

In the end, the stated purpose of the volume aside, it deserves reiterating that the diversity of voices in this volume serves an equally important purpose: to illustrate the impact of Daniel Dinnsen's career. It is clear upon reading this volume that Dinnsen's influence was as wide-reaching as it was profound. Whether the chapters in this volume directly build upon that work or illustrate how related fields have advanced, both serve as fitting tribute.

Hawkins, John A. 2014. *Cross-linguistic variation and efficiency*. Oxford: Oxford University Press. Pp. xiv + 271. UK £29.99 (softcover).

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The main goal of Hawkins in *Cross-linguistic Variation and Efficiency*, as in his *Efficiency and Complexity in Grammars* (2004), is to show that language usage shapes grammars. In his research program, Hawkins provides evidence from different languages to demonstrate that many typological patterns and language universals are rooted in language performance and gives evidence of the deep role performance plays in shaping grammars. He argues that performance and grammatical preferences are governed by principles of efficiency and complexity. To this end, the author reports his empirical findings regarding the cross-linguistic variation of syntactic structures (e.g., relative clauses, noun phrases). These findings stem from the integration of the study of generative linguistic rules, typological generalizations, language processing models developed in psycholinguistic studies, and experimental and empirical data collected by various linguists (Greenberg 1963, Dryer 1992, Haspelmath 1999, Comrie 1989).

The first chapter "Language variation and the Performance-Grammar Correspondence Hypothesis", introduces Hawkins' Performance-Grammar Correspondence Hypothesis, previously introduced in his other works (1994, 2004), which states that "Grammars have conventionalized syntactic structures in proportion to their degree of preference in performance, as evidenced by patterns of selection in corpora and by ease of processing in psycholinguistic experiments" (p. 3). In the rest of this book, Hawkins provides empirical evidence and corpus-based data to support this hypothesis with the goal of convincing linguists that they need to incorporate this generalization into their theories of grammatical universals.

The second chapter, "Three general efficiency principles", begins with the summary of said principles, already proposed in Hawkins (2004). The "Minimize Domains" principle predicts that the human language processor prefers the smallest possible syntactic domains in which to evaluate a given grammatical relation. The "Minimize Forms" principle puts forth that minimizing the formal complexity of each linguistic form is preferred. Finally, "Maximize Online Processing" is a preference for selecting and arranging linguistic forms so as to provide the earliest possible access to as much of the ultimate syntactic and semantic representation as possible. Hawkins then discusses the relationship between complexity and efficiency,

emphasizing that if a message is delivered rapidly and with the least processing effort then that communication is deemed effective. The last section of this chapter provides some examples of syntactic alternations from different grammatical phenomena such as extraposition, head-complement ordering, and complex inflectional markings and functional categories, which are argued to support the idea that Hawkins' efficiency principles cooperate and compete to make the grammar more efficient.

In the third chapter, "Some current issues in language processing and the performance-grammar relationship", Hawkins focuses on performance and provides a summary of some current related methodological and theoretical issues in psycholinguistics. He discusses ease of processing in relation to efficiency, emphasizing that the current literature on working memory simply says "that processing becomes harder, the more items are held and operated on simultaneously when reaching any one parsing decision" (p. 47). Hawkins also examines whether his efficiency principles are implemented from only the hearer's perspective, or could also play a role in a speaker's performance. The advantages and disadvantages of different methods of data collection used; online, acceptability, and corpus data, are also addressed. Hawkins then shows how grammatical facts could be accounted for by psycholinguistic model-building, noting that there is a correspondence between performance data and grammars. The final section of this chapter is a discussion of the incorporation of efficiency principles into Chomsky's minimalist program (Chomsky 1995).

The fourth chapter, "The conventionalization of processing efficiency", focuses on how forms and rules of grammars are fixed or conventionalized "in favor of one or other performance alternative, in ways that reflect efficient processing" (p. 73). The author endeavours to show how grammaticalization and processing are related using data from constructions such as definiteness marking, sentential subject extraposition and heavy NP shift. He concludes that these phenomena are difficult to explain in purely grammatical terms and that they are better explained in terms of efficiency; "grammars appear to have conventionalized the most efficient options in these cases" (p. 84). Hawkins believes that processing efficiency helps linguists to understand which structures will change, the timeline of change and the directionality of change. In the rest of the book, he considers different kinds of patterns of typological variation which could have emerged from these efficiency-determined grammaticalizations.

