

Morphological Typology and Linguistic Cognition

Workshop at the 2017 Linguistic Institute

(Lexington, Kentucky, USA)

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Organizing Committee

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This NSF-funded workshop will explore the role of linguistic cognition in shaping morphological patterns within and across languages. The central question of the workshop is whether the cognitive processing of language creates a persistent influence on the typological distributions of morphological structures in the world's languages. This workshop will explore the hypothesis that morphological structures interact dynamically with lexical processing and storage, with the parameters of morphological typology being partly dependent on the cognitive pathways for processing, storage, and generalization of word structure, and vice versa. We are interested in the nature of this interaction, and seek to determine how far it will take us towards explaining system-level principles of morphological organization and their cross-linguistic distribution. By bringing together different types of linguists – experimentalists, typologists, computational modelers, formalists – we hope to shape a research agenda and push forward progress in this area. The workshop will take place during the Linguistic Society of America's 2017 Linguistic Summer Institute at the University of Kentucky.

In recent years there has been increasing attention to the ways in which morphological structure is closely tied to the cognitive processing of word structure and lexical representation. For instance, it has long been known that morphological structures differ widely in productivity. However, attempts to explain productivity differences in terms of the structural (i.e., phonological, morphological, semantic) selectional restrictions that bases and affixes impose on each other have produced only limited success. For example, there are suffixes that have a broad domain of application and are productive, like English *-ness* (e.g., *happiness*, *helpfulness*). However, there are also suffixes like diminutive *-let* (e.g. *piglet*, *booklet*) that have a broad domain of application but nonetheless have limited productivity. In principle, *-let* could apply to any monosyllabic concrete noun, but in practice, it is rarely used to coin new words. There is thus no direct, consistent relationship between degree of structural restriction and productivity.

There is now strong evidence that the weak relationship between structural restrictions and productivity reflects the fact that the cognitive processing of word structure mediates the relationship. Study of token blocking effects (whereby, for instance, lexical storage of *thief* blocks productive coining of *stealer*, and *secrecy* probabilistically blocks *secretness* (Aronoff 1976; Bauer 2001)) led to the broader idea that the key to explaining morphological productivity, and differences therein, lies in understanding how cognitive processing mechanisms promote or inhibit the generalizability of word-internal structure. Hay and Baayen (2002: 226) focus on affix parsability. They argue that “The larger the number of tokens that is parsed [into morphological constituents during lexical access – A.S.], the more activated and robust the representation of the affix is, and so the more available it becomes for the formation of new forms.” At the same time, despite the commonsensical logic that the more an affix is used, the more productive it must be:

... productivity cannot be construed as arising as a simple function of the number of times one has encountered an affix. On the contrary – the more often you encounter an affix, the less likely you are to decompose forms containing it, and so the less productive that affix is likely to be. (Hay and Baayen 2002: 219)

In other words, an affix's productivity is a function of how often words containing it are parsed, but the rate at which a complex word is parsed into constituents *decreases* with increasing token frequency (among other factors). Thus, frequency of use is not directly determinative of productivity. This positions morphological productivity as an emergent property that is inextricably connected to and mediated by linguistic cognition (Plag 2005; Rácz et al. 2015).

Productivity has turned out to be the wedge opening the door to evidence that morphological processing is highly sensitive to the distributional properties of the input, and that the cognitive pathways for processing word structure therefore may vary within a given language (Bertram et al. 2000a; Bertram et al. 2000b; Laudanna and Burani 1995). In turn, this has led to questions about whether there are cross-linguistic differences in how word structure is processed. After all, languages differ substantially in the extent to which they utilize morphological structure. They also differ in terms of how their morphological systems are structured. If morphological processing is sensitive to the distributional properties on a language-internal basis, it follows that there might also be substantial differences in morphological processing across languages.

