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L2 FUNDAMENTALS

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In 2009, it will be 20 years since the first publication of Bley-Vroman's fundamental difference hypothesis (FDH; Bley-Vroman, 1989, 1990), although versions of the FDH had already been circulating unofficially at that time. This theoretical proposal brought many central issues of SLA theory and practice to the forefront of the field. Most of these issues are still debated today: the critical period hypothesis (Birdsong, 2005; DeKeyser, 2000; DeKeyser & Larson-Hall, 2005), domain-specific versus domain-general acquisition processes (Dekydtspotter, Sprouse, & Thyre, 1999/2000; O'Grady, 2005), implicit versus explicit learning (see the special issue of *SSLA*, Hulstijn & Ellis, 2005), the use of general problem-solving skills in second language (L2) learning (Hulstijn, 2005), and the importance of the native language (Schwartz & Sprouse, 1996; White, 1989). This thematic issue of *SSLA* takes stock of what has been achieved in the past 20 years with regard to fundamental first language (L1)-L2 acquisition differences and related questions. A more nuanced and balanced picture of the SLA process takes shape, and the short answer to the question of the difference between L1 and L2 acquisition seems to be: L1 and L2 acquisition are fundamentally different in some respects and fundamentally similar in others.

Bley-Vroman's (1990) *Linguistic Analysis* article starts with a list of 10 differences between L1 and L2 acquisition. Foreign language learning, according to Bley-Vroman, is distinguished from L1 acquisition by these 10 characteristics listed in (1).

(1) a. lack of success
b. general failure
c. variation in success, course, and strategy
d. variation in goals
e. correlation of age and proficiency

I am grateful to the participants and the other organizers of the Generative Approaches to Second Language Acquisition (GASLA 9) conference held at the University of Iowa in May 2007. All but one of the articles in this special issue were presented either as plenary addresses or as regular papers at this conference. My deepest thanks go to all the participants in this thematic issue and to Silvina Montrul for her comments on this introduction. All remaining errors are mine.

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f. fossilization
g. indeterminate intuitions
h. importance of instruction
i. negative evidence
j. role of affective factors

The first three characteristics amount to more or less the same claim: The success of SLA is not guaranteed, and individual L2 learners who pass for native speakers may be outliers. Bley-Vroman (1990) suggested that such outliers may be as rare as the pathological cases of children deprived for one reason or another of linguistic input who ended up without a native language. The third difference, in particular, argues that child language is different not only in degree of attainment but in the course and strategy of acquisition as well. The fourth difference captures the fact that an adult learner may decide to learn as much of the L2 as is needed for a job or a specific purpose, which never happens with children. The fifth and sixth differences invoke age effects. The (negative) correlation of age and proficiency has been attested in study after study (Birdsong, 2005; DeKeyser, 2000; DeKeyser & Larson-Hall, 2005), no matter whether results indicated a steep decline that resulted in a clear cutoff point after which nativelike acquisition is compromised (i.e., critical period) or a much more gradient decline of achieved competence correlated with age at start of acquisition (i.e., age effects). Fossilization is another phenomenon that just does not happen in normal child language acquisition. The seventh difference alleges that L2 learners have indeterminate intuitions about grammaticality due to the variety of strategies they employ to judge sentences. The eighth and ninth differences are related: The importance of instruction and practice for SLA may be due to the necessity of correction and negative evidence for learning. Finally, affective factors such as personality traits, socialization, motivation, aptitude, and attitude play a role in the SLA process but are not relevant to child language development.

Even the most cursory overview of these contrasts makes one thing obvious: There are indisputable distinctions between the ways children acquire their native languages and the ways adults acquire a L2. However, we could just as easily come up with 10 similarities between the two kinds of acquisition, starting with the most obvious one: SLA is a human language acquisition process, and the grammatical system that L2 learners build in their mind or brain is a natural language system.[1] Although lists are an important starting point, the ultimate goal is to uncover the underlying linguistic representations and processes that can explain this contrasting achievement.

Bley-Vroman's (1990) FDH has had such a significant impact because it made a coherent, internally consistent proposal that agreed with the existing research data at the time. The central argument is that the

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domain-specific language acquisition device (i.e., Universal Grammar [UG]) ceases to operate in adults (which leads to critical period effects), and that adult learners use their domain-general problem-solving skills as well as conscious observation of the data and practice to acquire a L2. The latter claim explains several of the observed differences between L1 and L2 acquisition—namely, variation in outcome, the importance of instruction and practice, and the role of affective factors. The major underlying difference between L1 children and L2 adults is that adults already have a native language, so in a sense, their language acquisition device has been activated. This fact gives adult learners access to linguistic principles, properties that are the same in all natural languages. Parameters, or points of linguistic variation, cannot be truly reset to create a nativelike linguistic representation. This view has been refined over the years (see, e.g., the failed functional features hypothesis; Hawkins & Chan, 1997) and has recently been articulated as the interpretability hypothesis (Hawkins & Hattori, 2006; Tsimpli & Dimitrakopoulou, 2007).

The FDH's (Bley-Vroman, 1990) claim that adults use domain-general problem-solving skills argues specifically against the Fodorian type of informational encapsulation of language acquisition (Fodor, 1983, 2000). Direct observation and pattern noticing also follow from the FDH: Whatever properties are observable from the input are learnable without recourse to UG and do not involve grammar restructuring. Another implication has to do with explicit learning: Because adults use general problem-solving skills, their cognitive abilities (aptitude, working memory span, etc.) will directly impact their language learning skills.

