

Second Language Acquisition

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1. Introduction

Usage-based approaches hold that we learn linguistic constructions while engaging in communication, the “interpersonal communicative and cognitive processes that everywhere and always shape language” (Slobin 1997). Constructions are form-meaning mappings, conventionalized in the speech community, and entrenched as language knowledge in the learner’s mind. They are the symbolic units of language relating the defining properties of their morphological, syntactic, and lexical form with particular semantic, pragmatic, and discourse functions (Bates and MacWhinney 1987; Lakoff 1987; Langacker 1987; Croft 2001; Croft and Cruse 2004; Goldberg 1995, 2003, 2006; Tomasello 2003; Robinson and Ellis 2008; Bybee 2008). Broadly, Construction Grammar argues that all grammatical phenomena can be understood as learned pairings of form (from morphemes, words, and idioms, to partially lexically filled and fully general phrasal patterns) and their associated semantic or discourse functions. Such beliefs, increasingly influential in the study of child language acquisition, have turned upside down generative assumptions of innate language acquisition devices, the continuity hypothesis, and top-down, rule-governed, processing, bringing back data-driven, emergent accounts of linguistic systematicities. Constructionist theories of child first language acquisition (L1A) use dense longitudinal corpora to chart the emergence of creative linguistic competence from children’s analyses of the utterances in their usage history and from their abstraction of regularities within them (Goldberg 1995, 2006, 2003; Diessel, this volume; Tomasello 1998; Tomasello 2003).

Second language (L2) learners share the goal of understanding language and how it works. Since they achieve this based upon their experience of language usage, there are many

commonalities between first and second language acquisition that can be understood from corpus analyses of input and from cognitive- and psycho-linguistic analyses of construction acquisition following associative and cognitive principles of learning and categorization. Therefore Usage-based approaches, Cognitive Linguistics, and Corpus Linguistics are increasingly influential in L2A research too (Ellis 1998, 2003; Ellis and Cadierno 2009; Robinson and Ellis 2008; Collins and Ellis 2009), albeit with the twist that since they have previously devoted considerable resources to the estimation of the characteristics of another language -- the native tongue in which they have considerable fluency -- L2 learners' computations and inductions are often affected by transfer, with L1-tuned expectations and selective attention (Ellis 2006c; Ellis and Sagarra, 2010a) blinding the acquisition system to aspects of the L2 sample, thus biasing their estimation from naturalistic usage and producing the limited attainment that is typical of adult second language acquisition (L2A). Thus L2A is different from L1A in that it involves processes of construction and *reconstruction*.

The organization of the remainder of chapter is as follows. Section 2 provides evidence for the psychological reality of constructions in L2. Section 3 presents a psychological analysis of the effects of form, function, frequency, and contingency that are common to both L1 and L2 construction learning following statistical learning processes which relate input and learner cognition. It illustrates each point with empirical demonstrations of these effects separately for L1 and for L2. Section 4 considers L1 \Rightarrow L2 transfer as it affects the conceptual underpinnings of constructions and their understanding. Section 5 considers L1 \Rightarrow L2 transfer or "learned attention" and how this affects learners' sensitivity to different aspects of the linguistic form of constructions. Finally, section 6 presents some priorities for future research.

2. L2 constructions

Demonstrations of the psychological reality of constructions in native speakers' language (e.g., Goldberg, Casenhiser, and Sethuraman 2004; Pickering 2006) prompted research investigating whether constructions also underpin second language learners' linguistic competence, and how L2 learners implicitly "tally" (Ellis 2002) and tune their constructional knowledge to construction-specific preferences in terms of the words that preferably occur in

those constructions. For example, Gries and Wulff (2005) showed (i) that advanced L2 learners of English who were native speakers of German showed syntactic priming for ditransitive (e.g., *The racing driver showed the helpful mechanic ...*) and prepositional dative (e.g., *The racing driver showed the torn overall ...*) argument structure constructions in an English sentence completion task, (ii) that their semantic knowledge of argument structure constructions affected their grouping of sentences in a sorting task, and (iii) that their priming effects closely resembled those of native speakers of English in that they were highly correlated with native speakers' verbal subcategorization preferences whilst uncorrelated with the subcategorization preferences of the German translation equivalents of these verbs. There is now a growing body of research demonstrating such L2 syntactic priming effects (McDonough 2006; McDonough and Mackey 2006; McDonough and Trofimovich 2008; Gries and Wulff 2009).