To take a single example of this hypothesized relationship, Frost et al. (1997) show that in Hebrew masked visual priming, prime-target pairs sharing the same three-consonant root facilitate lexical retrieval of the target, even in the absence of semantic relatedness (e.g., *klita* 'absorption' facilitates *taklit* 'a record', both of which are derived from the root *klt* yet share little if any semantic relationship). These results were confirmed using cross-modal priming techniques in Frost et al. (2000). This contrasts with results for English (e.g., Marslen-Wilson et al. 1994), where facilitation has been shown not to occur for semantically opaque prime-target pairs (e.g., *successful* does not facilitate *successor*), and Maltese, in which Semitic pairs analogous to the Hebrew words above do not show facilitation (Ussishkin et al. in progress). Importantly, Hebrew words are highly structured according to a system of morphological templates, whereas such a system only exists for the Semitic half of the Maltese lexicon, and not at all for English. With Frost et al. (1997), we interpret the Hebrew morphological priming results as suggesting that the greater robustness of morphological structure in Hebrew results in a more central role for morphological structure in lexical access, compared to languages like English.

Convergently, Plaut and Gonnerman (2000) found using computational simulation that in a morphologically rich artificial language (analogous to Hebrew), morphologically related but semantically opaque derived words were primed by their bases, whereas in a morphologically poor artificial language (analogous to English), no priming was found in this condition, although priming was found in more transparent items. They conclude that the morphologically rich language exhibited priming in the absence of semantic similarity "... because the organization of the internal representations in the network are dominated by the pervasive morphological structure of the language to such an extent that even opaque items participate in it. By contrast, in the impoverished language, the same items are free to behave idiosyncratically..." (479). Taken together, the behavioral and computational data demonstrate one way in which cross-linguistic differences in morphological structure may operate to shape morphological processing.

At the same time, substantially less attention has been given to the inverse question: whether processing contributes a persistent bias to the morphological typological patterns of the world's languages. This is the issue that is at the core of the proposed workshop. Despite a range of interesting individual papers (some of which are cited below in the list of possible workshop topics), this has remained an underexplored area, lacking a cohesive research agenda defined by shared questions and goals.

A hypothesis that flows naturally from previous work, and that this workshop will explore due to it having received little direct attention, is that morphological structures interact dynamically with lexical processing and storage, with the parameters of morphological typology being partly dependent on the cognitive pathways for processing, storage, and generalization of word structure, and vice versa. For instance, derivational suffix ordering is primarily scopal in both English and Russian, but English also shows template-like effects in the sense that if suffix combination A-B exists, B-A does not (Plag and Baayen 2009). By contrast, suffix ordering is somewhat

freer in Russian, e.g., *žal-ost-liv-yj* ‘compassionate’ and *spraved-liv-ost* ‘justice’. Templatic versus scopal affix ordering (in inflection) is a typological dimension – for example, templatic ordering takes precedence over scope in Pulaar (Atlantic family, Paster 2005), but the opposite is true in Athapaskan (Rice 2000). Sims and Parker (2015) show that relatively more free derivational suffix ordering in Russian correlates to a greater likelihood for derived words to be processed compositionally, as evidenced by the distributional properties of Russian and English words, such as category-conditioned productivity (higher on average in Russian) and the growth rate of unique derived words as a function of corpus size (faster growth in Russian). This suggests that the relative freeness of Russian derivational suffix ordering derives in part from processing biases, and that in turn, the resulting language-specific distributional differences feed back into the processing system, reinforcing some cognitive pathways over others.

This raises the question of whether and how typologically stable combinations of properties develop, and the role of cognitive processing biases in their development and maintenance. And of course, the opposite side of the same coin concerns the forces that mitigate the likelihood of typologically unusual combinations of features. To take a well-known issue in morphological typology, agglutinative languages are often defined jointly by having highly segmentable morphemes and invariant morpheme shape (Comrie 1989). Languages with high morpheme segmentability rarely exhibit much allomorphy beyond what is dictated by automatic phonology. In other words, they lack inflection classes. At the same time, these two properties are logically distinct issues. It is therefore notable that the cross-linguistic association between high morpheme segmentability and little inflection class structure (and conversely, between being fusional and having robust inflection class structure) is so strong. Comrie suggests a functional explanation for observed cross-linguistic patterns:

... a language which represented the ideal fusional type would have all of its morphology in terms of suppletion; if it also had an ideally high index of synthesis [i.e., many morphemes per word -- A.S.], then each sentence would simply be totally and unsegmentably distinct... (Comrie 1989: 45)

However, this still does not specify the elements that produce such a functional bias, nor does it detail how they operate and interact. We are interested in this nitty-gritty detail. Ultimately, we expect a dynamic interaction between cognitive and structural factors to be crucial to explaining system-level principles of morphological organization, and their cross-linguistic distribution. In this workshop we seek to determine how far this idea will take us.