The native language is argued by Bley-Vroman (1990) to be the primary source of knowledge about the L2. It is certainly a generator of hypotheses on how certain L2 features work. What other linguistic properties, apart from universal principles like subjacency (i.e., a principle that disallows movement across more than one bounding node) and the empty category principle (i.e., a universal syntactic constraint that requires that traces must be properly governed), can be gleaned from the native language and from observation? Quite a lot, indeed! The adult L2 learner does not need to acquire anew the fact that the L2 allows recursion; that it has a finite set of phonemes, syllables, feet, and phonological phrases; that syntactic phrases are built according to the X-bar schema and attributed grammatical functions; that the L2 has relative clauses, Boolean-type connectors, quantifiers, and pronouns, among others, because there is no natural language without these properties. However, observation of L2 input can also give the learner head and complement directionality (the basic word order in the language), the necessity for subjects in embedded clauses, the presence or absence of agreement morphology, tense and aspect marking on the verb, and a whole range of similar important linguistic facts.[2] On the assumption

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that human beings are excellent pattern-noticing machines, the acquisition of these facts would not represent an insurmountable difficulty to the learner. Whenever an array of superficially unrelated constructions is underlyingly linked to a common parameter setting in a language, the FDH would predict that these constructions would be learned in a piecemeal fashion independently of each other, as the linguistic input makes them available to the individual learners.

What is the burden of proof incumbent on opponents of the FDH? Challengers of the FDH have to show that when adult learners display knowledge of properties standardly attributed to UG, this knowledge is attained by the same means as in L1 acquisition. After all, it is conceivable that adult L2 learners have superficially similar knowledge, with fundamentally different underlying linguistic representations. In other words, challengers need to examine learning situations in which, even if success is documented, there is no alternative explanation other than the operation of UG. If such success is attested, then a weaker version of the FDH will be supported. In Bley-Vroman's (1990) own words,

> the empirical issue is essentially whether there are characteristics of learner language which prove a knowledge of 'possible language' above that which can be obtained as a byproduct of the native language. As of now, there is no clear evidence of such characteristics. If such evidence should turn up, a somewhat less radical view of the fundamental difference hypothesis than that proposed here may be justified. (p. 17)

Because our experimental and theoretical knowledge has increased and expanded in new directions during the last 20 years, the evidence should be reconsidered. Are we in a better position, 20 years later, to offer a definitive conclusion to the fundamental difference question? Instead of a *yes*/*no* answer, is a more elaborate picture of the SLA process warranted? The goal of the present thematic issue is precisely to paint this more coherent and detailed picture. Each of the individual contributions addresses different aspects and implications of the FDH. Taken together, they offer a theoretically sophisticated yet balanced state-of-the-art collection of views. Here, I spell out some common assumptions of the language faculty architecture, which will be echoed in Bley-Vroman's "The Evolving Context of the Fundamental Difference Hypothesis" and will be implicitly or explicitly assumed by the rest of the contributions. Then, Bley-Vroman's (1990) original L1-L2 acquisition comparison will be extended with a discussion of child language rates of acquisition that point to linguistic properties having different degrees of difficulty depending on the type of input and the type of property (integrative vs. interface properties). I suggest that the language architecture, and particularly our view of where language variation

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lies, is crucial in predicting L1 rates of acquisition and SLA successes. The research findings summarized and presented in these articles seem to directly challenge the FDH and to support the "less radical view of the fundamental difference hypothesis" (Bley-Vroman, p. 17).

CURRENT VIEWS OF THE LANGUAGE ARCHITECTURE

Generative acquisition research enjoys the advantage of a well-developed property theory (i.e., a theory of what constitutes knowledge of language) that spells out the universal and language-specific properties of each natural language grammar. The implication of this division of properties is that only the language-specific properties have to be noticed and learned based on meaningful input. Our understanding of the nature of the language faculty architecture is also central to addressing L1-L2 acquisition differences, because this architecture directly predicts what has to be learned. Both the Minimalist Program (Chomsky, 1995, 2001), one of the latest developments in the generative research tradition, and the antisyntactocentric position of Jackendoff (2002), more widely assumed by psycholinguists and neurolinguists in their work on processing language, will be considered to answer this question.

The Minimalist research endeavor (Chomsky, 1995, 1998, 2001, 2005) maintains the traditional characterization of language, since Aristotle at least, as a system that links sound and meaning. Thus, the expressions generated by a language must satisfy two interface conditions: Those imposed by the articulatory-perceptual (AP) system and those imposed by the conceptual-intentional (CI) system. The language faculty is the optimal realization of the interface conditions. In practical terms, there is not much redundancy in the system, and the notion of economy of derivation applies: If you have to choose between two converging derivations, choose the one with the smaller number of steps, at the same time obeying the simplest (i.e., local) movement.

Earlier concepts of the language faculty architecture included the extended standard theory model in the 1960s and 1970s (Chomsky, 1965), for which there were different levels of representation: Deep-structure and Surface-structure, among others. The government and binding model in the 1980s (Chomsky, 1981) retained D-structure and S-structure, which were characterized by certain operations that happened at them; for instance, the verb moved from verb to inflection at S-structure (overtly) in French but at logical form (LF; covertly) in English (at least according to some analyses of Pollock's,1989, verb movement parameter). A general thrust of the Minimalist Program is to keep only those levels that are minimally necessary: This has culminated in the

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abolition of D-structure and S-structure. Chomsky (2001, 2005) defended the idea that there is only one level of computation between numeration and spell-out, where merge and agree apply, thus disposing of LF and phonological form as levels of computation. After the point of spell-out, there are only the interfaces with the AP and CI systems. These systems provide the morphosyntactic and phonetic information needed to linearize the linguistic signs (i.e., arrange these linguistics signs one after the other in time), produce a sentence, and assign a semantic interpretation to that sentence.

