What Are Generative Interlanguage Models Models Of?

Rex A. Sprouse

1. Introduction

The (roughly) biannual Generative Approaches to Second Language Acquisition Conference is an international venue for research based in generative approaches to nonnative language (L2) acquisition (henceforth, I will use term GASLA to refer to this research paradigm rather than to the conference). The explicit goal of many, perhaps most, of the papers presented at this conference is to offer or to test models of L2 knowledge, development, processing, or use reflecting the aspirations of generative grammar more generally. The aims of this paper are (1) to reflect on the putative motivations and assumptions of this research program and (2) to offer preliminary results of one ongoing research project that is attempting to extend these this research paradigm into a linguistic domain that hitherto has been relatively understudied within this overall approach, namely, interlanguage phonology.

Perhaps it would be useful to say straightaway what GASLA is not. First, GASLA is not the search for the best descriptions and analyses of specific natural language phenomena with an eye toward understanding what such analyses tell us about the initial state of the formal representation of language in the human mind (also known as Universal Grammar or UG) as this (necessarily) pertains to native language (L1) acquisition. Such a search defines the general field of generative linguistics, and the insistence that a fully detailed account of all aspects of UG be clearly established before meaningful GASLA work can proceed is tantamount to deferring GASLA research indefinitely. In the best case, GASLA researchers must content themselves to work with the best available account for a particular set of non-trivial linguistic phenomena, and they frequently must simply choose one account among competing accounts for the sake of concreteness.

Secondly, GASLA is not the search for techniques for optimizing the development of L2 proficiency in instructional (or other) contexts. That is the field of (outcome-oriented) foreign or second language pedagogy, and this field is concerned not only with the mental representation of L2 knowledge, but also with a range of issues in the philosophy, ethics, economics, and politics of public, private, and commercial language education. Pedagogical advice based on GASLA research findings must always have a strongly contingent flavor, because GASLA research is concerned with how the human mind functions, not how constituencies within a given society would like it to function. For example, it is possible that GASLA research may reveal the possibility, plausibility, or likelihood that a child or adult L2 learner (henceforth, L2er) of a given target language (TL) will become cognitively indistinguishable from a monolingual native speaker (henceforth, L1er) of that language. However, GASLA research is strictly neutral on the importance or desirability of such an achievement.

It is important for members of the GASLA community to recognize that when we bracket out these two areas of inquiry, we leave many of our colleagues and virtually all of the general public scratching their heads. However, this is not to suggest that GASLA research cannot bear on these questions or that

its findings are irrelevant to general linguistics or to the quest for more effective language instruction. Indeed, a clear understanding of how grammatical development proceeds in adults may well have implications about the plausibility of particular approaches to the initial state in L1 acquisition, as well as the likelihood that input of a given quantity or quality might trigger the acquisition of a particular TL grammatical representation in L2 acquisition. Nevertheless, these are broader impacts of GASLA research, not the basic impulse underlying it.

Turning to what GASLA is, I will first review some of the key insights and research goals that have arisen from the past six decades of generative grammar. Then, I will name and discuss three basic questions that I see naturally arising within GASLA: (1) the basic developmental question; (2) the general L2 paradox; and (3) the L1/L2 outcome differential. In discussing the second question, I will present some preliminary findings of an ongoing project seeking to extend the GASLA paradigm from morph-syntax and semantics to phonology. Overall, I will suggest that GASLA research has tended to concentrate on the first two of these questions, but that at this point, much remains to be explored regarding the third question.

2. Some central insights of generative grammar

Over the roughly six decades since the publication of Chomsky (1957), the generative approach to linguistics has experienced a series of controversies, upheavals, realignments, and other developments. Yet, (most) generative grammarians share a set of basic assumptions about the basic nature of human language, which to my mind includes the following propositions. The human linguistic capacity is profoundly creative. L1ers are able to construct novel linguistic objects to express an infinite array of discrete thoughts, to recognize novel linguistic objects as acceptable or unacceptable, and to assign interpretations to the acceptable ones. Given this bounded infinity of discrete linguistic objects coupled with the finite nature of the human brain, humans must have some kind of mentally represented computational system with at least one recursive operation. Almost all humans are able to acquire this capacity for the language to which they are exposed in early childhood, but to the best of our knowledge, members of no other species can do this. This suggests that the ability to acquire and represent human language grammars is species-specific and hence innate in some sense. When we start to look carefully, we find that human language grammars exhibit properties that have no apparent analogs or applications in other cognitive domains. Furthermore, the developmental timing of the acquisition of complex phonological, morphosyntactic, and semantic properties is entirely out of sync with the development and expression of many other cognitive and behavioral properties. This suggests that this ability is domain-specific. When we look even more carefully, we find that human language grammars exhibit some properties for which there is no relevant evidence in the input ("primary linguistic data") available to learners. This is typified in breakdowns of logical analogical extensions of well-motived generalizations. Young children acquiring their L1 pass through surprisingly predictable developmental stages on their way toward adult-like competence and behavior, and there is little indication that they formulate and test a wide range of logically plausible, but linguistically unattested hypotheses. Indeed, their intuitions about acceptability and interpretation are in many cases amazingly adult-like. Likewise, adults are able to process auditory input in their L1s rapidly and in largely predictable ways. This suggests that there are specific pathways for L1 acquisition and for L1 processing that tightly interact with mentally represented linguistic knowledge. *UG* is the term of art for the initial state that enables a human to undergo this development as a reflexive response to primary linguistic data, and determining the properties of UG is one of the primary tasks of generative linguistics.

