

Introduction

The following document represents NASA Mir science program results to date. Each investigation is summarized, and includes the objectives, operations, results, and conclusions. A publications list is available for some investigations.

Contents

ADVANCED TECHNOLOGY

Astroculture (ASC)	5
Commercial Generic Bioprocessing Apparatus (CGBA)	6
Commercial Protein Crystal Growth (CPG)	7
Materials in Devices as Superconductors (MiDAS).....	8
Optizone Liquid Phase Sintering Experiment (OLiPSE) (LPS)	9

EARTH SCIENCES

Calibration & Validation of Priroda Microwave Sensors (IKAR).....	11
Comparison of Atmospheric Chemistry Sensors on Priroda & American Satellites (Chemistry)	12
Mir Window Survey.....	13
Regional & Temporal Variability of Primary Productivity in Ocean Shelf Waters (Color)	14
Test Site Monitoring (TEST)	15
Validation of Biosphere-Atmosphere Interchange Model for Northern Prairies (Prairies).....	16
Validation of Priroda Rain Observations (Rain)	17
Visual Earth Observations	18
Visual Observations (VObs)	21
Watershed Hydrologic Studies.....	22

FUNDAMENTAL BIOLOGY

Cellular Mechanisms of Space Flight-Specific Stress to Plants Experiment	23
Developmental Analysis of Seeds Grown on Mir.....	25
Effective Dose Measurements at EVA	27
Effects of Gravity on Insect Circadian Rhythmicity	28
Environmental Radiation Measurements on Mir Space Station.....	29
Greenhouse - Integrated Plant Experiments on Mir	30
Incubator - Effects of Weightlessness on the Avian Visuo-Vestibular System: Immunohistochemical Analysis	32
Incubator - Effects of Weightlessness on Vestibular Development of Quail	33
Incubator - Expression of Contractile Proteins in Microgravity.....	34
Incubator - Hypogravity's Effect on the Life Cycle of Japanese Quail	35
Incubator - Skeletal Development in Long-Duration Space Flight.....	36
Standard Interface Glovebox Hardware Verification	38

HUMAN LIFE SCIENCES

Analysis of Volatile Organic Compounds on Mir Station.....	39
Anticipatory Postural Activity (Posa)	40
Assessment of Humoral Immune Function During Long-Duration Space Flight.....	42
Bone Mineral Loss and Recovery after Shuttle-Mir Flights.....	43
Cardiovascular Investigations - Adaptive Changes in Cardiovascular Control at μ G (E712)	45
Cardiovascular Investigations - Autonomic Mechanisms During Prolonged Weightlessness (E709).....	47

Collecting Mir Source and Reclaimed Water for Postflight Analysis	48
Crewmember and Crew-Ground Interactions During NASA-Mir.....	50
The Effects of Long-Duration Space Flight on Eye, Head, and Trunk Coordination During Locomotion.....	52
The Effects of Long-Duration Space Flight on Gaze and Voluntary Head Movements	55
Evaluation of Skeletal Muscle Performance and Characteristics	57
Frames of Reference for Sensorimotor Transformations.....	58
Gas Analyzer System for Metabolic Analysis Physiology (GASMAP) Facility Operations.....	59
Inflight Radiation Measurements	60
Magnetic Resonance Imaging (MRI) After Exposure to Microgravity	61
Microbial Interaction in the Mir Space Station Environment	63
Microbiological Investigations of the Mir Station and Crew	64
Protein Metabolism During Long-Term Space Flights.....	66
Renal Stone Risk Assessment During Long-Duration Space Flight.....	67
Sleep Investigations - Human Circadian Rhythms and Sleep in Space (E639).....	69
Sleep Investigations - Microgravity, Sleep/Wake Immune Functions (SWIF) in Humans (E710).....	71
Sleep Investigations - Sleep and Vestibular Adaptation (E663).....	72

INTERNATIONAL SPACE STATION

Enhanced Dynamic Load Sensors (EDLS) on Mir.....	73
Inventory Management System (IMS)	74
Mir Audible Noise Measurement (MANM).....	75
Mir Electric Field Characterization (MEFC)	76
Mir Environmental Effects Payload (MEEP).....	77
Mir Structural Dynamics Experiment (MiSDE).....	78
Mir Wireless Network Experiment (MWNE).....	79
Optical Properties Monitor.....	80
Orbital Debris Collector (ODC)	81
Passive Optical Sample Assembly (POSA #1 and #2)).....	82
Polish Plate Micrometeoroid Debris (PPMD) Collector.....	83
Shuttle-Mir Alignment Stability Experiment (SMASE).....	84
Space Portable Spectroreflectometer (SPSR)	85
Test of Portable Computer System (TPCS) Hardware	86
Water Microbiological Monitor (WMM).....	87

LIFE SUPPORT RISK MITIGATION

Volatile Organic Analyzer (VOA).....	88
Volatile Removal Assembly (VRA)	89
Water Quality Monitor (WQM)	90

MICROGRAVITY

Ambient Diffusion-Controlled Protein Crystal Growth.....	91
Angular Liquid Bridge Experiment in the Microgravity Glovebox (ALB)	92
Binary Colloidal Alloy Tests (BCAT1, BCAT2)	93

Biochemistry of 3-D Tissue Engineering - BTS.....	94
Biotechnology System (BTS) CoCulture (COCULT)	95
Biotechnology System (BTS) Diagnostic Experiment	96
Biotechnology System (BTS) Facility Operations.....	97
Canadian Protein Crystallization Experiment (CAPE).....	99
Candle Flame in Microgravity (CFM) - MGBX	100
Cartilage in Space - BTS.....	101
Colloidal Gelatin.....	103
Forced Flow Flamespread Test (FFFT)	104
Interface Configuration Experiment (ICE) in the Microgravity Glovebox	105
Interferometric Study of Protein Crystal Growth in the Microgravity Glovebox.....	107
Liquid Metal Diffusion Experiment (LMD) - Microgravity Isolation Mount	108
Mechanics of Granular Materials (MGM)	109
Microgravity Glovebox (MGBX) Facility Operations	112
Microgravity Isolation Mount (MIM)	113
Opposed Flow Flame Spreading over Cylindrical Surfaces (OFFS).....	114
Passive Accelerometer System (PAS) - MGBX	115
Protein Crystal Growth (PCG) GN2 Dewar	116
Queen's University Experiment in Liquid Diffusion (QUELD).....	117
Space Acceleration Measurement System (SAMS) Operations	119
Technological Evaluation of the Microgravity Isolation Mount (TEM-1 & 2)	120

SPACE SCIENCES

Mir Sample Return Experiment (MSRE).....	122
Particle Impact Experiment (PIE)	123