

## G. BIOSCIENCES

### OBJECTIVES

To determine the effects on living terrestrial organisms of conditions in the earth's upper atmosphere, in space, and in other planetary atmospheres. To determine the effects of flight through space on living organisms. To investigate the existence of life throughout the solar system, and to study in detail whatever extraterrestrial life forms exist.

### PROBLEMS

The opportunity now exists to conduct fundamental life sciences research in satellites and space probes. In such research, conditions in space and conditions during flight through space enter as new experimental variables. Principal interest lies in the components of the space and space flight environment that are irrevocably different from the terrestrial, such as radiation and the altered gravity state. The former is qualitatively and quantitatively different from terrestrial radiation and looms as a far more important problem than originally thought. The latter offers the possibility of elucidating biological processes known to be effected by weight or apposition of one part against another, such as cell division and organogenesis. These and other areas of study could be carried out in satellites or space probes from which specimens under study could be recovered.

More specifically, fundamental experiments on living organisms in the satellite environment or in other types of space vehicles and stations should be conducted along the following general lines:

- Animal navigation and orientation
- Mitosis and embryology
- Plant morphogenesis
- Geotropic response of plants to  
altered gravitational fields
- Biological rhythms and cycles
- Altered gravitational effects on blood  
circulation in animals
- Vestibular physiology
- Neuropharmacology--effects of tranquilizers,  
motion sickness drugs, etc.
- Effects of cosmic radiation
- Tolerance limits for combined stresses
- Physiological and psychological deterioration
- Effects of acceleration and deceleration



There has been considerable speculation about the possibility of the existence of extraterrestrial life forms. The debate ranges from whether or not life exists on Mars and Venus, and if so in what form, to whether or not spores and similar life forms can survive the rigors of interplanetary space. Investigations of these topics must for the most part await observations which can be made on direct samples and studied in space laboratories of the future. It is conceivable, however, that with proper and specialized instrumentation and remote sampling techniques it may be possible to obtain evidence of primitive or complex organic material without the presence of a scientist and a laboratory in the sample area. Elaborate instrumentation and the recovery of records, or advanced telemetering techniques could provide information about the nature of biochemicals on the planets.

#### PROGRAM

The program in biosciences is still being formulated. Immediate steps include a series of discussions with leading bioscientists to firm up important initial lines of attack.

