SECOND LANGUAGE ACQUISITION OF THE LEXICON

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1   Introduction

No matter the theoretical perspective, the lexicon is a key component of language. In spite of this importance, it has not always been focus of mainstream second language acquisition research. However, as we shall see, understanding the lexicon is vital to any theory of SLA. Although theories of morpho-syntax come in and out of fashion, Jackendoff's (2002a) review of different stages in the development of Chomsky's (1965, 1981, 1995) generative grammar over 30 years shows that the one *enduring* element is the lexicon. In fact, Jackendoff (2002a, p. 130) asserts that almost all theories of language can agree that the lexicon contains items that contain 'a long-term memory association of phonological, syntactic and semantic features'. In some cases, for example concrete objects, the lexicon may also contain a visual-spatial structure. As such, he argues that the lexicon as a whole is part of the interface components (see White, this volume). Hence, the lexicon is *central* to the whole system because the lexicon encodes phonological and morphological information that is vital in establishing *meaning contrasts*. In addition, it is the source of important syntactic information in verb argument structure. Last, but certainly not least, it stores concepts.

Like language itself, then, the lexicon is not an undifferentiated whole and can therefore be understood only by investigating its different parts separately. The literature reflects this fact about the lexicon through its many strands of research. Psycholinguists, generative SLA researchers, connectionist researchers and pedagogical researchers have different interests and methodologies. Psycholinguists such as Kroll and her colleagues (Kroll and de Groot, 1997; Kroll and Sunderman, 2003) and Jiang (2000, 2002) focus on the relationship between L1 and

L2 forms, meaning storage, and processing. They have focused almost exclusively on nouns. Researchers interested in verb meaning and morphosyntax have concentrated more on the conceptual structure of verbs and how crosslinguistic differences in the lexicalization of concepts can affect morpho-syntax (e.g. Juffs, 1996; 2000; Hirakawa, 1995, 2001, 2006; Inagaki, 2001; Montrul, 1999, 2001; Toth, 2000; White, et al. 1998; 2003, Chapter 7; Yuan, 1999; Zyzik, 2006). Researchers such as N.C. Ellis (2002, 2005) approach the lexicon from connectionist viewpoint and emphasize the role of frequency in acquisition of words, collocations, and morpho-syntactic patterns. Researchers interested in word learning in instructional contexts focus much more on frequency of words and their collocations in corpora and less on the representation and processing of richer semantic representations (e.g., Cobb's website, the Compleat Lexical Tutor, <http://www.lextutor.ca/>, McCarthy, 1994; Nation, 2001). Finally, sociocultural researchers point out the need to understand concept development from the point of view of participation in a culture (Vygotsky, 1986; Lantolf and Thorne, 2006).

Because SLA researchers have written about the L2 lexicon from so many different viewpoints, an overview is needed that ties together and situates the research in a synthesis of what we think we know about lexical representation. The chapter's structure therefore follows two main themes suggested by Gregg (1996) for any theory of SLA. Section 2 addresses the 'what' of learning the lexicon and section 3 concerns how lexical items are stored and learned.

2.1   A basic model

The first question for study of the lexicon is to decide 'what' needs to be learned or acquired.

The nature of the representation of each part of the lexical entry will differ depending on the kind

of knowledge it is. These different aspects of a lexical item's structure are reflected in Levelt's

(1989) model in Figure 1, adapted by Jiang (2002, p. 619) and in other publications.

