GENERAL CONCLUDING REMARKS

There exist vast tracts of saline and semi-arid lands in India and the problem of advancing deserts is very real in this country. Increased use of chemical fertilisers and ground water supply has further complicated the already existing problem of increasing salinity in agricultural soils. Blue-green algae, first as colonisers and then, as versatile survivors, have drawn the attention of biologists as the bio-fertiliser of the future and as possible agents for reclamation of saline soils. The fact that there are several terrestrial cyanophytes and that some of them are halotolerant or even halophilic is not new to algologists; the arid and semi-arid region of Kachchh in north-west India has yielded several species of terrestrial, marine and non-marine species of blue-green algae which in fact form the bulk of algal flora found in this region. According to geological records, the land area of Kachchh was under the sea till the Cretaceous period; during this period, the land gradually emerged from the sea. Thus, the region has inherent salinity in its soils further aggravated by extremes of climate and very meagre, irregular rainfall. While a large quantum of work exists on the physiological
and metabolic aspects of blue-green algae in general, salinity effects have not been studied in detail.

It is against this background, that the present study was initiated which, in all modesty, can only be considered a small attempt to have a look at how certain life processes in a representative organism adjust to a saline situation. The important results of this investigation can be briefly summarised as follows:

1. *Phormidium ambiguum* Gomont was isolated from the soil-microflora forming a dry crust over certain saline soils of Kachchh, India. The alga was made bacteria-free after several lengthy attempts using a combination of methodologies; it was then maintained in laboratory conditions.

2. To test the extent of its halotolerance, the alga was grown in culture media supplemented with varying concentrations of sodium chloride; the alga survived NaCl concentrations of upto 2.0 per cent. The adaptation period (lag-phase) increased from control (non-saline) to 2.0 % NaCl-level; this resulted in decreased bio-mass. However, relative growth rates (RGR) were enhanced by 1.0 %, 2.0 % and 0.5 % NaCl concentrations (in decreasing
order); this was especially so during the third and fourth week of growth.

3. Chlorophyll 'a' levels in R. ambiguum were adversely affected by salinity. However, the simultaneous increase in c-phycocyanin content was significant; it could be playing an important role in increasing the versatility of the organism to survive under salt stress (or the physiological drought caused thereby).

4. Activities of three enzymes viz. Peroxidase, Catalase and Protease were assayed. Data so collected pointed to increased respiration under environmental duress. It was concluded that increase in catalase activity was an indicator of increased $\text{H}_2\text{O}_2$-toxicity as a result of saline stress. Proteolytic activity also increased. Enzyme RNase could not be detected.

5. During electrophoresis, 15-16 bands of soluble proteins were observed in the homogenate of R. ambiguum. Shifts in the $R_m$ values of some bands indicated either a change in the conformation of protein molecules or possibly, even its de novo synthesis as a reaction to increased external salinity.
6. The molecular heterogeneity of enzyme peroxidase was observed to be on the lines of iso-peroxidases found in higher plants. The band-pattern again showed significant variations in their number and Rm values as NaCl concentration increased. Electrophoresis of amylase and phosphorylases did not yield any significant information.

7. Results of experiments cited above were sought to be explained in terms of protein and amino acid metabolism vis-a-vis salinity.
   a. Total RNA was adversely affected by salinity.
   b. Total protein (kjeldahl) showed similar trend.
   c. However, the number and quantity of amino acids showed interesting variations not entirely in agreement with the total protein content as affected by increasing NaCl salinity.
   d. Studies with $^{14}$C-L-leucine showed that increasing salinity affects its uptake by cells of P. ambiguum adversely. However, incorporation of labelled leucine into proteins and hence, protein synthesis, improved at 0.5% NaCl level; the same at 2.0% level showed slowest rate.
possibly due to the damage to the protein synthesising machinery.

e. Free amino acids were conspicuously less in number and quantity except at 2.0% level, where probably slow rates of protein turnover, results in increased amino acids. Protein-bound amino acids were present in relatively large quantities.

f. Increase in the levels of proline and leucine specially in the free pool of P. ambiguus, was cited as an adaptation mechanism, both playing an osmo-regulatory role in the survival of the alga under osmotic stress.

These somewhat intriguing results were further explained in terms of the 'two-moiety' theory of proteins accepted for higher plants.