(c) 1: The spectrum of iron through filtered tap-water extract of wood shavings of *Bija* or *Bijasal* (*Pterocarpus marsupium* Roxb.)

(d) 2: The spectrum of iron through filtered tap-water extract of the wood shavings of *Sagwan* or teak (*Tectona grandis* Linn.)

(e) 3: The spectrum of iron through filtered tap-water extract of the wood shavings of *Siwan* (*Gmelina arborea* Roxb.)

(f) 4: The spectrum of iron through filtered tap-water extract of the wood shavings of *Salai* (*Boswellia serrata* Roxb.)

It will, thus, be seen that the absorption-spectrum in each case is very clear and characteristic gradually fading and disappearing in varying degrees towards the violet end of the spectrum. In *Pterocarpus marsupium* Roxb. (text-figure 1) the quantum of absorption is remarkably great, whereas *Gmelina* arborea Roxb. (text-figure 3) surprisingly enough shows a discontinuous phenomenon of absorption in its spectrum. The other two, namely, *Tectona grandis* Linn. (text-figure 2) and *Boswellia serrata* Roxb. (text-figure 4), display characteristic absorption of their spectra in varying degrees.

The experiment was repeated several times even (*a*) with tap-water extracts taken from different specimens of the same species of timber-wood, and (*b*) with concentrated tap-water extracts of the very same four species of timber-wood under study, but the result in each case was found to be invariably always in close conformity with the findings of our very first spectrograph.

The study has, by now, been extended to two other species of wood, namely, of *Neem* (*Azadirachta indica* A. Juss.) (Meliaceæ) and of *Santra citrus suntara* Engl. (Rustaseæ). Here also the absorption-spectra are specific for each of them.

Further study and investigation are in progress.

We wish to record our sincerest thinks to Dr. A. S. Ganesan, Physics Department of the Science College, Nagpur, for his valuable help, to Mr. H. S. George, Chief Conservator of Forests, C.P. and Berar, Nagpur, for very kind and ready permission to make a free use of his Departmental Library, and to Mr. Haji Fazal, Nagpur, for his generous offer of the specimens of timber-woods for our experiments.

(MISS) R. SHAH.
T. C. N. SINGH.

Horticulaural Research Institute,
Nagpur—Ajni, C.P.,
*June* 11, 1944.

## CURRENT BEDDING AND TECTONICS

IN a recent letter to *Current Science*[1] Professor Rode objects to my use of the disposition of current-bedded structures in determining the stratigraphical and tectonic sequence of the Central Himalaya,[2] on the grounds that the method is of doubtful value when applied to disturbed rocks. It is only in the study of disturbed rocks, however, that there is any need to use bedding textures and structures in fixing the stratigraphical order. In undisturbed regions the sediments are normally accepted as lying in their original order of deposition. The current-bedding method has been extensively employed in Northern Europe,[3] and, apart from the Himalayan region now under question, has been adopted by C. S. Pichamuthu in his study of the Archæan rocks of the Chitaldrug Schist Belt.[4] Not only are such structures preserved in areas of complex thrusts and overfolds, but they may be recognised in rocks which have undergone the effects of meso-grade metamorphism.[5] I have seen them in many places in the garnet-biotite-quartz granulites of the Main Himalayan Range.[6] For the preservation of such structures it is only necessary that strong shearing stress or excessive soaking should not have been operative in the rising and ebbing tide of metamorphism.

In the case of the Tal rocks of the Central Himalaya, we are not concerned with any possible obliterating effects of metamorphism on bedding structures. Apart from very local crush effects, the Tal rocks in the basins between longitudes 77° 30′ and 79° are not metamorphosed, although there has been selective silicification of some of the sandstones as compared with the shales, due to the greater permeability of the sandstones to solutions carrying silica. The Tal quartzites and sand-

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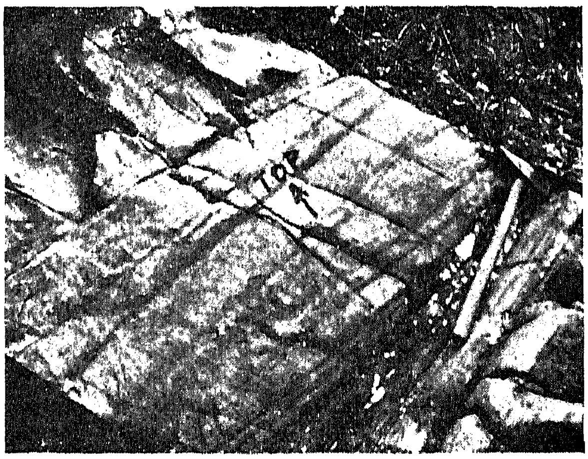

FIG. 1. Curremt-bedded Upper Tal quartzites. Map No. 53 J/3 (30°22′30″:78° 0′30″). Feb. 1936

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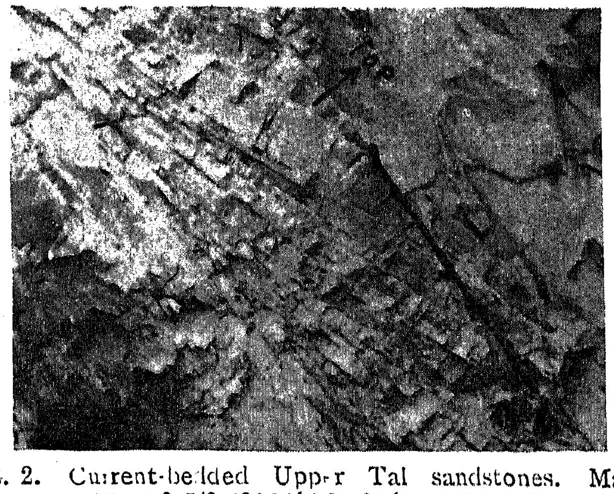

FIG. 2. Current-bedded Upper Tal sandstones. Map No. 53 J/3 (30°4′:78° 30′). May 1936.

stones possess, unequivocally preserved, excellent current-bedded and ripple-marked structures. The former have proved that the Upper Tal arenaceous rocks, and the Lower Tal shales into which they grade downwards, are not inverted. Two photographs of current-bedding in the Tal quartzites and sandstones are submitted with this letter, in both examples the concave sides of the current-bedding planes facing upwards towards the Tal limestone and, in the Ganges section, the overlying Nummulitic series.

