CRITICAL PATH ROADMAP	PRIMARY SPECIES / GROUND EXPERIMENT TITLE		NASA OBPR - TASK BOOK Year Experiment Was Listed in Book								
DISCIPLINE(S)	TYPE		<u>1995</u>	1996		<u>1998</u>	<u>1999</u>	2000	2001	2002	
Muscle Alterations & Atrophy	Animal	A DNA Chip Approach to the Discovery of Gravity Response Genes in Brain and Muscle				1000	1999	2000	2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy; Cardiovascular Alterations	Animal Animal	Activity Dependent Signal Transduction in Skeletal Muscle Baroreflex Function in Rats after Simulated Microgravity		1996	1997	1998 1998	1999	2000			
Muscle Alterations & Atrophy	Animal	Biochemical Adaptations of Anti-Gravity Muscle Fibers to Disuse Atrophy	1995	1996	1997	1998					
Muscle Alterations & Atrophy; Bone Loss	Animal	Bone and Muscle Recovery after Simulated Microgravity							2001	2002	
Muscle Alterations & Atrophy	Animal	Calcium Homeostasis and muscle phenotype: Role of cellular Energetics							2001	2002	
Muscle Alterations & Atrophy	Animal	Calpains in Simulated Microgravity Induced Atrophy							2001	2002	
Muscle Alterations & Atrophy; Cardiovascular Alterations	Animal	Cardiac Atrophy				1998	1999	2000			
Muscle Alterations & Atrophy; Cardiovascular Alterations	Animal	Cell & Molecular Biomechanics: Cardiac & Skeletal Muscle			-	-			2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy	Animal Animal	Discovery and Definition of the Microgravity Transcriptome, with Application to Muscle Atrophy and Regeneration Processes Effect of Unloading on Protein Content in Skeletal Muscle: I. Muscle and				1998			2001	2002	
Musele Alterations & Altophy	Annia	Pharmacological Inhibitors of This Degradatative Pathway; II. Effects of Unloading on Myosin Content and Isoform Specific Regul				1998					
Muscle Alterations & Atrophy	Animal	Effect of Unloading on Protein Content in Skeletal Muscle: Regulation of the Ubiquitin- Proteasome System					1999	2000			
Muscle Alterations & Atrophy; Neurovestibular Adaptation	Animal	Effects of Artificial Gravity: Central Nervous System Neurochemical Studies	1995	1996	1997	1998					
Muscle Alterations & Atrophy; Immunology, Infection & Hematology	Animal	Effects of Hind Limb Suspension on Local Inflammation and Wound Healing in a Murine Model						2000	2001	2002	
Muscle Alterations & Atrophy	Animal	Effects of Hindlimb Suspension on Skeletal Muscle Growth	1995	1996	1997						
Muscle Alterations & Atrophy	Animal	Effects of Unloading on Myosin Content and Isoform-Specific Regulation in Skeletal Muscle					1999				
Muscle Alterations & Atrophy	Animal	Gene Expression Profile of Unloaded Skeletal Muscle							2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy;	Animal Animal	Gene Expression Profiling of Unloaded Skeletal Muscle GH/IGF-I Transgene Expression on Muscle Homeostasis				1998	1999	2000	2001	2002	
Clinical Capabilities Muscle Alterations & Atrophy;	Animal	Glucose Kinetics and Muscle Atrophy (This Task began in FY2000)					1999	2000	2001	2002	
Food & Nutrition Muscle Alterations & Atrophy	Animal	Gravitational Effects on Signal Transduction		1996	1997	1998	1999				
Muscle Alterations & Atrophy;	Animal	Healing Response of Injured Rodent Knee Ligaments to Hindlimb Unweighting and the		.,,,,	.,,,,	1770	1999	2000	2001	2002	
Bone Loss; Immunology, Infection & Hematology; Clinical Capabilities		Therapeutic Efficacy of Growth Hormone (This Task began in FY2000)									
Muscle Alterations & Atrophy	Animal	Hyper-Dynamic Environment Program Neuromuscular Adaptations of Rhesus Macques to a Hyperdynamic Environment					1999				
Muscle Alterations & Atrophy	Animal	Inflammatory and Mechanical Components of Muscle Injury		1996	1997	1998	1999				
Muscle Alterations & Atrophy	Animal	Limb Muscle Function with Unloading and Countermeasures	1995	1996	1997	1998	1999	2000	2001	2002	
Muscle Alterations & Atrophy	Animal	Mechanical and Molecular Stimuli for Normalizing Muscle Mass During Unloading	1995	1996	1997	1998	1999	2000	2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy;	Animal Animal	Mechanical Signal Transduction in Countermeasures to Muscle Atrophy Microvascular Changes During Microgravity	1995	1996		1998	1999	2000	2001	2002	
