SUMMARY

1. A culture of hydra invariably appeared to be immortal because endless subcultures could be derived from it, but the life of an individual hydra belonging to any such culture was constrained by a finite life span.

2. Three ecotypes of hydra obtained from Santiniketan, Madurai and Hyderabad were taken to compare the range of their longevity; the lower and upper limits of their structural stability were 11 and 46 days, 19 and 62 days, and 36 and 141 days respectively.

3. The problem of ageing was undertaken indepth at morphological, behavioral, cellular, biochemical and molecular levels in the ecotype collected from Santiniketan as a function of its total range of existence.

4. The incidence of death was found to be of increasing order till 25 days following which it decreased. It had been maximum during 20-25 days of its life.
5. Each hydra showed distinct signs of imminent death about 4-5 days before actually it happened; when it led a sedentary life with no locomotory activity and cessation of budding. After 4-5 days, each hydra lost its structural configuration and collapsed into a heap of loose cells.

6. A direct relationship between the longevity and rate of bud production was observed. Depending upon their longevity, hydras having shortest life span showed lowest rate of bud production and those having longest life span displayed it to be the highest.

7. The rate of bud production increased during first two quarters of life followed by a decrease in the subsequent quarters irrespective of the longevity.

8. Hydras displayed longest life span were used for analysing further the process of ageing at cellular, biochemical and molecular levels.

9. The first sign of ageing was detected in the arrangements of cells of the body wall of 30 days old hydra when the bud region down to the basal
disc portion presented a depleted arrangement of cells. Further at about 42 days, the ectoderm and endoderm became remarkably thin. Mesoglea disappeared at many places, the body wall contained large number of dedifferentiated cells and tentacles had become naked to have only a few nematocytes.

10. Tissue maceration technique had revealed the fluctuations in the total cell population and relative densities of various cell types in course of ageing. The total cell population increased during first 24 days following which it decreased. The overall numerical contribution of all other cell types also followed almost similar trend.

11. Ratio of mitotic and non-mitotic cells as a function of time revealed that the mitotic cells contributed maximum to the total cell population till 24 days following which they decreased progressively.

12. The biochemical analysis showed that the total body protein of a hydra followed the pattern of
total cell population in that it kept on increasing till 24 days following which it decreased.

13. The specific activity of alkaline phosphatase increased till 24 days. During 24-30 days it remained almost same following which it decreased.

14. The specific activity of acid phosphatase increased during 2-24 days and 30-42 days giving two peaks of enzyme activity at 24 and 42 days.

15. The specific activity of glucose-6-phosphate dehydrogenase increased gradually till 30 days following which it decreased.

16. The synthetic rate of DNA, RNA and protein was followed by using radio isotopes incorporation technique. The rate of DNA synthesis was maximum at 30 days followed by a sharp decline. At 30 days the synthetic rate was more than 10 times the rate at 2 days. The synthetic rate of RNA showed a gradual increase till 30 days followed by a decline till 42 days. The synthetic rate of protein remained almost same during first
6 days followed by an increase during next 24 days. The highest rate of protein synthesis was seen at 30 days.

17. The event of death in hydra was a molecular programme and before it actually happened several factors of morphological, behavioral, cellular, biochemical changes preceded. Some such modulations had been documented to pin point that the life of an individual hydra had a finite time scale of existence.