Movement of syntactic phrases, or the fact that some phrases surface or are interpreted in a different location than where they originated, is an undeniable property of human language. In the Minimalist framework, movement is explained as necessary for the checking of formal lexical features. Most lexical items come into the numeration (the initial array of lexical items to be used in the sentence phrase structure) prespecified with their features in the lexicon, and these features are checked in the syntactic derivation.[3] Lexical items that include inflectional morphemes minimally combine phonological, semantic, and formal syntactic features. Two types of features are relevant to the syntax-semantics interface: interpretable and uninterpretable features. Interpretable (semantic) features are legible at LF and contribute to the interpretation, so they cannot be eliminated. Uninterpretable, or formal features, on the other hand, should be eliminated before spell-out, because they do not contribute to meaning; for example, in the sentence in (2), the interpretable feature [plural] on the subject phrase nominal head survives into CI, the phonetic feature [pronounce the affix as /-s/] is used at AP. In contrast, the uninterpretable [plural] feature on the verb, which ensures agreement, is eliminated by CI, although it may be maintained until AP to be pronounced. Because the selection of a feature as interpretable or uninterpretable is subject to language variation, it is predicted to pose a problem for L2 learners (see Adger, 2003, for more examples of features across languages).

(2) *The student-**s*** ***are** arriving.*
[pl] [*u*pl]

A slightly modified diagram of the general language architecture from Adger (p. 146) is reproduced in Figure 1.

Lexical items are drawn from the lexicon into the numeration. The syntactic structure (also known as narrow syntax) can be imagined as a working space in which operations such as select and merge combine lexical items into phrases and then into larger phrases. Syntactic operations continue until all of the lexical items in the numeration are exhausted, and all uninterpretable features are checked and deleted. Both visible and invisible movements take place at the level of narrow

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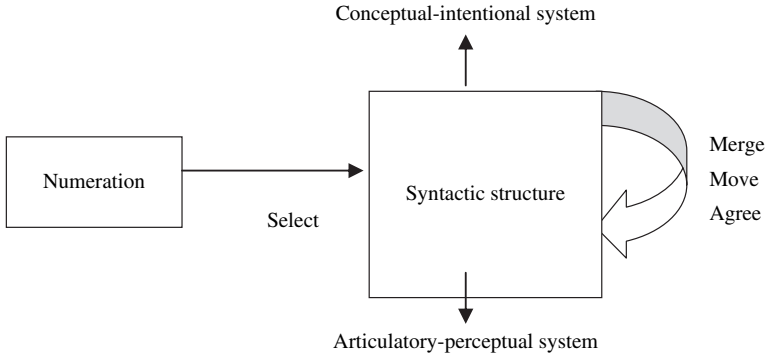


Figure 1. General architecture of the language faculty, as used in the production of an utterance.

syntax, in which principles and language-specific parameters reside. The complete syntactic object (a tree) is then passed on by means of spell-out to the AP and the CI systems. The sentence interpretation is read off the syntactic object at the CI interface; it is linearized, and pronunciation instructions are sent to the AP interface.

Jackendoff (2002) argued that the Minimalist picture of the language faculty is unfairly skewed toward syntax, because syntax is proposed to be the only generative component of the grammar, whereas phonology and semantics are relegated to the interfaces. Jackendoff criticized the Minimalist framework for not making it excessively clear exactly what happens at the interfaces and what kinds of operations take place there. To make linguistic theory more compatible with findings from neurolinguistics and psycholinguistics, Jackendoff proposed that all three modules of the grammar are generative in the sense that they can generate structure by compositionally unifying units dedicated to the particular level. Jackendoff called his model the parallel architecture.

> Linguistic structure is viewed as a collection of independent but linked levels of structure: phonology, syntax, and semantics. Each level of structure is characterized by its own set of primitives and combinatorial principles. The linking among levels of structure is established by a set of interface constraints—among which are the words of the language. Thus, a well-formed sentence has well-formed structures in each component, connected in a well-formed fashion by linking constraints. Within this organization, syntax is but one among several "cooperating" generative components. (p. 198)

At each level of the language architecture, a number of rules and constraints—called *integrative* processes—operate, which allow for the

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formation of fully specified structure at that level. The classical example of these is the syntactic parser, which integrates a determiner and noun into a determiner phrase (DP) and a verb and a DP argument as the verbal phrase (VP), among others. At the interfaces, another kind of processes—called *interface* processes—takes as input one type of linguistic structure and provides as output another type of linguistic structure. Note that the interface processes are qualitatively different from the integrative processes. A crucial part of this parallel architecture is the working memory. It is a separate facility in the brain, where representations from long-term memory are retrieved and copied in order to undergo processing. The working memory is understood not as a static place for temporary storage but as a workbench or blackboard, on which processors can cooperate in assembling linguistic structures.

Phonological structure uncontroversially has tiers: prosodic, syllabic, and segmental structure as well as morphophonological structure that join the segments into words and prosodic words. Syntactic structure (i.e., the syntactic tree) contains heads and phrases arranged hierarchically in accordance with syntactic constraints. The semantic, or conceptual, structure also consists of several tiers, each of which conveys a different aspect of sentence meaning. The *descriptive tier* contains roughly the information that can be encoded in a predicate logic: conceptual functions, arguments, and modifiers. Conceptual constituents, labeled with their own constituent type, may include situation, place, object, event, and state, among others. The *referential tier* organizes the referential claims about the entities of the sentence, including when two noun phrases point to the same extralinguistic referent. The last tier of conceptual structure is the *information structure tier*, which captures the organization of topic and focus (also known as theme or rheme, topic or comment, old or new information, etc.). This part of linguistic structure encodes the function of a particular phrase within the discourse, from the point of view of the speaker-hearer interaction.

These two views—namely, the Minimalist language architecture (Chomsky 1995, 2001) and Jackendoff's (2002) parallel architecture—are probably not irreconcilable. The claims of both theories will be unified as far as possible by taking what is universal and what can differ among languages into consideration. These two views of the language architecture lead us into an elaboration of where principles and parameters reside within the system.