Figure 1. Levelt's (1989) model of the lexical entry
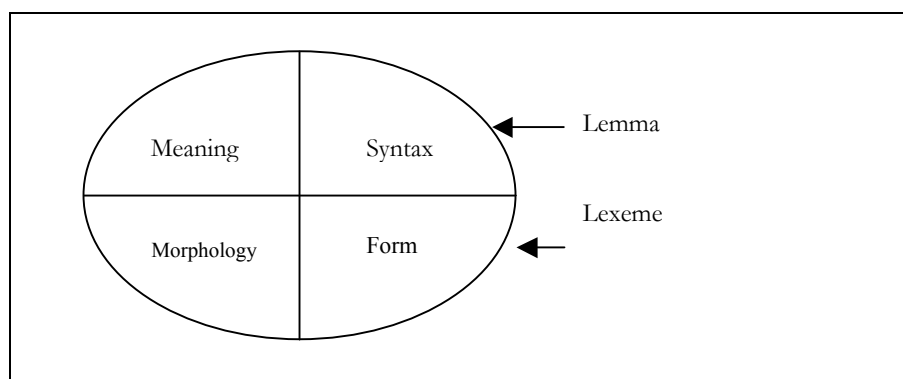
Beyond this basic model, fundamental disagreements remain on what is, in fact, *in* the lexicon

and how the internal structure of each cell in Figure 1 is represented and learned. In the past,

generative theory treated the lexicon as somewhat uninteresting because it was assumed that the

lexicon contained everything that could not be handled by rules and constraints. The metaphor

used by diSciullio and Williams (1987) was that the lexicon is a 'jail' where all the lawless items

of language are stored; the interesting parts of language were thought to be the 'laws' that

governed their combination, so the lawless words were left to rot on their own in jail. To some

extent, this view of the lexicon as a store of arbitrary labels is correct. Obviously, form-meaning

phonological labels must be learned from input and can be easily forgotten. This situation

contrasts with combinatorial mechanisms such as 'merge', 'movement', and abstract constraints

on interpretation of semantic scope (e.g. Chomsky, 1995; Crain and Pietroski, 2002), which presumably cannot be learned from input alone.

However, when one considers the internal structure of the cells in Figure 1, it is clear that what we call the 'meaning' and 'syntax' of a word must be defined in a complex and abstract system. Jackendoff (2002a, 2002b) has been particularly influential in proposing the details of each cell in Figure 1. Jackendoff (2002b, p. 27) suggests that information in a lexical entry will be distributed across at least *three* structures, linked by a 'subscript', and the fourth, morphology must also be included. *It is worth repeating and emphasizing that a lexical entry is not a single, indivisible 'slot' or chunk in a list.* Each of the four elements in (1) and (2) can be stored, manipulated, and learned *separately*.

(1) Lexical entry for 'sit'

a. Phonology: /sɪt/:   [Note contrast with other words: /**h**ɪt/, /sɪ**n**/, etc.]

b. Syntax: category [V], intransitive: unaccusative: V __ <1> ([PREP: in/on/down/down on]); (transitive – rare).

c. Type: (Concept): go from standing or lying down to a seated position (intrans); to place something in a seated position (trans.).

The claim that the lexical entry consists of a linking of these these independent structures is important for theories of language and language development that permit the separation of the syntactic-semantic component from the phonological component (Hawkins, this volume; White,

this volume). Quite simply, it allows for cases where a form can be recognized, but not linked to a fully elaborated meaning and vice-versa. In specific theoretical models, the split allows 'incorrect' phonological forms to be inserted into syntactic trees that have the correct morpho-syntactic features (Embick and Noyer, 2006). Moreover, this claim is central to research of psycholinguists such as Kroll and Jiang, who assume that L2 and L1 lexical forms (phonological and written) can be stored independently of syntax and conceptual structure.

Other information mentioned must also be considered part of a lexical entry (Jackendoff, 2002b). This information concerns the morphology, for example in (2):

2. Morphology: / sɪt /: related words: /sæt/ past; /sɪtɪŋ/ - progressive/gerund

Notice that for the word 'sit', English has an *irregular* past form and a *regular* progressive/gerund form. Jackendoff argues that these two kinds of elements are stored differently: 'sat' will be a form that is listed in the lexicon as one of about 180 irregular past tenses in English, but 'sitting' is a form that is produced by affixation. Jackendoff (2002b) uses the term 'free combination' or 'unify' for morphology instead of 'rule'; grammatical 'unification' will depend on the subcategorial properties of the stem. For example, '-ing' would 'select' an appropriate [V], to 'unify' with and create 'sitting'. In this way, word formation would take place in much the same way as syntactic operations such as 'merge' in the Minimalist approach to language (Chomsky, 1995). Such operations do *not* occur 'in the lexicon' but are

created on-line by the computational system.[1] The assumption that morphological forms can be separate from syntactic structure is also crucial to discussions of second language errors in inflectional morphology (Hawkins, this volume).

