

of leucopelargonidin having the probable structure (I) in which the linkage between the two C_{15} units is shown as C_4-O-C_4 . Alternative linkages C_4-O-C_3 or C_3-O-C_4 are also conceivable.² The parent proanthocyanidin formed an acetate with acetic anhydride and pyridine at room temperature, m.p. 120–25° (d), $[\alpha]_D^{25} - 27.7^\circ$ (C, 0.18 in chloroform), $C_{46}H_{42}O_{19}$.

The leaves of *Salacia chinensis* were also similarly extracted with warm petroleum ether, ether, warm acetone and warm alcohol. The petroleum ether extract yielded gutta which was identified as described under the stem. The ether extract did not yield any definite substance. The solvent-free acetone extract was macerated with petroleum ether, ether and chloroform in the cold to remove waxes and colouring matter. An almost colourless solid remained. After repeated purification by taking up in methanol and precipitating with ether the m.p. was 218–30° (d) (yield 0.1%). On boiling with ethanolic hydrochloric acid it gave

rise to three flavylum salts (paper chromatography); the nature of the parent proanthocyanidin(s) is being investigated.

The warm alcoholic extract of the leaves after removal of solvents was treated in exactly the same manner as described under the acetone extract. The product, an almost colourless powder, m.p. 210–25° (d) (yield 0.5%), also gave rise to three flavylum salts. The nature of this (these) proanthocyanidin(s) is also under investigation.

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NMR STUDY OF MERCURIC SULFATE MONOHYDRATE

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THE X-ray structural analysis of $HgSO_4 \cdot H_2O$ was first carried out by Bonefacie.¹ In their refinement of the structure, Templeton *et al.*² have commented on the hydrogen bonding in the structure. In view of these comments, it was thought interesting to undertake a PMR study of the single crystal.

$HgSO_4 \cdot H_2O$ belongs to the orthorhombic space group $Pmcn - D_{2h}^{16}$ with four molecules in the unit cell. The general positions are given by:

$$\pm [(x, y, z); (\frac{1}{2} - x, \frac{1}{2} - y, \frac{1}{2} + z); (\frac{1}{2} + x, \bar{y}, \bar{z}); (\bar{x}, \frac{1}{2} + y, \frac{1}{2} - z)]$$

Crystallographically, there are two non-equivalent $p-p$ vectors in any of the three crystal planes.

Large single crystals were grown in the manner described by Templeton *et al.* They were examined using a modified PKW-type of wide line NMR spectrometer constructed in our laboratory. The signals were recorded for 18 orientations of the magnetic field in the ab - and the bc -planes, at intervals of 10° each.

The Pake splitting of the signals due to dipolar interaction, ΔH (in gauss) is given by³:

