
Concluding Remarks

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Concluding remarks

BY W. D. P. STEWART, F.R.S.

Over the past two days of this symposium I have been impressed by the interest and enthusiasm shown for the subject of the nitrogen cycle. The programme has been diverse, with agriculturalists, environmentalists, those interested in forestry, aquatic environments, plant physiology and medicine all contributing.

Dr Lake has rounded off the general discussion admirably: he has emphasized that there are many questions still to be answered and various speakers and contributors have pointedly emphasized that while we know much about the various reactions of the nitrogen cycle, at least in gross terms, good solid quantitative data on various processes are scarce. Even for N_2 fixation about which, as Professor Postgate rightly said, more is probably known than about any other process of the nitrogen cycle, there is still uncertainty about how much N is fixed in the oceans of the world, despite the fact that these cover the bulk of the Earth's surface. Professor Fogg has mentioned the difficulties of obtaining such data in so vast an area. But it is not only in the sea that there are problems. As yet we have few good quantitative data on losses by denitrification: how much is lost as N_2 and how much as N_2O . The studies of Dr Dowdell and his colleagues are an important step in the right direction. Detailed quantitative studies are required on the various processes of the nitrogen cycle. That is where progress will have to be made in the future. I believe that too much time has been spent in the past on mass balance studies and not enough time on getting accurate measurements of the various processes by experimentation.

My final point relates to the interests of the various groups of contributors: the agriculturalists, the workers from the water industry, and those interested in health aspects. The agriculturalists have rightly to be concerned primarily with food production and this requires high additions of fertilizer N to the land. There is simply no alternative at present in the U.K. However, having said that, the agriculture industry also seemed to be slightly complacent about the effects that such N additions are having on the environment and was, I thought, just a little reluctant to admit to modern N fertilizer practices having a significant effect on it. Our contributors from the water industry have pointed out clearly that NO_3^- levels are rising, and that in some cases the concentrations will exceed current World Health Organization recommended limits for nitrates in drinking water. At the same time, some at least were reluctant to agree that at present anything should be done about this. One discussant stated very clearly that in his view the water industry could not be expected to take remedial action lightly because of the high costs involved and the marginal evidence that NO_3^- , at present and near future concentrations in the drinking waters of the U.K., was likely to be a major health hazard. This was despite the evidence presented by Dr Magee that certain N compounds ingested in food and drinking waters can cause health hazards. As Dr Magee explained, the deleterious effects of various N compounds on health are clearly established. It is whether they are important in man and at what concentrations that still have to be resolved.

I hope that one of the most important features of this symposium has been that workers in

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the various disciplines who have attended have been able to appreciate more fully the problems and findings of others interested in different areas of the nitrogen cycle. If that has been achieved, the meeting will have been worthwhile.