Jackendoff makes the important point that lexical items are not *words*. Some lexical items are *smaller* than words, e.g. affixes that are both inflectional (e.g. /t/ - [past]) and derivational, e.g. [/-nɛs/ [a property] /ADJ -/]. Although Jackendoff (2002b) suggests that English may store many affixed forms, in highly inflected languages, such as Turkish and Navajo, it would be absurd to propose that all forms of *all* verbs are stored in *all* of their inflected forms. The point here is that *some* regular inflected forms may be stored, but others are created via the computational module. Some evidence for this position comes from Alegre and Gordon (1999), who showed that in even in English only regular inflected forms with frequencies of over 6 per million in a corpus showed effects for storage.

The lexicon also contains elements that are *larger* than words. These elements are also lexical items. The classic examples are set phrases ('right to life', 'tax and spend', 'easy does it', 'all mouth and trousers') and idioms ('a stitch in time saves nine', 'his goose is cooked', 'spill the beans' (Nunberg, Sag, and Wasow, 1994). Jackendoff (2002b) argues that such items are stored in the lexicon. The fact that they can be manipulated by re-arranging the items proves that idioms and set phrases are stored with complete morphosyntactic information, and not as unanalyzable chunks.

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[1] Naturally, this claim is controversial and not accepted by connectionists.

On the basis of this evidence, Jackendoff argues that a theory of what is in the lexicon must be heterogeneous. In other words, one has to allow for both storage and free combination of items, with a 'cline' from storage to free production. This is a version of the dual mechanism approach articulated in Clahsen (1995).

It is important to add that applied linguists who have carried out in depth research on corpora and classroom instruction have also gone beyond the quartet of '(phonological) form', 'syntax', 'morphology' and 'concept'. Nation (2001, p. 27) suggests the following list of what is means to know a word, emphasizing both receptive and productive knowledge.

e.g. /kæt/, in (3)

(3)

a. Form Pronunciation (how is spoken, what does it sound like):

$$/kæt/ \rightarrow [k^hæt]$$

Written (spelling) 'cat'

Word parts   (morphological forms that do not change class)

Cat-s, but presumbably not 'catty'.

'Catty' is derived from 'cat', but means something different, i.e. 'spiteful' or 'mean-spirited'. This is typical of the difference between inflected and derived forms of a word, where derived forms involve 'semantic drift' away from the core meaning of a word. Such drift may be culturally specific – some cultures may not associate qualities such as 'mean' and 'spiteful' with cats.

b. Meaning   What meaning does the word signal: feline

What is included in the concept: domestic feline and wild feline.

Associations: which other words does it make us think of? E.g.

Dog, tiger, lion, tabby, kitten, etc.

c. Use   Which patterns does the word occur in?

the cat; a cat; etc. 'rain cats and dogs', 'cat-call', ' big cat', 'alley cat' etc.

Which words of other types of words occur with this word?

cats and dogs; domestic cat; wild cat, etc.

Constraints: register: cat vs. feline creature, etc.

Nation's list of knowledge components for a lexical item makes clear that there is a lot more to know about a word than just its phonology, semantics, morphology and syntax. Nation's description is useful for a teacher, but the 'shopping' list of features is not as useful as more theoretical approaches in understanding the stages through which learners go in assembling the information in the cells in Figure 1 into a complete lexical entry.

2.2   Representation of forms

The theory of forms belongs of course to phonology and sound-spelling mappings. We will not discuss those theoretical issues in any great detail in this chapter, since an adequate discussion belongs in part to a theory of acquisition of (phonemic) contrasts. Essentially, the acquisition of forms involves the mechanical mapping of sound sequences or spellings to the rest of the lexeme/lemma structure. The internal representation of these sound strings is the topic of phonology. (See Archibald, this volume; Jackenoff, 2002b, chapter 1).

