1089-35-180 **Igor Szczyrba*** (igor.szczyrba@unco.edu), University of Northern Colorado, Department of Mathematical Sciences, Greeley, CO 80639, and **Martin Burtscher** and **Rafal Szczyrba**.

Computational modeling of brain dynamics in traumatic scenarios – a new universal Brain Injury Criterion.

Traumatic Brain Injury is a dreadful human ailment that often results in irreversible disability. We numerically model the brain dynamics of various traumatic scenarios such as car accidents, head collisions during football games, and repetitive blows to the head of a boxer. Our computational model is based on a generalization of the Navier-Stokes PDEs that includes an additional nonlinear term to describe the propagation of shear waves in the brain matter, which lead to a straining of neurons. We introduce a modification of the strain matrix that allows us to evaluate the severity of neuronal strain and, consequently, the potential localization of brain damage. We also develop a new universal 'external' Brain Injury Criterion (BIC) that is based on the analysis of the temporal evolution of the spatial distribution of energy in the moving skull. Our new criterion unifies two existing criteria that have been developed independently for traumatic head translations and rotations, which use the head acceleration and velocity/acceleration, respectively, as injury predictors. The results of our numerical simulations as well as the BIC predictions can help in developing better protective measures in cars, sport helmets, etc. (Received February 13, 2013)