une conférence organisée par
Le Réseau International de Biolinguistique

UQAM
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sur la complexité des langues humaines

Description

Les langues humaines sont des systèmes complexes, tant en ce qui a trait à la nature des éléments linguistiques que par les propriétés des opérations qui les composent de manière récursive.

Comment caractériser cette complexité, comment la localiser et comment est-elle traitée par les systèmes computationnels humains ou par les machines?

Programme

9:00-9:30	ACCUEIL
9:30-10:15	Anna Maria Di Sciullo UQAM Complexité dérivationnelle
10:15-11:00	Tobias Scheer Université de Nice-Sophia Antipolis, Laboratoire CNRS Syntaxe sans mélodie
11:00-11:15	PAUSE
11:15-12:00	Harry van der Hulst University of Connecticut La phonologie des langues signées est-elle moins complexe que la phonologie des langues orales (si oui pourquoi?)
12:00	DÎNER
13:30-14:15	John Lumsden UQAM Complexité dans la mémoire procédurale : une analyse unifiée des six déclinaisons des catégories nominales en ancien anglais
14:15-14:30	PAUSE
14:30-15:15	John Goldsmith University of Chicago Apprentissage non supervisé de la morphologie
15:15-15:45	TABLE RONDE

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Résumés des communications

Morphological Complexity

Anna Maria Di Sciullo
UQAM

Morphological complexity has been discussed in several works starting from the sixties (Bar-Hillel & Shamir 1960, Langendoen 1981, Carden 1983, Culy, 1985, a.o) as well as more recently (Moscoso del Prado Martin, Kostic & Baayen 2004, Bane 2008, Milin, Kuperman, Kostic & Baayen 2009, a.o.). I isolate two perspectives on morphological complexity: the statistical information theoretic approach, which I referred to as E-complexity; and an approach that relates morphological complexity to the length of a form's derivation (Kolmogorov 1965, Chaitin 1987, Fodor, Bever & Garrett 1974). I term this latter view I-complexity. I argue that languages differing in E-complexity, such as French and English (Bane 2008) do not differ in derivational I-complexity. I review experimental works relating morphological I-complexity and processing.

Morphological I-complexity is a function of the recursive application of the operations of Language Faculty. These operations derive hierarchical structures, which may include zero-morphology. I discuss the results of psycholinguistic experiments indicating that the mind/brain processes differences in hierarchical relations, which may not be associated with overt morphological material. If hierarchical representations are legible at the Conceptual interface but not at the Sensorimotor interface, it is natural to assume that I-complexity is processed at the interface between the language faculty and the Conceptual interface. I-complexity is not occurrence-dependent and it cannot be measured on the basis of externalized data. E-complexity however, is a function of the density of externalized data, or string sets, and it is natural to assume that it is processed at the interface between the language faculty the Sensorimotor and the sub-system of the brain deserving mathematical reasoning. The relation between I-complexity and E-complexity can then be seen as a relation between the computational procedure of the Language Faculty, conceptualization vs. externalization, and the general reasoning system.

Melody-free syntax

Tobias Scheer
Université de Nice-Sophia Antipolis, Laboratoire CNRS

Zwicky & Pullum's (1986) claim that syntax is never impacted by any phonological property (phonology-free syntax) has been challenged empirically based on a large range of data, showing that intonation, stress, tree-geometric properties of the prosodic constituency, the size of lexical items (minimal word constraints), rhythm and tone may be a factor in syntactic computation. I show that all cases on record involve phonological properties that are located above the skeleton, and conclude that the correct generalization is *melody*-free syntax: items located below the skeleton, i.e. melodic primes (depending on the theory, binary or monovalent features, unary items such as GP-Elements), are invisible in syntax.