2.3   Representation of morphology

Morphology is an issue that has been the center of linguistic theorizing over the past several years. One very influential, but controversial proposal, is Distributed Morphology (Embick and Noyer, 2006). These issues are discussed at greater length in Hawkins (this volume) and so will not be the focus of theoretical description in this chapter.

2.4   Representation of meaning and syntax

One of the most challenging parts of the lexicon is the lemma – the semantics and syntax in the top cells in Figure 1. Much of the work on conceptual *semantics* of nouns has been carried out by researchers who are rarely referred to in the second language acquisition literature (Hatch and Brown, 1995, is an exception). In this regard, Fodor and Lepore (1996, p. 267) state that "A theory of concepts has two things to explain: how concepts function as categories, and how a finite mind can have an infinite conceptual capacity." This sentiment is echoed by Jackendoff (1992) and Pustejovksy (1995). However, although they agree on the problem, they cannot agree on a solution. No consensus on the best theory exists, even though philosophers of language and cognitive linguists have written a great deal on this issue (Cruse 1986; Croft and Cruse, 2004; Fodor, 1998; Jackendoff, 2002b).

One of main issues in a theory of concepts/meaning is whether word meaning can be broken down into parts. For example, speakers of English know the word 'man' denotes a 'human' who is 'adult' and 'male'. Due to such intuitions, semanticists have tried to develop theories of meaning that 'unpack' words in 'simpler' terms or semantic (binary) 'features' such as [±HUMAN], [±ADULT], [±MALE]. Verbs might be similarly 'unpacked' in terms of meaning

components, so a proposal for the 'decomposition' of 'melt' might be something like [CAUSE[BECOME [Liquid]]], whereas 'freeze' would be [CAUSE[BECOME [solid]]] (Talmy, 1985). Hence, the lexical semantics literature attempts to explain intuitions about how words are related (e.g. synonymy, antonymy, hyponymy, meronymy (whole-part relations, e.g. 'finger' is a part of 'hand') and polysemy) by referring to subsets of 'features' that words share. Such decompositional theories have been the focus of considerable research and disagreement over the years.
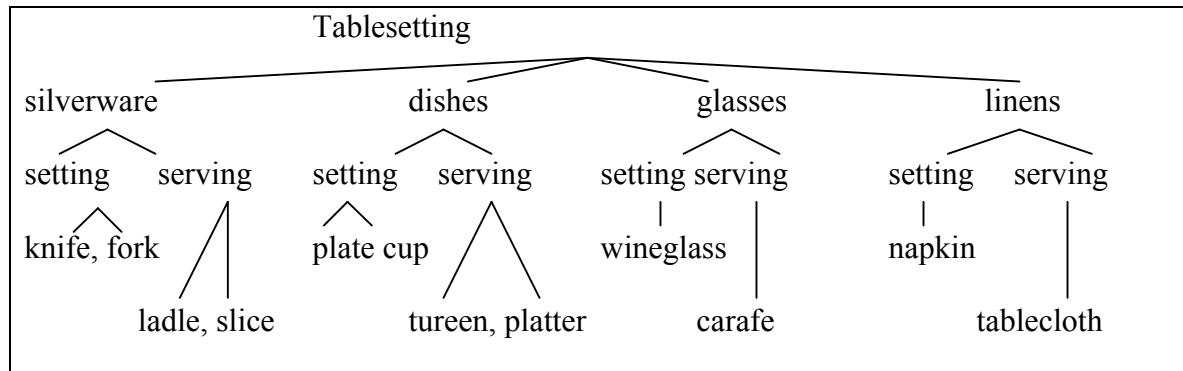
2.4.1   *Decompositional theories of noun meaning*

