Smart Suits to Enable Astronaut Exploration of Mars and Enhance Performance on Earth

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Scan-Model-Innovate-Make-Explore! This talk presents advanced spacesuit concepts for human exploration of Mars as well as how these wearable technologies can be used here on earth to enhance mobility and locomotion. Three suits will be discussed: the Gravity Loading Countermeasure Suit; an Astronaut Injury Prevention suit; and the second skin BioSuit™ for Mars exploration. The gravity loading skin suit strives to alleviate astronaut musculoskeletal loss for intravehicular activity (IVA) and is manifest to fly to the International Space Space in 2015. Current research to prevent astronaut injury and provide protection in traditional gas-pressurized spacesuits has led to a novel wearable pressure sensing garment to quantify human-suit interactions. Hotspots are identified that correlate with astronaut musculoskeletal shoulder injury. One of the key requirements of human planetary surface exploration is a spacesuit that enables astronaut locomotion. Planetary mobility places new challenges that can only be attained through implementing revolutionary designs that facilitate natural locomotion and minimize energetic expenditures. The MIT BioSuit™ System leverages patented design concepts and implements active materials technologies to provide a technically feasible 29 KPa mechanical counter pressure spacesuit.