It is shown in a further step that the same is also true in the opposite direction: (morpho-)syntax can influence phonology only at and above the skeleton. There are no cases on record where the carrier

of morpho-syntactic information in phonology would be, say, a feature [+labial]. All interface theories, structuralist and generative alike, implement this insight, if tacitly: carriers of morpho-syntactic information are held to be juncture phonemes, SPE-type diacritics (# and +) and more recently prosodic constituency – all are inserted at or above the skeleton.
The examination of other phenomena reveals the same watershed line: morphology (phonologically conditioned infixation and allomorphy), category-sensitive phonology and (phonological) absolute agrammaticality are also melody-free. On the other hand, melody is also unable to impact categories above the skeleton: cases where the computation of stress, tone or syllable structure reacts on the presence of absence of, say, labiality, are unheard of.
This straightforwardly leads to the conclusion that sonority is *not* a melodic prime: it *is* a factor in the computation of stress, tone and syllable structure. The non-melodic character of sonority was established independently (de Lacy, 2002, and Gordon, 2006:52). The question, then, is what kind of animal sonority is if it is not a melodic prime, i.e. of the type [±son]. Systems based on unary primes offer an alternative: sonority is complexity: the more primes contribute to the segmental makeup, the more sonorous the segment. This (rather old) perspective on sonority is introduced in further detail, and it is argued that complexity-defined sonority also offers a way to make the melody → syllable transition cross-modal, and hence to preserve its universality. Sonority is a property of sound, absent from the other natural way of externalizing grammar, i.e. sign language. While only sound is more or less sonorous, all primes, whatever they be in kind, are more or less complex.
Finally, the overall landscape is given an interpretation in a modular perspective. The result is that phonology is made of two distinct computational systems, one taking melodic primes as an input and returning melodic primes in a different arrangement (e.g. a palatalization), another taking the linear order of segments and sonority as an input and computing syllable structure.

Is sign language phonology less complex than spoken language phonology? (and if so, why?)

Harry van der Hulst
University of Connecticut

In this talk I will compare structure and processes in the phonologies of signed and spoken languages. In the early phases of sign linguistics, emphasis was placed on the fact that sign languages have all the relevant properties that spoken languages have and should therefore be recognized as natural human languages. This finding is no longer in dispute. Earlier studies often aimed at stressing the equivalence by showing how theoretical concepts that had been developed on the basis of spoken languages could be fruitfully applied to sign languages. In the domain of phonology this resulted in claims about 'syllable structure' in sign languages and suggested analogies between 'feature systems' and notions such as 'sonority' in both modalities. My talk starts with a critical examination of such analogies. I will show that the 'logic' of phonological analysis leads to establishing important differences between phonological structure in both modalities. The equivalence, I will conclude, lies not in the actual structures, but in the cognitive/linguistic principles that determine structure. I will show that the complexity of structure in sign languages regard the inventory of 'segments' (units that are analogies to spoken language phonemes), whereas what might be called syllable structure is very simple. I then turn to the notion of 'phonological rule' and discuss the fact that both language modalities differ significantly in the complexity of phonological processing, which I will attribute to factors that lie outside the language faculty per se.

Complexité dans la mémoire procédurale : Six déclinaisons du vieil anglais

John Lumsden
UQAM

Le système de la langue humaine forme un ensemble de sous-systèmes enchâssés dans la cognition générale. Ainsi, la complexité des langues est en rapport avec la complexité de ce système général. La présente discussion de la flexion nominale en vieil anglais traite des conséquences de l'hypothèse voulant que la flexion des langues humaines fasse partie de la mémoire procédurale (cf., Paradis et Gopnik (1997), Ullman (2001), Paradis (2004, 2009)). Ce système procédural doit fonctionner de façon automatique, c'est à dire sans faire appel aux principes déclaratifs, par exemple, le principe de Panini (cf., Halle et Marantz 1993, Anderson 1992, etc.). Sous cette optique, la flexion serait articulée dans un seul système, et non pas répartie dans une panoplie de déclinaisons et conjugaisons autonomes. Enfin, chaque élément primitif requiert sa représentation unique dans le système. Toute combinaison possible de tels éléments serait inscrite dans la structure du réseau cognitif.

Unsupervised learning of morphology

John Goldsmith
University of Chicago

Learning the morphology of a language involves extracting a large amount of information from the data that is given to the learner, even if the learner knows where the boundaries are between the words. The learner must decide how many morphemes there are in each word, and where the boundaries are between the morphemes; what phonological rules are operative at morpheme boundary; and what sets of affixes may be attached to what sets of stems. All of these are difficult challenges for a learner, and typically linguists who are concerned with the acquisition of syntax assume that the discovery of morphemes (and allomorphy) has already been carried out. In this talk, I will discuss the successes (and failures) of an algorithm for learning morphology which employs Minimum Description Length analysis. Illustrations from English and French will be given. The principal conclusion that we draw from this is that a quantitative analysis of grammar complexity is essential for grammar induction.