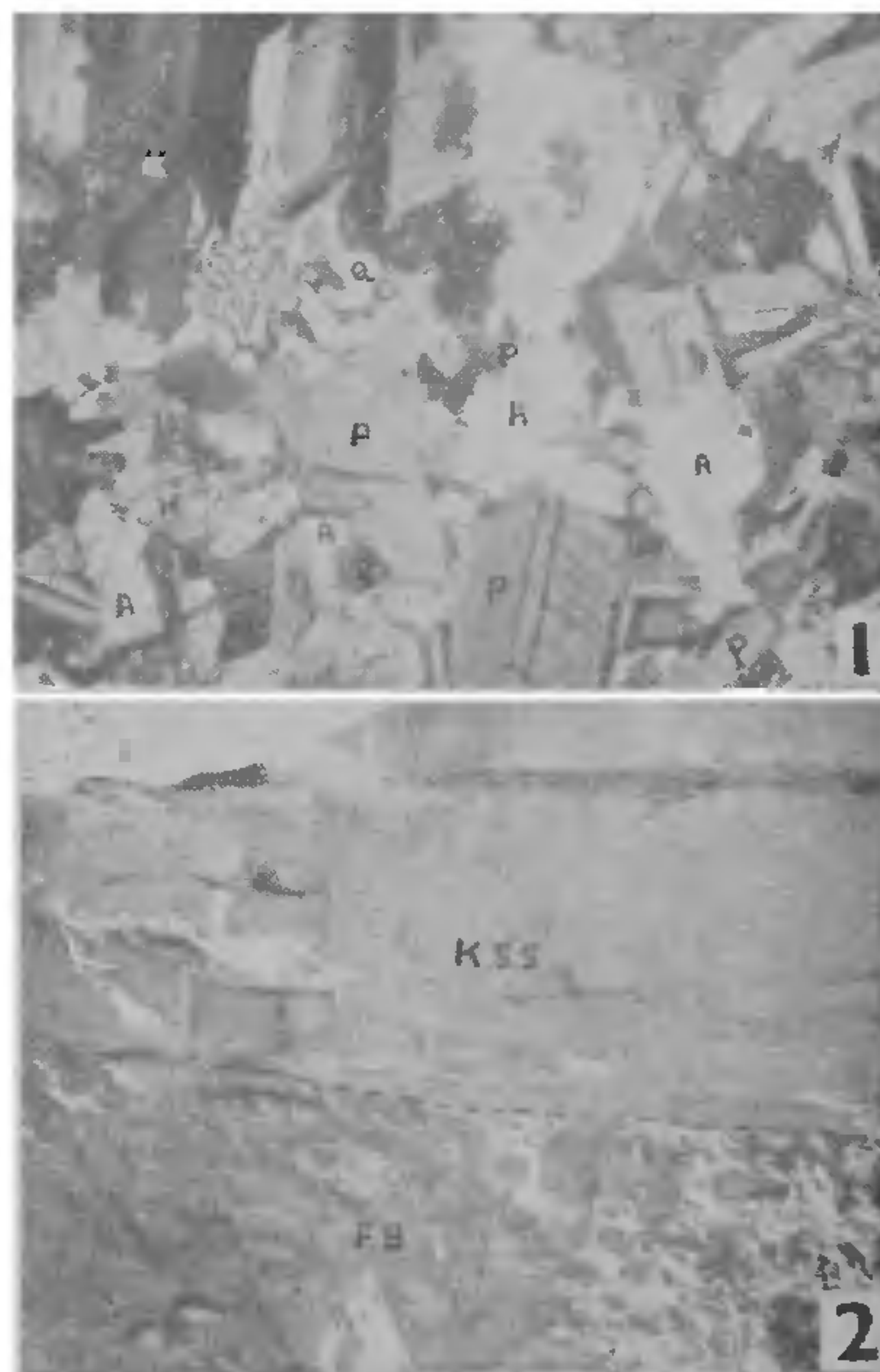


FIG. 1. Photomicrograph of a thin section of Gwalior sill from Ghosipur quarry showing ophitic and micropegmatitic textures. Minerals—P: Plagioclase, A: Augite, Q: Quartz and H: Hornblende. C. N., × 40.

FIG. 2. Fault breccia (F.B.) at the contact between Kaimur Sandstone (KSS) and underlying Gwalior Sill (not seen), along the eastern cliff of Gwalior fort-hill.

Weathering of dolerite to a depth of about 25 m from its surface and a uniform development of spheroidal weathering to a similar depth clearly shows that the rock had been exposed to weathering for a long time.

(3) Generally, fault breccia occurs between the dolerite sill and the overlying Kaimur Sandstone (Fig. 2), varying in thickness from a few inches to about 12 m as seen in the hillock southwest of Gwalior, on the road to Tigra Dam. It is important to note that the fault breccia consists of fragments of overlying sandstone and also red shales mixed up in a reddish-brown matrix, consisting of plenty of mica.

(4) The Kaimur Sandstone shows very little disturbance. Generally, it consists of massive sandstone. Near the contact, the thickness of sandstone beds gets reduced to about 2 cm or even less (Fig. 2). Incipient crystallisation with the formation of magnetite crystals is also noticed near the contact.

Fault breccia is developed after the formation of the Kaimur Sandstone. Verma, Roonwal and Chaku (1970) 'conjecture' the contact 'as indicative of dislocation'. The present study has revealed that the fault breccia is developed due to the movement of Kaimur Sandstone over the surface of the sill; the extent of the movement is, however, not clear. Perhaps a thin layer of Morar Shales, present over the sill surface, is removed during this movement. This explains the occurrence of shale fragments in the fault breccia. It is also observed that the stratigraphic position between the Gwalior Sill and Kaimur Sandstone is not affected during this movement. The authors, therefore, consider the contact between the two formations as a 'faulted contact' and not as a 'thrust contact'.

