

5. There was a slight but unconfirmed indication of a relative movement between the new rainbow and the normal.

On account of the displacement of the new one both with respect to its centre and its in-

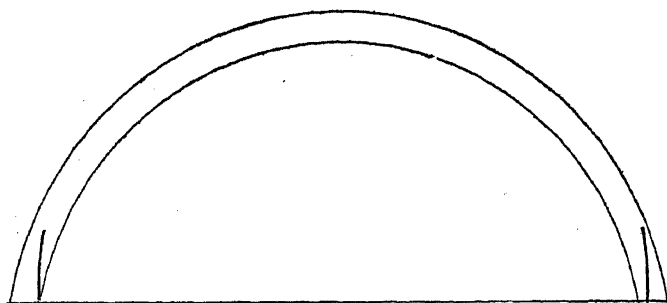


FIG. 1

clination relative to the normal rainbow, it must have its origin in the reflected image of the sun at some surface. Such a surface must be a large sheet of water or the surface of a cloud. But the smallness of the displacement does not warrant the former hypothesis. It appears, therefore, that the source for this extra rainbow must be the reflected image of the sun over a cloud. This surface must be the top one as the new bow forms a larger arc of a circle than the normal as is apparent from the figure. A large sheet of cloud was also present in the west in a suitable position for such a reflection to take place. The smaller intensity of the new bow also confirms this hypothesis as the surface of the cloud can only be a poor reflector.

Further qualitative or quantitative data could not be taken on this phenomena owing to its transient nature.

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### THERMODYNAMIC CHARACTERISTICS OF THE EQUILIBRIUM BUTENE -1 $\rightleftharpoons$ BUTADIENE -1, 3 + HYDROGEN

THE above equilibrium was studied experimentally in this laboratory by Ghosh and Roy<sup>1</sup> and accurate values for the equilibrium constant  $K_p$  were obtained at five temperatures. From the values of the equilibrium constant an equation was derived<sup>2</sup> for the free energy change  $\Delta F_T$  of the reaction, assuming the approximate specific heat equation.

$$\Delta C_p = 6.86 - 0.0046 T + 0.000,0006 T^2$$

as the specific heat of butadiene was not then known. When two sets of reliable values for the specific heat of butadiene had become known a re-evaluation was made.<sup>3</sup> After a careful study of existing spectroscopic and calorimetric data, Aston *et al.*<sup>4</sup> have given tables for the specific heats of butene and butadiene from which it is found that Beeck's<sup>5</sup> value for butene assumed in the original paper<sup>2</sup> and in the subsequent note<sup>3</sup> is much too low. The specific heat equation for the above equilibrium on the basis of Aston's results is

$\Delta C_p = 6.256 - 0.002734 T - 0.00,00,0246 T^2$  and this in conjunction with equilibrium data<sup>1</sup> gives as the standard free energy equation.

$$\Delta F_T = 25,612 - 6.256 T \ln T + 0.001367 T^2 + 0.00,00,00,41 T^3 + 16.05 T$$

and the thermodynamic characteristics at standard state as

$$\Delta F^\circ_{298} = 19,884 \quad \Delta H^\circ_{298} = 27,334 \quad \text{and} \\ \Delta S^\circ_{298} = 25.0$$

as against the values given in the original paper<sup>2</sup>

$$\Delta F^\circ_{298} = 20,015 \quad \Delta H^\circ_{298} = 27,342 \quad \text{and} \\ \Delta S^\circ_{298} = 24.6.$$

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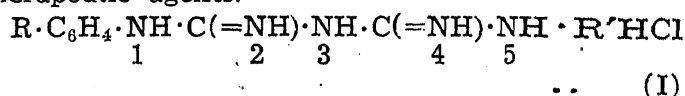
1. Ghosh and Roy, *Proc. Nat. Inst. Sci., India*, 1946, 22, 97. 2. —, *Ibid.*, 1946, 22, 115. 3. Ghosh and Rama Das Guha, *Curr. Sci.*, 1946, 15, 125. 4. Aston, *et al.*, *J. Chem. Phys.*, 1946, 4, 680. 5. Beeck, *Ibid.*, 1936, 4, 680.

### STUDIES IN ANTIMALARIALS—SOME SULPHA-BIGUANIDE DERIVATIVES

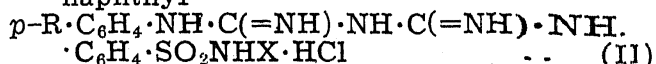
AMONG sulphanilamides<sup>1-3</sup> sulphadiazine is the most effective and possesses a slight but definite prophylactic action<sup>4</sup> in malaria. Meta-chloridine,<sup>3</sup> a recent suppressive antimalarial drug of the sulpha-group, is also a pyrimidine derivative.

Considering the activity of sulphadiazine, Curd and Rose<sup>5</sup> prepared at first its sulphur-free analogues of phenyl-substituted pyrimidine type and their later work culminated in the discovery of paludrine,<sup>5,7</sup> which is a substituted biguanide derivative.

Compounds of the type (I) have not shown appreciable antimalarial activity<sup>6</sup> which might be partly due to lack of any potential substituent in the aromatic nucleus at N<sup>5</sup>-position of the biguanide molecule. Hence it was thought of interest to prepare compounds of type (II) where "SO<sub>2</sub>NH<sub>2</sub>" or substituted "SO<sub>2</sub>NH<sub>2</sub>" radical is introduced in the aromatic nucleus at N<sup>5</sup>-position, and for this purpose only potent sulpha compounds, sulphanilamide, sulphathiazole and sulphadiazine were selected. It may be mentioned that compounds of the type (III) have already been patented<sup>8,9</sup> as therapeutic agents.



R = alkyl, halo, nitro, etc. R' = phenyl or naphthyl



(a) X = H and R = H, m.p. 228°; R = Cl, m.p. 233°; R = Br, m.p. 245-6°; R = NO<sub>2</sub>, m.p. 217°; R = CH<sub>3</sub>, m.p. 231°; R = CH<sub>3</sub>O, m.p. 234°.

(b) X = 2-thiazolyl and R = H, m.p. 225°; R = Cl, m.p. 219°; R = Br, m.p. 197° (with