1077-37-2905 **Lucy E. Spardy*** (les65@pitt.edu), 301 Thackeray Hall, Pittsburgh, PA 15205, and **Sergey N. Markin**, **Natalia A. Shevtsova**, **Boris I. Prilutsky**, **Ilya A. Rybak** and **Jonathan E. Rubin**. *A dynamical systems analysis of afferent control in a neuromechanical model of locomotion.*

We analyze a simplified model of mammalian locomotion where a spinal central pattern generator (CPG) is coupled to a biomechanical limb system, with afferent feedback to the spinal circuits and CPG closing the control loop. In this model, the CPG establishes a rhythm when a "supra-spinal" drive is present, and afferent feedback from a one-joint limb helps to stabilize the CPG operation and control the timing of phase switches. Increasing the drive intensity to the CPG yields an increase in locomotor speed by reducing the duration of the stance phase, at a relatively constant duration of the swing phase, a phase asymmetry observed in normal locomotion in cats. Transitions associated with changes in ground reaction force or motoneuron outputs abruptly alter the vector field in the limb dynamics phase plane. We show how the position of the locomotor oscillation trajectory relative to these transient vector fields and their critical points explain the model's ability to replicate this experimentally observed locomotor asymmetry. This analysis, along with observations gained from explaining the mechanism responsible for rhythm generation, allows us to establish a reduced model for which an argument for existence and uniqueness of a periodic orbit can be constructed. (Received September 22, 2011)