THE NEW VIEW OF PARAMETERS AND PRINCIPLES

Given the Minimalist language architecture in Figure 1 and Jackendoff's (2002) parallel architecture, what is to be learned and what comes for

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free? In other words, where does language variation lie? The older generative frameworks like principles and parameters (Chomsky, 1981, 1986) viewed parameters, or points of variation, as rather baroque syntactic objects that consisted of a trigger (some salient linguistic property) and a range of superficially unrelated constructions. Examples of such parameters that allegedly make clusters of constructions available in the grammar at the same time include the verb movement parameter (as studied by White, 1990/1991, for SLA), which is responsible for knowledge of adverb placement, negation, and question formation, as well as the compounding parameter (as proposed by Snyder, 1995, 2001, and tested by Slabakova, 2002), which relates noun-noun compounds, verb particles, resultatives, and double object constructions. The predictive power of such parameters is considerable: Once the trigger is acquired, language learners are expected to become aware of the superficially unrelated but underlyingly related cluster of constructions.[4] The theoretical attraction of such parameters comes from their deductive consequences; however, the early promise did not live up to expectations (see Baker, 1996, who discussed syntactic theory; Carroll, 2001, and Lardiere, 2009, who discussed parameters in SLA).

The conceptual development of the Minimalist Program (Chomsky, 1995, 2001) has substituted these attractive but complex creations with a simpler and more realistic version of a parameter. It is fair to say that the formal features are the new parameters where language differences reside. A set of functional categories (e.g., aspect phrase, tense phrase [TP], complementizer phrase [CP], negation phrase) constitute an essential part of narrow syntax, which captures grammatical meanings such as aspect, tense, agreement, negation, and type of clause, among others. Each functional category is associated with a lexical item or items specified for the relevant phonological, semantic, and formal features. A finite set of formal features is made available to the language learner by UG. Semantic features come from the common conceptual structure.[5] Learning a first language involves selecting the relevant features from the universal inventory and mapping them to particular lexical items. The feature values are set based on observation of the input; for example, the universal feature [number] will receive values of /singular/ and /plural/ in a language like English but /singular/, /dual/, and /plural/ in a language like Hopi. In the case of SLA, learners must restructure their grammar by assembling and reassembling their native features and possibly some new features into the matching lexical equivalents (see Lardiere's, 2008, 2009, feature reassembly hypothesis). For example, the [habitual event] aspectual meaning, together with the [ongoing event] meaning, are reflected in the imperfective aspectual tense in Spanish, as illustrated in (3); however, the [habitual event] meaning is coupled with the [complete one-time event] meaning in the perfective aspectual form (the simple past tense) in English, as illustrated in (4).

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(3) a. habitual
Guillermo robaba en la calle.
Guillermo rob-IMP in the street
"Guillermo habitually robbed (people) in the street."
b. complete one-time event
Guillermo robó en la calle.
Guillermo rob-PRET in the street
"Guillermo robbed (someone) in the street."

(4) a. habitual
Felix robbed (people) in the street.
b. complete one-time event
Felix robbed a person in the street.

Learning of the simple past tense meanings, then, for a Spanish native speaker will involve uncoupling of [habitual] from [one-time event] and reclassifying this semantic feature as part of the imperfective morphology. The crucial task of the linguist is to determine how this feature assembly is constrained and how UG maintains its facilitative role in SLA.

Additionally, it is not obligatory for all grammatical meanings to be reflected in a functional morpheme; for example, some languages (e.g., German, French, Russian) have a polite and a regular form of second person pronouns, whereas other languages like English do not mark the politeness distinction morphologically but through other lexical means or allow context to fix the distinction. To take another feature, some languages (e.g., Bulgarian, Albanian) have verbal morphology that signals that the speaker was not a witness to the event or state denoted by the proposition (i.e., evidentiality marking), whereas many languages can only reflect this grammatical meaning periphrastically. Linguists argue that these differences lie at the syntax-semantics and the syntax-pragmatics interfaces (as long as the functional lexicon is viewed as an integral part of the syntax).

If parameters are relegated to the functional lexicon, then learning the lexicon constitutes the most significant learning task and also the greatest challenge in SLA. To be more specific about what learning an item from the functional lexicon entails, let us take the English copula *is* as an example: Learners have to acquire its phonological features (its pronunciation) and its semantic feature [present] as well as the uninterpretable formal features [third person] and [singular]. One last formal feature will ensure that the copula in English moves to or is merged in the TP (unlike main verbs) and can even move to the CP that inverts with the subject if the sentence is a question.[6]

In sum, there is a universal semantic-pragmatic component (the CI system for Chomsky, 2004; the conceptual structure for Jackendoff, 2002) that provides all the potential (grammatical and idiosyncratic lexical) meanings that languages express. The same interpretational

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mechanisms are available to all languages and are fed by the same universal syntactic system. Language variation lies in the way languages choose to express universal grammatical meanings: Some languages have grammatical word endings, some languages allow the context to fix the values of the specific features (at the syntax-pragmatics interface), and other languages use periphrastic lexical means. It is logical that only the variable properties illustrated in (5) will be relevant to the FDH. Invariant, or universal, properties may come either from the native language or from UG, and it is impossible to tease the two apart (Hale, 1996).

(5) a. Universal: the general mechanisms of syntactic and semantic computation, the CI system
b. Variable across languages: features (formal, semantic, and phonological) and feature combinations of the functional lexicon items, the syntax-semantics interface, the syntax-phonetics/phonology interface, the syntax-discourse/pragmatics interface

WHAT CAN CHILD LANGUAGE ACQUISITION TELL US ABOUT THE RELATIVE DIFFICULTY OF VARIOUS LINGUISTIC PROPERTIES?

