Research *in Motion*

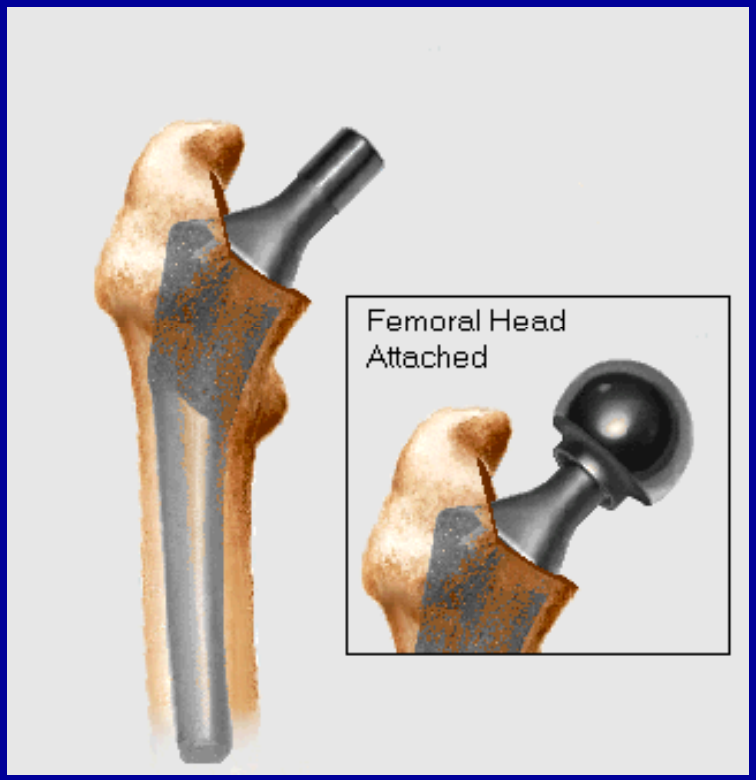
B. Sonny Bal, MD, JD, MBA
Associate Professor
Department of Orthopaedic Surgery
University of Missouri School of Medicine

