Learning, Optimization, and Language Design

Charles Yang
Department of Linguistics and Computer Science University of Pennsylvania

Human language is defined by the biologically unique system of linguistic computation but is at the same time constrained by its connection to other cognitive and perceptual systems. The Minimalist Program seeks to identify the properties of these interface systems, which may in turn contribute to the understanding of the design features of language.

While the conceptual-intentional and the articulatory-perceptual systems have received much attention in recent years, we suggest that principles of learning, which are revealed in the course of language acquisition, may provide another set of interface conditions that shape the properties of language. This work develops from the theme of the "third factor" in language design (Chomsky 2005): principles of learning and optimization that are not specific to the faculty of language.

We discuss two very different kinds of language acquisition patterns, which reflect the origin and composition of the kinds of hypothesis spaces entertained by the learner. One type of learning is characterized by the child learner's spontaneous access to non-target grammatical forms which are nevertheless biologically possible
options: the totality of variation is universal and ultimately located in the language faculty, for which parameter setting is the paradigm case. The demise of such non-target forms takes place gradually as they succumb to competition pressure from the target grammar. We suggest that this type of learning by selection, which has important consequences in language change, is closely related to probabilistic learning mechanisms widely attested in other domains and species.

The other type of acquisition pattern appears to operate within an inductively constructed, language specific, rather than universal,
hypothesis space. Some of the clearest examples include the acquisition of certain aspects of morphology, phonology, and language specific rules and constructions in syntax, which are often laden with exceptions and irregularities. Unlike gradual selectionist learning, these phenomena show the pattern of abrupt emergence of linguistic productivity. Drawing from the literature of language processing, we suggest that the general principle of efficient computation is responsible for the organization of generalizations and exceptions such that the time course of online processing is optimized.

We further suggest that these two types of learning provide a principled division between the core and the periphery of grammar.