Here, child language acquisition as a reflex of the language architecture is discussed in more detail. Bley-Vroman's (1990) third L1-L2 difference—namely, variation in success, course, and strategy—may actually present an overidealized picture of child language acquisition. The implication of this difference is that child language acquisition is uniform and quite fast. In the past 20 years or so, researchers have identified many linguistic properties that children acquire fast and error-free and others with which they arguably struggle until age 6–8 or later. Early and late-acquired properties in L1 grammatical development will be briefly compared, on the basis of a quick survey of Guasti (2002) and O'Grady (1997), two popular textbooks on child language acquisition.[7] I will show that differential difficulty and consequent differences of rate and age of acquisition of certain properties may fall out of the language architecture. This implies that SLA rates and differential difficulty follow from the same language architecture, at least partially.

Allowing for individual differences, at the age of 2–3, children are already accurate with inflectional morphology for tense, agreement, aspect, and case marking. Root infinitives (in languages for which children display them) disappear by age 3. Children have acquired that subject-verb agreement is a structure-dependent phenomenon, they know whether the verb moves out of the VP in their language (including the auxiliary-main verb distinction in English and the verb-second phenomenon in

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languages like German), and they correctly set the value of the null subject parameter. Starting around age 3;5, children produce and understand long-distance *wh*-questions and some relative clauses. These are all properties fixed in the morphosyntactic features of functional lexicon items and involve calculations within the syntactic module.

However, children have trouble with passive constructions with nonactional verbs (i.e., verbs whose action is not visible; Guasti, 2002) including the *by*-phrase (e.g., *The boy is seen by the horse*) until age 5–6. Until age 6, children who speak Icelandic, Russian, and English have trouble with the interpretation of pronouns, which they allow to have a reflexive meaning (e.g., *Big Bird is washing him* is equivalent to *Big Bird is washing himself*). Comprehension of control constructions still develops between the ages of 5 and 7. Children may also have difficulties interpreting scalar implicatures pragmatically: They accept as true a sentence like *Some horses jumped over the fence* in a situation where all horses have jumped over the fence (Papafragou & Musolino, 2003). Finally, Dutch children do not interpret a scrambled object (moved to another position in the sentence) as necessarily specific until age 12 (Krämer, 2000; Unsworth, 2005, 2007). At the same time, by age 5, children are targetlike when they scramble objects. It appears that adultlike interpretation may come surprisingly late for some subtle native properties like scrambling and even for some not so subtle properties such as imperfective tense meaning (van Hout, 2008).

The most significant research questions of L1 acquisition are thus: Why should children be delayed in some of their interpretations, and what makes a property difficult for children to acquire? Child language researchers (e.g., Guasti, 2002; Reinhart, 2006) have struggled with these fundamental issues and have proposed several explanations provided in (6).

(6) a. Children's cognitive development may impede acquisition.
b. Input frequency (robustness of the evidence) may contribute to differential rates of acquisition.
c. Children's processing resources are more limited than adults' ones.
d. Children have difficulty integrating discourse information with the sentence interpretation.

De Villiers (2007) argued that children's cognitive development, as evidenced by children's theory of mind (i.e., the reasoning about what others believe) between the ages of 2 and 4, presents multiple potential connections between the conceptual and linguistic development, but the direction of influence is not at all clear. De Villiers made a compelling case that, actually, after age 4, it is language that helps the theory of mind and not the other way around, because learning the language structures involved in complementation allows children to understand

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other speakers' knowledge states. Cognitive development has been ruled out as the true reason for children's scalar implicature interpretation as well (Guasti et al., 2005).

Quantitative characteristics of the child-directed input may have been mostly, and wrongly, neglected in generative child language acquisition research until recently.[8] However, it has been demonstrated (Yang, 2002, 2004) that frequency of linguistic constructions impacts the rate of acquisition. The variation hypothesis (Legate & Yang, 2007; Yang, 2002, 2004, 2006) links innate knowledge to construction frequency effects and claims that in acquiring their native language, children are guided not only by innate knowledge of linguistic properties but also by the frequency of the data that highlight these properties in the surrounding linguistic input. This hypothesis explains gradual, not abrupt, changes in children's grammar and has been supported with child language data on *wh*-fronting, verb raising, obligatory subject, verb-second, and scope marking.

Although the cognitive delay explanation has been mostly discredited, the processing-resources and discourse-integration explanations have been viewed as causally linked. In light of a long line of child language acquisition research, Reinhart (2006) proposed that children's delayed interpretation of scope shifts (quantifiers surface in situ but are interpreted with wide scope), focus-marking, pronoun reference, and scalar implicature computation can be attributed to a difficulty of integration of the sentence meaning with different strands of information beyond the sentence level. Reinhart argued that these are all areas of the grammar in which successful computation necessitates building a relevant reference set of constructions, checking the contextual needs of the situation, and selecting the optimal competitor from that reference set. These are restricted cases that only operate at the interfaces of the syntax with the CI system (i.e., quantification, pronouns), syntax with the AP system (i.e., focus), and syntax with pragmatics (i.e., scalar implicatures). These imperfections of optimal design are expected to—and indeed found to—lead to higher processing costs, which cause children to select interpretations at random (i.e., to guess).

In sum, this necessarily brief and sketchy inspection of child language development provides evidence that different areas of the grammar are acquired at very different rates. Some studies (e.g., van Hout, 2008) have found that even when children use a particular construction in a targetlike manner, they do not necessarily interpret it in an adultlike way. Frequency of parameter value evidence in the input has been argued to be important. Crucially, children have been found to guess when a sentence interpretation depends on building and keeping in working memory a competing set of syntactic trees and choosing the right one based on discourse and context observation. Interface properties that integrate information that belongs to two linguistic systems are harder for children than integrative properties, which operate within

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one linguistic level; and the difference may boil down to differential processing costs.