This general picture did not emerge overnight. It is easy to forget that many things that seem obvious from the perspective of 2015 seemed crazy in 1955. When Chomsky published *Syntactic Structures* in 1957, it shocked and re-energized the world of linguistics that the blizzard of surface forms associated with the English verbal complex could be reduced to a rather simple, elegant formal rule system. It was not immediately obvious at the dawn of generative grammar in the 1950s how severe the challenge of acquiring such a formal rule system in early childhood might turn out to be. At first it just simply seemed that morphosyntax is very complicated and abstract, but children seem to figure it out despite the haphazard way they encounter primary linguistic data. They seem to come equipped with just the right toolkit for this task, and as clearly demonstrated by Chomsky (1959), simplistic stimulus-response accounts based in Behaviorist Psychology, such as Skinner (1957), cannot begin to account for the computational complexity involved in acquiring a system generating a discrete infinity of sentences.

Only later did it become clear that if the input leads to the proper generalizations (which in some sense must be the case), it should also (but does not) lead to over-extensions for which there is no reliable counter-evidence in contextualized primary linguistic data.

To my mind, the phenomenon known as Strong Crossover is one of the clearest examples of this. Consider the sentences in (1) and imagine a context of an all-boys camping trip, so our world of discourse contains only males.

(1) a. Who thinks he is hungry?
    b. Who does he think is hungry?

The relevant aspects of the examples in (1) are that they contain both a *wh*-phrase in initial position (*who*) and a third-person singular subject pronoun (*he*) later in the sentence. Interrogatives of this type are not rare, not "exotic," and not "complex" (apart from the fact that the sentences contain an embedded clause). However, they differ significantly in the range of interpretations that can be associated with them. The English pronoun *he* can be used deictically. That is, *he* can be used to refer to a male whose identity is established linguistically or contextually outside the sentence in which it occurs. Suppose we are talking about Richard and someone utters one of the examples in (1). These examples can then be rephrased as in (2).

(2) a. Give me the name of the person x such that x thinks that Richard is hungry.
    b. Give me the name of the person x such that Richard thinks that x is hungry.

Let us refer to this as the deictic interpretation of the pronoun.

Sentence (1a) can also have a very different interpretation, viz. where the pronoun *he* does not point out any particular individual, but is a placeholder for a second occurrence of the interrogative *who*. This interpretation of (1a) can be somewhat stiltedly rephrased as in (3).

(3) Give me the name of the person x such that x thinks x is hungry.

Let us refer to this as the bound interpretation of the pronoun.

Suppose that a child acquiring English has encountered both sentences (1a) and (1b) in contexts where it would be reasonable to assume that the deictic interpretation was intended by the speaker. Furthermore, let us assume that this same child has encountered (1a) in a context where the bound interpretation makes sense. If the child is keeping track, she might subdoxastically construct the equivalent of the Table 1.

Table 1

	deictic interpretation of *he*	bound interpretation of *he*
Who thinks he is hungry?	yes	yes
Who does he think is hungry?	yes	

The set of sentences of any natural language represents a discrete infinity. Since the input to the acquisition process is finite, we must assume that (some version of) natural analogical extension is at work in language acquisition. Presented with the data in Table 1, the natural analogy would be to fill in the lower right-hand cell with 'yes' as in Table 2. That is, natural analogical extension would lead to the prediction that a sentence like (4b) should allow the bound interpretation of the pronoun *he*.

Table 2

	deictic interpretation of *he*	bound interpretation of *he*
Who thinks he is hungry?	yes	yes
Who does he think is hungry?	yes	yes

However, this does not match the intuitions of native English speakers when they are (typically, to their befuddlement) asked whether sentence (1b) can be rephrased as (4).

(4) Give me the name of the person x such that x thinks x is hungry.

That is, the summary of the intuitions of actual native speakers of English about the interpretation of the sentences in (1) is what we find in Table 3.

Table 3

	deictic interpretation of *he*	bound interpretation of *he*
Who thinks he is hungry?	yes	yes
Who does he think is hungry?	yes	no

The unexpected 'no' in the lower right-hand cell of the table in Table 3 (known as a Strong Crossover effect) is a case of the poverty of the stimulus (or as I prefer to say for cases like this, the bankruptcy of the stimulus). The point is not merely that this knowledge cannot be triggered by anything in the input; what is crucial is that what is inferable from the input (dyads of the form in (5)) should lead the language-acquiring child to a non-target-like grammar.

(5) < (sentence [*who…he…*]), (interpretation of *he*) >

It turns out that it is not only the case that adult English speakers reject (4) as a possible interpretation of (1b). Experimental work with young children shows that they can assign the bound interpretation to the pronoun *he* in sentences like (1a), but not sentences like (1b). (Crain & Thornton 2000; Thornton 1990). This leaves as the possible source of this knowledge only something inherent in the child's brain/mind distinct from experience of the input. To the extent that this knowledge has no imaginable source of application to any non-linguistic aspect of cognition, this is not merely innate knowledge, but domain-specific innate knowledge. To my mind, this kind of example is the strongest evidence for the role of Universal Grammar (i.e. innate linguistic knowledge) in native language acquisition. The rigorous exploration of natural language phonology, morphosyntax and semantics triggered by the goals of generative grammar has led directly to the discovery of these phenomena, and I have seen no plausible counter-evidence or counter-arguments to this line of reasoning.

Of course, the work of generative grammar does not end simply with identifying phenomena of this sort. Rather, generative linguists seek to find rigorous formal accounts of such phenomena, ideally with an eye toward sorting out the contributions of the input, general cognition, and UG. Ideally, any serious account will have to be compatible with what is already known about UG; hence, a comparison with other phenomena may lead to a refinement of the account of the newly discovered phenomenon or to a new proposal about the precise form or content of UG.

One must sift through a very large body of linguistic phenomena in order to identify the ones that are directly relevant to choosing among models of UG current at any given time. There was (and continues to be) significant discovery and debate about whether the formal system that human beings walk around with in their brains is derivational or purely representational, whether phrase structure rules are central or epiphenomenal, whether semantic interpretation is read off underlying structures, surface structures, some other structure, or built up in tandem with syntactic derivation. Generative linguists have disputed whether phrase structure is restricted to binary branching, and if so, why. Other issues include the representation of case marking and agreement; the inventory of lexical and functional categories and of phonetically null categories; the locus of lexical insertion within derivations; the proper treatment of grammatical function alternations such as active-passive, causative-inchoative, the dative and locative alternations—the list goes on and on.