Although it is not necessary in areas removed from orogenic zones to prove the correct order of deposition, current-bedding sometimes provides useful information about palæogeographical conditions. The Vindhyan system of Peninsular India offers an interesting study by this method.[7]

Geological Survey of India,
Calcutta,
*May* 11, 1944.

J. B. AUDEN.

1. *Current Science*, 1944, **13**, 74. 2. *Rec. Geol. Surv. Ind.*, 1933, **67**, 392. 3 *Geol. Mag.*. 1930, **67**, 68–92. British Regional Geology: The Grampian Highlands, 1935, 29. 4. *Curr. Sci.*, 1937, **6**, 95. 5 Die Gesteinsmetamorphose (Grubenmann-Niggli), 1924, 62. 6. *Rec. Geol. Surv. Ind.*, 1935, **69**, 135. 7. *Mem. Geol. Surv. Ind.*, **62**, 1933, 216.

## ASSAY OF FERRI SUBCHLORIDUM CITRATUM, B.P.

THE method recommended by the B.P.[1] for the assay of ferri subchloridum citratum consists in dissolving an accurately weighed quantity of the powder in dilute sulphuric acid and determining the ferrous iron in the solution by titration with standard potassium dichromate, using a solution of potassium ferricyanide as external indicator. C. G. Lyons and F. N. Appleyard[2] have shown that the official method gives results which are appreciably too high. They have recommended the use of ceric sulphate in place of potassium dichromate for the titration of the ferrous iron. Phenyl anthranilic acid or ferrous o-phenanthroline ion have been recommended as internal indicators. Other indicators were tested and found to be less suitable. C. G. Lyons and F. N. Appleyard[3] have also found that in the assay of saccharated iron carbonate by titration with dichromate, cane-sugar interferes by giving too high results. C. Morton and D. C. Harrod[4] also observed the interference of carbohydrates in the determination of ferrous iron by titration with potassium dichromate, using either potassium ferricyanide as the external indicator or diphenyl amine as the internal indicator. They recommended the employment of Heisig's[5] method in such circumstances. C. R. Viswanadham and G. Gopala Rao[6] have found that oxalic, tartaric, and citric acids interfere in the titration of the ferrous iron by dichromate, using both the internal and external indicators. They have explained the phenomenon on the basis that the reaction between ferrous salts and dichromate induces the reaction between dichromate and organic acids like oxalic, tartaric and citric acids.

We have now found that an accurate assay of ferri subchloridum citratum is possible by using sodium vanadate as the oxidizing agent in place of potassium dichromate for the titration of the ferrous iron. A decinormal solution of sodium vanadate is prepared and standardised as follows: The requisite quantity of pure ammonium vanadate, "Merck", is weighed out into a conical flask, distilled water added, together with a slight excess of pure sodium carbonate and boiled to drive off the ammonia completely. The resulting solution of sodium vanadate is transferred to a measuring flask and made up to the mark. We found that a solution of sodium vanadate made in this way keeps quite well. An aliquot volume of standard (decinormal) ferrous ammonium sulphate solution is taken in a beaker, 0·5 c.c. of a 0·1 per cent. diphenylamine indicator solution and 2 to 3 c.c. of phosphoric acid are then added followed by 10 c.c. of 4 N sulphuric acid. The ferrous solution is then titrated with the sodium vanadate solution, run from the burette until a permanent blue-violet colour results. The solution may suitably be diluted. A correction of 0·3 c.c. of N/10 vanadate solution to be subtracted from the titre is to be applied for 1 c.c. of 0·1 per cent. indicator solution.

In the following tables we record the results of the determination of ferrous iron in admixture with citric acid in about the same proportions as in ferri subchloridum citratum, under

TABLE I

Amount of ferrous iron taken = 0·0431 gm.

| Amount of citric acid added | Amount of ferrous iron found by the official method (dichromate titration) | Amount of ferrous iron found by the authors' method (vanadate titration) |
|---|---|---|
| 0·00875 gm. | 0·0470 gm. | 0·0431 gm. |
| 0·01750 „ | 0·0504 „ | 0·0429 „ |
| 0·03500 „ | 0·0560 „ | 0·0431 „ |
| 0·10500 „ | 0·0683 „ | 0·0428 „ |
| 0·17500 „ | 0·0730 „ | 0·0433 „ |

TABLE II

Amount of citric acid added = 0·0350 gm.

| Amount of ferrous iron taken | Amount of ferrous iron found by the official method | Amount of ferrous iron found by the authors' method |
|---|---|---|
| 0·02155 gm. | 0·0339 gm. | 0·02150 gm. |
| 0·04310 „ | 0·0593 „ | 0·04310 „ |
| 0·06465 „ | 0·0825 „ | 0·06480 „ |