Table 2. PHOTOCHEMICAL REDUCTION OF ELEMENTAL NITROGEN BY NITROGEN DEPLETED CELLS OF *Anabaena flos-aquae A*-37

Time	μl. nitrogen fixed	μl. oxygen produced	O_2/N_2
35	5	14	–
50	29	42	1·45
65	32	48	1·50
80	35	54	1·54
95	36	57	1·58
110	36	59	1·64
125	36	62	1·72
140	37	60	1·62
			$\bar{x}$ 1·58

$Q_{N_2}^{N_2}(N) = 188$; $Q_{N_2}^{N_2} = 12{\cdot}1$; $Q_{O_2}^{N_2}(N) = 283$; $Q_{O_2}^{N_2} = 18{\cdot}1$.

The results obtained from the manometric studies with *Anabaena flos-aquae A*-37 indicate that this alga is capable of reducing elemental nitrogen with concomitant oxygen production.

Table 1 contains the results found when normal cells not depleted of nitrogen were used as the inoculum. The ratio of oxygen produced to the nitrogen fixed ranges from 1·34 to 1·67 with a mean value of 1·46. This is very close to the theoretical value of 1·50 (ref. 1). Fig. 1 contains these data plotted in relation to time.

The results in Table 2 were obtained when nitrogen depleted cells were used as the inoculum. Here the ratio of oxygen produced to nitrogen fixed ranges from 1·45 to 1·72 with a mean value of 1·58. The response from the nitrogen depleted cells was much greater than that of the normal cells, which is to be expected as the nitrogen depleted cells would have a carbohydrate reserve which would enable the cells to assimilate nitrogen at a more rapid rate. The carbohydrate reserve would be used for the manufacture of protein and other nitrogenous substances as the required nitrogen became available. Fig. 2 contains the data plotted in relation to time.

The indication that *Anabaena flos-aquae A*-37 is capable of reducing elementary nitrogen photochemically would have great value in a system which required more oxygen than could be derived from photosynthesis alone.

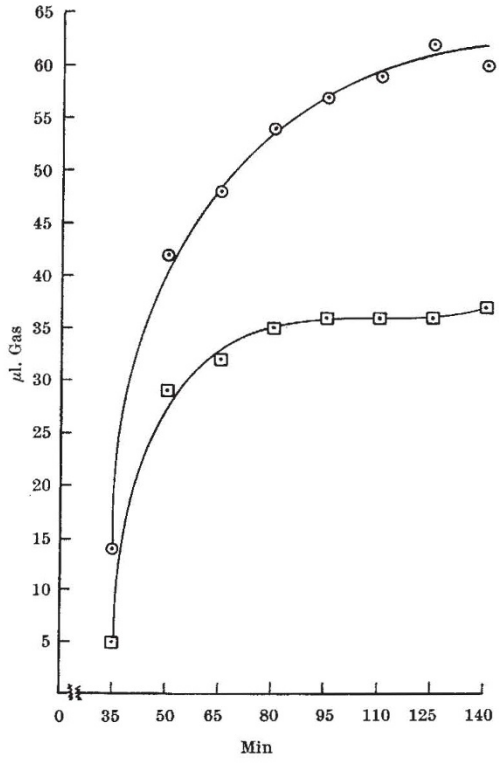

Fig. 2. Photochemical reduction of elemental nitrogen by nitrogen depleted cells of *Anabaena flos-aquae A*-37. ⊡, Nitrogen uptake; ⊙, oxygen produced.

To make use of basic equations to illustrate this fact, let us assume that the following reactions occur:

$$6\ CO_2 + 6\ H_2O \longrightarrow C_6H_{12}O_6 + 6\ O_2$$
$$3\ H_2O + N_2 \longrightarrow 2\ NH_3 + 1{\cdot}5\ O_2$$

$$6\ CO_2 + 9\ H_2O + N_2 \longrightarrow C_6H_{12}O_6 + 2\ NH_3 + 7{\cdot}5\ O_2$$

A 25 per cent increase in oxygen production could be gained using an alga with this ability.

This work was done in co-operation with the National Aeronautics and Space Administration, Washington, D.C.

EDITH B. DAVIS
R. G. TISCHER

Department of Microbiology,
Mississippi State University.

[1] Fogg, G. E., and Than-Tun, *Biochim. Biophys. Acta*, **30**, 209 (1958).
[2] Cobb, jun., H. D., dissert., Univ. Texas (1963).
[3] Tischer, R. G., *Nature*, **205**, 419 (1965).
[4] Davis, Edith B., and Tischer, R. G., *Physiol. Plant.*, **19**, 823 (1966).
[5] Moore, B. G., and Tischer, R. G., *Canad. J. Microbiol.*, ii, 877 (1965).
[6] Dyer, D. L., and Gafford, R. D., *Dev. Indust. Microbiol.*, **3**, 87 (1963).
[7] Hughes, E. O., Gorham, P. R., and Zehneder, A., *J. Microbiol.*, **4**, 227 (1958).
[8] Myers, J., in *Handbuch Der Pflanzenphysiologie*, edit. by Ruhland, W., **5**, 211 (Springer, Berlin, 1960).
[9] Umbriet, W. W., Burris, R. H., and Stauffer, J. F., *Manometric Techniques*, 14 (Burgess Publishing Co., Minneapolis, 1964).

Variation in a Strain of Classical *Vibrio cholerae*

HAEMAGGLUTINATING activity has been observed occasionally in stock laboratory cultures of some strains of classical *Vibrio cholerae*[1,2]. It is therefore necessary to use recently isolated organisms in haemagglutination tests for the differentiation of vibrios.

During an investigation of the mechanism of direct haemagglutination in vibrios, five El Tor strains and four classical *V. cholerae* strains were serially subcultured in heart extract nutrient agar and nutrient broth at 37° C. After every sixth passage, the haemagglutinating activity and cholera-phage sensitivity of each strain were tested to determine whether there had been any change. Surprisingly, one recently isolated classical strain of *V. cholerae* (STMC 583) in the twelfth serial subculture in nutrient broth showed haemagglutinating activity. It retained, however, its sensitivity to cholera-phage IV and polymyxin (50 μg/disk) and did not produce acetyl-methyl-carbinol. At the eighteenth subculture stage the organism still maintained its haemagglutinating property. Thus, even a recently isolated strain of *V. cholerae* may acquire haemagglutinating activity.

K. N. NEOGY
A. C. MUKHERJEE

Department of Bacteriology,
School of Tropical Medicine,
Calcutta.

[1] Finkelstein, R. A., and Mukerjee, S., *Proc. Soc. Exp. Biol. and Med.*, **112**, 355 (1963).
[2] Zinnaka, Y., Shimodori, S., and Takeya, K., *Jap. J. Microbiol.*, **8/3**, 97 (1964).

Dehydroxylation of Caffeic Acid by a Bacterium isolated from Rat Faeces

THE removal of phenolic hydroxyl groups in rats and rabbits was first reported in 1957 by Booth *et al.*[1]. More recently, Booth and Williams[2] showed that dehydroxylation of caffeic acid to *m*-hydroxy-phenyl-propionic and *m*-coumaric acids was also carried out by rat and rabbit caecal contents and sheep rumen liquor. In accord with their results, Booth and Williams suggested that intestinal micro-organisms could be responsible for the dehydroxylation reactions.