This recent research within a Cognitive Linguistics framework echoes some of the earliest work on L2A within the Structuralist tradition. Charles Fries, the founder of the English Language Institute at the University of Michigan, distinguished between lexical and structural meaning, with structural meaning concerning the patterns relating a particular arrangement of form classes to particular structural meanings. In his view, language acquisition is the learning of an inventory of patterns as arrangements of words with their associated structural meanings. Fries' (1952) *Structure of English* presented an analysis of these patterns, Roberts' (1956) *Patterns of English* was a textbook presentation of Fries's system for classroom use, and *English Pattern Practices, Establishing the Patterns as Habits* (Fries, Lado, and the Staff of the Michigan English Language Institute 1958) taught beginning and intermediate EFL students English as patterns using audiolingual drills.

Second Language Acquisition (SLA) theory has continued to recognize the importance of phraseology since: as holophrases (Corder 1973), prefabricated routines and patterns (Hakuta 1974), formulaic speech (Wong-Fillmore 1976), memorized sentences and lexicalized stems (Pawley and Syder 1983), lexical phrases (Nattinger 1980), formulas (Ellis 1994; McLaughlin 1995), chunks (Ellis 1996), and constructions (Ellis 2003, 2006a).

Every genre of English for Academic Purposes and English for Special Purposes has its own phraseology, and learning to be effective in the genre involves learning this (Swales 1990). Lexicographers develop their learner dictionaries upon large corpora (Hunston and Francis 1996; Ooi 1998) and dictionaries focus upon examples of usage as much as definitions, or even more

so. Nattinger and DeCarrico (1992) argue for the "lexical phrase" as the pedagogically applicable unit of pre-fabricated language, "for a great deal of the time anyway, language production consists of piecing together the ready-made units appropriate for a particular situation and ... comprehension relies on knowing which of these patterns to predict in these situations. Our teaching therefore would center on these patterns and the ways they can be pieced together, along with the ways they vary and the situations in which they occur" (Nattinger 1980, p. 341). The Lexical Approach (Lewis 1993), similarly predicated upon the idiom principle (Sinclair 1991), focuses instruction on relatively fixed expressions that occur frequently in spoken language. Corpora now play central roles in language teaching (Sinclair 1996; Cobb 2007; Römer 2008). There has never been more interest in second language phraseology, as recent reviews in applied linguistics (Cowie 2001; Wray 2002; Schmitt 2004; Granger and Meunier 2008) and cognitive linguistics (Robinson and Ellis 2008) attest.

3. Form, function and frequency in L1 and L2 learning of constructions

If the units of language are constructions, then language acquisition is the learning of constructions. So L2A depends upon learners' experience of language usage and upon what they can make of it. Psychological analyses of the learning of constructions as form-meaning pairs is informed by the literature on the associative learning of cue-outcome contingencies where the usual determinants include: factors relating to the form such as frequency and salience; factors relating to the interpretation such as significance in the comprehension of the overall utterance, prototypicality, generality, redundancy, and surprise value; factors relating to the contingency of form and function; and factors relating to learner attention, such as automaticity, transfer, overshadowing, and blocking (Ellis 2002, 2003, 2006c, 2008). These various psycholinguistic factors conspire in the acquisition and use of any linguistic construction. Constructionist accounts of language acquisition thus involve the distributional analysis of the language stream and the parallel analysis of contingent perceptual activity, with abstract constructions being learned from the conspiracy of concrete exemplars of usage following statistical learning mechanisms (Christiansen and Chater 2001) relating input and learner cognition.