LANGUAGE ARCHITECTURE EFFECTS IN SLA

If child language acquisition rates and accuracy are largely predicted by the current view of the language architecture, what about SLA rates and differential success? The (incomplete) cognitive development factor is obviously out of play when we consider adult SLA, but the three other explanations—input frequency, processing resources, and integration of discourse information with the sentence interpretation—are very relevant to the L2 development process.[9] Here, I link the three remaining factors that allegedly determine L1 acquisition rates with findings of SLA research as discussed in this special issue. The goal of this L1-L2 acquisition connection is to highlight not only the differences but, crucially, the similarities between the two types of cognitive processes. The manner in which evolving linguistic theory impacts theories of SLA will be examined first.

Bley-Vroman's contribution presents an updated version of the FDH in light of recent changes in generative linguistic theory. He argues that the logical problem of foreign language learning as formulated in the original work still holds: The two most important differences are that adult SLA is not reliable and does not converge (i.e., adults acquiring the same target language may not reach the same grammatical system). Bley-Vroman further makes the case that the theory of the grammar, in which the original formulation was couched, has changed so much that a reformulation of the FDH is necessary. After discussing the change from rich UG to Minimalism, Bley-Vroman maintains that what is not working, or not working well enough, in SLA is the core system of the grammar. For this reason, learners resort to the peripheral systems of the grammar, employing various patches and viruses (i.e., piecemeal acquisition of input-based generalizations). Note that these peripheral means of acquisition are also available to the native speaker: The claim is that they are the only mechanism available to the L2 learner. In this respect, the reformulation of the FDH echoes Clahsen and Felser's (2006) shallow structure hypothesis and Ullman's (2001) declarative/procedural model of SLA (see, Herschensohn, this issue, for a discussion).[10]

Belikova and White's contribution is also inspired by the changing linguistic theory. Belikova and White revisit subjacency, a purported linguistic principle frequently used in the 1980s and 1990s to argue for or against access to UG in SLA. They trace the history of this concept through three reincarnations and argue that a newer (and simpler)

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linguistic formulation of the constraint that prohibits extraction out of subjects and adjuncts explains most of the empirical findings in the literature. Belikova and White also point to the fact that if a universal semantic computation mechanism is assumed, it becomes a moot point whether observation of the constraint is due to UG or to the native grammar.

The three remaining factors that influence child language rates of acquisition (input, processing, and interfaces) are now examined to find out how these factors play out in SLA. The issue of quality and quantity of input necessary for developing nativelike L2 grammars is taken up in the Montrul article. Montrul contends that acquisition sequences from early bilingual (heritage) speakers are uniquely relevant to the fundamental difference thesis and discusses a number of experiments that compare heritage speakers with late learners matched in proficiency. The FDH predicts that heritage speakers should not differ from native speakers because they acquired the language well before puberty. Whereas the acquisition patterns of late and early bilinguals are similar in some respects (e.g., *wh*-movement), Montrul found selective advantages of early bilinguals in other respects (e.g., gender marking). These findings point to the importance of abundant and consistent linguistic input for successful acquisition and to the necessity of differentiating between easy-to-acquire and hard-to-acquire modules of the grammar.

There seems to be a shaky consensus on several factors that affect L2 processing, in the following order: proficiency level, native language, age of acquisition, and working memory resources (see Hopp, 2007, and Indefrey, 2006, for recent reviews and abundant references). Processing speed and its relation to accuracy are taken up in the Herschensohn article. In a survey of ample evidence from L2 processing, Herschensohn formulates the gradient difference hypothesis and argues that the majority of the L2 findings are compatible with a quantitative difference between L1 and L2 speakers in terms of processing speed and brain area activation, a difference that may sometimes lead to differential accuracy but very rarely to a different mental representation. Herschensohn also brings forward the child L2 pathway of linguistic development and compares it with the L1 and the adult L2 pathways to argue that child-adult dissimilarities emerge gradually rather than abruptly.

Acquisition at the interfaces is the topic of the review article by Dekydtspotter and the empirical study presented by Song and Schwartz. Whereas children's problem at the interfaces is to integrate properties that operate on two linguistic levels, the learning task for L2 speakers is compounded by mismatches between how their native language calculates an interface property and how the target language does. Both contributions describe severe poverty-of-the-stimulus learning situations: completely idiosyncratic properties at the syntax-semantics

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and syntax-pragmatics interfaces, which are not available in the native grammar. L2 learners demonstrate consistent successful acquisition of such properties, which seems to have no other source but the innate UG-provided hypothesis space (i.e., knowledge of what is possible in a natural language grammar).

In his contribution, Dekydtspotter also uses the same findings to address the epistemological question of informational encapsulation of SLA and argues for the domain-specificity of SLA. Poverty-of-the-stimulus learning situations represent, in Bley-Vroman's (1990) words, "a knowledge of 'possible language' above that which can be obtained as a by-product of the native language" (p. 17) because these can only arise from the deductive access to UG. The central question posited by the FDH—namely, whether successful L2 learners attain nativelike proficiency using the same means as children acquiring their native language—is also tackled by child L1, child L2, and adult L2 developmental route comparisons. These are reviewed by Herschensohn and directly investigated by Song and Schwartz. L2 adults and L2 children in Song and Schwartz's study were found to be perfectly aligned in their developmental pathways and many acquired the target property to nativelike accuracy. Because child-adult differences in SLA are directly predicted by the FDH, Song and Schwartz's results cast doubt on the fundamental difference between these two types of learners.

