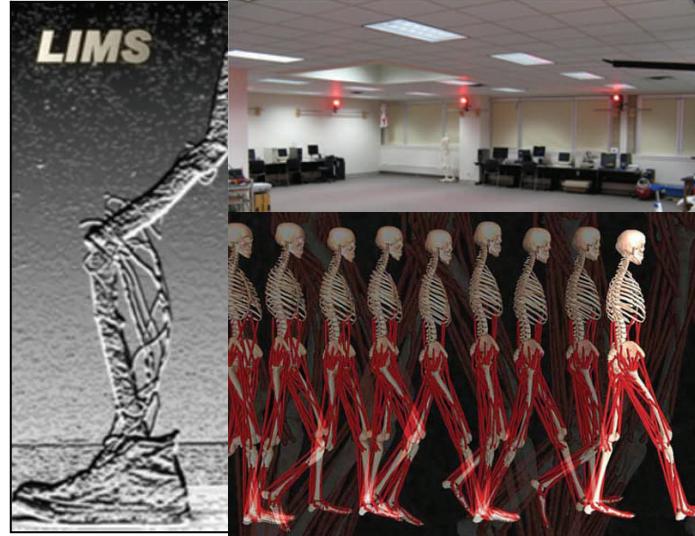


# La Crosse Institute For Movement Science (LIMS)

Thomas Kernozeck, PhD, Director

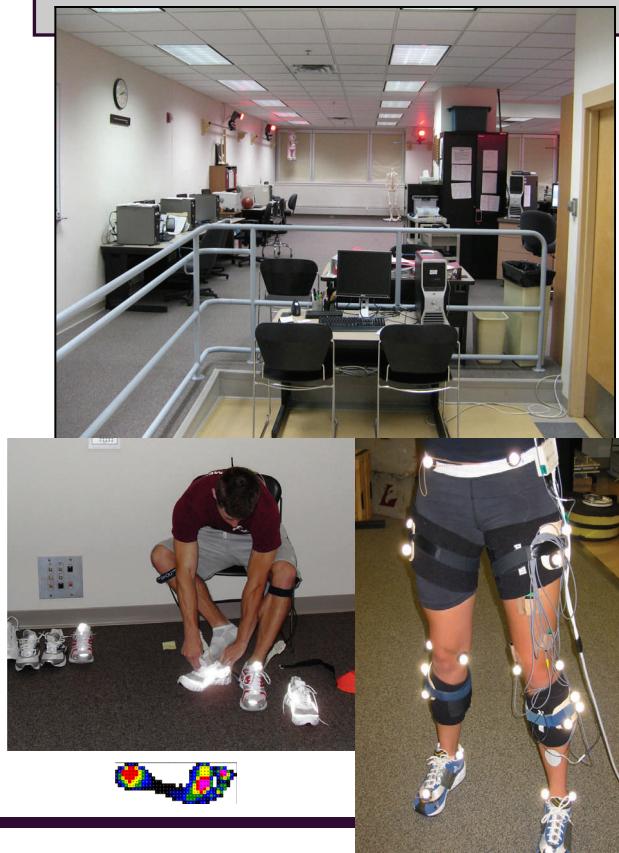
The Institute was created in 2005 at the University of Wisconsin-La Crosse in the Department of Health Professions in the Health Science Center. The Institute brings together scientists and clinicians of various disciplines in the quest for new knowledge related to human movement, the identification of factors related to injury, the foundations of therapeutic exercise and injury prevention.

Each year over 40 students from graduate and undergraduate programs across the UW-L campus are involved in laboratory research including Physical Therapy, Exercise and Sport Science, Physics, and Biology. High technology funding from the State of Wisconsin supports 8 Physics Biomedical undergraduate student internships in the lab. A graduate assistant from Exercise and Sport Science is also assigned to the lab. Faculty, graduate and undergraduate students annually present research at professional meetings in physical therapy, biomechanics and sports medicine.



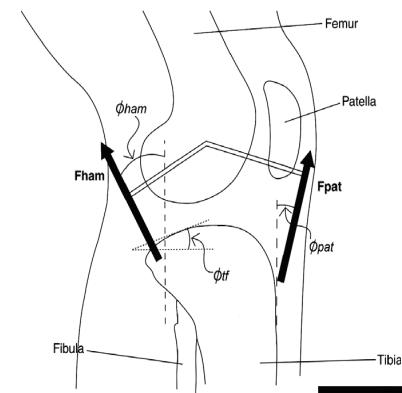
## Current Projects in the Lab...

