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Is it all processing all the way down?*

Robyn Orfitelli and Maria Polinsky
UCLA / Harvard University

One of the primary goals of linguistics is to determine which aspects of language structure and use are language-specific and which ones are domain-general. We may be unified by the desire to separate explanations into domain-general cognitive mechanisms and language-specific mechanisms, but the way we achieve this separation differs depending on one's theoretical persuasion. A strict nativist — who is unlikely to exist — would posit that all of language is part of Universal Grammar (UG), while a strict emergentist would claim that none of language is domain-specific and that language arises entirely from general cognitive mechanisms. The Amelioration Hypothesis (AH) is a specific case of strict emergentism, positing that language is driven by a desire to limit the processing burden of language production and comprehension. According to the AH, all language use by adults may be boiled down to processing simplification, and the developmental steps of first and second language acquisition aim to ease the processing burden of language.

UG and AH are decidedly radical. Pushing a radical position to its extreme is the best way to see how well it works, and this hypothesis test is useful when both approaches handle the same data. Our goal here is not to keep score for different frameworks, but rather to emphasize empirical data critical to the foundation of either theory.

In our commentary, we would like to emphasize the point that when seeking support for a particular approach, it is important to identify cases that this approach, but not the alternative, can account for. We believe that such cases are still outstanding. In what follows, we will first consider an instance in language development that UG and AH explain equally well. We will next discuss two instances in acquisition where AH does not describe the steps that children go through. And finally, we will discuss a case in adult grammar where UG, but not the AH, can describe the data. If this case leads to a future refinement of the AH, that of course will be an excellent development.

UG: 1, AH: 1. In his work, O'Grady provides many examples where the Amelioration Hypothesis suffices to explain data that nativists have explained

using UG, including the development and use of scope relationships in English and Korean. In fact, the AH fares particularly well in its approach to such cases of ambiguity resolution. In addition to the cases considered by O'Grady, the AH could readily explain speakers' online preference for the lower attachment site in cases of attachment ambiguity (Frazier and Fodor, 1978; a.o.), as in (1).

(1)   The student photographed the fan of the actress who was looking happy

Even up through the age of 5 years, children's preference for minimal attachment remains so strong that they will ignore contextual cues that point to a different attachment site (Goodluck and Tavakolian, 1982; Felser et al., 2003).[1]

Another domain where the AH fares very well has to do with the acquisition of some word order principles. For example, Goodall (2007) also appeals to the interaction of processing ease and syntactic optionality to explain why Spanish-acquiring children master inversion in *wh*-questions earlier than English children. His point is that English children have to tap into their grammatical knowledge, whereas Spanish learners tap into processing, and that explains the difference in the acquisition trajectories of *wh*-questions in two languages. Although nativist explanations have been provided for the Spanish data, they are also consistent with the reduction of working memory load, as predicted by the AH.

Challenges to the AH.

It is not our goal to present a long list of problems that the AH may face. Instead, we would like to introduce a general principle which could guide the future testing of the AH. Since the main tenet of the AH is that language use and acquisition are driven by the need for processing simplicity, it is critical to consider linguistic situations where speakers have a choice between two or more options that differ in terms of the processing load. If speakers (or language learners) always choose in favor of the least processing effort, that would be a strong argument in favor of the AH. Let us now present two instances where empirical evidence does not co-operate with the AH: the acquisition of *wh*-questions and clitics. We would like to note that while O'Grady's hypothesis, as presented in the keynote, is mainly about comprehension, our illustrative data come primarily from production; the data are still relevant because the AH is a broad-based, general hypothesis of language, which will encompass production as well as comprehension.

There is general agreement that a fronted *wh*-word invokes a discontinuous dependency: the parser needs to wait until the subcategorizing predicate in order to build the dependency. (The actual syntax of such a dependency is not important here; it could be A-bar movement or long-distance anaphoric dependency — nothing hinges on a particular analysis, since the dependency is long-distance no

matter what.) Leaving a *wh*-word in situ would minimize processing costs by elim-inating the long-distance dependency. However, even in languages where speakers have a choice between *wh*-movement (2a) and *wh*-in-situ (2b) (e.g., Romance, Basque), children initially prefer moving the *wh*-word to the front in both short and long *wh*-questions (Weissenborn et al., 1995; Jakubowicz & Strik, 2008; Junkal Gutierrez Mangado, 2009). This pattern is unexpected under the AH.

(2) a. Où   dis-tu   que Marie va ?   *French*
          where say-you that Marie goes
     b. Tu dis que Marie va   où ?
          you say that Marie goes where?
          'Where do you say that Marie is going?'