With the advent of the Principles and Parameters approach in the 1980s, rigorous comparative study became increasingly important, because UG must be restrictive enough to account for the poverty of the stimulus associated with native language acquisition, but sufficiently permissive to allow for the range of actually attested grammars. The Minimalist Program introduced in the 1990s also called for a draconian sharpening of Occam's Razor as applied to the formal machinery of morphosyntactic theory within generative grammar, as well as a re-examination of which aspects of grammar might exhibit the hallmarks not of accidents of human cognitive evolution, but of general quasi-metaphysical principles of the universe (e.g. "economy", "optimal solutions" etc.). Noam Chomsky himself has frequently pointed out that Principles and Parameters and the Minimalist Program as such are not specific theories, but rather approaches or programs, within which specific theories or hypotheses can be formulated.

3. The basic developmental question

The basic developmental question for GASLA research is this: How can we best provide an empirical characterization of and an explanatory account for the developmental stages of Interlanguage, with respect to both linguistic representations and the performance systems that they underlie? An obvious place to begin is to ask whether the same set of principles present in the initial state of L1 acquisition (i.e. UG) is also present in L2 acquisition. The early pioneering work of Clahsen & Muysken (1986, but first presented in 1982), identified, analyzed, and compared developmental stages in the placement of verbs in native German and Romance-German interlanguage. This was based on their study of both child and adult learners' production data, but the assumption was that such production data are highly probative for establishing mentally represented formal grammars. Clahsen & Muysken assumed that such formal systems included a set of context-free phrase structure rules and movement rules. Their claim was that the movement rules in German child grammars (by definition) fall within what is permitted by UG, while the movement rules required to capture some of the Romance-German interlanguage stages fall outside UG; hence, their conclusion was that child, but not adult language development is constrained by UG. This conclusion offers an immediate explanation for the robust observation that typical L2 acquisition outcomes differ strikingly from typical L1 outcomes. In their responses, both duPlessis, Solin, Travis & White (1987) and Schwartz & Tomaselli (1990) offered sketches of the same set of developmental stages in terms of setting and re-setting of parameters independently motivated by comparative study of native language grammars, showing that all the relevant phenomena fall within what is permitted by UG, even if the sequence of stages in L1 and L2 acquisition of German verb placement differ. It is important to recognize that the researchers on both sides of that now classic debate were engaging in GASLA research. That is, a generative approach to adult L2 acquisition does not assume a priori that the all and only the cognitive principles underlying L1 acquisition also underlie L2 acquisition. This is in principle an empirical question, but one that comes into particularly sharp focus when it is approached from the perspective of generative grammar. This seminal controversy is an exemplar of GASLA as a stimulus for careful description and analysis of developmental stages in L2 development.

This tradition was continued in the transfer debate of the mid-1990s, when the proponents of Minimal Trees (Vainikka & Young-Scholten 1994, 1996), Valueless Features (Eubank 1996), and Full Transfer/Full Access (Schwartz & Sprouse 1994, 1996) all conducted careful studies of cross-sectional and/or longitudinal data sets in order to establish stages in interlanguage development, for which they then proposed formal characterizations. Of course, it is not the case that the identification and characterization of developmental stages can be studied only on the basis of production data. Rigorously designed tasks, acceptability judgment tasks, truth value judgment tasks, picture identification and interpretation tasks, arrange-these-cards-to-form-as-many-sentences-as-you-can tasks etc. etc. can also be used. GASLA researchers also investigate the development of interlanguage processing and interlanguage phonological systems using appropriate experimental protocols.

In the past 30 years, the GASLA community has produced an impressive body of research on developmental stages ranging from very early beginning learners to highly advanced near-native speakers. In recent years, this has been extended to the study of development in third language acquisition (e.g. Bardal & Falk 2007; Giancaspro, Halloran & Iverson 2015; Leung 2005; Rothman 2015; Rothman & Halloran 2013). In terms of complexity, the difference between the description and analysis of L2 and L3 acquisition might be likened to the difference between human travel to the moon and to Mars. This is because the number of potentially interacting factors multiplies rapidly, and it is not immediately obvious precisely which learner profiles form the appropriate comparisons. This includes questions about L1 and TL and their relative sequencing, including the level of proficiency learners have attained in the L2 before the onset of exposure to L3 input. Furthermore, the practical challenges of identifying and studying relevant populations can be extremely difficult. For example, researchers in the United States can find reasonable numbers of native speakers of English who after attaining a high level of proficiency in Spanish undertake the acquisition of Portuguese, but rather few native speakers of English who after attaining a high level of proficiency in Portuguese undertake the acquisition of Spanish. However, the search for a reasonable number of native speakers of Russian who after attaining a high level of proficiency in Turkish undertake the acquisition of Mohawk would clearly be a fool's errand, although it could be an extraordinarily well chosen population for the study of the effect of acquiring an "agglutinating" language as an L2 on native speakers of an "inflectional" language before

undertaking the acquisition of a "polysynthetic" language as an L3. Despite the many challenges involved, the study of L3 development offers great promise, precisely because of its complexity. In "simple" L2 acquisition, the L1 is not only the first language to have been acquired, but also the most recent one to have been acquired, and simultaneously the one that is typologically both most similar to and most different from the new language. Careful L3 developmental studies present the possibility of disentangling these properties and appear to be an exciting way forward to a better understanding of how the human mind represents multiple grammars.