The determinants of learning include (1) input frequency (type-token frequency, Zipfian distribution, recency), (2) form (salience and perception), (3) function (prototypicality of

meaning, importance of form for message comprehension, redundancy), and (4) interactions between these (contingency of form-function mapping). Consider each in turn:

3.1 Input frequency

3.1.1 Construction frequency

Frequency of exposure promotes learning and entrenchment – frequently experienced constructions are processes with greater facility. Psycholinguistic research shows how language processing is intimately tuned to input frequency at all levels of grain: input frequency affects the processing of phonology and phonotactics, reading, spelling, lexis, morphosyntax, formulaic language, language comprehension, grammaticality, sentence production, and syntax (Ellis 2002). That language users are sensitive to the input frequencies of these patterns entails that they must have registered their occurrence in processing. These frequency effects are thus compelling evidence for usage-based models of language acquisition which emphasize the role of input.

3.1.2 Type and token frequency

Token frequency counts how often a particular form appears in the input. Type frequency, on the other hand, refers to the number of distinct lexical items that can be substituted in a given slot in a construction, whether it is a word-level construction for inflection or a syntactic construction specifying the relation among words. For example, the “regular” English past tense *-ed* has a very high type frequency because it applies to thousands of different types of verbs, whereas the vowel change exemplified in swam and rang has much lower type frequency. The productivity of phonological, morphological, and syntactic patterns is a function of type rather than token frequency (Bybee and Hopper 2001). It does so because: (a) the more lexical items that are heard in a certain position in a construction, the less likely it is that the construction is associated with a particular lexical item and the more likely it is that a general category is formed over the items that occur in that position; (b) the more items the category must cover, the more general are its criterial features and the more likely it is to extend to new items; and (c) high type frequency ensures that a construction is used frequently, thus strengthening its representational schema and making it more accessible for further use with new items (Bybee and Thompson 2000). In contrast, high token frequency promotes the entrenchment or conservation of irregular forms and idioms; the irregular forms only survive because they are

high frequency. These findings support language's place at the center of cognitive research into human categorization, which also emphasizes the importance of type frequency in classification.

3.1.3. Zipfian distribution

In the early stages of learning categories from exemplars, acquisition is optimized by the introduction of an initial, low-variance sample centered upon prototypical exemplars (Elio and Anderson 1981, 1984). This low variance sample allows learners to get a fix on what will account for most of the category members. The bounds of the category are defined later by experience of the full breadth of exemplar types. Goldberg, Casenhiser & Sethuraman (2004) demonstrated that in samples of child language acquisition, for a variety of verb-argument constructions (VACs: VL verb locative, VOL verb object locative, VOO ditransitive), there is a strong tendency for one single verb to occur with very high frequency in comparison to other verbs used, a profile which closely mirrors that of the mothers' speech to these children. In natural language, Zipf's law (Zipf 1935) describes how the highest frequency words account for a disproportionately high amount of linguistic tokens - the most frequent word occurs approximately twice as often as the second most frequent word, three times as often as the third most frequent word, etc. Thus *the*, the most frequently occurring word, by itself accounts for nearly 7% of all word occurrences. Goldberg et al. (2004) show that Zipf's law applies within these VACs too, and they argue that this promotes acquisition: tokens of one particular verb account for the lion's share of instances of each particular argument frame; this pathbreaking verb also is the one with the prototypical meaning from which the construction is derived (see also Ninio 1999, 2006).