First, consider decompositional theories of nouns. Researchers such as Jackendoff (1990) and Pustejovsky (1995) advocate the decomposition of lexical items into features that define them; in that sense concepts can be said to be definitional. Early decompositional approaches to word meaning attempted to break words down into features by analogy with phonemes. For example, in Table 1, these differences are encoded as *binary* features, whereas in Figure 2 they are taken from a tree in Cruse (1986), cited in Hatch and Brown (1995).
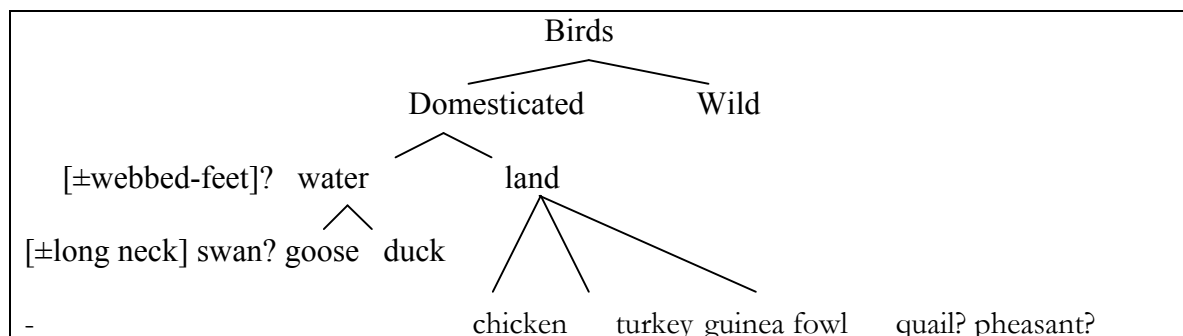
Table 1. Features for table settings

	Silverware	Dishes	Glasses	Linens	Setting	Serving
Knife	+	-	-	-	+	-
Ladle	+	-	-	-	-	+
Plate	-	+	-	-	+	-
Platter	-	+	-	-	-	+
Wineglass	-	-	+	-	+	-
Wine carafe	-	-	+	-	-	+
Napkin	-	-	-	+	+	-
Tablecloth	-	-	-	+	-	+

Figure 2. Table setting. (Cruse, 1986, p. 147; Brown and Hatch, 1995, p. 37)

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                          Tablesetting
silverware            dishes          glasses           linens
setting   serving   setting  serving  setting serving  setting   serving
knife, fork         plate cup          wineglass        napkin
          ladle, slice         tureen, platter     carafe          tablecloth
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Although these are interesting 'common-sense' taxonomies, the problems with making relationships among words formally precise are considerable. For example, Figure 3 suggests an analysis of domesticated birds (as opposed to pets, such as parrots). They could be split into 'water' and 'land' birds (webbed-feet might be a distinguishing feature). However, for 'duck' vs. 'goose',does [±long neck] play a role as feature? If so, how can 'swan' be distinguished from 'goose'? Which feature(s) will distinguish a 'guinea fowl' from a 'turkey'? How can we include 'pheasant' and 'quail' raised for shooting, meat, and eggs, and so on.

Figure 3. Domestic Birds

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                            Birds
                  Domesticated        Wild
   [±webbed-feet]?   water      land
[±long neck] swan? goose   duck
-                          chicken    turkey guinea fowl    quail? pheasant?
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More recent accounts of semantics and cognition in features for nouns can be found in Pustejovsky (1995), who is a generative linguist, and Croft and Cruse (2004), who are functional linguists. We will review them in that order. In addressing the problem of a finite mind having an infinite conceptual capacity, Pustejovsky (1995;1998) proposes a decompositional theory that makes use of 'qualia' rather than binary features. Qualia are features that relate to the 'real world' in some sense and were originally discussed in work by Aristotle. Pustejovsjy (1995, p. 76) suggests that qualia structure specifies four aspects of a word's meaning, listed in (4):

(4)a. CONSTITUTIVE: relation between object and constituent parts.

    e.g. material, weight, parts

  b. FORMAL: that which distinguishes it from a larger domain.

    e.g. orientation, magnitude, shape, color, position

  c. TELIC: its purpose and function.

    e.g. purpose, function

  d. AGENTIVE: factors involved in its origin or 'bringing it about'

    e.g. creator, artifact, natural kind, causal chain

For example, in (5) Pustejovsky suggests the following basic structure for the noun 'novel':

5.

