University of Arizona
Fall semester 2021

<u>Biolinguistics</u>

LING/PSYCH/PHIL 449A/549A

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This is a Graduate/Senior Undergraduate Course, with registered students. It has a dedicated D2L website. External auditors are welcome to attend and welcome to ask questions live in the Q&A part of each lecture.

All lectures are on Wednesdays 10am to 12:30pm Tucson time, via Zoom

Zoom link for all the lectures: https://arizona.zoom.us/j/89273501160

Calendar
Wednesday August 25:
Massimo and Tom: General introduction and preparation for Chomsky's lectures.

Three lectures by Noam Chomsky:
<u>General Title</u>: *The Human Capacity: What might we come to understand?*
Wednesday September 1st Lecture I: *The Challenge.*
Wednesday September 8 Lecture II: *Foundations.*
Wednesday September 15 Lecture III: *The Enabling Function of SMT.*

Abstract:
Paleoanthropologist Alexander Marschak "coined the term *the human capacity* to denote [the] elusive quality that makes humans so distinctive" (Ian Tattersall). When we inquire into this elusive quality, we find two striking properties: language and thought – at least *thought* in any way we can grasp and can study. A plausible conclusion then is that they are identical: Language is a system for generating thought, and thought is what is generated by language. That is the answer that resonates through intellectual history until the 20th century, and has been resurrected in the "generative enterprise" and independently in the study of human evolution. Understanding the human capacity rests on genuine explanations of the crucial properties of this generative system, explanations that satisfy the conditions of evolvability and learnability. Optimal results would satisfy the Strong Minimalist Thesis (SMT), a goal by now partially achieved in ways that also begin to account for why language is structured and organized as it is (the "enabling function"). Among the huge areas unexplored in these efforts are some that were central to classical concerns and may be beyond the reach of inquiry.

Wednesday September 22nd

Angela D. Friederici (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany)

Title: *Syntax in the human brain.*

Abstract: Language is a uniquely human trait. The different aspects of the language system, namely phonology, semantics and syntax have long been discussed with respect to their brain basis as well as their species-specificity. Here I argue that syntax as the ability to process hierarchical structures is specific to humans, and that this ability is supported by an identifiable fronto-temporal neural network involving the posterior part of Broca's area which is connected to the posterior temporal cortex via a particular white matter pathway. This pathway is weak in non-human primates. In humans, it matures slowly after birth and is tightly linked to the development of syntactic abilities. This pathway is largely independent from the modality of the language input, be it auditory or signed, but it is modulated by the processing demands of a given language. These results lead to a brain-based model of language that can account for a universal language system as well as processing differences across languages.

Wednesday, September 29

Luigi Rizzi (Collège de France and University of Siena)

Title *Cartographic structures and the growth of trees in language development.*

Abstract: Cartographic research over the last quarter of a century highlighted the complexity of syntactic representations. The empirical discoveries of cartographic research raise the issue of acquisition: how are the fine details of syntactic structures acquired by the child? Do the highly articulated structural maps arrived at in this line of research offer any guidance to the study of language development?

In work conducted jointly with Adriana Belletti (University of Siena) and Naama Friedmann (Tel Aviv University) we have started addressing this broad question. As an initial case study, we have looked at the developmental course of the acquisition of the left periphery of the clause in Hebrew, by capitalizing on 1. A map of the left periphery in this language, also based on the existing literature (Shlonsky 2013), and 2. A cross-sectional corpus study

conducted by Friedmann & Reznik (2017), on individual recording of 56 children ranging from age 1.6 to age 6.1, which we have extended in various ways. The systematic use of Guttman scales (Guttman 1944) makes it possible to capture implicational patterns in development abstracting away from major individual differences in developmental speed.

The key hypothesis we made to connect cartography and development is very simple: children acquire complex structures bottom up, first acquiring lower zones of the tree, and then progressively adding more external zones. The structural succession of layers in the map reflects the temporal trajectory of development, in that no internal zone is skipped in the growth of the mental tree. This idea connects to old approaches to structural growth from simpler to more complex structures (e.g., Radford 1990, Clahsen 1990/1, Rizzi 1993/4), but innovates in taking full advantage of the details of cartographic maps.