- Modeling the knee to better understand mechanisms of non-contact ACL injuries in females.
- Evaluating running mechanics of females with patellofemoral pain compared to healthy controls.
- Examining native Americans in Wisconsin for developing plantar pressure related foot wounds.
- Examining changes in impact dynamics during running with variations in shoe midsole hardness.



## LIMS Lab Facilities

LIMS labs in the Health Science Center include the 1,800 square foot biomechanics and 1,900 square foot exercise physiology laboratory. The biomechanics laboratory includes an 8 camera motion analysis system and three force platforms, electromyography, seating, barefoot and in-shoe pressure measurement technology, an isokinetic machine and an electromagnetic tracking system. The exercise physiology laboratory includes metabolic and gas analysis systems for bike or treadmill use.



## LIMS Scientists



### 18 Research Presentations by LIMS Faculty at Scientific Conferences

Combined Sections of the American Physical Therapy Association. February 2010, San Diego, CA.

American Society of Biomechanics Annual Meeting, August 2010, Providence, RI.

EMED Scientific Meeting, August 2010, Providence, RI.

American College of Sports Medicine Annual Meeting, May 2010, Baltimore, MD.

American Association of Cardiovascular and Pulmonary Rehabilitation Annual Meeting ("AACPR"), October 2009, Pittsburg, PA.

17th Congress of the International Federation of Associations of Anatomists, August 2009, Cape Town, South Africa.

Annual Meeting of the American Association of Physical Anthropologists, April 2010, Albuquerque, NM.

Annual Meeting of the Federation of American Societies for Experimental Biology /American Association of Anatomists, April 2010, Anaheim, CA.

### Doctorate in Physical Therapy (DPT) Students present research at Wisconsin Physical Therapy Spring Meeting in Green Bay, WI

"Effects of NIKE + iPod Sport Training Kit on Fitness in 7th Grade Children" with **Kyle Armstrong**

"Effects of Medially Wedged Orthoses on Running Mechanics of Females With and Without Patellofemoral Pain with **Andrew Boldt, Elizabeth Geissler and Christine Tuma**.

"The Effects of a Student Assisted Exercise Program to Support Functional Improvements for a Subject Five Years Post Stroke" with **Boldt, Courtney Heinz, Micah Menges and Dan Thour**.

"Running Injury, Balance and Proprioception" with **Bri Bouffard, Stephanie Richardson, Eric Seppelt and Elissa Schmidt**.

"Comparison of Knee Moments with Varied Resistance on Cybex Arcuate Trainer" with **Monica Crook, Heinz, Amy Juel and Tessa Pecha**.

"Case Study of the Effect of Electrical Stimulation on Gait in a Child With Arthrogryposis" with **Stephanie Dittrich and Kelly Mohr**.

"Predictive Validity of the Walking Trail B test" with **Libby Drazkowski**

"Comparison of Lower Extremity Kinematics and Kinetics During a Typical and Flexed Drop Landing" with **Jacqueline Fliess, Ashley Patterson and Mary Schachtnner**.

"Case Report of Diagnosis and Treatment of a Child With Athetoid Quadriparetic Cerebral Palsy, Epilepsy and Myasthenia Gravis" with **Amy Finch and Megan Schlittler**.

**Chris Durall, DPT, ATC, MSPT** (UW-La Crosse Health Center)

**John Greany, PT, PhD**, Exercise Physiologist, (Health Professions)

**Thomas Greiner, PhD**, Biological Anthropologist, (Health Professions)

**Di-An Hong, PhD**, Biomechanist, (Laboratory Manager, Health Professions)

**Tom Kernozeck, PhD**, Biomechanist, (Health Professions)

**Stacey Meardon, PT, ATC, PhD**, Biomechanist/Motor Control, (Health Professions)

**Robert Ragan, PhD**, Computational Physicist (Physics)

**John Willson, MSPT, PhD**, Biomechanist, (Health Professions)

## New ACSM Fellow

Tom Kernozeck, PhD was awarded Fellow status with the American College of Sports Medicine based on his published work in sports medicine. This is the most prestigious distinction within ACSM. The award was recognized at the 2010 American College of Sports Medicine Meeting in Baltimore, MD in May.



