

## BOOK REVIEWS

*Azospirillum* II—Genetics, physiology, ecology edited by W. Klingmuller. Birkhauser Verlag, Basel, 1983, pp. 194, Sw. Fr. 48.

This volume represents the proceedings of the second workshop on 'Azospirillum : Genetics, Physiology, Ecology' held at the University of Bayreuth, West Germany, on September 6 and 7, 1983. There were about 50 participants from Europe, Israel, Egypt, U.S.A. and South America.

*Azospirillum* is a bacterium discovered about 10 years ago, which is able to fix nitrogen in association with roots of several grasses. These bacteria have drawn considerable interest all over the world because of their potential application as biofertilizers. Nitrogen-fixing *Azospirillum* was suggested to provide fixed nitrogen to crop plants which could increase crop productivity or reduce the requirements for fixed nitrogen fertilizers or both. Results of greenhouse or field experiments have not been conclusive, but the majority of the reports given in this book, have given positive indications. In addition to supplying the plants with fixed nitrogen, *Azospirillum* has been shown to augment plant growth by excreting phytohormones such as auxins, cytokinins and gibberellins or by stimulating the uptake of nitrate, phosphate, potassium or other mineral ions into plants.

In order to understand the interactions between crop plants and *Azospirillum*, various workers have approached the problem from different angles. Some of the contributions by these workers are given below.

The volume begins with a review by Dobereiner of recent work on *Azospirillum*. A new species, *Azospirillum amazonense*, has been isolated from various regions of Brazil and has been characterized. It is very acid tolerant and uses sucrose. This and two other species, recently isolated, appear to be extremely promising in field experiments where the other *Azospirillum* strains do not survive so well.

A paper by Schwabe and Weber describes the investigations to find out whether *Azospirillum* can take up plasmid DNA or whether the DNA is only unspecifically bound to the cell. Unfortunately, the results are not conclusive and the paper, as presented in the proceedings, suffers from the defect that a portion of the text between pages 61 and 64 is missing.

Hartmann *et al* have selected *Azospirillum* mutants with altered nitrogen regulation and also those which overproduce auxins. They have made the interesting observation that both of them increase the growth of maize, although their sites of action are different.

In an attempt to understand the interactions between crop plants and *Azospirillum*, Heinrich and Hess have carried out experiments under defined laboratory conditions, using *Azospirillum brasilense* and found that this association results in nitrogen fixation or denitrification, depending on the amount of oxygen and nitrate available. These experiments, however, have been carried out so far with very young wheat plants which are sufficiently supplied with nitrogen from the protein reserve of the seeds. Definite conclusions on the effects of nitrogen fixation and denitrification on the growth of plants can be drawn only after the experiments are repeated with older plants.

Albrecht *et al* have made the significant observation that *Azospirillum* introduced into the soil to fix nitrogen by plants decrease considerably in numbers rapidly. They have also shown that lack of adequate soil moisture can have deleterious effects on some strains of this bacterium. This factor is important, because it may pose a substantial barrier to the survival of inoculated organisms, especially in regions of low soil moisture, due to scant rainfall and limited facilities for irrigation.

Kapulink and Okron, working in Israel, have shown that in spring the roots of wheat inoculated with *Azospirillum*, emerging after germination, are colonized by the bacteria, their growth and branching promoted, and mineral uptake from the soil solution enhanced. The colonization dynamics of roots by *Azospirillum* and the partial contribution of nitrogen fixation on yield have yet to be demonstrated, mainly in the field.

Several authors have demonstrated progress in the collection of different types of *Azospirillum* mutants. They have shown by molecular hybridisation methods of homology of the *nif* HDK genes of *Klebsiella pneumoniae* (a well-known nitrogen fixing organism) with DNA fragments of *Azospirillum*. The mutants may be helpful to elucidate to what extent the observed inoculation effects are due to nitrogen fixation or to other factors.