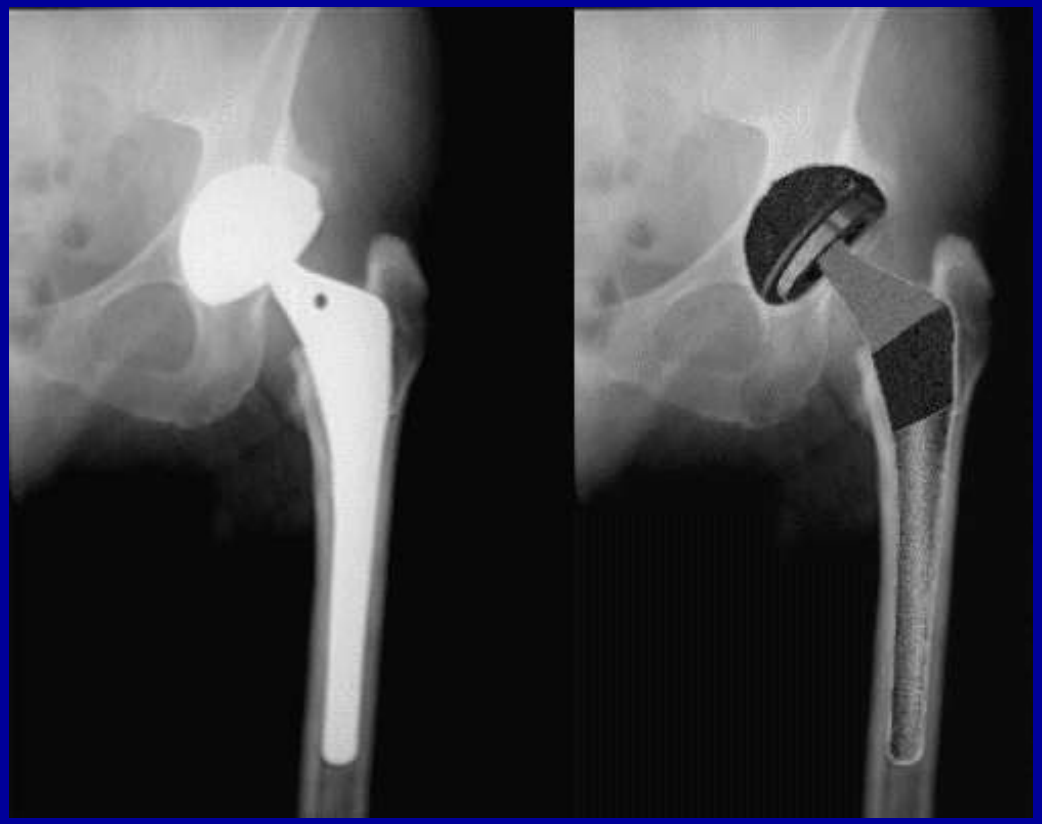
Great Expectations

Life expectancy is now 77.7 years … and people are expecting to stay *actively moving* through those years.

Aging baby boomers expect to stay active, placing unprecedented demands on surgical options previously reserved for the elderly.

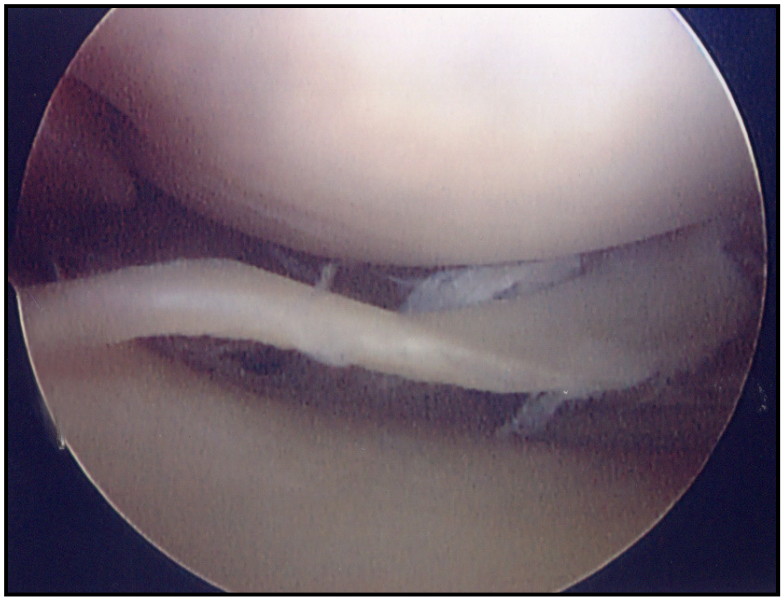
Total Hip Replacement





Knee Replacement

Joint Replacement Advances



- Materials (Failure)
- Bearings (Wear)
- Surgery
  - Infection
  - DVT
- Today:
  - Biomaterials
  - Bearings
  - Safe Surgery
- Future?
  - Biological solutions

Meeting Demand for Ortho R&D

- Biomaterials
  - Mimic skeletal bone (elasticity, porosity)
  - Bearing wear and compatibility
  - Biological options
- Surgical techniques and procedures
  - Less invasive surgery and faster recovery
- Patient education and rehabilitation
  - Consumers are better informed

Collaborative Research

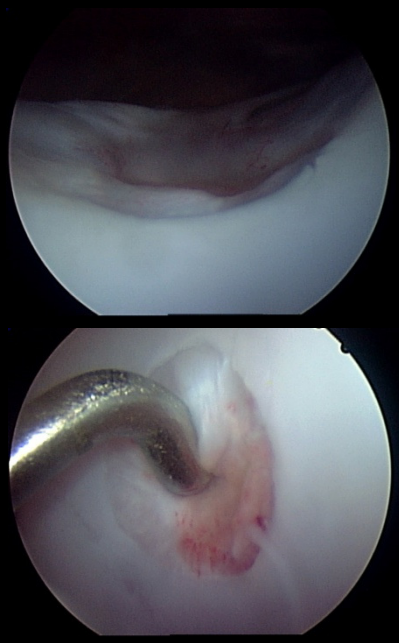
- Orthopaedic scientists and surgeons
- Engineering and materials scientists
- Veterinary medicine scientists and clinicians

Working together.

