

## **Gradient symbol processing in speech production**

Matthew Goldrick  
Northwestern University

Symbolic theories such as generative grammars explain the highly structured, systematic, and productive nature of phonological knowledge by appealing to discrete, combinatorial mental representations. However, a large body of work has argued that such theories have difficulty capturing gradient aspects of cognition. How can we capture such phenomena while still capitalizing on the advantages of symbolic theory? I'll sketch a novel theoretical framework, Gradient Symbol Processing (GSP), that characterizes how symbolic knowledge processing emerges from the parallel, distributed microstructure of cognition. Like other symbolic theories, GSP captures knowledge of gradient patterns through stochastic processing. The novel aspect of GSP is that it allows symbolic representations themselves to have both combinatorial and gradient structure. I'll illustrate the application of this framework to categorical and gradient data from speech production.

Joint work with  
Paul Smolensky  
Donald Mathis

Supported by the National Science Foundation (BCS-0846147)