This hypothesis reflects a ‘complex systems’ perspective that focuses on the interaction between elements in a system, how they give rise to the collective behaviors of the system, and how the system interacts with its environment. In complex systems, the properties of a system as a whole are not necessarily directly determined by the properties of its individual elements; rather, the ways that the elements interact are themselves of central importance. This entails the need for a systemic perspective. The proposed workshop starts from the fundamental premise that typological variation is profitably investigated in terms of system-level interactions between elements in individual languages, with the mechanisms of linguistic cognition forming a crucial environment for those interactions. The patterns of co-occurrence that define morphological typology depend on the distributional properties of elements within a specific language, but they play out in the context of a universally shared cognitive system.

A system-level approach has deep roots in the field of morphology, but approaching morphological typology from a complex systems perspective offers new ways to think about system interactions, including between linguistic cognition and the patterns of morphological expression found in the world’s languages. It also offers new tools for that investigation, drawn primarily from information theory.

As both behavioral experimental and corpus/computational methods have become more accessible and mainstream in linguistics, and neurolinguistic imaging techniques have been developed and applied to language research, it has become possible to explore in greater detail the relationship between how words are cognitively

processed, and how morphological systems evolve over time. By bringing together linguists who are working on morphological questions from different perspectives – experimentalists, typologists, computational modelers, formalists – we hope to shape and push forward an agenda that connects cross-linguistic tendencies in morphological structuring to cognitive processing and lexical organization.

We find the following issues to be of particular importance for investigation. They form the overarching questions for the workshop:

1. What are the cognitive pathways that lead to cross-linguistic morphological tendencies, and how do they create persistent biases over time towards certain language structures and not others?
 - a. What are the conditions under which cognitive organization and processing lead to morphological generalization (vs. morpholexicalization)? Are certain configurations more stable for morphological generalization than others, and if so, (how) does this lead over time to observable typological patterns?
 - b. How stable are typologically unusual combinations of properties, and what factors promote their development/maintenance/loss?
 - c. To what extent do such biases influence morphological decomposition and what factors might support or inhibit such biases?
2. How do system-level principles of morphological organization (e.g., the tendency of highly agglutinative languages, but not fusional ones, to have little or no inflection class structure) emerge from interactions between the cognitive processing of language, the representational structure of the lexicon, patterns of language use, social factors, universal principles of grammar, and other factors? Are cognitive processing and system-level principles of morphological organization co-adaptive?
3. Are there cross-linguistic differences in the existence of uniquely morphological principles of organization and/or the modularity of language architecture? How does psycholinguistic/neurolinguistic/corpus evidence inform this question?
4. What is the role of language-specific distributional properties in influencing the perception and processing of speech with respect to morphological structure?

We imagine papers on any number of specific phenomena that bear on these questions, including but certainly not limited to:

1. Learnability and how that influences morphological systems over time (Goldsmith and O'Brien 2006; Hare and Elman 1995; Daland et al. 2007; Sims 2015)
2. 'Template-emergent' vs. 'scope-emergent' affix ordering as a typological dimension (Caballero 2010; Sims and Parker 2015)
3. Suffixing preference, i.e., the predominance of suffixation over prefixation in the world's languages (Bauer 2003; Bybee et al. 1991; Cutler et al. 1985; Fortescue and MacKenzie 2004; Hawkins 1988; St. Clair et al. 2009)
4. Concatenation preference, i.e., the predominance of concatenative morphology over non-concatenative in the world's languages (Ussishkin 2006)
5. Morphological productivity, competition between forms, and their relationship to morphological processing and lexical organization (Bauer 2001; Hay and Baayen 2002; Lindsay and Aronoff 2013; Plag and Baayen 2009)
6. Linguistic perception and its relationship to tendencies in morphological marking (Caballero and Kapatsinski 2014)
7. Empirical metrics of morphological complexity, especially in inflectional systems (Ackerman and Malouf 2013; papers in Baerman et al. 2015; Bane 2008; Bonami et al. 2011; Sims 2015a; Stump and Finkel 2013)

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