In sum, linguistic theory, although a moving target for language acquisition researchers, has evolved in a genuinely positive direction. It now provides principled explanations for previously murky acquisition patterns and highlights the parallels between L1 and L2 acquisition pathways. Quantity and quality of the linguistic input are the principal factors that affect language learners. Both L1 children and L2 learners lack sufficient processing resources to integrate key information at the linguistic interfaces and thus use available strategies to achieve linguistic competence. Children eventually overcome these difficulties and make it to adult native competence. There are also some L2 learners who establish nativelike linguistic representations, crucially for properties that cannot be deduced from the input. Whereas children inevitably become native adults with regard to processing resources, L2 learners continue to show restricted processing resources. The difference in linguistic achievement between children and adult language learners, then, appears to be gradual and quantitative, but not qualitative, and may be fundamental only in processing.

CONCLUSION

It would be quite difficult to overstate the impact that the FDH has had on the field of SLA as a cognitive science. It has stimulated an enormous

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amount of productive research, which argued for or against this hypothesis. Many questions remain in the study of L2 learning; for example, we may ask if L2 learners of a given language can become as fluent and functional as native speakers of that language (the utilitarian question), or we may ask if L2 learners go through the same stages of acquisition of certain properties as children do when they acquire their native language (the process-oriented question). It is important to know whether L2 pragmalinguistic skills are achievable in L2 communication (part of the communicative competence question). The SLA research community is also interested in the best ways of teaching the L2 so that learners are linguistically and pragmatically functional in the L2 (the goal-oriented question). There is, however, a more fundamental (pun intended) question that underlies all these research questions; that is, whether the linguistic representations of L2 learners and native speakers are fundamentally different and whether the ways L2 linguistic representations are established are fundamentally different from the ways children acquire their native language. The possible answers to these questions can help the field of SLA reconsider answers to all the other worthwhile research questions that arise when the L2 learning process and result are investigated.

In discussions of a comprehensive theory of SLA, the ultimate goal of the field of SLA research, it is customary to invoke the fable of the elephant and the six blind men. However, L2 researchers are not blind, and it is high time we collectively acknowledge that some parts of linguistic knowledge may be innate and other parts are sensitive to regularities and frequency in the input—that is, may have commonalities with general types of learning.

NOTES

1. Other similarities may include the following: successful acquisition in some areas of the grammar; successful convergence on a complete nativelike L2 grammar by some individual learners regardless of strategy; effect of quality and quantity of the input on L1 and L2 rates of acquisition; age effects in L1 and L2 acquisition, without a steep decline that indicates a clear cutoff point in SLA; bilingual (two L1s) and heritage grammars may not be entirely similar to monolingual grammars, which suggests fossilization; determinate intuitions about grammaticality in L2 grammars; unimportance of instruction and no effect of negative evidence with respect to some properties of the grammar.

2. Languages of the non-*pro*-drop variety, like English, have obligatory subjects in embedded contexts (e.g., *John thought *(he) would win the race*), whereas *pro*-drop languages like Spanish allow such null subjects.

3. Exceptions of this prespecification include case features on nouns, which get valued by the inflectional and the verbal heads.

4. For an extensive treatment of this topic, see Lardiere's (2009) keynote article as well as the commentaries.

5. Phonological features are idiosyncratic, language-specific, and learnable, which is also the case for the features of all other lexical items.

6. Details differ in different analyses, but the important thing to notice is that movement is due to the checking requirement of a formal feature.

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7. The various studies that support these observations will not be referenced here (see O'Grady, 1997, and Guasti, 2002, for a comprehensive literature review).

8. See, for example, the 2008 special issue of *Second Language Research* that dealt with Dutch gender marking where quality and quantity of the input are among the most important factors that explain both L1 and (child and adult) L2 acquisition rates.

9. Even if cognitive maturity of adult L2 learners is taken for granted, another cognitive factor—namely, cognitive aging—may be at play.

10. If an acquisition mechanism argued to be the only mechanism in SLA is also used in L1 acquisition, then the answer to whether this is a fundamental difference comes down to glass-half-full versus glass-half-empty arguments.

REFERENCES

Adger, D. (2003). *Core syntax: A minimalist approach*. Oxford: Oxford University Press.

Baker, M. (1996). *The polysynthesis parameter*. Oxford: Oxford University Press.

Birdsong, D. (2005). Interpreting age effects in second language acquisition. In J. F. Kroll & A. de Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 109–128). Oxford: Oxford University Press.

Bley-Vroman, R. (1989). What is the logical problem of foreign language learning? In S. M. Gass & J. Schachter (Eds.), *Linguistic perspectives on second language acquisition* (pp. 41–68). New York: Cambridge University Press.

Bley-Vroman, R. (1990). The logical problem of foreign language learning. *Linguistic Analysis*, *20*, 3–49.

Carroll, S. E. (2001). *Input and evidence: The raw material of second language acquisition*. Amsterdam: Benjamins.

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.

Chomsky, N. (1981). *Lectures on government and binding*. Foris: Dordrecht.

Chomsky, N. (1986). *Knowledge of language: Its nature, origin, and use*. New York: Praeger.

Chomsky, N. (1995). *The Minimalist Program*. Cambridge, MA: MIT Press.

Chomsky, N. (1998). Minimalist inquiries: The framework. *MIT Occasional Papers in Linguistics*, *15*, 1–56.

Chomsky, N. (2001). Derivation by phase. In M. Kenstowicz (Ed.), *Ken Hale: A life in language* (pp. 1–52). Cambridge, MA: MIT Press.

Chomsky, N. (2004). Beyond explanatory adequacy. In A. Belleti (Ed.), *Structures and beyond: The cartography of syntactic structures* (Vol. 3, pp. 104–131). Oxford: Oxford University Press.

Chomsky, N. (2005). Three factors in language design. *Linguistic Inquiry*, *36*, 1–22.

Clahsen, H., & Felser, C. (2006). Grammatical processing in language learners. *Applied Psycholinguistics*, *27*, 3–42.

DeKeyser, R. (2000). The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition*, *22*, 495–533.

