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Proceedings of the Annual Meeting of the Cognitive Science Society

Title
Grammar in Phonological Cognition: A Symposium in Honor of Paul Smolensky, Recipient of the Fifth David E. Rumelhart Prize/Phonological Contrast in Learning

Permalink
https://escholarship.org/uc/item/3wn879kr

Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 27(27)

ISSN
1069-7977

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Publication Date
2005

Peer reviewed

Grammar in Phonological Cognition:
A Symposium in Honor of Paul Smolensky, Recipient of the Fifth David E. Rumelhart Prize

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This symposium will feature four of Smolensky's students, representing the next generation of researchers addressing phonology from various cognitive science perspectives. The focus is on the role of grammar in linguistic cognition. Spanning the spectrum encompassed by Smolensky's research from low-level processing to abstract symbolic computation, the speakers address the emergence of discrete categories from continuous dynamical variables (Gafos), the interaction between articulatory coordination and higher-level units such as syllable positions in a phonological grammar (Davidson), the nature of inductive biases as revealed in learning of novel sound patterns (Wilson), and the role of sound changes in learning the covert sound structure of lexical items (Tesar).

Nonlinear links between continuity and discreteness: transparency in vowel harmony

Adamantios Gafos & Stefan Benus
Linguistics Department, New York University

A fundamental problem in spoken language is the duality between the continuous aspects of performance and the discrete aspects of phonological competence. We study a specific instance of this problem in Hungarian vowel harmony. We present a model where continuous phonetic distinctions uncovered by our experiments are linked to discrete phonological form using the mathematics of nonlinear dynamics.

Phonotactics and gestural coordination in phonological grammar

Lisa Davidson
Linguistics Department, New York University

Research in Articulatory Phonology, which takes dynamical articulatory gestures as the basic units of phonological representation, has demonstrated that the temporal coordination of these gestures is sensitive to syllable structure (e.g. Browman and Goldstein 1995, Byrd 1996, Kochetov to appear). While these studies have determined the coordination relationships that exist between articulatory gestures within the same syllable, they do not discuss how syllabic affiliations are determined nor how languages impose restrictions on syllable formation. A gestural theory of syllable structure (Gafos 2002) requires a mechanism for determining when multiple gestures can be combined into syllabic constituents like onsets or codas. This talk focuses on how the organization of gestures into syllables interacts with phonotactic restrictions, or constraints on how sounds may be sequenced in a language. Two types of data pertaining to phonotactics are investigated: (1) experimental evidence demonstrating that English speakers manipulate gestural coordination in surprising ways when faced with non-native (phonotactically illegal) sequences, and (2) the positional distribution of consonant clusters in English. The analysis of this data illustrate that the tools of Optimality Theory, such as alignment and local conjunction (McCarthy and Prince 1993, Smolensky 1997), contribute to a comprehensive account of gestural coordination in a phonological grammar.

Locality and similarity in phonological learning

Colin Wilson
Linguistics Department, UCLA

A long-standing issue is the nature and strength of the preferences, or inductive biases, that guide the learning of sound patterns. Experiments on the learning of artificial grammars containing novel patterns reveal biases in favor of local conditioning and alternation between perceptually similar sounds. Constraint-based models incorporating these factors provide a more principled account of the human data than general learning algorithms that lack such biases.

Phonological Contrast in Learning

Bruce Tesar
Linguistics Department, Rutgers University

The interdependence of mappings and phonological underlying forms creates a large and complex search space for the phonological learner. This talk will argue that the learner can significantly constrain their search within that space by attending to contrasts in the surface realizations of morphemes. By looking at pairs of morphemes that surface differently in the same environment, the learner can determine things about the underlying form of each of the morphemes that cannot be determined by considering either morpheme by itself. By considering only such pairs at a time, the number of underlying forms that must be simultaneously considered is restricted, so that the learner can test different possible underlying forms for a few morphemes, avoiding the prospect of simultaneously varying the underlying forms for all of the morphemes attested in the data.