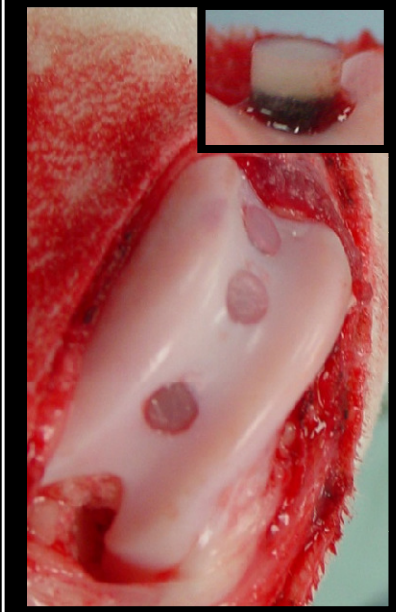
Collaboration

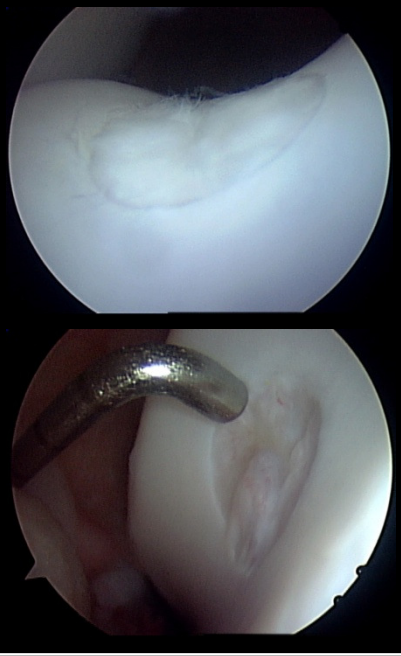
Comparative Orthopaedics Laboratory-MU
Missouri University of Science & Technology-Rolla
Department of Orthopaedic Surgery-MU