This line of analysis leads to the identification of three stages in the acquisition of the left periphery (LP) in Hebrew:

1. A stage in which no manifestation of the LP is observed;
2. A stage with argument and adjunct wh-questions (but not with *why*) and adverb preposing is found, but with no other manifestations of LP constructions:
3. A stage in which the other major LP constructions are found: relatives, *why* questions, topicalization, and clausal embedding.

These temporal stages match the structural zones that constitute the LP tree. These findings confirm the bottom-up acquisition mode, and raise important theoretical and empirical issues which will be addressed in the talk.

Wednesday, October 6
Paul Pietroski (Distinguished Professor, Rutgers University and Distinguished University Professor Emeritus, University of Maryland)
Title: *The Extension Dogma.*
Abstract: In studies of meaning, linguists and philosophers have often followed Donald Davidson and David Lewis in assuming that whatever meanings are--if there are any--they determine extensions, at least relative to contexts. After reviewing some reasons for rejecting this assumption, which is especially unfriendly to mentalistic conceptions of meaning, I'll suggest that this assumption became prevalent for bad reasons. As time permits, I'll conclude by reviewing some experiments which suggest that even if we focus on quantificational determiners, mentalistic conceptions of meaning are motivated and The Extension Dogma should be abandoned.

Wednesday, October 13
Norbert Hornstein (Professor Emeritus, Linguistics, University of Maryland)
Title: *A quick whig history of Generative Grammar and the questions that drove it.*
Abstract: The Generative program initiated by Chomsky in the mid 50s has been, IMO, wildly successful. That is not always the accepted view however. In this lecture I aim to outline the logic of the program over and how it has unfolded over the last 60 years or so. Appreciating this logic allows one to more reasonably judge how far it has come in its own terms and to evaluate the success/failure of the Generative project.

The lecture will circle around three questions. First, what is the actual object of linguistic study? The short answer is that the object of study is the faculty of language (FL), not language or languages. Second, how to study FL? The short answer is that there have been three questions guiding the program that I will outline and we will discuss. Third, what are the current questions driving research and how do they relate to the third leg of this inquiry that flies under the banner of the Minimalist Program?

Wednesday, October 20
Heidi Harley (Department of Linguistics, University of Arizona)
<u>Title</u>: *Late Insertion: Theoretically explanatory and psychologically real*.
<u>Abstract</u>: When planning a speech act, a speaker logically proceeds from an idea to an articulation. Based on patterns of production errors, Garret (1976) and Levelt (1989) proposed a model for speech production that follows stages of mapping from semantic representation through grammatical encoding to phonological encoding as the last step. A decade later, for completely independent reasons, theoretical linguists proposed a similar model of grammatical competence, according to which phonological form is inserted 'late', to realize an abstract grammatical representation syntactically constructed to represent the logical structure of the thought being expressed. I will go over this proposal, articulating the grammatical explananda that motivate it, and then discuss Pfau (2000, 2008), in which it is shown that errors of speech production receive a rich treatment if the psychological model incorporates many of the theoretical mechanisms proposed to account for grammatical patterns in general.

Wednesday, October 27
Massimo Piattelli-Palmarini (Department of Linguistics, Department of Psychology and Cognitive Science Program, University of Arizona)
<u>Title</u>: *Normal language in abnormal brains.*
<u>Abstract</u>: There is little doubt that, in the adult, specific brain lesions cause specific language deficits. Yet, brain localizations of linguistic functions are made problematic by several reported cases of normal language in spite of major brain anomalies, mostly, but not exclusively, occurring early in life. The signal cases are hydrocephaly, spina bifida and hemispherectomy. Many patients have normal syntax and lexicon, but suffer from grave problems in the use of language (they are linguistically dyspraxic), showing that the interface is affected. These cases are discussed and possible solutions are suggested: namely a vast redundancy of neurons and/or the role of microtubules as neuron-internal processors and key factors in signaling and guiding the growth and reconfiguration of the brain.