Ellis and Ferreira-Junior (2009a, 2009b) investigate effects of type/token distributions in the islands comprising the linguistic form of the same English verb-argument constructions in the European Science Foundation (ESF) corpus of naturalistic second language acquisition (Perdue, 1993). They show that in the naturalistic L2A of English, VAC verb type/token distribution in the input is Zipfian and learners first acquire the most frequent, prototypical and generic exemplar of the verb island (Tomasello, 1992) (e.g. *put* in VOL, *give* in VOO, etc.). Their work further illustrates how, in the acquisition of, for example, the caused motion construction (X causes Y to move Z_{path/loc} [Subj V Obj Ob]_{path/loc}), the whole frame as an archipelago of islands is important. The Subj island helps to identify the beginning bounds of the

parse. More frequent, more generic, and more prototypical occupants are more easily identified. Pronouns, particularly those that refer to animate entities, readily activate the schema (see likewise for L1, Childers & Tomasello, 2001). The Obj island too is more readily identified when occupied by more frequent, more generic, and more prototypical lexical items (pronouns like *it*, required by discourse constraints, rather than nouns such as *napkin*). So, too, the locative is activated more readily if opened by a prepositional island populated by a high frequency, prototypical exemplar such as *on* or *in* (see likewise for L1, Tomasello, 2003, p. 153). Activation of the VAC schema arises from the conspiracy of all of these features, and arguments about Zipfian type/token distributions and prototypicality of membership extend to all of the islands of the construction. Ellis and Larsen-Freeman (2009) describe computational (Emergent connectionist) serial-recurrent network models of these various factors as they play out in syntactic and semantic bootstrapping and the emergence of constructions as generalized linguistic schema from their frequency distributions in the input.

3.1.4. Recency

Cognitive psychological research shows that three key factors determine the activation of memory schemata - frequency, recency, and context (Anderson 1989; Anderson and Schooler 2000). Language processing also reflects recency effects. This phenomenon is known as priming and may be observed in phonology, conceptual representations, lexical choice, and syntax (McDonough and Trofimovich 2008). Syntactic priming refers to the phenomenon of preferentially using or processing a particular syntactic structure given prior exposure to the same structure. This behavior occurs in hearing, speaking, reading or writing.

Section 2 introduced early research into L2 syntactic priming effects (Gries and Wulff 2005; McDonough 2006; McDonough and Mackey 2006; McDonough and Trofimovich 2008). A more recent demonstration is that of Gries and Wulff (2009), who focussed upon whether English gerund and infinitival complement constructions are stored as symbolic units by German language learners of English. A corpus analysis of these constructions in the *International Corpus of English* identified the verbs distinguishing best between the two constructions, and these were then used as experimental stimuli in sentence completion and sentence acceptability rating experiments. Gries and Wulff investigated two kinds of short-distance priming effects: how often subjects produce an *ing-to-'other'*-construction after rating an *ing-* or *to-*construction,

and how often they produce an *ing-/to-/other'*-construction after producing an *ing-* or *to-* construction in the directly preceding completion, as well as a measure of longer-term within-subject accumulative priming. Both the gerund and infinitival complements patterns exhibited verb-specific constructional preferences and priming effects, confirming their status as constructions.

3.2 Form (salience and perception)

The general perceived strength of stimuli is commonly referred to as their salience. Low salience cues tend to be less readily learned. Ellis (2006b, 2006c) summarized associative learning research demonstrating that selective attention, salience, expectation, and surprise are key elements in the analysis of all learning, animal and human alike. As the Rescorla-Wagner (1972) model of associative learning encapsulates, the amount of learning induced from an experience of a cue-outcome association depends crucially upon the salience of the cue and the importance of the outcome.

Many grammatical meaning-form relationships, particularly those that are notoriously difficult for second language learners like grammatical particles and inflections such as the third person singular *-s* of English, are of low salience in the language stream. For example, some forms are more salient: *'today'* is a stronger psychophysical form in the input than is the morpheme *'-s'* marking 3rd person singular present tense, thus while both provide cues to present time, *today* is much more likely to be perceived, and *s* can thus become overshadowed and blocked, making it difficult for second language learners of English to acquire (Ellis 2006b, 2008; Ellis and Sagarra, 2010b, in press; Goldschneider and DeKeyser 2001).