The proceedings of the workshop have been published within three months of its conclusion—which is an exceptional case. However, in a hurry to publish the proceedings on time a number of typographical errors have crept into the book. These, however, do not detract from the value of the publication. The book should be read by microbiologists, agricultural scientists and biochemists interested in the process of biological nitrogen fixation.

Microbiology and Cell Biology Laboratory  
Indian Institute of Science  
Bangalore 560 012.

T. RAMAKRISHNAN

**Lamarck the mythical precursor** by Madeleine Barthelemy-Madaule. English translation by M. H. Shank. The MIT Press, Cambridge, Massachusetts, U.S.A., 1982, pp. 189, \$ 20.13.

A delightful book that presents Lamarck not as a precursor caught between the 'not yet' and the 'no longer' but rather as an observer studying the facts of nature, as a synthesiser organising these facts into a philosophy of nature, as a transformist reconciling his theory of descent with the situational demands of static creationism. There is a touch of poignancy in these pages delineating a man of genius who dies blind and penniless, is buried in an unmarked grave, is condemned by his immediate contemporaries and too often brushed aside by later scholars. The author is aware of a resurgence of interest on the relative importance of the 'innate' *versus* the 'acquired' in modern evolutionary biology and seeks not so much to 'rehabilitate' Lamarck's theories but rather to try and understand them in the background of his scientific philosophical and theological setting. Lamarck's achievements could then have an intrinsic worth rather than be mere stepping stones for others to trample upon.

Lamarck's fortunes, or rather misfortunes were perhaps due to his very genius. "It sometimes requires a high price to be a man of genius—the farther ahead of time he is the higher the price" (p. xi). As he paid this price, his supporters seemed to have compensated him with the name Precursor. However, the term has its limitations since it can also denote 'one who stops on the track when others after him run to the finish line'. Consequently one should be wary of regarding him as merely a precursor since it might be the best way to fail to understand him. By considering several Lamarkian key concepts, his position in the interaction between ideology and science especially during the early 19th century, this book attempts to establish Lamarck in his own right as scientist and philosopher.

The first chapter 'Who is Lamarck' is mainly biographical. Born of noble but straightened lineage in Picardy, Lamarck first opted for a military career. A physical injury put an end to martial ambitions and diverted him to meteorology, botany, zoology, geology and paleontology. His mind could thus range over a vast field mostly through his connection with the *Jardin du Roi* in Paris.

The scientist in Lamarck emerges in the second chapter entitled 'Nature'. Here Lamarck straddles the 18th and 19th centuries. He moves beyond the era of Linnaean classification as he remarks 'One is not truly a botanist because one can identify at a glance a large number of diverse plants even according to the latest nomenclature' (p. 6). Influenced by Jussieu and protected by Buffon Lamarck progressed from 'Natural history' to what would soon be called 'Biology'. In a search for principles and the unification underlying a multiplicity of facts, Lamarck looked for the genealogy of living beings, a hierarchial order and a knowledge of origins.

The chapter on 'Nature' dwells mostly on the difficulties of a Transformist when confronted by powerful Creationists and an authoritarian Empire. Lamarck's idea of a 'Supreme Power' delegating the mode of execution to 'Nature' was an attempt to continue as an evolutionist without being categorised as an atheist. The following chapters evaluate Lamarck's enumeration of biological groups or 'series' and their modulation by 'circumstances', the law of use and disuse and 'the transmission of acquired characters'.

The chapter 'When History is read backwards' is perhaps the most interesting. Lamarck is projected against the ideologies and scientific theories that have preceded him and have continued much after him. Madeleine Barthelemy-Madaule has with a few strokes of her pen shown us that the debate continues—be it between Lamarck or Darwin, Monod or Teilhard de Chardin. Her refreshingly gallic expressions have been ably rendered into English by M. H. Shank.

Centre for Taxonomic Studies  
Bangalore 560 001.

CECIL J. SALDANHA