"Screening for Clinical and Biomechanical Risk Factors Associated with Plantar Wound Development in Wisconsin Native Americans with Peripheral Neuropathy from Diabetes" with **Cassie Heizler**

"Reliability of Ankle Brachial Index Values by Student and Experienced Physical Therapist" with **Josh Miller**

"Gluteal Muscle Activity in Healthy Female Runners and Runners with Patellofemoral Pain" with **Katlin Strauss, Dan Thour and Adam Wirtz**.

"The Fitness Benefits of Pushing a Baby Stroller" with **Karen Hanadel and Kris Greany**



## Q&A with Stacey Meardon on Stress Fractures in Runners

**What is it?** A stress fracture is a break in the cortical bone typically characterized by localized pain upon palpation of the region. Stress fractures are due to abnormal stress and are most often experienced by active populations, in particular military recruits and runners. In fact, stress fractures have been reported to account for up to 15% of injuries in recruits and 30% in runners. The two most common locations for lower extremity stress fracture are the tibia and the metatarsals. In contrast to a fracture from a direct impact, a stress fracture is due to repetitive impacts over time. Typically, the onset is gradual and associated with progressively increasing pain with activity.



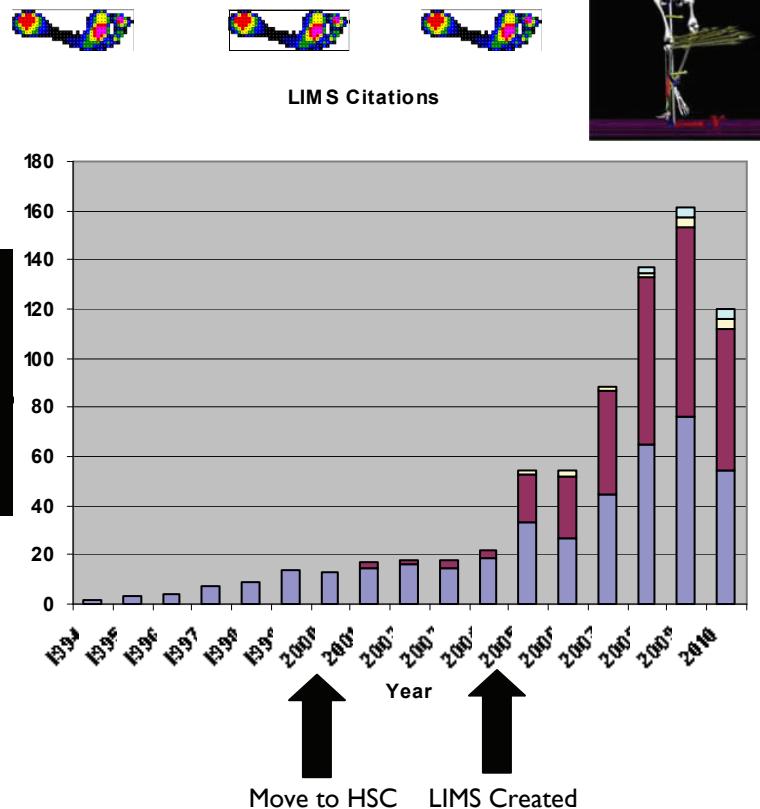
**What causes it?** For the most part, risk factors of stress fractures can be classified into three main areas: overall bone health, training patterns, and gait mechanics. Underlying bone health is influenced by factors such as nutrition, genetics and hormones. Adequate calcium and vitamin D are important for bone health as is consuming enough calories to offset the athlete's energy expenditure. Persons with low bone mineral density, smaller cross sectional area of bone, eating disorders and abnormal menstrual cycles are particularly at risk for stress fracture. In addition, faulty training patterns (volume, intensity, duration, and rest periods) can lead to unaccustomed bone stress or too little time for recovery allowing for the accumulation of microdamage leading to a stress fracture.

From a biomechanical perspective, stress fracture has also been linked to skeletal alignment (i.e. Q-angle, arch height, and leg length). Dynamically, foot pronation and pronation velocity, knee internal rotation and abduction and hip adduction during the stance phase of running have been associated with stress fracture in females. While not consistent in all literature, increased impact peak of the vertical ground reaction force and increased torsional moment of the foot have been connected to stress fracture. Elevated rates of loading also seem to play a role in stress injury development. Higher vertical loading rates have been documented in both runners with overuse injury and stress fracture. In military populations, fitness and flexibility of the hip and ankles has been coupled with stress fracture risk.