3.3 Function

3.3.1 Prototypicality of meaning

Categories have graded structure, with some members being better exemplars than others. In the prototype theory of concepts (Rosch and Mervis 1975; Rosch et al. 1976), the prototype as an idealized central description is the best example of the category, appropriately summarizing the most representative attributes of a category. As the typical instance of a category, it serves as the benchmark against which surrounding, less representative instances are classified -- people more quickly classify as *birds* sparrows (or other average sized, average colored, average

beaked, average featured specimens) than they do birds with less common features or feature combinations like geese or albatrosses. Prototypes are judged faster and more accurately, even if they themselves have never been seen before -- someone who has never seen a sparrow, yet who has experienced the rest of the run of the avian mill, will still be fast and accurate in judging it to be a bird (Posner & Keele, 1970). The greater the token frequency of an exemplar, the more it contributes to defining the category, and the greater the likelihood it will be considered the prototype. The best way to teach a concept is to show an example of it. So the best way to introduce a category is to show a prototypical example. Ellis & Ferreira-Junior (2009a) show that the verbs that second language learners first used in particular VACs are prototypical and generic in function (*go* for VL, *put* for VOL, and *give* for VOO). The same has been shown for child language acquisition, where a small group of semantically general verbs, often referred to as *light verbs* (e.g., *go, do, make, come*) are learned early (Clark 1978; Pinker 1989; Ninio 1999). Ninio argues that, because most of their semantics consist of some schematic notion of transitivity with the addition of a minimum specific element, they are semantically suitable, salient, and frequent; hence, learners start transitive word combinations with these generic verbs. Thereafter, as Clark describes, “many uses of these verbs are replaced, as children get older, by more specific terms. . . . General purpose verbs, of course, continue to be used but become proportionately less frequent as children acquire more words for specific categories of actions” (p. 53).

3.3.2 Redundancy

The Rescorla-Wagner model (1972) also summarizes how redundant cues tend not to be acquired. Not only are many grammatical meaning-form relationships low in salience, but they can also be redundant in the understanding of the meaning of an utterance. For example, it is often unnecessary to interpret inflections marking grammatical meanings such as tense because they are usually accompanied by adverbs that indicate the temporal reference. Second language learners’ reliance upon adverbial over inflectional cues to tense has been extensively documented in longitudinal studies of naturalistic acquisition (Dietrich, Klein, and Noyau 1995; Bardovi-Harlig 2000), training experiments (Ellis and Sagarra, 2010b, in press), and studies of L2 language processing (Van Patten 2006; Ellis and Sagarra 2010a).

3.4 Interactions between these (contingency of form-function mapping)

Psychological research into associative learning has long recognized that while frequency of form is important, so too is contingency of mapping (Shanks 1995). Consider how, in the learning of the category of birds, while eyes and wings are equally frequently experienced features in the exemplars, it is wings which are distinctive in differentiating birds from other animals. Wings are important features to learning the category of birds because they are reliably associated with class membership, eyes are neither. Raw frequency of occurrence is less important than the contingency between cue and interpretation. Distinctiveness or reliability of form-function mapping is a driving force of all associative learning, to the degree that the field of its study has been known as ‘contingency learning’ since Rescorla (1968) showed that for classical conditioning, if one removed the contingency between the conditioned stimulus (CS) and the unconditioned (US), preserving the temporal pairing between CS and US but adding additional trials where the US appeared on its own, then animals did not develop a conditioned response to the CS. This result was a milestone in the development of learning theory because it implied that it was contingency, not temporal pairing, that generated conditioned responding. Contingency, and its associated aspects of predictive value, information gain, and statistical association, have been at the core of learning theory ever since. It is central in psycholinguistic theories of language acquisition too (MacWhinney 1987; Ellis 2006b, 2006c, 2008; Gries and Wulff 2005; Gries, this volume), with the most developed account for second language acquisition being that of the Competition model (MacWhinney 1987, 1997, 2001). Ellis and Ferreira-Junior (2009b) use ΔP and collocation analysis measures (Stefanowitsch and Gries 2003; Gries and Stefanowitsch 2004; Stefanowitsch, this volume) to demonstrate effects of form-function contingency upon L2 VAC acquisition. Wulff, Ellis, Römer, Bardovi-Harlig and LeBlanc (2009) use multiple distinctive collexeme analysis to show effects of reliability of form-function mapping in the second language acquisition of tense and aspect. Boyd and Goldberg (2009) use conditional probabilities to analyse contingency effects in VAC acquisition. This is still an active area of inquiry, and more research is required before we know which statistical measures of form-function contingency are more predictive of acquisition and processing.