Novel		
…		
- Qualia =	CONST	= **narrative**
	FORMAL	= **book**
	TELIC	= **reading**
	AGENT	= **writing**

For Pustejovksy, a verb would also consist of an event structure and an argument structure, which are discussed later in this section. For all lexical entries, Pustejovsky allows such templates to be filled by culturally specific information. The combination of noun and verb qualia structures can explain the various 'compositional' meaning of phrases. For example, P contrasts the meanings of 'enjoy' in: 'Mary enjoyed the movie last night', 'John enjoys his morning coffee', and 'Bill enjoyed Steven King's last book', where the meanings of 'enjoy' involve respectively 'watching', 'drinking', and 'reading' because of the noun complement in each sentence. (See also Harley (2004) and Yoshimura and Taylor (2004) for interesting applications of decomposition and qualia theory for verb subcategorization). Both Jackendoff (2002b) and Van Valin and La Polla (1997) adapt some version of this approach. Hence, qualia structure provides a detailed framework with which to describe word meaning. However, these proposals for the organization of concepts have not influenced any second language acquisition research, judging by the lack of reference to such approaches in the L2 literature.

Although decomposition seems to provide insights in some cases, problems of finer-grained analysis that will provide complete sets of distinctive features have led Fodor (2001) to reject *any* theory of concepts for nouns that is based on componential analysis. Instead, Fodor (2001) and Fodor and Lepore (1996) advocate a theory of concepts as indivisible or as 'atomic' monads. (In philosophy, 'monad' means an absolutely simple entity). If we can understanding meaning without having access to component parts, features or semantic components may not be part of a mental representation of a word (Fodor, 1998; Landau, 2000). Since decompositional features are a part of theory of polysemy, etc., researchers who deny such features find it hard to account for intuitions about word-relatedness (synonmy/polsemy, etc). Their position forces them to

dismiss intuitions about how words are related as uninteresting. For example, Fodor and Lepore assert (1998, p. 287):

We do not have a theory of polysemy beyond the suggestion, implicit in the preceding, that where it is sensitive to the syntactic structure of the context, polysemy belongs not to the theory of content but to the theory of logical form. That leaves many residual cases like lamb ('meat' vs. 'animal'), window ('the opening' vs. 'what fills the opening'), newspaper ('the thing that is read' vs. 'the organization that publishes it'). We suspect that there is nothing interesting to say about such cases; the meanings of words can partially overlap in all sorts of ways, so there are all sorts of ways in which polysemous terms can differ from mere homonyms. Nothing in the literature convinces us that there are powerful generalizations to state.

Fodor's stance puts many of the 'facts' that need to be accounted for into the realm of real world knowledge and out of the *linguistic* (=formal) lexicon and into what Embick and Noyer (2006) label the 'encyclopedia'. This conclusion does *not* mean that linguists do not have to be concerned about the acquisition of such meanings; it just means that a restricted *formal* theory of the kind we are familiar with in morphosyntax will not be available where concepts are concerned.

The implication is that in a view of language that is modular, that is one that separates the specific language module from general cognition, parts of the problem of word meaning not relevant to syntax are outside the formal linguistic module, but must interface with it (Pinker, 1989, p. 166). As Jackendoff (2002b, p. 376) pointed out over ten years after Pinker suggested this distinction, the problem is that no principled division between narrowly 'linguistic' and 'encyclopedic' meaning has been made. Some of the second language acquisition literature lags behind in even recognizing that these problems are issues at all, let alone confronting the differences among languages in concept categories, representation in nouns, and how those differences might affect second language learning of nouns.

In spite of the lack of agreement with nouns, a form of semantic feature analysis been central to research on the acquisition of verb meaning and clause structure in SLA. The decomposition of verb features was inspired by Talmy (1985) and his ideas have been adopted in some form by both cognitive/functional linguists. The basic idea is that verbs' meanings are made up of semantic primitives which combine to create the lexical conceptual structure of a verb. Juffs (2000) summarized how this might work.