Cardiovascular Alterations		more rusediai enanges baring moregranny									
Muscle Alterations & Atrophy	Animal	Molecular Mechanisms Regulating Muscle Fiber Composition Under Microgravity				1998	1999	2000			
Muscle Alterations & Atrophy	Animal	Molecular Signaling in Muscle Plasticity				1998	1999	2000			
Muscle Alterations & Atrophy Muscle Alterations & Atrophy	Animal Animal	Motoneuron Influences on Muscle Atrophy in Simulated Microgravity Neuromuscular and Endocrine Factors in Weightlessness-Induced Atrophy				1998 1998	1999 1999	2000 2000			
Muscle Alterations & Atrophy;	Animal	Optimization of a Biomechanical Countermeasure for Disuse Osteopenia;			1997	1998	1999	2000	2001		
Bone Loss		Optimization of a Biomechanical Countermeasure for Disuse Osteoporosis									
Muscle Alterations & Atrophy; Radiation Effects	Animal	Redox Modulation of Muscle Function in Microgravity							2001	2002	
Muscle Alterations & Atrophy	Animal	Role of Growth Hormone Secretogoue and Exercise on Muscle								2002	
Muscle Alterations & Atrophy	Animal	Role of Growth Hormone Secretogoues and Exercise on Muscle Homeostasis Under					1999	2000	2001	2002	
Muscle Alterations & Atrophy	Animal	Microgravity Role of Muscle Loading on Mechanisms of Protein Translation and Impact on Unloading							2001	2002	
Muscle Alterations & Atrophy	Animal	Induced Atrophy Signal of Muscle Atrophy in Unloading								2002	
Muscle Alterations & Atrophy	Animal	Signaling of Muscle Atrophy in Unloading; Signaling of Muscle Atrophy with Unloading; Signal of Muscle Atrophy in Unloading					1999	2000	2001	2002	
Muscle Alterations & Atrophy	Animal	Signal of Muscle Atrophy in Unloading Skeletal Muscle Growth and Repair during Microgravity				1998	1999	2000	2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy	Animal	The Activation of Protein Breakdown in Muscle upon Unloading and Possible Countermeasures				1770	.,,,	2000	2001	2002	
Muscle Alterations & Atrophy; Cardiovascular Alterations	Animal	Vascular Control of Skeletal Muscle Blood Flow after Simulated Microgravity				1998					
Muscle Alterations & Atrophy	Cells	Cytoskeletal Contributions to Changes in Elasticity of Mammalian Myocytes after Cyclilc Mechanical Loading					1999	2000			
Muscle Alterations & Atrophy	Cells	Cytoskeletal Contributions to Changes in Elasticity of Mammalian Myocytes after Cyclilc Mechanical Loading					1999	2000			
Muscle Alterations & Atrophy	Cells	Mechanical Loading, Growth Factor Release and Regulation of Skeletal Muscle Mass: A Potential Site for the Application of Microgravity-Induced Muscle Atrophy Countermeasures						2000			
Muscle Alterations & Atrophy	Cells	Mechanical Modulation of Striated Muscle Phenotype	1995	1996							
Muscle Alterations & Atrophy;	Cells	NSCORT: Gravitational Biology;		1996	1997	1998	N/A	N/A	2001		
Immunology, Infection & Hematology Muscle Alterations & Atrophy	Cells	Gravitational Biology Nutritional Modulation of Pancreatic Endocrine Function in Microgravity							2001	2002	
Muscle Alterations & Atrophy Muscle Alterations & Atrophy	Cells	The Effect of Mechanical Unloading Upon Human Myotube Sarolemma Cholesterol Content: A Potential Site for the Initiation of Muscle Atrophy					1999		2001	2002	
Muscle Alterations & Atrophy; Clinical Capabilities; Cardiovascular Alterations	Human	Correlation Between Physiology and Shuttle Emergency Egress (1 year proposal)	1995								
Muscle Alterations & Atrophy	Human	Countermeasure for Microgravity-Induced Muscle Atrophy	1995	1996							
Muscle Alterations & Atrophy; Bone Loss	Human	Defining and Preventing Bone Loss: A Model for Microgravity							2001	2002	
Muscle Alterations & Atrophy; Clinical Capabilities; Cardiovascular Alterations	Human	Design and Validation of a Dynamic Exercise Countermeasure Device							2001	2002	
Muscle Alterations & Atrophy	Human	Effects of Bedrest on Forearm Muscle Reflexes	1995	1996	1997	1998					

CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY	CIES / GROUND EXPERIMENT TITLE	NASA OBPR - TASK BOOK Year Experiment Was Listed in Book									
	SPECIES /		4005							0000		