3.5 Conclusions on Construction Acquisition

A range of factors thus influence the acquisition of linguistic constructions, whether in L1 or L2:

- a. the frequency, the frequency distribution, and the salience of the form types,
- b. the frequency, the frequency distribution, the prototypicality and generality of the semantic types, their importance in interpreting the overall construction,
- c. the reliabilities of the mapping between a and b,
- d. the degree to which the different elements in the islands of a construction are mutually informative and form predictable chunks.

4. Reconstructing meaning in L2 – Cross-linguistic transfer

Cognitive Linguistics (Langacker 1987, 2000; Taylor 2002; Croft and Cruse 2004; Robinson and Ellis 2008) provides detailed qualitative analyses of the ways in which language is grounded in our experience and our physical embodiment which represents the world in a very particular way. The meaning of the words of a given language, and how they can be used in combination, depends on the perception and categorization of the real world around us. Since we constantly observe and play an active role in this world, we know a great deal about the entities of which it consists. This experience and familiarity is reflected in the nature of language. Ultimately, everything we know is organized and related to our other knowledge in some meaningful way, and everything we perceive is affected by our perceptual apparatus and our perceptual history.

Language reflects this embodiment and this experience. Consider, for example, the meanings of verbs like *push*, *poke*, *pull*, *hold* and so on, and similar words from other languages.

Theoretical understanding of the differences between these words cannot be forthcoming without inclusion of a model of high-level motor control - hand posture, joint motions, force, aspect and goals are all relevant to these linguistic distinctions (Bailey 1997; Bergen and Chang, 2005; Lakoff and Johnson 1999; Feldman 2006). These sensori-motor features are part of our embodiment, they structure our concepts, they play out in time. Thus Cognitive Linguistics emphasizes how language is learned from participatory experience of processing language during embodied interaction in social contexts where individually desired non-linguistic outcomes are goals to be achieved by communicating intentions, concepts and meaning with

others. An understanding of participation in situated action is thus essential to the understanding of meaning and the acquisition of linguistic constructions in L1 and L2.

Consider too the meanings of spatial language. These are not the simple sum that results from addition of fixed meanings given by prepositions for 'where' an object is, to the meanings of other elements in the sentence describing 'what' is being located. Spatial language understanding is firmly grounded in the visual processing system as it relates to motor action (Regier and Carlson 2002; Coventry and Garrod 2004), the multiple constraints relating to object knowledge, dynamic-kinematic routines and functional geometric analyses. Meanings are embodied and dynamic (Elman, 2004; Spivey 2006; McRae et al. 2006); they are flexibly constructed on-line. Meanings like this cannot simply be taught by L2 rules and learned by rote; optimally they are learned in situated action.