4. The general L2 paradox

In a large percentage of cases, adults acquiring a new language experience significant difficulty in the acquisition and use of relatively "simple" features of pronunciation, grammatical form, and appropriate word choice. Paradoxically, GASLA research has demonstrated that these very same learners develop systems of linguistic knowledge of a startlingly rich and complex nature, including properties for which there is little or no evidence in the input. Specific studies include evidence that such learners exhibit the same asymmetries as native speakers on phenomena such as the interpretation of overt vs. null pronouns in null-subject languages (Kanno 1997; Pérez-Leroux & Glass 1997) the acceptability of remnant scrambling vs. remnant topicalization in German (Hopp 2005; Schreiber & Sprouse 1998); the acceptability of process vs. result interpretation of double genitives in French (Dekydtspotter, Sprouse & Anderson 1997); the multiple event requirement in floated vs. *in situ* quantifiers in French (Dekydtspotter, Sprouse & Thyre 1999/2000), scope asymmetries with pied-piping vs. stranding of restrictions on interrogative quantifiers in French (Dekydtspotter & Sprouse 2001; Dekydtspotter, Sprouse & Swanson 2001), weak vs. strong movement violations in English (Martohardjono 1993), and the distributive interpretation of quantifiers and target landing sites in Japanese (Marsden 2009).

Most of these studies explicitly or implicitly involve the acquisition of a morphosyntactic or syntactico-semantic paradigm congruent with Table 3 above, here generalized as Table 4.

Table 4

	Context or interpretation I	Context or interpretation II
Structure A	Yes	yes
Structure B	Yes	no

In general there is a tripartite poverty of the stimulus involved in acquiring knowledge of this paradigm: (1) The crucial generalization is underdetermined by primary linguistic data; (2) The generalization is not instantiated in the learner's L1; and (3) The generalization is not the object of explicit instruction. Typically the reason why the generalization is not instantiated in the learner's L1 is that one or both of the prerequisite structures is not instantiated in the L1. It is often the case that studies of this genre show that early L2ers who are unlikely to have acquired both the prerequisite TL structures do not exhibit a clear asymmetry in their acceptance of items in the lower-right vs. items in the lower-left or upper-right. However, more advanced L2ers, who can be shown or reasonably assumed to have acquired both Structure A and Structure B, do exhibit the relevant asymmetry.

Within the conceptual framework of GASLA, this general paradox is immediately explained by the assumption that UG plays essentially the same role in adult L2 acquisition as in child L1 acquisition, paired with the further assumption that UG is not strictly coextensive with the entire set of learning algorithms and performance systems. In other words, there may be (in some sense) a "Critical Period" (age-related decline) for certain facets of language acquisition, but not for the role of UG in language acquisition.

Although the General L2 Paradox has been intensely documented in the domains of morphosyntax, and syntactico-semantics has been intensively studied by GASLA researchers, I am aware of rather few studies that approach the L2 acquisition of phonology from a similar perspective. Of course, L2 phonetics is a very robust and active field, and many researchers are examining issues such as category formation, phoneme discrimination in perception and production, the role of orthography, age-dependent effects, among other questions. Furthermore, the literature of approximately 15 to 20 years ago includes a variety of proposals for how a comparison of L1 and TL features as defined in specific versions of

phonological theory can predict which phonemic contrasts will come readily and which was come only with great difficult, if at all, in adult L2 acquisition. However, it is the rare L2 phonologist today who is pursuing questions regarding the role of phonological principles of UG in L2 acquisition. In his 2012 dissertation on the acquisition of stress assignment in Turkish, Öner Özçelik does just this, and recently, he and I have begun to study the acquisition of non-canonical vowel harmony in Turkish by adult English-Turkish L2ers. Here I will try to summarize the basic question and our results thus far.

The Turkish vowel system includes phonemically 8 vowels, which are standardly classified by three binary features: [±high], [±back], and [±round], as shown in Table 5.

Table 5

	Front vowels		Back vowels	
	Unrounded	Round	Unrounded	Round
High	/i/ \<i>	/y/ \<ü>	/ɯ/ \<ı>	/u/ \<u>
Non-High	/e/ \<e>	/ø/ \<ö>	/a/ \<a>	/o/ \<o>

All of the vowels in Turkish suffixes are specified for [±high], but most are underspecified for [±back] (and [±round]) with the latter features filled in through a process of vowel harmony. More precisely, [+high] vowel harmony targets are underspecified for both [±back] and [±round] and the specifications for both these features almost always spread from the vowel in the immediately preceding syllable. On the other hand, (unless underlyingly specified for all features and not subject to vowel harmony at all) [-high] vowels of Turkish suffixes can only be [-round], due to the presence of a separate (more general) constraint in Turkish grammar against the presence of [-high] rounded vowels in non-initial syllables; hence, in these cases it is only the specification for [±back] that spreads from the vowel in the immediately preceding syllable. Consider the examples in (6) and (7), which illustrate the basic paradigm of Turkish vowel harmony using simple monosyllabic roots.

(6) Suffix vowel underlyingly specified as [+high]: 3rd person possessive

				root vowel	suffix vowel
a.	ün-ü	[yny]	'(his) fame'	{[+high] **[-back] [+round]**}	{[+high] **[-back] [+round]**}
b.	iş-i	[iʃi]	'(his) work'	{[+high] **[-back] [-round]**}	{[+high] **[-back] [-round]**}
c.	kuş-u	[kuʃu]	'(his) bird'	{[+high] **[+back] [+round]**}	{[+high] **[+back] [+round]**}
d.	kız-ı	[kɯzɯ]	'(his) girl'	{[+high] **[+back] [-round]**}	{[+high] **[+back] [-round]**}
e.	göz-ü	[gøzy]	'(his) eye'	{[-high] **[-back] [+round]**}	{[+high] **[-back] [+round]**}
f.	ders-i	[dersi]	'(his) lesson'	{[-high] **[-back] [-round]**}	{[+high] **[-back] [-round]**}
g.	dost-u	[dostu]	'(his) friend'	{[-high] **[+back] [+round]**}	{[+high] **[+back] [+round]**}
h.	at-ı	[atɯ]	'(his) horse'	{[-high] **[+back] [-round]**}	{[+high] **[+back] [-round]**}