**How is it treated?** Depending on the location and severity, up to 12 weeks of rest from impact activity may be needed for recovery. A gradual return to activity without pain is needed to ensure adequate bone remodeling. Underlying factors (i.e. diet, menstrual dysfunction, training patterns, and gait mechanics) that contributed to the stress fracture should be investigated and a plan to address any impairments should be established by the health care team.

## Growth in Impact of LIMS Research

UW-L LIMS Research has grown over the last several years with the hard work of new faculty members and the ongoing work of current faculty. Web of Knowledge (ISI - Thomson Reuters) is one of the world's leading citation databases with coverage of over 10,000 high impact journals in the sciences, social sciences, arts and humanities. By measuring the frequency of citations of LIMS research manuscripts in other manuscripts, one can see how often other researchers worldwide are citing LIMS work in their papers. This can be interpreted as a measurement of the impact that LIMS research has on the scientific and research community. Arrows on the figure (right) marks the Department of Health Professions moving to the Health Science Center and second arrow marks the University formally establishing LIMS on the UW-L campus.



## Recent Publications

**Greany, JF**, Di Fabio, RP. (in press) Models to Predict Fall History and Fall-Risk for Community-Dwelling Elderly. *Physical & Occupational Therapy in Geriatrics* (epub Sept 2010).

Patrek M, **Kernozeck TW**, **Willson JD**, Wright G, Doberstein S. (in press) The effects of hip abductor fatigue on female single leg landing mechanics. *Journal of Athletic Training*.

Fedie R, Carlstedt K, **Willson JD**, **Kernozeck TW**. (in press) Effect of attending to a ball during a side-cut maneuver on lower extremity biomechanics in male and female athletes. *Sports Biomechanics*.

Smith, J.P., **Kernozeck, T.W.**, Kline, D.E., Wright, G.A. (in press). Kinematic and kinetic variations between three depth jump conditions in male ncaa division III athletes. *Journal of Strength and Conditioning Research*. 2010 Jan 21. [Epub ahead of print]

**Meardon S.A.**, Derrick T.R., & Hamill J. (in press) Running Injury and Stride Time Variability over a Prolonged Run. *Gait & Posture*.

Thomas J.R., Alderson J.A., Thomas K.T., Campbell A.C., Edwards W.B., **Meardon S.A.**, & Elliot B.C. (in press). Is there a central pattern generator for right versus left hand throwing in children? *Research Quarterly for Exercise & Sport*

Haag S, Wright G, Gillette C, **Greany, J.** Effects of Acute Static Stretching of the Throwing Shoulder on Throwing Velocity and Accuracy. *Journal of Strength and Conditioning Research*. 2010; 24(2), 452-457.

Foster, C., Porcari, J.P., Gibson, M., **Greany, J.F.**, Tatali, N., Recalde, P. (2009) Translation of submaximal exercise test responses to exercise prescription using the talk test. *Journal of Strength and Conditioning Research*; 23(9); 2425-2429.

**Willson JD**, Davis IS. (2009) Core Strength and Lower Extremity Mechanics During Jumping in Females with Patellofemoral Pain. *Journal of Sport Rehabilitation*. 18:76-90.

Chan, M., Huang, C., Chang, J. **Kernozeck, T.W.** (2009). Kinematics and kinetics of the knee and hip position of female basketball players during side-step cutting with and without dribbling. *Journal of Medical and Biological Engineering*. 29(4): 178-183.



**Fater, D.C.W., Kernozeck, T.W.** (2009). Cervical traction in sitting and supine using home traction units. *Physiotherapy Theory and Practice*. Nov-Dec;24 (6):430-6.

Gillette J.C., Stevermer C.A., Miller R.H., **Meardon S.A.** & Schwab C.V. (2010). The effects of age and type of carrying task on lower extremity kinematics. *Ergonomics*. 53(3): 355–364.

**Meardon S.A.**, Edwards W.B., Ward E.D. & Derrick T.R. (2009). Orthotic intervention on Second Metatarsal Bone Strain during Simulated Cadaver Walking. *Foot and Ankle International*. 30(10), 998-1004.

Wallace, B.J., **Kernozeck, T.W.**, Kline, D.E., White, J., Peng, H., Huang, C., Wright, G.A. (2010). Quantification of vertical ground reaction forces of popular bilateral plyometric exercises. *Journal of Strength and Conditioning Research*. 24(1):207-12.



**For more Information about LIMS,  
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