The second example is observed in the acquisition and use of direct (3a) and in-direct (3b) object clitics in several Romance languages, in particular Romanian:

(3) a. Moş Crăciun *i*   -a adus   un cadou *fetiţei*   *Romanian*
          Santa Clause   him/her-DAT has brought a   present girl.the.DAT
          'Santa brought the girl a present.'
     b. Elefantul   *l-*   a stropit   pe *băiat*
          elephant-the him-ACC- has sprinkled on boy
          'The elephant sprinkled the boy.'   (Babyonyshev & Marin, 2006: 18)

Again, we would like to stay as theory-neutral as possible and abstract away from a particular analysis of cliticization; for our purposes it is only important that the clitic and the object that follows the verb (both are italicized in (3)) form a dis-continuous dependency. Such a dependency is particularly challenging because it goes from the lexically impoverished element (the clitic) to the noun phrase that provides richer referential content. In line with the AH, object clitics prove difficult for young children acquiring several Romance languages, including French, Italian, and Catalan (cf. Wexler et al., 2004, and references therein). In other Romance languages, including Romanian and Spanish, however, object clit-ics are regularly produced and understood in appropriate sentential contexts from an extremely early age (Wexler et al., 2004; Babyonyshev & Marin, 2006). Without recourse to abstract syntactic and phonological differences independent of the parser, it is difficult to account for this categorical distinction.

Arguments in support of UG.

A theory of language acquisition *and* language use is tasked with explaining not only the stages of language development, but also the end state of language mastery. In this section, we discuss the predictions of the AH regarding anaphor

resolution in adult language and introduce several data points which seem to run counter to processing simplicity.

As in the previous section, we will remain theory-neutral regarding the syntactic specifics of different accounts; it will suffice to say that (i) anaphors must co-refer with an earlier determiner phrase in the sentence, and (ii) not all determiner phrases are equally eligible for co-reference — there must exist some metric by which an anaphor and its antecedent are linked:

(4) $Mary_j$'s $sister_i$ saw $herself_{i/*j}$.

One long-standing account of this linking is Binding Principle A (Chomsky, 1981, 1986), taken by strict nativists to be a basic tenet of UG. The AH offers an alternative account, however, under which anaphor resolution operates under the efficiency requirement: "dependencies (lexical requirements) must be resolved at the first opportunity" (O'Grady, 2010). In the case of (4), this successfully predicts that the closest available noun, "sister," serves as the co-referent.

Although the AH can account for basic instances of anaphor binding, it is not always the case that the anaphor co-refers with the closest, most efficient referent, even in English. Four such instances are provided in (5): the head noun of the binder DP has a postnominal modifier (5a); the subject is associated with a three-place predicate; a bound reflexive appears inside a moved constituent (5c); and an emphatic reflexive (5d).

(5) a. The $girl_i$ who likes $Mary_j$ saw $herself_{i/*j}$
     b. Mary glued John to herself/*himself.
     c. Near $himself_i$ is where $John_i$ found it.
     d. Which $author_i$ wrote [every article about $politics]_j$ $himself_i$/*$itself_j$?

When we consider languages other than English, the AH runs into further difficulties. In languages with prepositional possessive, such as Romance, the DP closest to the anaphor cannot be the binder, so the AH would need to account differently for the English (5) and the French (6).

(6) La $soeur_j$ de $Marie_i$ $s_{j/*i}$'est   vue.
     the $sister_j$ of $Marie_i$ $self_{j/*i}$ is   seen
     'Marie's sister saw herself/*Marie.'

Another problem case occurs in languages with verb-object-subject (VOS) word order, such as Malagasy, in which the bindee linearly precedes the binder (7). Without making reference to structural relationships such as c-command, it is not clear how to accommodate such data. Note also that even if we reverse the rule for binding, allowing it to operate from right to left, the binder and the anaphor are separated by another expression, similar to the English examples in (5):

(7) Mihevitra ny tena-ny   ho hajain'i   Soa Rakoto
     think   DET self-3POSS PRT respect.THEME_TOP'by Soa Rakoto
     'Rakoto thinks himself to be respected by Soa.'   (Rackowski & Travis,
     2000: 133)

Let us conclude. It is quite possible that future work will uncover ways of accounting for the phenomena that we have presented as challenging to the AH, but in order for that to happen, it will be important to base our comparison between the radical nativist and radical emergentist approach on a broader range of empirical facts. As we arrive at a better understanding of the interplay between grammar and parser, all sides stand to gain in the process. It may indeed not be necessary to advocate either a radical nativist or a maximalist emergentist approach to language (even when the arguments for either approach are only preliminary). Instead, we may adopt a combination of the two. We believe that this stance, which has been widely adopted in recent years, may prove fruitful in reconciling the benefits of the AH with the challenges presented here.

Notes

1. Snedeker & Trueswell (2004) present compelling arguments that lexical bias plays a large role in children's ambiguity resolution, possibly even overriding minimal attachment. We believe that this account is compatible with the AH, or at the very least, with emergentism, and so we will remain agnostic as to whether lexical bias operates exclusively in conjunction with minimal attachment in child processing.

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Authors' addresses

Robyn Orfitelli
UCLA Linguistics Department
3125 Campbell Hall
UCLA
Los Angeles, CA 90095

rorfitelli@ucla.edu

Maria Polinsky
Department of Linguistics
Boylston Hall Third Floor
Harvard University
Cambridge, MA 02138

polinsky@fas.harvard.edu