(7) Suffix vowel underlyingly specified as [-high]: dative

				root vowel	suffix vowel
a.	ün-e	[yne]	'(to the) fame'	{[+high] **[-back]** [+round]}	{[-high] **[-back]** [-round]}
b.	iş-e	[iʃe]	'(to the) work'	{[+high] **[-back]** [-round]}	{[-high] **[-back]** [-round]}
c.	kuş-a	[kuʃa]	'(to the) bird'	{[+high] **[+back]** [+round]}	{[-high] **[+back]** [-round]}
d.	kız-a	[kɯza]	'(to the) girl'	{[+high] **[+back]** [-round]}	{[-high] **[+back]** [-round]}
e.	göz-e	[gøze]	'(to the) eye'	{[-high] **[-back]** [+round]}	{[-high] **[-back]** [-round]}
f.	ders-e	[derse]	'(to the) class'	{[-high] **[-back]** [-round]}	{[-high] **[-back]** [-round]}
g.	dost-a	[dosta]	'(to the) friend'	{[-high] **[+back]** [+round]}	{[-high] **[+back]** [-round]}
h.	at-a	[ata]	'(to the) horse'	{[-high] **[+back]** [-round]}	{[-high] **[+back]** [-round]}

The examples in (6) illustrate vowel harmony with a suffix with a vowel pre-specified as simply [+high], the third person singular possessive suffix -I. (Here I follow the standard Turkological practice of using upper-case symbols to represent underspecified vowels subject to vowel harmony: I for an underspecified high vowel and E to represent an underspecified non-high front vowel.) The root vowels in the eight examples illustrate all eight logically possible combinations of the three binary features. In each instance, the vowel of the suffix is [+high], but the specification for the features [±back] and

[±round] are simply copied from the root vowel, as indicated by boldface type. For example, the word [gøz] (see (6e)) contains the vowel [ø], which has the features {[-high] [-back] [+round]}. Since the suffix vowel is specified as [+high], it can undergo both front/back and rounding harmony, resulting in a high vowel that is front and rounded, as with [ø], which leads to the vowel [y]. Because the suffix vowel here has four possible realizations, this vowel harmony pattern is often called "four-way vowel harmony" in Turkish textbooks.

The examples in (7) illustrate vowel harmony with a suffix with a vowel pre-specified for [-high], the dative case suffix. In these examples, the vowel of the suffix is [-high] and [-round], and as the vowel is [-high], only the specification for the feature [±back] is copied from the root vowel. Using the same example, [gøz], which contains a vowel with the specifications {[-high] [-back] [+round]}, since the suffix vowel -E is [-high], only the backness feature is copied from the root, and roundness is not, resulting in a suffix vowel that is not only [-high] (which is underlyingly specified) but also [-back] as with the root vowel, but, unlike the root vowel, it is [-round]. Because the suffix vowel here has two possible realizations, this vowel harmony pattern is often called "two-way vowel harmony" in Turkish textbooks.

Although English phonology does not have any process remotely resembling Turkish vowel harmony, there is no reason to think that the acquisition of these patterns poses a poverty of the stimulus problem for instructed English-Turkish L2ers. These surface alternations are extremely robust in the auditory input and are transparently represented in the Turkish writing system. Furthermore, English-speaking classroom learners of Turkish receive early and extensive instruction on these two primary patterns of vowel harmony.

The feature [±back] furthermore plays the central role in the distribution of the surface variants of the underlying underspecified lateral /l/ in Turkish. Consider the examples of typical uninflected native Turkic words in (8).

(8)	a. [bał]	bal	'honey'	**"dark" [ł]**
	b. [kuł]	bul	'to find'	**"dark" [ł]**
	c. [sołgun]	solgun	'pale'	**"dark" [ł]**
	d. [kıł]	kıl	'hair'	**"dark" [ł]**
	e. [leke]	leke	'dirt'	**"light" [l]**
	f. [bel]	bel	'back'	**"light" [l]**
	g. [kyl]	kül	'ash'	**"light" [l]**
	h. [jelken]	yelken	'sail'	**"light" [l]**

When the lateral occurs in the immediate environment of a [+back] vowel, the lateral is realized as a velarized [ł], generally known as the "dark" [ł] (as illustrated in (8a)-(8d)); when the lateral occurs in the immediate environment of a [-back] vowel, the lateral is realized as a non-velarized [l], generally known as the "light" [l] (as illustrated in (8e)-(8h)).

Consider next lexemes that end in a lateral in their uninflected forms. When a suffix with an underspecified vowel is added, this pattern is further enforced, as shown in the examples in (9).

(9)	a.	bal-a	[bała]	'honey.DAT'	**"dark" [ł]**
	b.	kul-a	[kuła]	'servant.DAT'	**"dark" [ł]**
	c.	kol-a	[koła]	'arm.DAT'	**"dark" [ł]**
	d.	kıl-a	[kıuła]	'hair.DAT'	**"dark" [ł]**
	e.	kül-e	[kyle]	'ash.DAT'	**"light" [l]**
	f.	il-e	[ile]	'city.DAT'	**"light" [l]**
	g.	göl-e	[gøle]	'lake. DAT'	**"light" [l]**
	h.	bel-e	[bele]	'back.DAT'	**"light" [l]**

In the examples in (9), the dative suffix, which is underlying underspecified for the feature [±back] has been attached to nouns ending in a lateral. Canonical vowel harmony results in dark [ł] preceded and followed by a [+back] vowels in (9a)-(9d) and in light [l] preceded and followed by [-back] vowels in (9e)-(9h.)

