

## Current Research

### *Charismatic Project*

Spring 2002 will mark the first year of study in the Charismatic Project. Thanks to a donation from Robert and Beverly Lewis, Drs. Chris Kawcak and Wayne McIlwraith, in collaboration with Dr. Marcus Pandy and Dr. Nick Brown from the University of Texas-Austin, are currently gathering data to develop a computer model of the entire equine forelimb, which will lead to the ability to determine joint surface forces in the fetlock joints of horses. This would aid in the early detection of subtle joint disease in horses.

With the help of Renee Lake, a graduate student in the Biomedical Engineering Program at CSU, dissection and analysis of the muscle morphology for 3 forelimbs is completed and the manuscript is being written. Data from these analyses will be used to calculate muscle forces that are involved in joint loading.

Computed tomographic (CT) images of the fetlock joint has been successfully reconstructed into 3D surfaces using Mimics software at Steadman-Hawkins Sports Medicine Foundation in Vail, CO. Considerable assistance was provided by Drs. Mike Torry, Michelle Sabic, and Kevin Shelburne. Dr. Brown has started working with SIMM, a complex computer system used to assist in development of a geometric musculoskeletal model. These images will

play an integral role in the development of the model's musculoskeletal geometry.

Moment arm and kinematic data are currently being acquired on equine limb cadavers to obtain an impression of limb movement in the horse. These data will also be used in the overall limb model to determine accurate joint loads.

A protocol for gait analysis has been developed. Motion capture and force plate equipment are currently being installed in the Orthopaedic Research Laboratory at CSU, and will be used to determine limb movement and loading as the horse moves. These data will also be integrated into the overall limb model to aid in calculating joint forces.

Results from these separate projects will be combined to develop a computer model of the equine forelimb, in which individual joint forces can be calculated. Based on imaging techniques such as CT and MRI, a particular horse can have a specific joint scanned, and the joint surface forces calculated. This will provide the ability to find subtle abnormalities in joint loading in a specific horse.

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*Robert and Beverly Lewis*



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