Empty Control



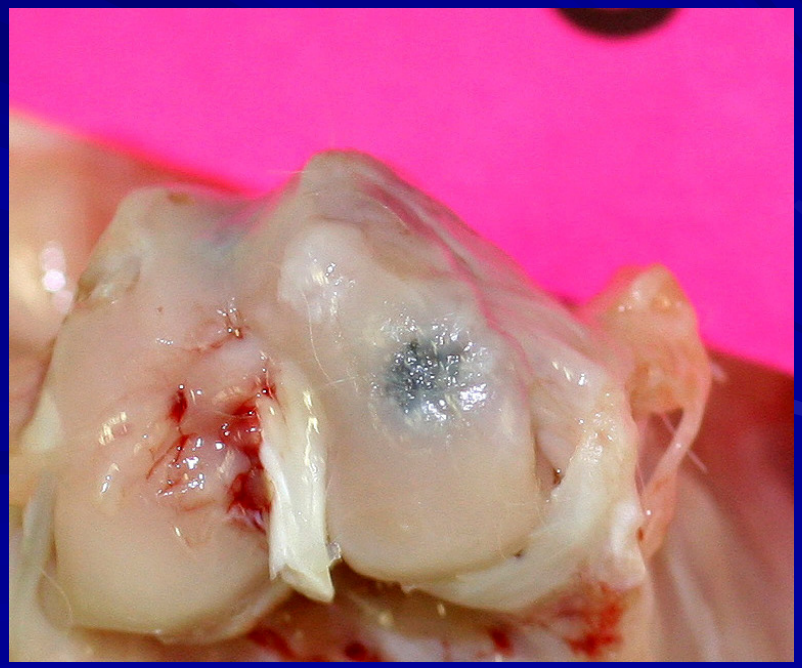
Implanted





Biomaterials

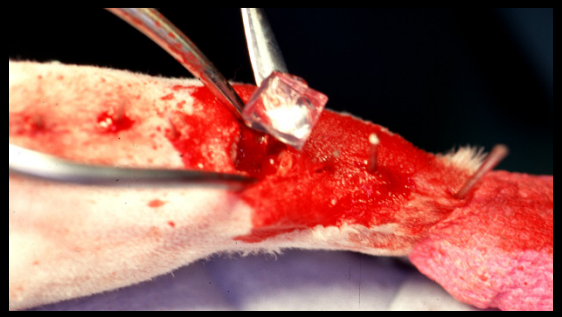
- OC plugs in Rabbits
  - Regenerate Cartilage
  - Bioactive Glasses