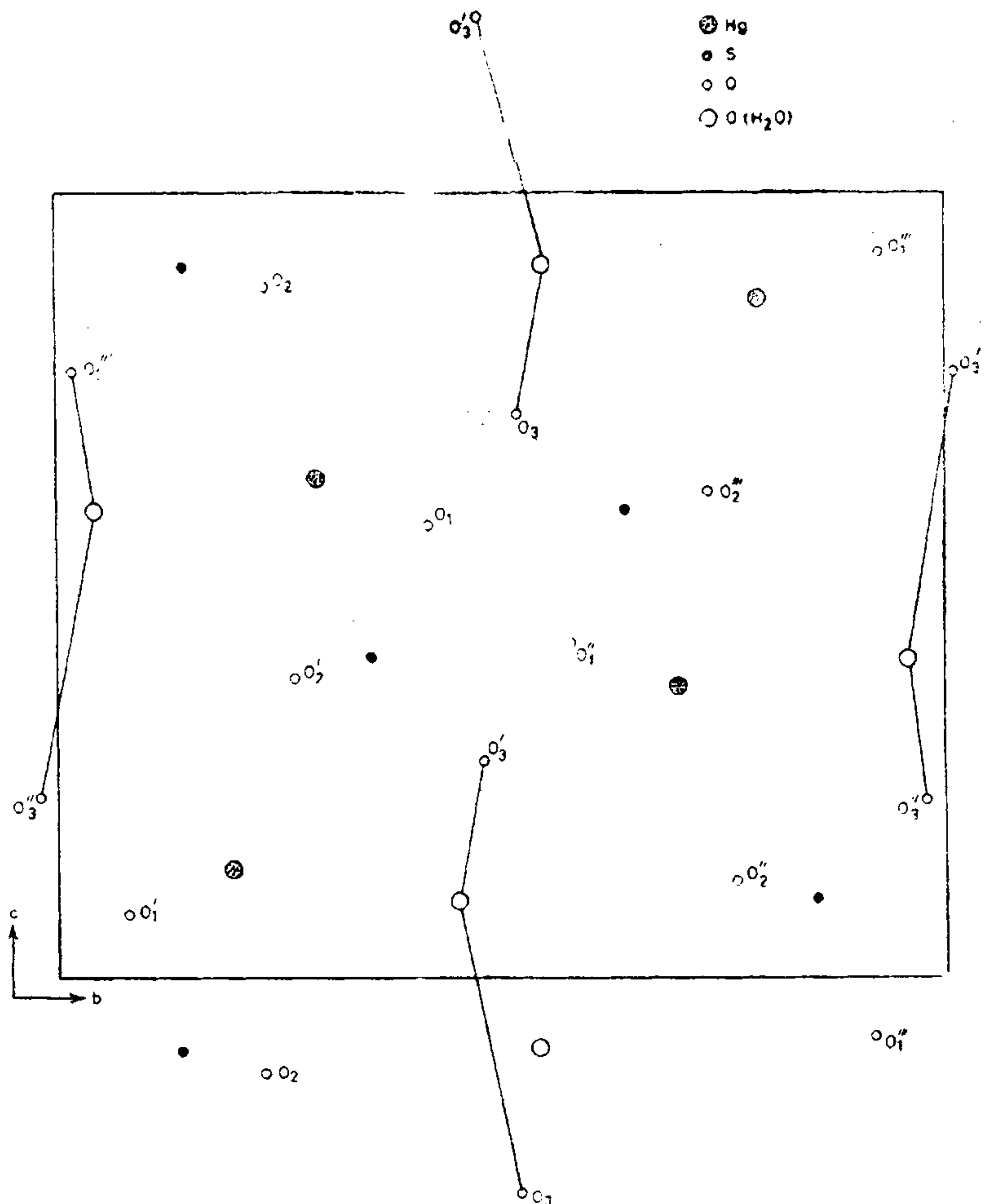
$$\Delta H = 2a (3 \cos^2 \delta \cos^2 \phi - \phi_0 - 1).$$

The experimental derivative curves for the rotations in the ab - and the bc -planes looked similar to the curves usually obtained for a single $p-p$ vector case. From each of these curves, a small central peak had to be subtracted before further analysis. This peak is presumably due to some free water in the crystal. The curves were resolved into Pake doublet derivatives, with a proper choice of a standard derivative curve from a well-resolved spectrum. The measured ΔH -values were then fitted into the Pake equation by the method of least squares. The parameters r , ϕ_0 and δ thus obtained, specify the length and the orientation of the interproton vector with respect to the crystallographic axes.

The interproton distance, r , was found to be $1.61 \pm 0.03 \text{ \AA}$

TABLE I

Bond system	Distances in Å	Orientation of O _A - O _B line				Orientation of P-P line				O _A - O(\hat{H}_2O) - O _B
		<i>ab</i> -plane		<i>bc</i> -plane		<i>ab</i> -plane		<i>bc</i> -plane		
		ϕ_0	δ	ϕ_0	δ	ϕ_0	δ	ϕ_0	δ	
O(3) - O(H ₂ O) - O'(3)	2.970, 3.136	172° 3'	57° 51'	4° 36'	31° 50'	175° 63'	5° 33'			117° 50'

FIG. 1. (100) Projection of $Hg SO_4.H_2O$.

