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Funded by: NSF-REU Biosystems Modeling

A functional computer modeling framework for post-traumatic stress disorder

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Post-traumatic stress disorder (PTSD) is a unique psychiatric condition in which the patient experiences diverse and intrusive psychological symptoms as a direct result of experiencing a traumatic event. As yet, no cure is available for PTSD, though some symptoms are treatable. A detailed, biologically realistic model of the specific neurological areas involved in generating the symptoms of PTSD would be useful in medical efforts to cure the condition. This model will aid in understanding of the mechanisms involved in producing the symptoms of PTSD as well as helping to identify crucial gaps in our knowledge of the brain systems involved in PTSD, thus providing goals for future research. The goal of this project was to identify the specific brain regions and circuits that would need to be included in a computer model for PTSD, and to begin creating this model. Modeling was begun using the GENESIS software package, which allows modeling of intracellular reactions, cellular potentials, signal transmission, and intercellular synaptic transmission. Thus large brain systems can be modeled in extreme detail. A multi-level framework for future GENESIS modeling was developed by generating a skeleton model that includes basic neurons and brain structures. This model can incorporate more detailed information at all levels from genetic and proteomic to intercellular and circuitry-related as this information becomes available.