



Colorado School of Mines  
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Web site: <http://www.mines.edu/Research/>

## ***Center for Intelligent Biomedical Devices and Musculoskeletal Systems (IBDMS)***

The multi-institutional Center for Intelligent Biomedical Devices and Musculoskeletal Systems (IBDMS) integrates programs and expertise from CSM, Rocky Mountain Musculoskeletal Research Laboratories (RMMRL), University of Colorado Health Sciences Center and the Colorado VA Research Center. Established at CSM as a National Science Foundation (NSF) Industry/University Cooperative Research Center, IBDMS is also supported by industry and State organizations.

IBDMS has become an international center for the development of Bionic Orthopaedics, sports medicine, human sensory augmentation, human amplifiers (exoskeletons), and smart orthoses. Through the efforts of this center, new major and minor programs in bioengineering and biotechnology are being established at both the CSM graduate and undergraduate levels.

With its Industrial Advisory Board (IAB), IBDMS seeks to establish educational programs and long-term basic and applied research efforts that improve U.S. technology. IBDMS focuses the work of diverse engineering, materials and medicine disciplines. Its graduates are a new generation of students with an integrated engineering and medicine systems view, with increasing opportunities available in the biosciences.

### ***Background:***

- Established in 1998
- National Science Foundation, Industry/University Cooperative Research Center
- Involved CSM faculty members from Engineering, Materials Science, Chemical Engineering, and Environmental Engineering
- Several internationally-known orthopedic surgeons and biomechanical engineers are involved from the Rocky Mountain Musculoskeletal Laboratory
- Funding is provided by National Science Foundation and twelve biomedical industries
- Joint research programs with three medical centers around the USA and one major center in England have been established. Research results have received international awards from the scientific community

### ***Areas of Expertise:***

- Implant design – hip, knee, TMJ, etc.
- Fluoroscopic imaging of joint motion
- In vivo measurements of implants dynamics
- Advanced biocompatible materials
- Modeling and simulation of musculoskeletal system
- Micro-electromechanical (MEM) sensors and actuators
- Electronically controlled implants
- Artificial sensory systems
- Implant simulator – knee, hip, and TMJ simulators
- Automatic control
- Telemetric implants
- Spinal injuries and implants

### ***Sponsoring Organizations:***

- National Science Foundation
- Twelve biomedical industries from Colorado and other states
- Colorado Advanced Technology Institute (CATI transferred to the Colorado Commission on Higher Education (CCHE) in 1999)

### ***Method of Technology Transfer:***

- Monthly meetings at industrial sites
- Semi-annual meeting with Industry Advisory Board (IAB)
- Quarterly project review meetings
- Presentations and publications at international conferences and scientific journals
- **Web site:** <http://www.mines.edu/research/ibdms/>

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