Constructions are conventionalized linguistic means for presenting different interpretations or construals of an event. They structure concepts and window attention to aspects of experience through the options specific languages make available to speakers (Talmy 2000a, 2000b). The different degrees of salience or prominence of elements involved in situations that we wish to describe affect the selection of subject, object, adverbials and other clause arrangement. In language comprehension, abstract linguistic constructions (like simple locatives, datives, and passives) serve as a "zoom lens" for the listener, guiding their attention to a particular perspective on a scene while backgrounding other aspects (Langacker 1987, 1999; Croft 2001; Croft and Cruse 2004; Taylor 2002). Language has an extensive system that assigns different degrees of salience to the parts of an expression, reference, or context. Talmy (2000a, b) analyses how the Attentional System of Language includes some fifty basic factors, its "building blocks". Each factor involves a particular linguistic mechanism that increases or decreases attention on a certain type of linguistic entity. Learning a language involves the learning of these various attention-directing mechanisms of language, and this, in turn, rests upon L1 learners' developing attentional systems and L2 learners' attentional biases.

Languages lead their speakers to experience different 'thinking for speaking' and thus to construe experience in different ways (Slobin 1996). Cross-linguistic research shows how different languages lead speakers to prioritize different aspects of events in narrative discourse (Berman and Slobin 1994). Because languages achieve these attention-directing outcomes in different ways, learning another language involves learning how to construe the world like

natives of the L2, i.e., learning alternative ways of thinking for speaking (Cadierno 2008; Brown and Gullberg 2008; Brown and Gullberg 2010) or learning to ‘rethink for speaking’ (Robinson and Ellis 2008). Transfer theories such as the Contrastive Analysis Hypothesis (Lado 1957, 1964; James 1980; Gass and Selinker 1983) hold that L2 learning can be easier where languages use these attention-directing devices in the same way, and more difficult when they use them differently. To the extent that the constructions in L2 are similar to those of L1, L1 constructions can serve as the basis for the L2 constructions, but, because even similar constructions across languages differ in detail, the acquisition of the L2 pattern in all its detail is hindered by the L1 pattern (Odlin 1989, 2008; Cadierno 2008; Robinson and Ellis 2008).

Achard (2008), Tyler (2008), and other readings in Robinson and Ellis (2008) show how an understanding of the item-based nature of construction learning inspires the creation and evaluation of instructional tasks, materials, and syllabi, and how cognitive linguistic analyses can be used to inform learners how constructions are conventionalized ways of matching certain expressions to specific situations and to guide instructors in precisely isolating and clearly presenting the various conditions that motivate speaker choice.

5. Reconstructing form in L2 – Cross-linguistic transfer

As Slobin notes, ‘For the child, the construction of the grammar and the construction of semantic/pragmatic concepts go hand-in-hand. For the adult, construction of the grammar often requires a revision of semantic/pragmatic concepts, along with what may well be a more difficult task of perceptual identification of the relevant morphological elements’ (1993, p. 242). L2 learners are distinguished from infant L1 acquirers by the fact that they have previously devoted considerable resources to the estimation of the characteristics of another language -- the native tongue in which they have considerable fluency (and any others subsequently acquired). Since they are using the same apparatus to survey their L2 too, their inductions are often affected by transfer, with L1-tuned expectations and selective attention (Ellis 2006) blinding the computational system to aspects of L2 form, thus rendering biased estimates from naturalistic usage and the concomitant limited endstate typical of L2A.

In cases where the forms lack perceptual salience and so go unnoticed (Schmidt 1990, 2001) by learners, or where the semantic/pragmatic concepts available to be mapped onto the L2 forms

are unfamiliar, additional 'Focus on Form' (attention to form in communicative context: Long 1991; Lightbown, Spada, and White 1993; Doughty and Williams 1998; Ellis 2001; Ellis 2005; Robinson 2001) is likely to be needed in order for the mapping process to be facilitated.

In order to counteract the L1 attentional biases to allow estimation procedures to optimize induction, all of the L2 input needs to be made to count (as it does in L1A), not just the restricted sample typical of the biased intake of L2A. Reviews of the experimental and quasi-experimental investigations into the effectiveness of instruction (Lightbown, Spada, and White 1993; Ellis and Laporte 1997; Hulstijn and DeKeyser 1997; Spada 1997; Doughty and Williams 1998; Norris and Ortega 2000), demonstrate that focused L2 instruction results in substantial target-oriented gains, that explicit types of instruction are more effective than implicit types, and that the effectiveness of L2 instruction is durable. Form-focused instruction can help to achieve this by recruiting learners' explicit, conscious processing to allow them to consolidate unitized form-function bindings of novel L2 constructions (Ellis 2005). Once a construction has been represented in this way, its use in subsequent implicit processing can update the statistical tallying of its frequency of usage and probabilities of form-function mapping.