Wednesday, November 3rd
David Poeppel (Ernst Struengmann Institute for Neuroscience & New York University)
<u>Title</u>: *Brain rhythms and the encoding of linguistic structure.*
<u>Abstract</u>: How language is represented and computed in the human brain is a fundamental area of brain research that continues to stimulate as much research as it does vigorous debate. Some classical questions (and persistent puzzles) - highlighting the tension between neuroscience research and language research - concern the role of structure and abstraction. Recent findings from human neuroscience, across various techniques (e.g. fMRI, MEG, ECoG), suggest that the brain supports hierarchically structured abstract

representations. New data on the role of brain rhythms show that such neural activity appears to underpin the 'tracking' of structure-building operations. If the new approaches are broadly plausible, they invite closer relations between fields and better linking hypotheses between the foundational questions that animate both the neurosciences and the language sciences. We are using techniques with adequate spatial resolution and temporal resolution to understand various linguistic subroutines. But unless we have the appropriate 'conceptual resolution,' the relation between neuroscience and language is likely to remain distant, and the proposals more metaphoric than mechanistic - and some of the deeper questions will remain opaque.

Wednesday November 10
Sandiway Fong (Department of Linguistics and Department of Computer Science, University of Arizona)
Title: *Towards computational efficiency in the Minimalist Program*

Abstract: The device we call the brain is a marvelous organ, endowing us with the capacity for symbolic thought, language and reasoning far beyond what other animals have exhibited. However, this marvel may not be the computational powerhouse that we might assume. There is evidence that the brain does not maximize sensory capacity, which suggests the computational brain is the weak link (or bottleneck) in the chain from external stimulus to thought (and response). In case after case, the brain does not make use of the full resolution of available sensory inputs. Perhaps the answer is that it cannot, as a slow organic system, it does not possess the necessary bandwidth, and therefore, it must (selectively) throw away much of the signal. The idea that this pressure for efficiency also pertains to both data and computation in language, born out of biological limitations, was termed *The Third Factor* by Chomsky (2006). Recently, in the Minimalist Program (Chomsky 2019 & *forthcoming*), Chomsky has laid out (seemingly conflicting) conditions that a theory of language must meet in order to qualify as a genuine explanation. A theory must only make use of mechanisms simple enough to have plausibly evolved, yet rich enough that the burden on the language learner is not impractical given primary linguistic data. Binary Merge (BM), applied recursively, is the simplest operation possible to obtain a discrete infinity of hierarchical structures. Therefore, in terms of evolutionary plausibility, BM represents the optimal solution. In terms of biological computation, BM will also be optimal provided it minimally burdens available resources, i.e. with respect to working memory size and combinatorial options. We discuss three examples of plausible third factor restrictions to BM.

Wednesday, November 17
David Medeiros (Department of Linguistics, University of Arizona)
Title: *"Calculating with categories": an architecture for language echoing Lenneberg's insights.*

Abstract: Eric Lenneberg's classic *Biological Foundations of Language* was a monumental achievement, laying the groundwork for the modern study of biolinguistics. In this talk, I describe a novel architecture for syntax that differs from standard approaches, hewing more closely to Lenneberg's prescient vision. Considerable evidence supports the existence of sharp word order universals, forbidding some word order patterns across languages. Ingenious experiments with artificial grammars demonstrate that these restrictions are not mere

accidents of history. Such experiments also teach us that whatever cognitive factors underlie the typology of possible and impossible orders across languages remain "active" in the adult mind, independent of the more narrow principles describing acquired adult languages.

In the theory I present, the universal grammatical automatism is a kind of "supergrammar"; the set of acceptable sentences in a given language forms a proper subset of the set of structures it can parse. This may seem to trivialize the notion of grammar, but the interesting consequence is that a number of previously-unrelated word order restrictions and locality constraints immediately follow, in exquisite empirical detail, as necessary consequences of the basic mechanism of the supergrammar.

In this, we find a sharp contrast with the standard Merge-based theory. Merge is thought to apply in two cases, External Merge (building the underlying structure) and Internal Merge (in effect, displacement leaving a copy). The problem that immediately arises is how to constrain Internal Merge, which without additonal machinery can generate all possible orders. Worse still, some well-known syntactic phenomena defy description with Merge, and must be banished to morphology (notably, head movement and Affix Hopping).

