new data were obtained from photographs of the infra-red region taken in the Spectroscopy Laboratories of the Imperial College, London (by S. G. K.) and of the visible region at low and high currents (two and twenty-three amperes) taken in this laboratory (by V. V.).

Four new systems of bands have been found starting with $\nu\nu$ 12911·0, 14160·8, 16073·3 and 21226·9 as the (0, 0) bandheads of the corresponding Deslandres schemes. Two of these, photographed in this laboratory from two ampere and twenty-three ampere arcs, are given below.

v' \ v''	0	1075·5	1	1088·2	2
0	16073·3(6)				
	971·7				
1	17045·0(4)	15969·5(4)			
		979·0			
2		16948·5(3)		15860·3(3)	

v' \ v''	0	1066·4	1	1057·8	2
	21226·9(5)	20165·8(2)			
		965·9			
1		21131·7(3)			
		974·2			
2	23177·6(2)	22105·9(3)		21048·1(2)	
		938·1			
3		23044·0(2)			

Physics Dept, Presidency College, Madras, *July* 9, 1954.

V. VITTALACHAR.
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NEW SEDIMENTS IN THE REWA SERIES (UPPER VINDHYAN SYSTEM) FROM SATNA DISTRICT, VINDHYA PRADESH*

THE following succession of beds has so far been recognised[1-3] in the Rewa Series (Upper Vindhyan System) in the Bundelkhand area: Upper Rewa sandstone, Jhiri shales, Lower Rewa sandstone, Panna shales and Rewa limestone.

While mapping in the erstwhile Baraunda State (now merged in Vindhya Pradesh and forming part of the Satna District), the present author discovered that in a part of this area in addition to the above horizons a succession of beds consisting of sandstones, shales and limestone occurs below the Rewa limestone and overlying the Kaimur sandstone. These beds total about 60′ in thickness and occur in perfect conformity with the overlying sequence. They have been traced over a distance of about 10 miles and an area of about 80 sq. miles.

A slight erosional unconformity between the basal limestone bed of this new succession and the Upper Kaimur sandstone is noticeable.

It is proposed to designate these newly discovered beds as the "Paisuni Stage" after the Paisuni river in whose valley they have been found to occur in great force. Thus, the Vindhyan succession in this area as established by the new survey is as follows:

Rewa limestone and the younger beds

Paisuni sandstone
Paisuni shales
Paisuni limestone
Kaimur sandstone

The Paisuni limestone, about 5′ in thickness, is greyish-green and buff in colour, and resembles the Rewa limestone in appearance. It forms the bottom-most horizon of the entire series and rests over the Kaimur sandstone. The overlying shales average about 35′ in thickness in the area covered so far They are generally of chocolate and green colour, and are highly fragmented. In general, the Paisuni limestone and shales are very closely similar to the younger Rewa limestone and the Panna and Jhiri shales respectively; and if examined in isolated outcrops it is indeed difficult to distinguish between the two sets.

The thin-bedded Paisuni sandstone, about 20′ in thickness, found underlying the Rewa limestone is, however, lithologically different from the other sandstones found in the Rewa series. The typical Rewa sandstones are indurated, compact and white or pink-coloured, while the Paisuni sandstone is a softer, somewhat loose-grained, greenish coloured and slightly foliated rock. The green colour is due to the presence of chlorite Fine specks of muscovite are also observed. This sandstone is much softer than the other Rewa sandstones and is a distinguishing feature of the Paisunis.

It appears that these beds occupy a much larger area than the Baraunda territory and their outcrops extend eastwards into the Banda District of Uttar Pradesh. Systematic mapping on regional basis will reveal the full extent of their outcrop.

A detailed account and geological map of these formations in the type area will be published in due course.

I am indebted to Dr. A. G. Jhingran, Geological Survey of India, for his active encouragement.

Geological Survey of India, S. M. MATHUR.
Lucknow, *May* 21, 1954.

* Published by permission of the Director, *Geological Survey of India*.

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PIEDMONTITE FROM ROBERTSONPET, MYSORE

PIEDMONTITE, the rare manganese member of the epidote group, was first reported in Mysore by the present author.[1] It has been studied in greater detail from its optical and chemical points of view and the results of the study are set forth in the present paper.

Piedmontite is fairly well developed in the champion gneiss at its contact with the hornblende schist in two localities near Robertsonpet, namely, 1 furlong south of Kemputhimmanahalli (78° 17′ 34″ : 12° 56′ 17″) and 3 furlongs east of Masika (78° 17′ 0″ : 12° 56′ 28″). The optical study of a number of grains of the mineral reveals that $X \wedge C = -5°$ and 2V varies between 75° and 80° with an average value of 76°. The optical characters of the mineral, as compared with those described by Short[2] and Simonson[3] from California, are as follows :

Robertsonpet (Mysore)	Madera County California	Los Angles County California
X = pale lemon yellow	X = Orange yellow to lemon yellow	X = orange yellow to lemon yellow
Y = pale amethyst	Y = amethyst to amethystine red	Y = amethystine red
Z = pale red	Z = carmine	Z = carmine
$\gamma - \alpha = 0{\cdot}029$	$\gamma - \alpha = 0{\cdot}060$	$\gamma - \alpha$ = High
$X \wedge C = \cdot -5°$	$X \wedge C = -4$ to 5°	$X \wedge C = -3$
2V = 75 to 80°	2V = 64 to 75°	2V = 70 to 80°

It is seen from the above comparison that the Mysore mineral agrees generally with the Californian minerals in its optical characters. It is significant, however, that the birefringence of the Californian minerals is very high, nearly twice as compared with that of the Mysore mineral.

A powder of this mineral, obtained by Thoulet solution, was analysed by Sri. T. D. Bhaskar, Central College, Bangalore, and it was found to contain 12·5 per cent. Mn_2O_3, which is very similar to the Mn_2O_3 content (12·13 per cent.) of piedmontite from Madera County,[4] California. On plotting the optical characters, 2V and $X \wedge C$ and Mn_2O_3 content of the Mysore mineral in the variation diagram proposed by A. M. Short[5] for piedmontites, it is seen that the values fit into the $X \wedge C$ and 2V curves perfectly. Short, in his study of piedmontites from California, showed with the help of the variation diagram that excess of manganese increases 2V and $X \wedge C$ and decreases the indices of refraction. In this connection he observed, "From data recorded by Larsen and from Anderson's conclusions, it is very probable that the N_g and N_p curves converge with increase of Mn_2O_3, but not enough data are available to justify a definite statement".[6] The Mysore mineral, like the piedmontite from Madera County, California,[7] occurs replacing biotite in a metamorphosed volcanic rock and thus agrees very closely with the latter not only in its mode of occurrence but also generally in its optical and chemical characters.

The author desires to express his indebtedness to Sri. L. Rama Rau and Dr. C. S. Pichamuthu for valuable suggestions and to Sri. T. D. Bhaskar for determining the manganese content of the mineral.

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Central College, Bangalore,
July 24, 1954.

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RESOLUTION OF MIXTURES OF AMINO ACIDS BY CIRCULAR PAPER CHROMATOGRAPHY*

ASIDE of the method of separation of amino acids by two-dimensional chromatogram, there are so far only two methods for this purpose, using the uni-dimensional technique. Redfield and Barron[1] have developed a method for the separation of a mixture of 18 amino acids, which

* After this communication was submitted for publication, there has appeared in the July issue of this Journal a note by Krishnamurthy and Swaminathan indicating the method for the separation of amino-acids by buffered circular paper chromatography.