Fiscal Year:	FY 2009	**Task Last Updated:**	FY 10/06/2008
PI Name:	Qin, Yi-Xian Ph.D.		
Project Title:	Combined Scanning Confocal Ultrasound Diagnostic and Treatment System for Bone Quality Assessment and Fracture Healing		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Smart Medical Systems and Technology Team		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **ExMC**:Exploration Medical Capabilities		
Human Research Program Risks:	(1) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (2) **Medical Conditions**:Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures (3) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight (4) **Renal Stone**:Risk of Renal Stone Formation		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	yi-xian.qin@stonybrook.edu	**Fax:**	FY 631-632-8577
PI Organization Type:	UNIVERSITY	**Phone:**	631-632-1481
Organization Name:	SUNY- The State University of New York		
PI Address 1:	Orthopaedic Bioengineering Research Laboratory		
PI Address 2:	Room 215, Bioengineering Bldg		
PI Web Page:			
City:	Stony Brook	**State:**	NY
Zip Code:	11794-5281	**Congressional District:**	1
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2007 Crew Health NNJ07ZSA002N
Start Date:	11/01/2008	**End Date:**	10/31/2012
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Mirza, Naureen (The Research Foundation of the State University of New York) Gelato , Marie (The Research Foundation of the State University of New York) Rubin, Clinton (State University of New York)		
Grant/Contract No.:	NCC 9-58-SMST01603		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Musculoskeletal complications, i.e., osteoporosis, induced by microgravity during extended space mission and age-related disorders represent a key health problem. Osteoporosis will diminish both the structure and strength of bone, each considered critical in defining the ability of the bone to resist fracture. Early diagnosis of such progressive bone loss would allow prompt treatment, and thus inherently reduce the risk of fracture. Bone mineral density (BMD) measurement is a well-accepted, standard assessment used for the diagnosis of osteopenia and osteoporosis, using dual-energy X-ray Absorptiometry (DXA) in the clinic. However, it is limited to a BMD index and insensitive to bone's physical properties. Advents in quantitative ultrasound (QUS) techniques can characterize both BMD and the material properties. Using a newly developed noninvasive Scanning Confocal Acoustic Diagnostic (SCAD) technology, strong correlations between SCAD determined data and bone's structural and strength parameters were observed. Ultrasound has also been shown therapeutic potentials to accelerate fracture healing. The objectives of this study are to develop a combined diagnostic and treatment ultrasound technology for early prediction of bone disorder and guided acceleration of fracture healing, using SCAD imaging and low-intensity pulse ultrasound. The technology will target to the critical skeletal sites, where may be significantly affected by disuse osteopenia and potentially at the risk of fracture, i.e., hip, long bone and wrist regions. We will evaluate bone¿s quality in clinical human subjects, and at the JSC/UTMB bedrest facility. Animal models and cadaver will be used for testing feasibility of identifying bone loss, fracture, and longitudinally treatment and monitoring. A noninvasive diagnostic and treatment technology using ultrasound will have significant potentials to prevent and treat bone fracture, and will address critical questions in the Bioastronautics Roadmap related to bone loss monitoring, prevention and recovery.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	A noninvasive diagnostic and treatment technology using ultrasound will have significant potentials to prevent and treat bone fracture.
Task Progress:	New project for FY2009.
Bibliography Type:	Description: (Last Updated: 02/17/2021)