This point highlights a crucial advantage of the present framework: the limits on displacement are baked into the architecture, rather than requiring external constraints. Even better, effects like head movement and Affix Hopping are readily explained by the same mechanism. All this confirms Lenneberg's *"[...] assumption of a unique, single "machine" that runs its own course like an automaton and can operate in just one essential way"* (Lenneberg 1967: 221)

Wednesday November 24
No lecture, due to immediate proximity to Thanksgiving

Wednesday December 1st
Thomas G. Bever (Regents Professor of Linguistics and Psychology, University of Arizona)
Title: *On Turning Language Inside Out.*
Abstract: Modern Psycholinguistics emerged from behaviorist/associationist background with lingering emphasis on exploring how "obviously" salient and prior surface serial phenomena "actually" reflect deeper structural organization – the task at hand was to demonstrate the so called "psychological reality of deep structure/derivations": this enterprise took the reality of serial surface representations for granted.
I will re-visit, known and little known phenomena, speculating that they show the converse: that many apparent serial surface structures in language are evanescent or even illusory, as fleeting expressions of externalization systems: they function as a tool for the verification of otherwise inchoate thoughts (Cf. Noam's abstract for this course). Thus, the phenomena actually complement and support the current model on which all language is divided into three parts: 1. UG with compositional principles and constraints. 2. The lexicon and 3. Externalization mechanisms and processes.
So question today is, *what is the status of the "psychological reality"* **of surface structures**?

1.Evidence that serially organized language representations are transiently constructed/imposed "from inside out" (aka "top down"; aka "abstract to concrete"; aka "inner to outer") during normal comprehension.
A. Implications of prior click mislocation data, delayed phrase building.
- i) Leftward mislocation in general, reflects delay in composing the serial string.
- ii) Complement subject-to-object raising from overlapping simultaneous phases….the phase imperative?

B. Single syllable voice changes are misreported as occurring in the head of the phrase they occur in - sometimes leftward, sometimes rightward from its acoustic position in the serial ph(r)ase.

C. Fine details of "surface phrase structure" are assigned after delay, at least for a clause (or phase?).

D. The established temporal ordering hierarchy of accessing Empty Category antecedents, WHtrace, NPTrace, PRO, reflects different stages of reconstructing temporary serial representations.

E. In silent reading, 'the voice in the head' and in vocal reading, Goodmanian "miscues", all indicate
an active creative component that organizes erratic saccadic input into an apparent serial stream of words and phrases.

2. Is *anything* about phenomenal language actually enduring, or is episodic language experience (whether private or public) based on transient serial externalizations of internal intentions?

A.Normal conversation lacks much of the categorical acoustic representation of what we think we "hear" concommitant with 'grammatical' representations.

B. Language intentions vs acoustic reality

i) In listening, we reconstruct the speech intention of others unifying the meaning with the acoustics:

ii) New demonstrations show that reconstruction often depends on acoustic input that *follows* the phenomenologically recognized sounds and words.

iii) The domain for such bi-directional interactive processing may be the phase

iv) Yet our conscious experience is of simultaneity between auditory input and its grammatical organization.

C. [speculation #1] Is there a corresponding disconnect in language production - speakers believe
they have uttered serially and accurately what they intended to articulate, even though they generally fail in acoustic detail.

D. [speculation #2] Insofar as serial structures seem sometimes to be stable representations, is that
a function of memory that follows externalizations processes and retains otherwise transient forms?

3. "Where" is language, in the mind or brain, or….?

A. Specific neuronal connections are insufficient to account for acquisition or processing alone.

i) Language acquisition persists despite a wide range of neurological genetic differences and anomalies.

ii) Interactions between neurons and clusters are too slow to account for processing speed.

B. The critical role of natural law ("universals of the third kind") and individually varying statistical experiences diffuses assignment of a specific neurological path or location as the specific locus of UG.

C. "There must be something else" to account for prodigious speed of language learning and use,

and human memory (cf Gallistel). Quantum computers inside each neuron, riding on Microtubules, or whole brain Oscillations converging in and out of phase? Or both in concert? Or neither?

4. In addition to language, humans appear to have a unique ability to interpret most phenomena as problems to solve – to find otherwise hidden sources of apparent experiences. Is this the cognitive engine that knits together UG, individual experience, natural law with inner and outer externalization of thought?

Is there after all, a *motive* for the child to incorporate its language experience into an integrated system, neither to imitate grownups, nor to communicate publicly, but as a tool to organize, elaborate and sense its own thoughts?   Perhaps Vygotsky was on to something on the outside.

Wednesday December 8
Wrap-up, then live Question&Answer about everything we have seen in this course.