where deep crustal fractures accentuated volcanic activity during which the carbonatite complexes were emplaced in the form of plugs.

Detailed study of the Narmada Rift Valley may bring to light many more carbonatite complexes both in the from of plugs and dyke-like intrusions emplaced along fault planes, which may have great economic significance as the deposits of niobium (columbium), rare-earths (cerium group), atomic minerals, fluorspar and apatite are known to be associated with them.

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STRATIGRAPHIC SUCCESSION OF THE BIJAWAR ROCKS IN THE TYPE AREA (BETWEEN BIJAWAR AND SILON), CHHATARPUR DISTRICT, M.P.

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THE studies of the Bijawar rocks have remained a much neglected topic of research in Indian stratigraphy. H. B. Medlicott in 1860 (*Mem. Geol. Surv. Ind.*, 2, p. 6) proposed the name "Bijawar" for the sediments found above the Bundelkhand granites and below the lower Vindhyan beds. He remarked that "the Bijawar formation is too confused to allow of the safe or ready determination of subdivision". A note, published by S. M. Mathur in 1954 (*Rec. Geol. Surv. Ind.*, 86, pp. 539–544), gives an account of the earlier work on the area together with the lithology of the Bijawar formation and its relationships with the overlying and underlying rocks. He has also presented a tentative table of the stratigraphic succession. In the past, several attempts have been made to work out its exact lithologic sequence, but enough success was not achieved. Its stratigraphic position has still remained a controversial problem and the tectonic details have not been attempted. The senior author feels that identification and correlation of similar rocks present along the Narmada and the Son valleys are possible only after working out the stratigraphic sequence and tectonics of the Bijawar rocks of the type area in every detail.

In the Pre-Cambrian terrain of excessive and repeated orogenic disturbance it is often very difficult to ascertain with certainty the original order of superposition of beds, unless features indicating the original top or bottom of the sequence are discovered and properly analysed. In course of lithologic and structural mapping of the rocks between east of Bijawar Town and Silon, the authors have discovered several perfectly preserved sedimentary structures. Amongst the several inherited structures, cross-bedding, ripple-marks and graded bedding have best served as reliable top-and-bottom criteria.

By the proper utilization of the several top and bottom features in the sub-metamorphic rocks around Bijawar, it has been possible to establish the following order of superposition:

Carbonatite-alkalic complex

VINDHYAN ROCKS

Upper Bijawar	Quartzitic sandstone	Greyish-white quartzitic sandstone
	Chocolate shale with tillites (?)	Chocolate shale to slate with ash-coloured silt, grit and sandstone bands (locally tillites ?)
	Ferrugineous conglomerates	Medium-grained and heterogeneous ferrugineous conglomerate
Lower Bijawar	White quatzites	Friable and white sandstone; Gritty and pebbly sandstone; Hard and white quartzite with pebbles; Hard and white quartzite
	Homogeneous conglomerate	Homogeneous very coarse conglomerate
	Ferrugineous quartzite	Ferrugineous quartzite mottled with white quartzite; Ferrugineous quartzite with shale and grit bands
	Ferrugineous shale	Hard dark brown ferriferous and siliceous shale
	Cherty quartzites	Pink and white cherty quartzite with gritty bands; Brown cherty quartzite with bands of jasperite

Bundelkhand Granites

Although several outcrops of metamorphosed basic igneous body in the sub-metamorphic rocks have been reported by earlier workers, the presence of an intrusive carbonatite-alkalic complex is recorded here, for the first time, from the type area of Bijawars. The complex transects the Bundelkhand granites, Bijawars and Vindhyans, and therefore is Post-Vindhyan in age.

B. Das is of opinion that the above geologic succession should be valid for the other parts of the Bijawar belt lying immediately south of the Bundelkhand granites and broadly applicable in the cases of such rocks found elsewhere. This should also be of great value in the identification and correlation of such rocks in the Narmada and the Son valleys. Detail lithologic and structural mapping by the authors have produced results of considerable tectonic significance, which are under analysis.

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CHEMICAL EXAMINATION OF THE STEMS AND LEAVES OF *MARSDENIA VOLUBILIS* T. COOK

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MARSDENIA VOLUBILIS T. Cook (Syn.: *Dregia volubilis* Benth. *ex.* Hook. *f*) (Fam.: Asclepidaceæ) is a stout tall climbing shrub growing wild in many parts of India. In Ayurvedic medicine the plant has been described[1] as cure for several diseases. The seeds of this plant have been examined by Reichstein *et al.*[2,3] who reported the isolation and chemistry of ester glycosides made up of steroid genins and 2-deoxy sugars. Similar compounds were also reported to be present in *Marsdenia tomentosa*.[4] In this communication the results of the chemical investigation of the stems and leaves of *M. volubilis* are reported.

The air-dried stems and leaves were powdered and extracted successively with hexane, chloroform and alcohol. The hexane extract on concentration deposited a very small quantity of a red pigment. The residue was chromatographed over alumina. The petroleum-ether-benzene (17:3) eluate yielded a colourless crystalline substance, needles from benzene, m.p. 277–79°, $[\alpha]_D^*$ ± 2°. It gave positive Liebermann-Burchard reaction (pink) and analysed † for the formula $C_{30}H_{50}O$. It formed a monoacetate, $C_{32}H_{52}O_2$, m.p. 297–300°. $[\alpha]_D$ + 12·3° and a monobenzoate, $C_{37}H_{54}O_2$, m.p. 289–92°, $[\alpha]_D$ + 39·4°. These properties led to the conclusion that the substance s taraxerol and a mixed m.p. determination of the substance and its benzoate with authentic taraxerol and taraxerol benzoate respectively confirmed the identity.

From the mother liquors of taraxerol another triterpenoid was obtained in small yield, nodules from petroleum ether, m.p. 87–88°, $[\alpha]_D$ − 8·7°. It analysed for the formula $C_{30}H_{50}O$ and formed a monoacetate, $C_{32}H_{52}O_2$, white crystalline powder from petroleum ether-benzene, m.p. 77–80°.

In the same chromatography petroleum ether-benzene (5 : 1) eluted a sterol (green colour in Liebermann-Burchard reaction), colourless feathery needles from petroleum ether, m.p. 158–60°, $[\alpha]_D$ − 37°. It analysed for the probable formula $C_{28}H_{48}O$ and formed a monoacetate, $C_{30}H_{50}O_2$, needles from ethanol, m.p. 137–38°, $[\alpha]_D$ − 39·2° and a monobenzoate, $C_{35}H_{52}O_2$, prisms from ethanol-benzene, m.p. 149–53°, $[\alpha]_D$ − 10·1°.

The chloroform extract residue of the plant material was chromatographed over alumina and all the fractions thus obtained gave positive Keller-Kiliyani reaction, indicating the presence of 2-deoxy sugars, and negative Legal and Kedde reactions. Hence these fractions may contain ester glycosides of the type isolated from the seeds by Reichstein *et al.*[3]

The alcohol extract was concentrated under reduced pressure and all the alcohol was removed by adding water at intervals. The aqueous liquid thus obtained was extracted successively

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* All rotations were determined in chloroform solution.

† All the compounds described herein gave satisfactory elemental analysis.