N 1 11 C 0 1 1	TYPE		<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>		
Muscle Alterations & Atrophy; Bone Loss	Human	Effects of Resistance and High-Impact Training on the Musculoskeletal System in Premenopausal Women			1997	1998						
Muscle Alterations & Atrophy	Human	Effects of Resistance Training, Using Fly-Wheel Technology, on Size and Function of Unloaded Skeletal Muscle					1999	2000				
Muscle Alterations & Atrophy;	Human	Exercise Within LBNP to Produce Artificial Gravity	1995	1996	1997	1998	1999	2000				
Bone Loss;												
Cardiovascular Alterations												
Muscle Alterations & Atrophy	Human	Genomics of Human Skeletal Muscle During Bedrest and Exercise; Genomics of Human Bedrest and Exercise							2001	2002		
Muscle Alterations & Atrophy;	Human	Growth Regulation in the Adult Cardiac Muscle Cell		1996	1997	1998						
Cardiovascular Alterations												
Muscle Alterations & Atrophy	Human	In vivo Stress-Strain Dynamics in Human Muscle							2001	2002		
Muscle Alterations & Atrophy	Human	Influence of Unweighting on Insulin Signal Transduction in Muscle				1998	1999	2000	2001	2002		
Muscle Alterations & Atrophy	Human	Integrating Human Muscle Energetics and Mechanics							2001	2002		
Muscle Alterations & Atrophy; Bone Loss	Human	Lower Limb Response to Impact Loads in 1G and Micro-G		1996	1997	1998	1999					
Muscle Alterations & Atrophy	Human	Magnetic Resonance Imaging in Assessing Forearm Muscle Fatigue after EVA-Related Tasks		1996	1997	1998						
Muscle Alterations & Atrophy; Clinical Capabilities;	Human	Measurement of Body Composition For Nutrition Assessment in Microgravity				1998	1999	2000				
Food & Nutrition												
Muscle Alterations & Atrophy	Human	Muscle Oxygenation as an Objective Method to Evaluate and Optimize the Space Station Glovebox Design			1997	1998						
Muscle Alterations & Atrophy	Human	Musculoskeletal Countermeasures to Spaceflight			1997	1998						
Muscle Alterations & Atrophy; Cardiovascular Alterations;	Human	NSCORT: Integrated Physiology	1995	1996	1997	1998						
Bone Loss												
Muscle Alterations & Atrophy;	Human	Nutritional Interventions to Improve Muscle Protein Metabolism During Stress (This Task					1999	2000	2001	2002		
Clinical Capabilities;		began in FY2000)										
Food & Nutrition												
Muscle Alterations & Atrophy;	Human	Prevention of Bed Rest Osteoporosis: Resistive Exercise			1997	1998	1999	2000	2001	2002		
Bone Loss;												
Clinical Capabilities												
Muscle Alterations & Atrophy; Bone Loss	Human	Prevention of Microgravity-Induced Stone Risk by KMgCitrate							2001	2002		
Muscle Alterations & Atrophy;	Human	Skeletal Muscle Response to Bed Rest and Cortisol Induced Stress							2001	2002		
Food & Nutrition												
Muscle Alterations & Atrophy; Bone Loss	Human	The Biomechanics of Exercise Countermeasures	1995	1996	1997	1998	1999					
Muscle Alterations & Atrophy	Human	The Biomechanics of Reduced Gravity Locomotion			1997	1998						
Muscle Alterations & Atrophy;	Other	Advanced, Multiple Projection, Dual Energy X-ray Absorptiometry (AMPDXA) Scanning							2001	2002		
Bone Loss		System										
Muscle Alterations & Atrophy	Other	Cellular and Molecular Mechanisms Mediating Rapid Resealing of Gravity-Induced Plasma Membrane Disruption						2000	2001	2002		
Muscle Alterations & Atrophy;	Other	Compact, High Precision, Multiple Projection DEXA Scanner				1998	1999	2000				
Bone Loss;												
Clinical Capabilities												
Muscle Alterations & Atrophy	Other	Growth Factors and Tension-Induced Skeletal Muscle Growth	1995	1996	1997	1998	1999	2000	2001	2002		
Muscle Alterations & Atrophy;	Other	Integrative Cardiac Myocyte Model: Ion Channels, Ca and Contraction							2001	2002		
Cardiovascular Alterations												
Muscle Alterations & Atrophy	Other	Metabolic Adaptation of Skeletal Muscle to Training/Detraining. A Systems Model							2001	2002		
Muscle Alterations & Atrophy	Other	Performance in Haptic Virtual Environments with Visual Supplement	1995	1996	1997							
Muscle Alterations & Atrophy	Other	Regulation of protein synthesis by strain induced signaling events								2002		