DeKeyser, R., & Larson-Hall, J. (2005). What does the critical period really mean? In J. F. Kroll & A. de Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 88–108). Oxford: Oxford University Press.

Dekydtspotter, L., Sprouse, R. A., & Thyre, R. (1999/2000). The interpretation of quantification at a distance in English-French interlanguage: Domain-specificity and second language acquisition. *Language Acquisition*, *8*, 265–320.

de Villiers, J. (2007). The interface of language and theory of mind. *Lingua*, *117*, 1858–1878.

Fodor, J. (1983). *Modularity of mind*. New York: Cambridge University Press.

Fodor, J. (2000). *The mind does not work that way*. New York: Cambridge University Press.

Guasti, M. T. (2002). *Language acquisition: The growth of grammar*. Cambridge, MA: MIT Press.

Guasti, M. T., Chierchia, G., Crain, S., Foppolo, F., Gualmini, A., & Meroni, L. (2005). Why children and adults sometimes (but not always) compute implicatures. *Language and Cognitive Processes*, *20*, 667–696.

Hale, K. (1996). Can UG and L1 be distinguished in L2 acquisition? *Behavioral and Brain Sciences*, *19*, 728–730.

Hawkins, R., & Chan, C. Y.-H. (1997). The partial availability of Universal Grammar in second language acquisition. *Second Language Research*, *13*, 187–226.

https://doi.org/10.1017/S0272263109090263 Published online by Cambridge University Press

Hawkins, R., & Hattori, H. (2006). Interpretation of English multiple wh-questions by Japanese speakers: A missing uninterpretable feature account. *Second Language Research*, *22*, 269–301.
Hopp, H. (2007). *Ultimate attainment at the interfaces in second language acquisition: Grammar and processing*. Groningen, The Netherlands: Grodil Press.
Hulstijn, J. H. (2005). Incidental and intentional learning. In C. J. Doughty & M. H. Long (Eds.), *The handbook of second language acquisition* (pp. 349–381). Oxford: Blackwell.
Hulstijn, J. H., & Ellis, R. (Eds.). (2005). Theoretical and empirical issues in the study of implicit and explicit second-language learning [Special issue]. *Studies in Second Language Acquisition*, *27*(2).
Indefrey, P. (2006). A meta-analysis of hemodynamic studies on first and second language processing: Which suggested differences can we trust and what do they mean? *Language Learning*, *56*(Suppl. 1), 279–304.
Jackendoff, R. (2002). *Foundations of language*. Oxford: Oxford University Press.
Krämer, I. (2000). *Interpreting indefinites: An experimental study of children's language comprehension*. Utrecht, The Netherlands: LOT.
Lardiere, D. (2008). Feature assembly in second language acquisition. In J. M. Liceras, H. Zobl, & H. Goodluck (Eds.), *The role of formal features in second language acquisition* (pp. 106–140). Mahwah, NJ: Erlbaum.
Lardiere, D. (2009). Some thoughts on the contrastive analysis of features in second language acquisition. *Second Language Research*, *25*, 173–227.
Legate, J. A., & Yang, C. (2007). Morphosyntactic learning and the development of tense: A new approach to root infinitives. *Language Acquisition*, *14*, 315–344.
O'Grady, W. (1997). *Syntactic development.* Chicago: University of Chicago Press.
O'Grady, W. (2005). The radical middle: Nativism without universal grammar. In C. J. Doughty & M. H. Long (Eds.), *The handbook of second language acquisition* (pp. 43–62). Oxford: Blackwell.
Papafragou, A., & Musolino, J. (2003). Scalar implicatures: Experiments at the semantics-pragmatics interface. *Cognition*, *86*, 253–282.
Pollock, J.-Y. (1989). Verb movement, Universal Grammar and the structure of IP. *Linguistic Inquiry*, *20*, 365–424.
Reinhart, T. (2006). *Interface strategies: Optimal and costly computations*. Cambridge, MA: MIT Press.
Schwartz, B. D., & Sprouse, R. A. (1996). L2 cognitive states and the full transfer/full access hypothesis. *Second Language Research*, *12*, 40–72.
Slabakova, R. (2002). The compounding parameter in second language acquisition. *Studies in Second Language Acquisition*, *24*, 507–540.
Snyder, W. (1995). *Language acquisition and language variation: The role of morphology*. Cambridge, MA: MIT Working Papers in Linguistics.
Snyder, W. (2001). On the nature of syntactic variation: Evidence from complex predicates and complex word-formation. *Language*, *77*, 324–342.
Tsimpli, I., & Dimitrakopoulou, M. (2007). The interpretability hypothesis: Evidence from wh-interrogatives in second language acquisition. *Second Language Research*, *23*, 215–242.
Unsworth, S. (2005). *Child L2, adult L2, child L1: Differences and similarities—A study on the acquisition of direct object scrambling in Dutch*. Utrecht, The Netherlands: LOT.
Unsworth, S. (2007). L1 and L2 acquisition between sentence and discourse: Comparing production and comprehension. *Lingua*, *117*, 1930–1958.
van Hout, A. (2008). Acquiring perfectivity and telicity in Dutch, Italian and Polish. *Lingua*, *118*, 1740–1765.
White, L. (1989). *Universal Grammar and second language acquisition*. Amsterdam: Benjamins.
White, L. (1990/1991). The verb movement parameter in second language acquisition. *Language Acquisition*, *1*, 337–360.
Yang, C. (2002). *Knowledge and learning in natural language*. Oxford: Oxford University Press.
Yang, C. (2004). Universal Grammar, statistics, or both? *Trends in Cognitive Sciences*, *8*, 451–456.
Yang, C. (2006). *The infinite gift: How children learn and unlearn the languages of the world*. New York: Scribner.

https://doi.org/10.1017/S0272263109090263 Published online by Cambridge University Press