6. Future Directions

So much remains to be understood. Robinson and Ellis (2008b) detail a long list of issues for research into cognitive linguistics, construction grammar, and SLA. For sake of brevity I highlight here just a few.

The study of child language acquisition has made so much progress in the last three decades because it undertook proper empirical analyses of learner language. SLA research is sorely in need of dense longitudinal corpora of adult language acquisition to allow detailed investigation of L2 construction acquisition as a function of input and learner cognition (Ortega and Ibarra-Shea 2005; Collins and Ellis 2009).

Although much has been learned about syntactic and semantic bootstrapping in the emergence of a few particular VACs from usage, a thorough investigation of the type-token frequency usage distributions of all English grammatical constructions is required. Large corpora such as the BNC (Davies 2004-) or COCA (Davies 2008-) are revolutionizing the study of lexical and phraseological form. But the primary motivation of construction grammar is that we

must bring together linguistic form, learner cognition, and usage. An important consequence is that constructions cannot be defined purely on the basis of linguistic form, or semantics, or frequency of usage alone. All three factors are necessary in their operationalization and measurement. This is a tall order. O'Donnell & Ellis (2010) outline a proposal to describe the verbal grammar of English, to analyze the way VACs map form and meaning, and to provide an inventory of the verbs that exemplify constructions and their frequency. This last step is necessary because the type-token frequency distribution of their verbs determines VAC acquisition as abstract schematic constructions, and because usage frequency determines their entrenchment and processing. NLP techniques help with the parsing, but the analysis of construction semantics remains ever difficult.

The research reviewed in section 3 demonstrates effects of a wide range of frequency-related factors underpinning ease or difficulty of construction acquisition. Research to date has tended to look at each hypothesis by hypothesis, variable by variable, one at a time. But they interact. And what is really needed is a model of usage and its effects upon acquisition. We can measure these factors individually. But such counts are vague indicators of how the demands of human interaction affect the content and ongoing co-adaptation of discourse, how this is perceived and interpreted, how usage episodes are assimilated into the learner's system, and how the system reacts accordingly. We need to develop models of learning, development, and emergence that takes these factors into account dynamically. Ellis and Larsen-Freeman (2009b) illustrate how this might be done, but only for the usual suspects of VL, VOL, and VOO. It's uncertain how well such models might scale up. And again, properly representing semantics in these models remains a major problem.

Finally, we need ever to remember that language is all about interactions. Cognition, consciousness, experience, embodiment, brain, self, and human interaction, society, culture, and history are all inextricably intertwined in rich, complex, and dynamic ways in language. Yet despite this complexity, despite its lack of overt government, instead of anarchy and chaos, there are patterns everywhere. Linguistic patterns are not pre-ordained by God, genes, school curriculum, or other human policy. Instead they are emergent (Ellis, 1998, 2006b; Hopper, 1987; MacWhinney, 1998) – synchronic patterns of linguistic construction at numerous levels (phonology, lexis, syntax, semantics, pragmatics, discourse, genre, ...), dynamic patterns of usage, diachronic patterns of language change (linguistic cycles of grammaticalization,

pidginization, creolization, ...), ontogenetic developmental patterns in child language acquisition, global geopolitical patterns of language growth and decline, dominance and loss, etc. We cannot understand these phenomena unless we understand their interplay. The framework of Complex Adaptive Systems can usefully guide future research and theory (Ellis and Larsen Freeman 2006a, 2006b; Ellis and Larsen-Freeman 2009; Beckner et al. 2009; Ellis 2008).

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