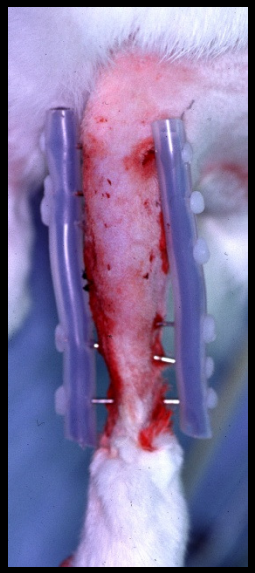


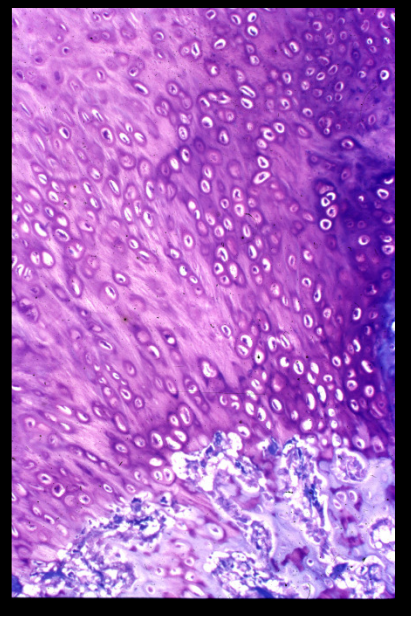
Tissue-engineered patella

- Columbia University
  New York City

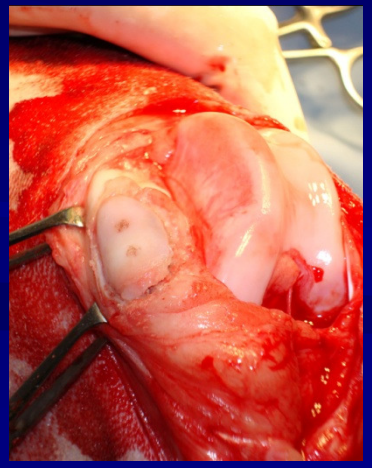
- COL at MU
  Columbia, MO

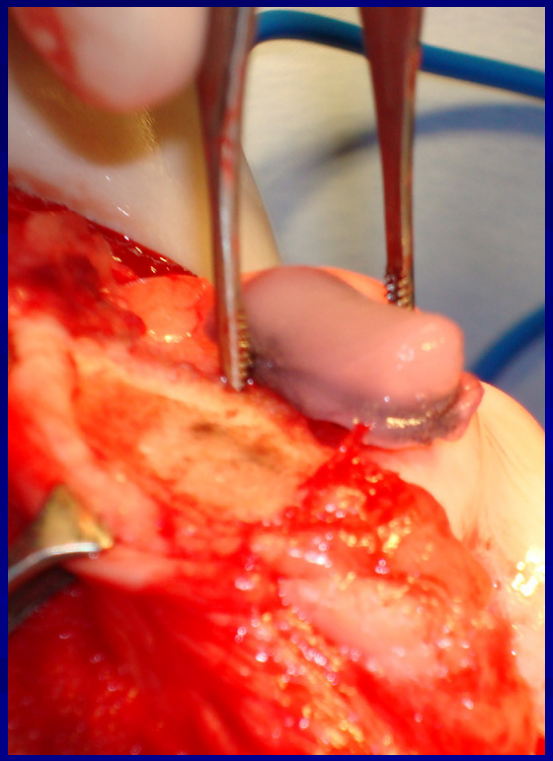






Stem Cell Engineered Cartilage

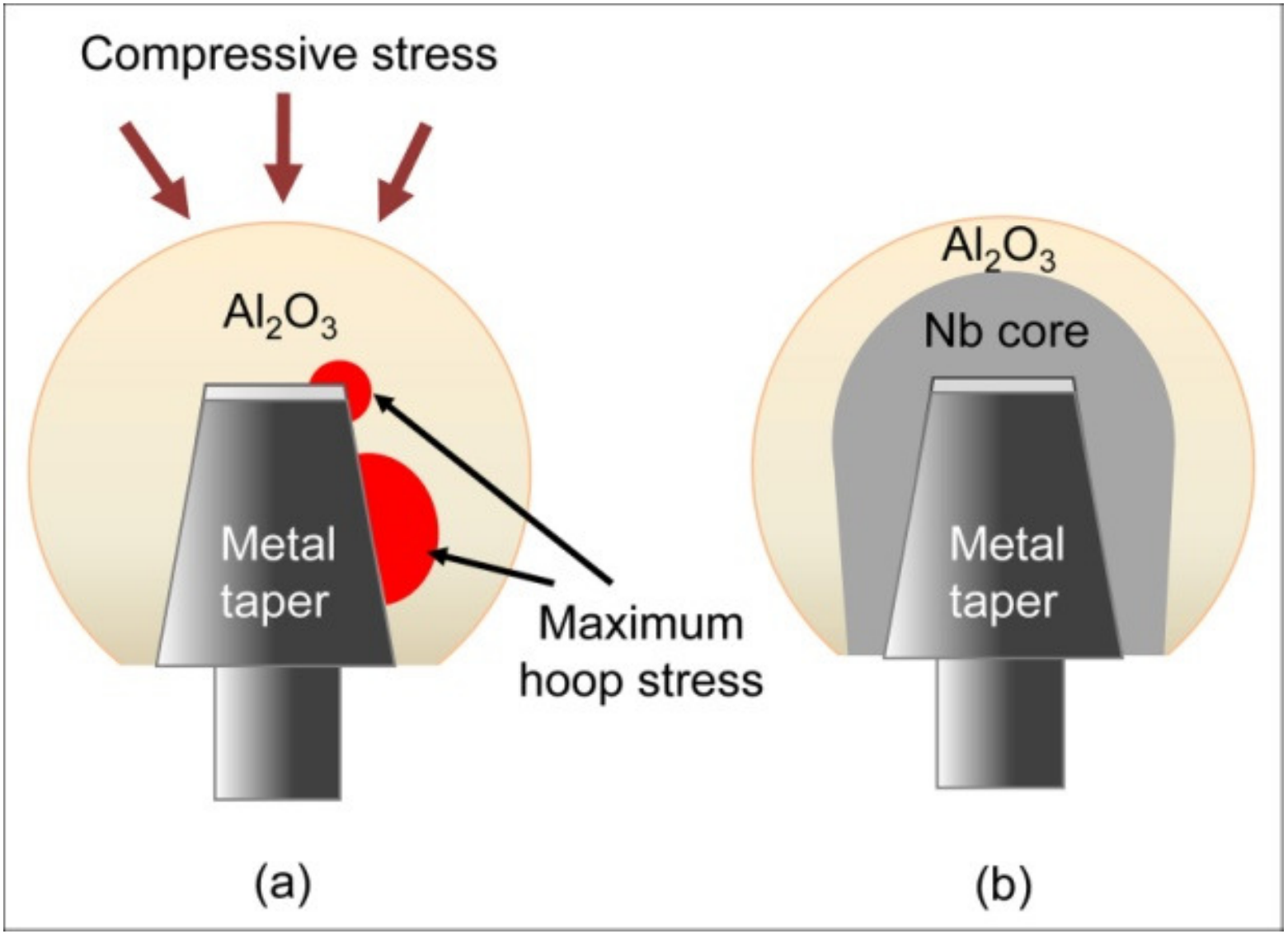