The examples of Turkish laterals discussed thus far _seem_ to give the appearance of a standard example of allophones of a single phoneme in complementary distribution. They are representative of

the vast majority of Turkish lexemes containing a lateral, and this distribution may be thought of as the canonical distribution of laterals in Turkish.

There is, however, a class of exceptional cases. Due to borrowing from Arabic, Persian, and some European languages, there are instances of light [l] in the environment of [+back] vowels. Some of the most common examples are listed in (10).

(10)   a.   rol   [rol]   'role'   "light" [l]
         b.   petrol [petrol]   'petroleum' "light" [l]
         c.   hal   [hal]   'situation'   "light" [l]

Examples like (10) suggest that (at least in some instances), Turkish laterals are in fact underlyingly specified for a feature like [coronal]. We may think of this phenomenon as the non-canonical distribution of /l/.

When a suffix with a vowel that is underlyingly underspecified for the feature [±back] is attached to the nouns in (10), the suffix vowel surfaces as [-back], as illustrated in (11).

(11)   a.   rol-e   [role]   'role.DAT'   "light" [l]   [-back] V
         b.   petrol-e [petrole]   'petroleum.DAT' "light" [l]   [-back] V
         c.   hal-e   [hale]   'situation.DAT' "light" [l]   [-back] V

In the examples in (11), an underlyingly underspecified vowel is realized as a [-back] vowel, despite the presence of a [+back] vowel in the immediately preceding syllable. This obtains because of the intervening underlyingly specified [Coronal] lateral. We may say that the non-canonical distribution of /l/ leads to non-canonical vowel harmony in Turkish.

Following Clements & Sezer (1982) (and in the spirit of Nevins 2010), let us assume that examples of this kind indicate that in (at least) certain lexical items Turkish laterals are pre-specified for the feature [-back] and that locality conditions on feature spreading dictate that this feature specification spreads rightward to the vowels that follow. In the presence of this pre-specified feature, general constraints on feature spreading block the spreading of the specification [+back] from the root vowel to the suffix vowel. Hence, the forms in (12) are not possible:

(12)   a.   *   rol-a   [rola]   'role.DAT'   "light" [l]   [+back] V
         b.   *   petrol-a [petrola]   'petroleum.DAT' "light" [l]   [+back] V
         c.   *   hal-a   [hala]   'situation.DAT' "light" [l]   [+back] V

This phenomenon is illustrated in a condensed Feature Geometric representation in (13) below (see Levi 2001 for a similar approach):

(13)
```
        r              o              l              e
        |              |              |              |
    C-place        C-place        C-place        C-place
                       |              |              |
                   V-place        V-place        V-place
                                               /
                       |              |     /
                    Dorsal         Coronal
```

For the sake of concreteness, we can follow Levi's (2001) analysis that the lateral has a V-place, pre-specified with Coronal (i.e. [-back]). This means that the final vowel, which is underspecified for [±back], will obtain this feature from the nearest feature-bearing element with a node bearing the same label, i.e. the lateral. In other words, even though the vowel features [±back] normally spreads through vowels, and consonants are transparent to this (vowel harmony) process (as only vowels have the V-Place node), the lateral consonant here is special in that it is underlyingly specified for the spreading feature (as [-back]), meaning that spreading from the vowel is blocked, and further spreading occurs from this consonant. This blocking effect follows from a well-motivated phonological principle of

Universal Grammar, Hammond's (1988) No Crossing Constraint. It is important, however, to note that the precise formulation is not entirely germane to the acquisitional question that Öner Özçelik and I investigated—although it of course *is* germane to general phonological theory. Something is responsible for the exceptionality of non-canonical vowel harmony.

Let us return to our English-speaking classroom learner of Turkish. In the overwhelming majority of cases, Turkish vowel harmony functions in the straightforward, rule-governed way outlined earlier. Non-canonical vowel harmony represents something of a needle in the haystack in the overall input. Not only do classroom learners receive no instruction on non-canonical vowel harmony, non-canonical vowel harmony directly violates the rules that they are explicitly taught. Of course, English will not help them out with the non-canonical distribution of the lateral in Turkish (or for that matter, its canonical distribution), because (for many speakers of US English) the distribution of the English lateral is dependent on the position of the lateral in a syllable, not on the quality of adjacent vowels: think *low* with a light-l before a back vowel and *heal* with a dark-l after a front vowel. Finally, it is precisely in examples of this type where Turkish orthography presents the L2er with potentially misleading input. This is because the Turkish writing system does not mark the unpredictable (hence, necessarily pre-specified) [-back] feature (Coronal) for the lateral in words like *rol*.

Here I report on the preliminary results our investigation of the acquisition of this phenomenon, involving 16 English-Turkish L2ers and 8 native speakers of Turkish. Participants completed a task where they were presented with 128 actual nouns and 128 nonce nouns and they were asked to select the appropriate suffix from a list of 2 or 4, depending on whether the suffix exhibits 2-way or 4-way vowel harmony. Half of the items were "pure" fillers, i.e. the uninflected nouns did not end in /l/, while the other half ended in /l/. Of those ending with /l/, half were pronounced with the canonical realization of /l/ for the frontness or backness of the immediately preceding vowel, and half with the non-canonical. The 8 vowels of the Turkish vowel system were equally distributed in the uninflected nouns. Finally, half of the trials involved auditory presentation only, while the other half involved auditory and visual presentation simultaneously. The preliminary results are given in Table 6.

