



## Advances in Space Biology and Medicine: 4

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This fourth volume in the series, dedicated entirely to the results of the first European study of the effects of long-term confinement and isolation. The volume continues to attempt to fulfill the aim of this series, to bring the findings and accomplishments in the field of space biology and medicine to a wider group of scientists than merely the relatively small group of biologists and physiologists currently involved in space experimentation.

The contributions are not only nicely spread geographically with three chapters from the United States, two each from Russia, Europe, and Japan, they also offer a wide range of topics in the field, covering humans, animals, plants, cells, and even potential extraterrestrial beings.

As before, not only problems investigated and results obtained are reviewed, but also some of the technical aspects peculiar to this field are treated. An example in this volume is the chapter on virtual environments by Ellis, which is meant to help investigators understand the opportunities that these techniques might offer for future investigations.

In view of the limitations on flight opportunities and the constraints still inherent in orbital experimentation, it is also important to consider the information that can be obtained from studies on the ground. In addition to simulation studies like bed rest for human subjects (see the chapter by Edgerton et al. on neuromuscular adaptation), tail suspension of rats, and plants on a clinostat (see the chapter by Masuda et al.), there is the interesting possibility of using gravitropic mutants for studying the effects of weightlessness on plant growth as described by Takahashi and Suge.

Two chapters are devoted to a review of the results on rats flown on nine Cosmos biosatellite flights between 1973 and 1989: the chapter by Krasnow deals with the neuromorphological effects of micro- and hypergravity; that by Popova and Grigoriev with the metabolic effects of spaceflight. The effects of weightlessness on heart and lung function in humans are reviewed in detail by Bonde-Petersen and Linnarson.

While the study of humans, animals, and plants in spaceflight have taught us much about the effects of the space environment on living organisms, we still have a very limited understanding of the mechanisms operating in these effects. The chapter by Rijken et al. on the effects of gravity on the cellular response to epidermal growth factor demonstrates how, by a judicious use of experiments on the ground and in sounding rockets, the mechanism of a microgravity effect on cell growth could be unravelled.

The question whether there is intelligent life elsewhere in the universe has intrigued mankind for a long time. In the chapter by Coulter et al. on NASA's High Resolution Microwave Survey the project to search for the existence of such life is described. The postscript to this chapter tells how through an unfortunate decision of the U.S. Congress this project after a successful start is threatened with an untimely ending.

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