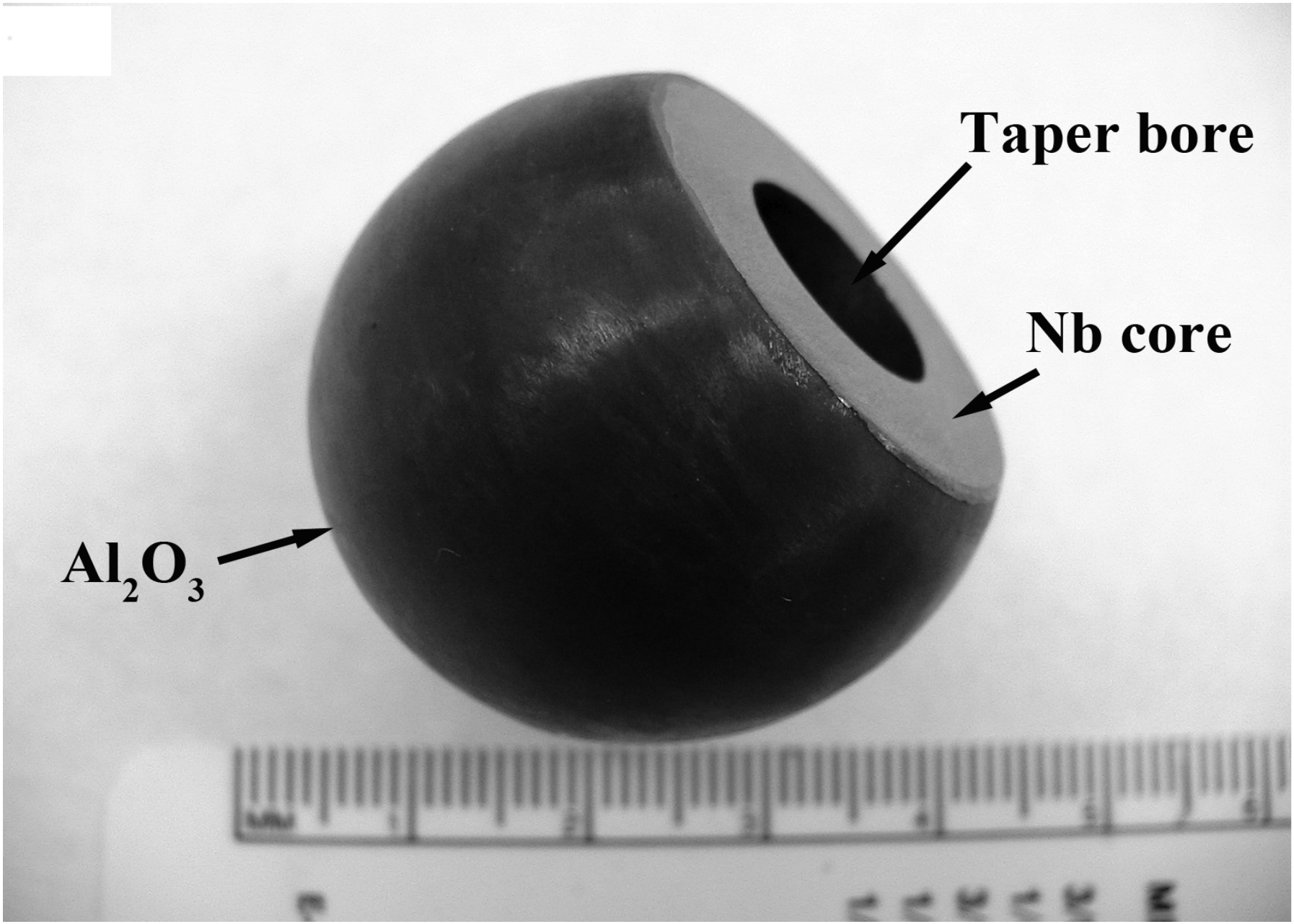


Comparative Orthopaedics

- **Identify** “real world” problems
- Develop **hypothesis** and aims
- **Break it down** into the components
- **Assess the variables** to test the hypothesis
- **Optimize** the solutions
- **Apply** it to the problem
- **Test** the solution in the real world
- Stakeholders: Veterinary and Human