Table 6
Results: Percentage of correct suffix choices

	Beginner (n=6)	Intermediate (n=5)	Advanced (n=5)	Native (n=8)
Fillers				
Auditory only	84.11%	93.75%	96.56%	98.83%
Auditory + visual	98.43%	99.06%	95.90%	98.04%
With canonical /l/				
Auditory only	77.09%	90.63%	96.25%	99.61%
Auditory + visual	96.67%	98.40%	99.20%	99.50%
With non-canonical light [l]				
Auditory only	44.17%	55.00%	55.00%	81.88%
Auditory + visual	2.50%	21.00%	32.00%	73.18%

As can be seen, all participants give near-ceiling results on fillers and examples with canonical /l/ with bimodal presentation, and the Advanced L2ers and the Native groups also do so with auditory-only presentation. Furthermore, the Intermediate group and even the Beginner group are far more accurate than chance with auditory-only presentation as well. This shows that the basics of Turkish vowel harmony are acquired very early on in the process of L2 acquisition of Turkish by speakers of English, and it suggests that Beginners and (to a certain extent) Intermediate learners are helped by visual presentation, but they are not entirely dependent on such presentation. Notice now that these near-ceiling or ceiling-directed performance rates on fillers and on examples with canonical /l/ should correlate with near-floor or floor-directed performances on examples with non-canonical /l/, if L2ers rely solely on what they have been told in classroom instruction about vowel harmony and about the standard Turkish orthography system, because the target-congruent computations here override the immediately preceding vowel. This is indeed what we find in the Beginners' performance with bimodal presentation. However, even the Beginners reveal a response pattern moving them away from what they have been explicitly taught when responding to auditory-only stimuli, and this trend continues with the

Intermediate and Advanced groups and begins to emerge even with bimodal presentation. Clearly, *something* is moving the L2ers away from what they have learned and this is effecting both real nouns and nonce nouns. I would submit that the most likely candidate is some version of the No Crossing Constraint. Of course, alternative hypotheses can be formulated and tested. But if this is at all on the right track, it suggests that (at least one of the) phonological principles of Universal Grammar may well be implicated in adult L2 acquisition.

The logic of this study does not crucially depend on the precise formulation of the rules of Turkish vowel harmony and lateral realization. The learnability problem has to do with the fact that the exceptional pronunciation of an intervening consonant overrides the extremely robust generalization that it is the preceding vowel that governs vowel harmony—and in this particular case, reliance on explicit instruction would lead to the non-TL result. However, something in the learners' brains is making them suspicious (whether consciously or not) about what explicit instruction would say about these cases and this carries over to nonce cases that the learners could not possibly have ever encountered. What makes this study, I hope, an example of the generative approach to L2 acquisition is not the precise version of Feature Geometry or underspecification theory or the No Crossing Constraint we assume. All that previous research was extremely helpful to us, to be sure, but the generative part is that we are trying to determine whether the phonological representations that L2ers acquire are subject to the same kinds of constraints as those that guide native phonological acquisition.

5. The L1/L2 outcome differential

If it is true that UG guides and restricts adult L2 acquisition, we are left with the question why so many adult L2ers experience significant difficulty in the acquisition and use of relatively "simple" features of word choice and form. The literature contains several proposals. One is that Full Transfer means that adult L2ers do not have the same starting point as child L1ers. When fine-grained issues are involved, there may be insufficient (or simply no) relevant input to dislodge facets of grammatical knowledge inherited from the L1. This becomes even more acute if some version of Sprouse's (2006) Deep Lexical Transfer is correct. Another proposal is that inflectional morphology is *one*—and perhaps *the*—major culprit. This is captured in Donna Lardiere's work on feature reassembly, which points out how complex the task of acquiring target-like inflectional morphology in a new language is, and the notion of a Morphological Bottleneck as developed (in my view) convincingly and eloquently in Roumyana Slabakova's 2008 book *Meaning in the Second Language*. Yet another proposal is that UG may be partially unavailable in adult L2 acquisition. Although there appears to be quite a substantial amount of evidence that several of the restrictive features of UG operate in adult L2 acquisition, it might be that not all of the primes presumably made available by UG—particularly ones associated with inflection—are still available. This is the conjecture underlying various versions of Hawkins & Chan's (1997) Failed Functional Features or Tsimpli & Dimitrakopoulou's (2007) Interpretability Hypothesis. My own reading of the GASLA literature suggests that we have not yet seen a sufficient number of studies designed to directly contrast competing accounts of non-convergence on the TL.

6. Briefest of conclusions

In sum, this paper has been intended to validate the basic program of GASLA research. In the past 30 years or so, much as been learned about the properties of interlanguage grammars by submitting them to formal rigorous investigation and inquiring into their epistemological status. I have sought to highlight three areas where much can still be learned: the role of previously acquired grammars in L3 (L4, L5, …) acquisition, the role of UG principles in the acquisition of L2 phonology, and the reason why adult L2 outcomes frequently diverge from L1 outcomes, even if interlanguage grammars uniformly fall within the set of grammar permitted by UG. We have learned much, but there is still much to discover.

References

Bardel, Camilla, & Falk, Ylva. (2007). The role of the second language in third language acquisition: The case of Germanic syntax. *Second Language Research*, 23, 459-484.

Chomsky, Noam. (1957). *Syntactic structures*. The Hague, The Netherlands: Mouton.

Chomsky, Noam. (1959). Review of B.F. Skinner's *Verbal behavior*. *Language* 35, 26-58.

Clahsen, Harold, & Muysken, Pieter. (1986). The availability of universal grammar to adult and child learners: A study of the acquisition of German word order. *Second Language Research*, 2, 93-119.

Clements, George N., & Sezer, Engin. (1982). Vowel and consonant disharmony in Turkish. In Harry van der Hulst & Norval Smith (Eds.), *The structure of phonological representations 2* (pp. 213-255). Dordrecht, The Netherlands: Foris.

Crain, Stephen, & Thornton, Rosilind. (2000). *Investigations in universal grammar: A guide to experiments on the acquisition of syntax and semantics*. Cambridge, MA: The MIT Press.

Dekydtspotter, Laurent, & Sprouse Rex A. (2001). Mental design and (second) language epistemology: Adjectival restrictions of *wh*-quantifiers and tense in English-French interlanguage. *Second Language Research*, 17, 1-35.

