Bone and Joint Center

- Research division of the Dept of Orthop Surgery
- Founded in 1990 under Dr. Eric Radin
  - chair, 1989-1995
  - established research center covering the range of disciplines needed to thoroughly investigate skeletal diseases.
  - interested in understanding the development and treatment of osteoarthritis
Research Interests

- Osteoarthritis
- Osteoporosis
- Ligament injuries
  - anterior cruciate ligament (ACL) rupture
- Tendon injuries
  - rotator cuff tears
- Spine function
Multi-Disciplinary Research Team

- Cell Biology
- Biochemistry
- Anatomy / Histology
- Biomechanics
- Motion Analysis
Personnel

- Additional Personnel
  - scientific editor (1)
  - emeritus scientist (1)
  - post-doctoral fellows (2)
  - instructors (2)
  - research engineers (3)
  - research assistants (3)
  - research coordinators (2)
  - research students (4)
  - grants/contract specialist (1)
Motion Analysis

- In-vivo joint function
  - shoulder
Motion Analysis

- In-vivo joint function
  - shoulder
  - cervical spine
  - knee
  - elbow
  - foot/ankle

- In-vivo tendon function
  - augmenting tendon repair/healing
Anatomy/Histology

- Understanding the mechanisms behind changes in bone mechanical properties due to:
  - estrogen depletion
  - diet
  - changes in mechanical loading
  - chronic alcoholism
Anatomy/Histology

- Characterization of materials (bone) by:
  - mechanical testing
  - histology
Anatomy/Histology

- Characterization of materials (bone) by:
  - mechanical testing
  - histology
  - histomorphometry
  - quantitative microradiography
  - collagen imaging using surface demineralization and AFM
Biomechanics

- Bone fractures
  - improving the diagnosis of fracture risk associated with osteoporosis
  - improving techniques for preventing and treating fractures
Biomechanics

- Estimating how mechanical strain is distributed in bone: the relationship between microstructural and strain heterogeneity and fracture.
  - high-resolution imaging
  - computer simulation
  - mechanical testing
Biomechanics

- Estimating how mechanical strain is distributed in bone
  - high-resolution imaging
    - micro-CT
    - tomosynthesis
Biochemistry

- Cartilage Breakdown
  - using OA cartilage, synovium, synovial fluid from patients to identify:
    - protein markers of cartilage breakdown
    - changes in cartilage matrix homeostasis
Biochemistry

- OA Pain
  - role of nutraceuticals (e.g., glucosamine, chondroitin sulfate) to treat pain
    - double-blinded study
    - effects of a nutraceutical on knee OA pain
Cell Biology

- Skeletal development and osteoarthritis

Type X collagen

Rat tibia human articular cartilage

interface with subchondral bone
Cell Biology

- Post-traumatic osteoarthritis
  - use of non-coding RNA’s in serum as biomarker for the early prediction of OA
Productivity

- NIH Funding
  - 74 years of grants
  - ~$21 million in total costs

- Publications
  - ~250 full-length manuscripts
Collaborations

- Universities / Research Hospitals
  - California Polytech. State Univ (SLO)
  - Cedarville University
  - Cleveland Clinic
  - Colorado State University
  - Detroit Medical Center
  - Louisiana State University
  - MD Anderson Cancer Center, University of Texas
  - Michigan State University
  - Oakland University
  - Ohio State University
  - Purdue University
  - Royal College of Surgeons in Ireland
  - Tufts University
  - University of California, Davis
  - University of Guelph, Ontario, Canada
  - University of Michigan
  - University of Notre Dame
  - University of Pittsburgh
  - University of Sydney, Australia
  - University of Utah
  - University of Vermont College of Medicine
  - Wayne State University
Collaborations

- Corporate Partners
  - DonJoy Orthopaedics
  - Hills Pet Food
  - Innovative Health Technologies
  - Nike
News From The Lab...

- **ORS Abstracts**: Researchers from the Bone and Joint Center had 12 abstracts accepted to the 2012 Orthopaedic Research Society annual meeting, to be held February in San Francisco.

- **2 New Grants**: Congratulations to Dr. Yener Yeni who was recently awarded grants from the National Institutes of Health (NIH) and Department of Defense (DOD).

- **New Grant**: Dr. Colin McDonald, along with Dr. Victor Chang from the Department of Neurosurgery, have recently been awarded a grant from the Congress of Neurological Surgeons to study cervical spine function after fusion.

- **NIH Recognition**: Dr. Gary Gibson and his research team have been recognized by the NIH for their research on biomarkers for predicting the development of osteoarthritis. Read more here.

www.henryfordboneandjointcenter.com
Thank You

Henry Ford Hospital
Detroit, MI
What Causes Knee Arthritis?

"Microklutziness": micro-incoordination causing **subtle changes** in joint motion

Abnormal forces on the cartilage

Biological changes

Osteoarthritis (worn cartilage)

Pain