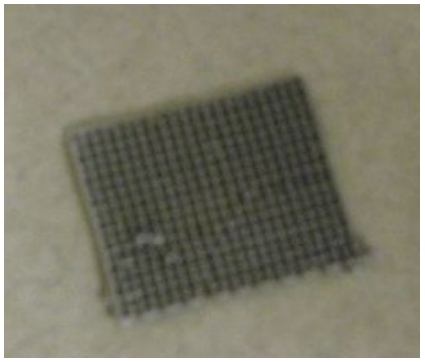
Ceramic-Metal Femoral Head



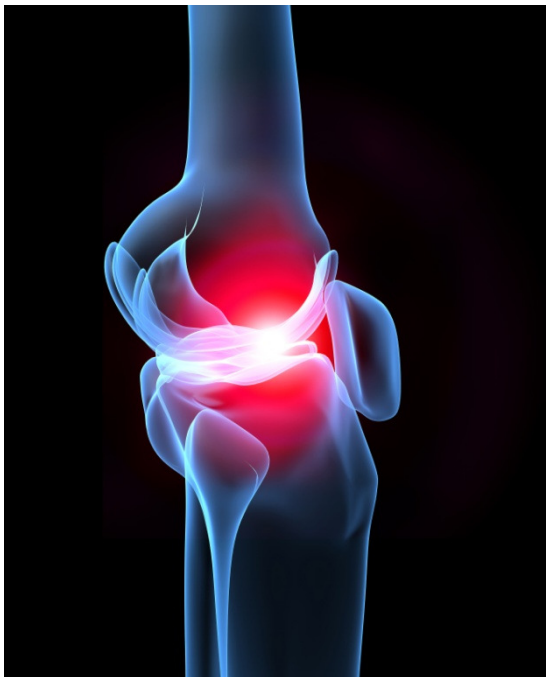

Taper bore
Nb core
Al_2O_3

Material Composites

- Optimizing Bioactive Glasses
- Testing tissue-engineered cartilage
- Combining biomaterials
  - Bioactive glass
  - Porous titanium
  - Biologically active materials

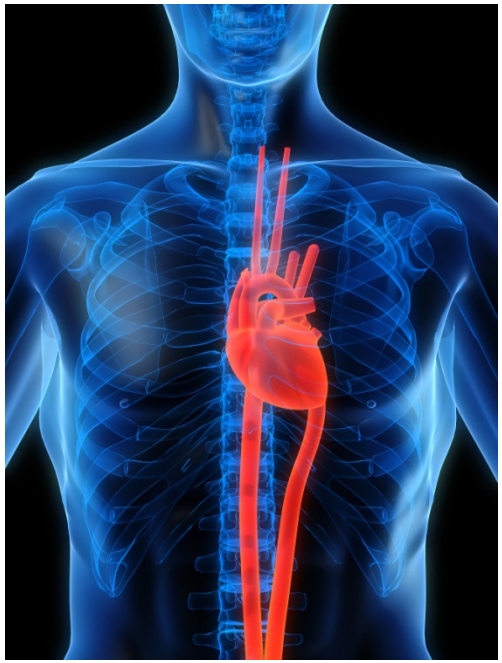


The Value of Investigation?



#1 Disability: Arthritis

Leading Cause of Death:
Heart Disease



The Case for Moving Forward

57% of adults with heart disease also have arthritis

Arthritis = difficulty being physically active

Less active = difficulty managing heart disease

Investments in Motion

Government grants

Foundation grants

Corporate giving

Individual giving

Research to Products

- Once we have the biomaterials:
- MU Biodesign Team
  - New applications
  - New solutions
- Business Incubator
  - Business School
  - Commercial Venture

Investments in Motion

Missouri Orthopaedic Institute

University of Missouri Health System