For rotation in the ab -plane, with the a -axis as the reference axis, and for rotation in the bc -plane with the c -axis as the reference axis,

$$\phi_0 = 175^\circ, \delta = 63^\circ$$

$$\phi_0 = 5^\circ, \delta = 33^\circ.$$

Hence, the projections of the p-p vector in the two planes are very nearly parallel to the a- and the c-axes respectively. It is due to this, that we have failed to observe sufficient resolution between the Pake curves corresponding to the two vectors, which are non-equivalent only in respect of their ϕ_0 -values. In the ac-plane, however, the spectra observed were typical of two non-equivalent p-p vectors. The parameters are also consistent with the results obtained in the other two planes.

Hydrogen bonding: Each Hg atom in the unit cell has two close neighbours: O(3) at 2.17 Å, and O(H₂O) at 2.24 Å which are approximately collinear with Hg. The other four neighbours, O(2), are at the corners of a rectangle whose shorter sides are perpendicular to the mirror plane containing Hg, O(3) and O(H₂O). This mirror is a symmetry requirement of this space group.

Our NMR results are consistent with two possible sets of hydrogen bonds, as follows:

(i) One involving the O(2) atoms not related by the mirror symmetry, and (ii) another involving the O(3) atoms from adjacent unit cells. The scheme (i) however leads to the protons being located along the edges of the

co-ordination polyhedron and this is extremely unlikely.

The distances and angles calculated on the basis of the X-ray data are furnished along with the PMR results, for scheme (ii) in Table I.

The long bond distances involved suggest rather weak bonding; this allows us to assume an O-H distance corresponding to the vapour value, viz., 0.96 Å. This, together with the observed H-H distances of 1.61 Å, gives H-O(H₂O)-H as 113° 58', which is near the O(3)-O(H₂O)-O'(3). Hence, we are led to suggest that the bonding to the O(3) atoms of adjacent unit cells is the probable one. The proposed hydrogen bonding is illustrated in Fig. 1.

Such a bonding appears to violate the mirror symmetry of the space group, and a neutron diffraction study of the crystal may be of interest.

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UNIT-HAIR RECEPTOR ACTIVITY FROM THE TELSON OF THE SCORPION, *HETEROMETRUS FULVIPES*

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LITTLE is known of the functional properties of hair receptors in scorpions. The mechanoreceptive function of hairs of scorpion was mentioned by Rao (1964) and Laverack (1966). According to Rao (1963) the 'B' type of hairs are principally mechanoreceptive and are distributed on the appendages, opistosoma and metasoma. Behavioral responses such as escape, attack, withdrawal and alert, etc., can be readily evoked either by delivering puffs of air onto the animal or by mechanically manipulating the hairs, thereby signifying the importance of these hairs in mediating behavioral responses of the animal. In spite of this fact, no one has reported an electrophysiological analysis of the properties of these hair receptors. One of the 'B' type of hairs on the enigmatic telson is chosen because of its easy accessibility for manipulation and also due to availability of long nerve for recording purposes.

The scorpion, *Heterometrus fulvipes* was used. The animal was fixed on to a dissection board with ventral side up and the telsonic nerve was exposed by carefully excising the exoskeleton. After severing the central connections the nerve was placed on a pair of silver-silver chlorided electrodes and the impulses were simultaneously led to a loud-speaker and Philips GM 5666 oscilloscope, after duly amplifying them with Type 122 Tektronix preamplifier. Recordings were made in air at room temperature (27° C.) and scorpion ringer (Padmanabhanaidu, 1967) was used to moisten the nerve. Two methods were employed to impart mechanical stimuli to the hairs. In one method, a needle mounted on a micromanipulator was used for brief and sustained displacement of the hair. The stimulus signal was monitored through a liquid potentiometer. The second device, employed mostly for high frequency stimulation, consists