

Montana Space Grant Consortium Student Research Symposium

Friday, April 15, 2011
SUB Ballroom D



12:30-1:15pm

Professor Dava Newman
Professor of Aeronautics and Astronautics
and Engineering Systems
Director, Technology and Policy Program
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Massachusetts Institute of Technology

An Invitation to Explore: Astronauts, Athletes and Engineers in Extreme Environments

My quest is to understand human performance across the spectrum of gravity. My research investigates human performance in extreme environments interweaving biomechanics, human factors engineering, modeling, and design. In the space environment, we quantify astronaut motion and study the subtle mechanisms underlying neuro-musculoskeletal adaptation, which are not easily studied on earth. From an engineering systems perspective, we investigate human-robotic space systems and contribute creative designs and methods to greatly advance our potential as explorers. The MIT BioSuit™ System is designed to revolutionize human space exploration by providing enhanced astronaut extravehicular activity (EVA) locomotion and performance based on the concepts of a 'second skin' capability.

The BioSuit™ concept provides an overall exploration system realized through symbiotic relationships between a suite of advanced technologies and human modeling and experiments. By working at the intersection of engineering, design, bioastronautics and policy, new emergent capabilities and interrelationships result for applications to space missions, medical rehabilitation, and extreme sports activities. In many respects, the BioSuit™ System mimics Nature. For example, the second skin is capable of augmenting our biological skin by providing mechanical counter-pressure. We have designed and tested prototypes that prove mechanical counter-pressure feasibility. The 'epidermis' of our second skin suit is patterned from 3D laser scans that incorporate human skin strain field maps for maximum mobility and natural movements, while requiring minimum energy expenditure for exploration tasks. Wearable technologies will be embedded throughout the BioSuit™ System to place the explorer in an information-rich environment enabling real-time mission planning, prediction, and visualization. The BioSuit™ System concept strives to augment human capabilities by coupling human and robotic abilities into a hybrid of the two, to the point where the explorer is hardly aware of the boundary between innate human performance and robotic activities.

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3:30-4:15pm

Jaime Waydo
Mechanical Systems Engineer
Jet Propulsion Laboratory
Pasadena, California

**From Montana to Mars:
Life at NASA's Jet Propulsion Laboratory**

Highlights of my career at NASA have included leading a series of Entry, Descent, and Landing (EDL) tests for the Mars Exploration Rover (MER) mission, which landed twin rovers successfully on Mars in January 2004. My most recent assignment was leading the mobility team for the Mars Science Laboratory (MSL) mission, a large rover scheduled to launch in November 2011. I grew up in Bozeman, Montana and earned my Bachelor's degree in Mechanical Engineering from Montana State University in 2000. I completed my Master's degree in Mechanical and Aerospace Engineering at UCLA in 2006. I will discuss how I went from a bachelor's degree at Montana State to a job at the Jet Propulsion Laboratory. I will talk about early jobs in my career including highlights of the Spirit and Opportunity Rover mission to Mars that landed in January 2004 and are still roving. I will show exciting videos and pictures of the current Mars Rover, Curiosity, slated to launch in November 2011 and talk about STEM jobs that are key to making that mission a success.