Among the different typological variation patterns, word order is the first area which is considered in chapter five, "Word order patterns: Head ordering and (dis)harmony". Head ordering is an important factor which is discussed in cross-linguistic typologies and formal grammars (Greenberg 1963, Hawkins 1983, Dryer 1992, Newmeyer 2005). Hawkins argues that harmonic word orders are more efficient, as well as being more frequent, than disharmonic ones. The principles of Minimize Domains and Maximize Online Processing predict that head initial languages (like English) prefer to put short constituents before long ones, and head-final languages (like Japanese) prefer a long-before-short order in their structures. Various examples are provided from the grammars of different languages to support these predictions.

Disharmonic orders, which are not frequent among languages, are those which go against both of these efficiency principles.

“The typology of noun phrase structure” is the topic of chapter six. It considers the cross-linguistic variation within noun phrase structure from the perspective of efficiency and online processing. The chapter begins with an overview of NP structure, summarizing the different categories which make up an NP and the various morpho-syntactic devices that signal the attachment of sister categories to an NP. Building hierarchical phrase structure trees in syntactic representations on the basis of terminal elements is a key part of grammatical processing; hence, Hawkins proposes the Axiom of Constructibility: “For each phrasal node P there will be at least one word of category C dominated by P that can construct P on each occasion of use” (p. 121). For an NP, the constructor C could be lexical (noun, pronoun) or functional (a nominalizer, case marking on adjectives, a definite article, etc.). Hawkins argues that in verb initial languages these linguistic units may be either lexical or functional, appearing at the beginning of a phrase and enhancing processing, while in verb final languages the functional constructors are not efficient for enhancing processing and should occur less frequently. Then, Hawkins proposes the Axiom of Attachability: “For each phrasal node P, all daughter categories {A, B, C, ...} must be attachable to P on each occasion of use” (p. 126). This entails that daughter nodes must have clearly identifiable grammatical markers that signal to the hearer that attachment to a particular mother node is licit. The more difficult the attachment is, the more overt grammatical or lexical information is required to bring it about. To support this hypothesis, Hawkins discusses (for example) that restrictive relative clauses that are adjacent to the head noun more freely delete an overt relativizer, while those that are non-adjacent do not induce deletion.

In chapter seven, “Ten differences between VO and OV languages”, Hawkins proposes a processing account of the discussed differences, some of which include mirror-image weight effects and head orderings, predicate frame and argument differentiation, and relative clause ordering asymmetries. He offers simple and motivated explanations in terms of efficiency for the relative productivity of head-initial and head-final languages. For example, he notes that a noun-Relative clause order is optimal for both his Minimize Domains and Maximize Online Processing principles in VO languages, but in head-final languages both cannot be satisfied, simultaneously, as the two patterns conflict in this language type.

In chapter eight, “Asymmetries between arguments of the verb”, Hawkins attempts to provide processing explanations for grammatical relations in the verbal domain ; ex. morphological case and agreement, thematic role hierarchies, and linear preferences. Many cross-linguistic generalizations show that there are asymmetries between the arguments of the verb. These subject-object asymmetries are seen in rule applicability patterns, formal marking patterns and in linear orderings. This chapter offers a proposal as to why there should be such asymmetries. He argues that these hierarchies are explainable in terms of his three efficiency principles; Minimize Domains, Minimize Forms and Maximize Online Processing.

Chapter nine is entitled “Multiple factors in performance and grammars and their interaction”. The author argues that his three efficiency principles interact, sometimes

cooperating and reinforcing each other, sometimes competing and causing variation. This chapter focuses on how the interaction of these principles yields three general patterns. In pattern one each principle P applies to predict a set of outputs {P}, as opposed to a competing set {P'} in proportion to the degrees of preference defined for each (p. 202). The second pattern concerns how powerful motivations for cooperation play an important role in shaping grammars. According to the third pattern the relative strength of principles in competition reflects overall ease of processing and advantages of efficiency. Hawkins believes that ease and efficiency shape performance and grammar and therefore the ways these efficiency principles interact with one another, and their relative strengths in conflict, should be determined by these same factors.

The last chapter of the book is “Conclusions”, in which Hawkins defines efficiency in the following way: “Communication is efficient when the message intended by speaker is delivered to hearer in rapid time and with the most minimal processing effort that can achieve this communicative goal” (p. 231). Then he discusses the consequences of his findings for grammatical theory and typology and draws attention to some bigger issues in linguistics and psycholinguistics which can benefit from his research program, such as theories of working memory, as well as the interactions of interference, frequency, predictability, expectedness and surprisal with grammaticality.

Hawkins’ book is a very important work in processing typology and it shows how performance and grammar are related, offering a distinct perspective on the study of language. His insights should be of interest to linguists, psycholinguists and computer scientists.

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