Dekydtspotter, Laurent, Sprouse Rex A., & Anderson, Bruce. (1997). The interpretive interface in L2 acquisition: The process-result distinction in English-French interlanguage grammars. *Language Acquisition*, 6, 297-332.

Dekydtspotter, Laurent, Sprouse Rex A., & Swanson, Kimberly A.B. (2001). Reflexes of mental architecture in second-language acquisition: The interpretation of *combien* extractions in English-French interlanguage. *Language Acquisition*, 9, 175-227.

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

duPlessis, Jean, Solin, Doreen, Travis, Lisa, & White, Lydia. (1987). UG or not UG, That is the question: A reply to Clahsen and Muysken. *Second Language Research*, 3, 56-75

Eubank, Lynn. (1996). Negation in early German-English interlanguage: More valueless features in the L2 initial state. *Second Language Research*, 12, 73-106.

Giancaspro, David, Halloran, Becky, & Iverson, Michael. (2015). Transfer at the initial stages of L3 Brazilian Portuguese: A look at three groups of English/Spanish bilinguals. *Bilingualism: Language and Cognition*, 18, 191-207.

Hammond, Michael. (1988). On deriving the well-formedness condition. *Linguistic Inquiry*, 19, 319-325.

Hawkins, Roger, & Chan, Cecilia Yuet-hung. (1997). The partial availability of Universal Grammar in second language acquisition: The 'failed functional features hypothesis. *Second Language Acquisition*, 13, 187-226.

Hopp, Holger. (2005). Constraining second language word order optionality: Scrambling in advanced English-German and Japanese-German interlanguage. *Second Language Research*, 21, 34-71.

Kanno, Kazue. (1997). The acquisition of null and overt pronominals in Japanese by English speakers. *Second Language Acquisition*, 13, 265-287.

Leung, Yan-kit Ingrid. (2005). L2 vs. L3 initial state: A comparative study of the acquisition of French DPs by Vietnamese monolinguals and Cantonese-English bilinguals. *Bilingualism: Language and Cognition*, 8, 39-61.

Levi, Susannah V. (2001). Glides, laterals and Turkish vowel harmony. *Papers from the Annual Meeting of the Chicago Linguistic Society*, 37, 379-393.

Marsden, Heather. (2009). Distributive quantifier scope in English-Japanese and Korean-Japanese interlanguage. *Language Acquisition*, 16, 135-177.

Nevins, Andrew. (2010). *Locality in vowel harmony*. Cambridge, MA: The MIT Press.

Özçelik, Öner. (2012). *Representation and acquisition of stress: The case of Turkish* (Doctoral dissertation, McGill University).

Rothman, Jason. (2015). Linguistic and cognitive motivations for the Typological Primacy Model (TPM) of third language (L3) transfer: Timing of acquisition and proficiency considered. *Bilingualism: Language and Cognition*, 18, 179-190.

Rothman, Jason, & Halloran, Becky (2013) Formal linguistic approaches to L3/Ln acquisition: A focus on morphosyntactic transfer in adult multilingualism. *Annual Review of Applied Linguistics*, 33, 51-67.

Pérez-Leroux, Ana Teresa, & Glass, William R. (1997). Null anaphora in Spanish second language acquisition: Probabilistic versus generative approaches. *Second Language Acquisition*, 15, 220-249.

Schreiber, Timothy, s& Sprouse, Rex A. (1998). Knowledge of topicalizationand scrambling in English-German Interlanguage. *McGill Working Papers in Linguistics*, 13, 162-72.

Schwartz, Bonnie D., & Sprouse, Rex A. (1994). Word order and nominative case in non-native language acquisition: A longitudinal study of (L1 Turkish) German interlanguage. In Teun Hoekstra & Bonnie D. Schwartz (Eds.), *Language acquisition studies in generative grammar: Papers in honor of Kenneth Wexler from the 1991 GLOW Workshops* (pp. 317-368). Philadelphia, PA: John Benjamins.

Schwartz, Bonnie D., & Sprouse, Rex A. (1996). L2 cognitive states and the Full Transfer/Full Access model. *Second Language Research*, 12, 40-72.

Schwartz, Bonnie D., & Tomaselli, Alessandra. (1990). Some implications from an analysis of German word order. In Werner Abrahamson, Wim Kosmeijer, & Eric J. Reuland (Eds.), *Issues in Germanic syntax*, (pp. 251-381). New York: Mouton de Gruyter.

Skinner, B.F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Slabakova, Roumyana. (2008) *Meaning in the second language*. New York: Mouton de Gruyter.

Sprouse, Rex A. (2006). Full Transfer and Relexification: Second language acquisition and creole genesis. In Claire Lefebvre, Christine Jourdan, & Lydia White (Eds.), *L2 acquisition and creole genesis: Dialogues* (pp. 169-181). Philadelphia, PA: John Benjamins.

Thornton, Rosalind Jean. (1990). *Adventures in long-distance moving: The acquisition of complex wh-questions* (Doctoral dissertation, University of Connecticut).

Tsimpli, Ianthi Maria, & Dimitrakopoulou, Maria. (2007). The interpretability hypothesis: Evidence from *wh*-interrogatives in second language acquisition. *Second Language Research*, 23, 215-242.

Vainikka, Anne, & Young-Scholten Martha. (1994). Direct access to X′-theory: Evidence from Korean and Turkish adults learning German. In Teun Hoekstra & Bonnie D. Schwartz (Eds.), *Language acquisition studies in generative grammar: Papers in honor of Kenneth Wexler from the 1991 GLOW Workshops* (pp. 265-317). Philadelphia, PA: John Benjamins.

Vainikka, Anne, & Young-Scholten Martha. (1996). Gradual development of L2 phrase structure. *Second Language Research*, 12, 7-39.

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