over Agra. It was therefore considered sufficient to analyse the Poona data into two groups: (1) when there was evidence of a lower transition between 13 and 15 gkm. and (2) when there was only one transition above 15 gkm.

Fig. 3 gives the average temperatures at different levels over Poona corresponding to each of these two groups. The difference between the two sets of averages is insignificant. Meridional advection can be expected to show the characteristic double transition best in those latitudes where the rate of change of height of tropopause with latitude is large. Agra lies in such a region in winter while Poona does not.

I am thankful to Dr. K. R. Ramanathan for suggesting this analysis.

Poona, M. W. CHIPLONKAR.
September 27, 1935.

Further Observations on the Diamagnetism of the Trivalent Bismuth Ion.

IN our note on the subject,[1] the value (43·80) for the diamagnetism of the trivalent bismuth ion was obtained by modifying the original Slater formula by assigning for electrons in the lower groups instead of shells and the *d* and *f* groups a value 0·85 instead of the usual 1. We have now calculated the value for Bi^{+3} by the orthodox Slater formula and its modification proposed by Angus and obtain the following results:—

		Experimental	Slater	Angus
$-x\times10^6$	Bi^{+3}	41·24	42·23	42·09

The agreement is as good as can be expected particularly on the Angus formula. More so when one realises that the Slater method is strictly valid for ions of the closed configuration type. Kido has brought out an interesting empirical relationship which seems to hold for a number of ions according to which the difference in the susceptibilities of ions due to two electrons is of the following order:—

	$-\Delta x\times10^6$
$P^{+3}-P^{+5}$	= 9·4
$As^{+3}-As^{+5}$	= 8·2
$S^{+4}-S^{+6}$	=10·4
$Se^{+4}-Se^{+6}$	= 9·5
$Cl^{+5}-Cl^{+7}$	=11·1
$I^{+5}-I^{+7}$	=12·5

The value for Bi^{+5} for which the Slater and Angus formulæ should strictly apply, has been calculated to be 29·22. The difference between Bi^{+5} and Bi^{+3} calculated on the Angus formula is 42·09—29·22= 12·87, which is of the same order as suggested by Kido and is of particular significance.

It may be recalled here that out of the many compounds of bismuth mentioned in our last note, the susceptibility values of four are described in the *International Critical Tables* (Bi_2O_3, $BiCl_3$, $BiBr_3$, BiI_3). Three of these are in excellent accord with our values and only one has been shown to have a lower value.

Full results are being communicated to the *Journal of the Indian Chemical Society*.

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October 5, 1935.

[1] *Curr. Sci.*, 1935, **4**, 153.

Some Aspects of the Mechanism of Non-Symbiotic Fixation of Atmospheric Nitrogen.

PREVIOUS studies on the economy of carbon during fixation of atmospheric nitrogen by Azotobacter, particularly by Stoklasa[1] and by Ranganathan and Norris[2] would suggest that the nitrogen fixers derive their organic nutrition chiefly from carbohydrates, though small quantities may be fixed in presence of other organic substances as well.

Our studies with the mixed flora of the soil showed that glucose which was provided as the organic nutrient was completely decomposed in the course of the first four days, being mostly converted into gases. Of the residual organic matter, 44·1 per cent. was accounted by micro-organisms (living as well as dead), 34·0 per cent. by organic acids (chiefly lactic, acetic, propionic and butyric) and the rest in some (yet unidentified) water soluble form. During this period only about a third of the usual quantity of nitrogen was fixed, and of this, the major part was present in water soluble form. In the course of the next four days a large part of the organic acids was lost, accompanied by corresponding increase in mucilage. There was also rapid fixation of atmospheric nitrogen, the C-N ratio of the organisms changing from 62·1 to 20·6. Between the 8th and the 12th days, there was very little change in the other constituents, but there was further fixation of nitrogen. After the 12th day, there was