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PALAEOMAGNETISM AND THE PHENOMENON OF MULTIPLE INTRUSION

WHEN palaeomagnetic work was first initiated, its main purpose was confined to solving some of the geophysical problems like the origin and history of the geomagnetic field, continental drift and polar wandering. Its usefulness is now found in solving some of the geological problems, such as, age determinations (Blundell, 1961; Storetvedt, 1966), correlation (Khan, 1960; Radhakrishnamurthy, 1963), and classification (Sahasrabudhe, 1963; Strangway, 1964) of the rocks. The work of the pre-

sent authors on the dolerite dykes of the Tirupati area also revealed the usefulness of the palaeomagnetic studies in establishing the phenomenon of multiple intrusion.

During the course of investigation of the dolerite dykes of the Tirupati area, a multiple intrusion was noticed about six miles south of Tirupati by the side of the Tirupati-Rayachervu road near the village Gangireddipalli. The multiple intrusion is formed by an injection of a younger dyke into the older. The younger dyke occurs in the middle of the older dyke making chilled contacts with the latter as seen in Fig. 1, A and B. In the figure, only one contact plane is shown.

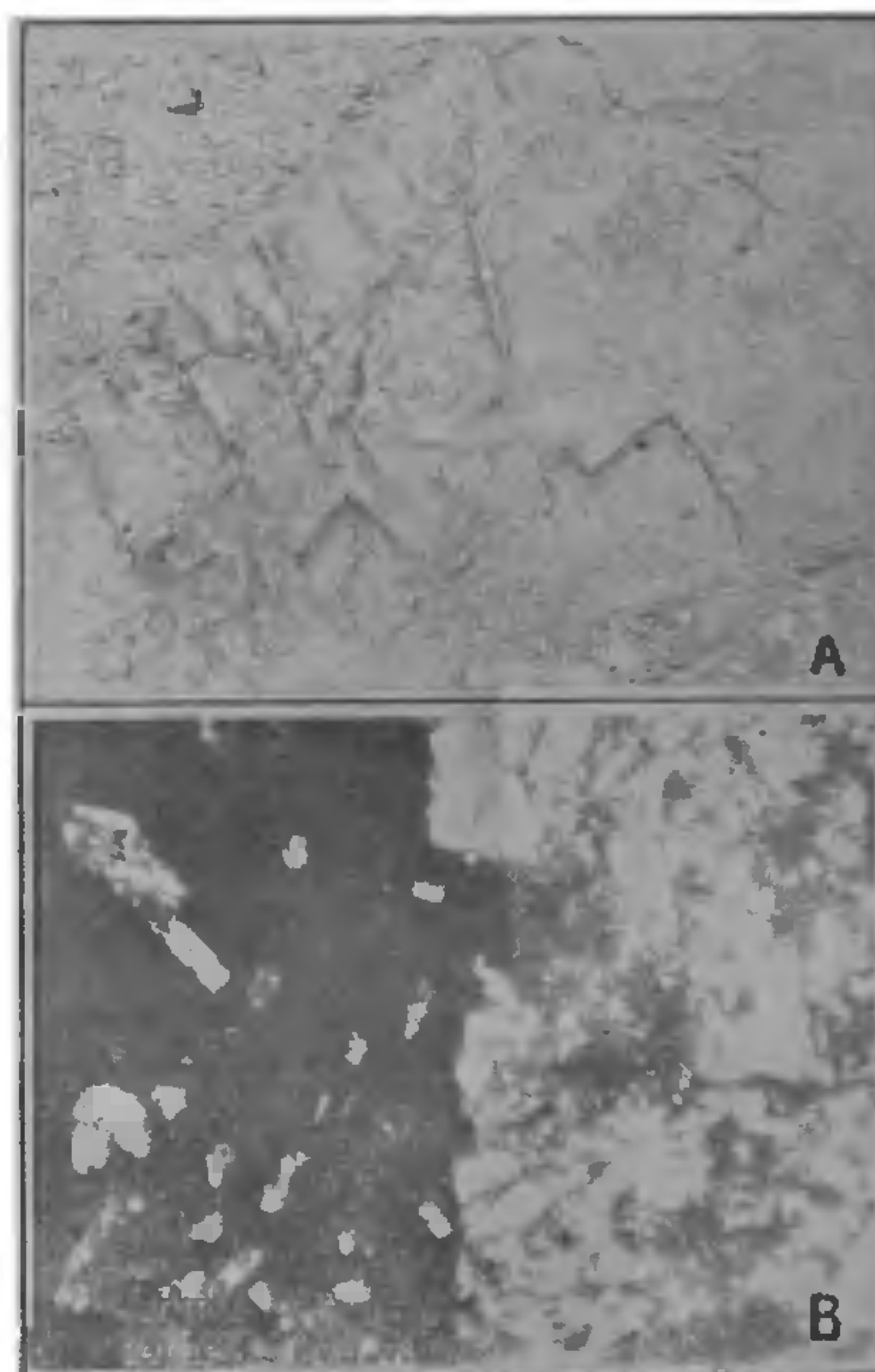


FIG. 1. A. Field photograph of the contact between the younger (left half) and the older (right half) dyke. The pen is placed along the contact. B. Photomicrograph of the contact between the younger (left half) and the older (right half) dyke.

Oriented samples were collected from both the dykes, and their natural remanent magnetic directions and intensities were measured using an astatic magnetometer. The results of the preliminary measurements are given in Table I, and the A.C. cleaned directions are shown in Fig. 2. From Table I and Fig. 2 it is evident that the older dyke is normally