Table 2. Building blocks of lexical-conceptual structure for verbs

Building block	Event types	Example
Main Functions		
ACT(+effect)	Causative events. Adds an external argument.	John filled the glass. The sun melted the ice.
ACT(-effect)	Non-causative transitives. Unergatives	Mary saw a ghost. Jane laughed.
GO+STATE	Unaccusatives (change of state)	The ice melted
GO+ PATH	Unaccusatives (motion)	The ball slid.
BE+STATE	Statives	A theory exists. John knows the answer.
Features	*Function which the feature is most commonly linked to.*	
± Effect	ACT	kill, (+effect); see (-effect)
±Manner	GO	pour, splash, spill.
Property of the Theme/Agent	THING	ooze: whatever oozes must be liquid but sticky. See Talmy (1985, p. 73).
±Polarity	BE+STATE	*believe*. vs. *doubt*
±Factivity	BE+STATE	*regret* vs. *hope*

Table 2 lists a set of semantic functions that make up a possible verb meaning. These main functions can be modified by a set of features that are motivated crosslinguistically through morphological analysis. Languages may vary in the way they that combine the major building blocks of verbs, but these patterns tend to be tendencies rather than absolute rules (Juffs, 1996; 2000). Combining functions (e.g. ACT with GO and STATE) is termed conflation. One of the most frequently cited examples is that Romance has a tendency to 'conflate' motion and PATH

in a verb, hence 'entrer, sortir, monter, descendre' in French, whereas Germanic languages tend to put the PATH outside the core morpheme, go *in*, go *out*, go *up*, go *down*, respectively. Instead, Germanic verbs include MANNER, e.g. 'dance', 'swim' with movement, which is not permitted by French. For example, in English one can say 'John swam the river' meaning John crossed the river by swimming, whereas the equivalent French sentence is ungrammatical '*Jean a nagé la rivière'; instead, the equivalent of the English paraphrase, 'Jean a traverse la rivière à la nage' is the only possibility. One can say 'Jean a nagé dans la rivière', but this only means that John swam *in* the river, and not that he crossed it.

Hence, the conceptual structure of a verb can have an influence on the number of noun phrases and prepositional phrases that may or have to occur in a clause containing that verb. Most theories assume an intermediate level of representation between lexical conceptual structure (LCS) to predicate argument structure (PAS), which dictates the number of noun phrases and prepositional phrases (arguments) that may appear in a clause. Languages may vary as to how these arguments are realized: in addition to NP and PP, some may be bound morphemes or zero. Table 3 provides an example of some crosslinguistic patterns of argument realization.

Table 3. Patterns of lexical conceptual structure, argument structure and argument projection for the verb 'break'.

Verb	To break casser (French) (da) po (Chinese)	Disappoint Deçevoir shiwang
LCS	[ACT+eff x [GO y [STATE]	[ACT +eff x [GO y [STATE]
PAS	V X \<Y\>	V X
Morphology	English: NP NP French: 'se' if no X argument Chinese: no morphology with alternation.	English: NP NP French: NP NP Chinese: causative morpheme 'shi' with transitive version is required to license X

Table 3 shows that although LCS may be similar because basic verbs ought to have close meanings − morphological operations mediate the expression of LCS and PAS in the syntax. For French, the intransitive version of a change of state verb requires the morpheme 'se' 'la fenêtre s'est cassée' = 'the window broke', whereas in Chinese it is the addition of a causative morpheme that is required for the transitive 'disappoint', 'Zhang San shi wo shiwang' = 'ZS made me disappointed' or 'Zhang San disappointed me'. Crosslinguistic differences in verb

meaning and morpho-syntax the effects on the acquisition of the lexicon are the topic of a small but growing number of studies to be discussed in section 3.

Pinker refers to rules that combine the major 'functions' such as ACT and STATE, as 'Broad Range Rules'. They determine the meanings of positions related to them, e.g. an NP associated with ACT is usually an agent. Pinker (1989) proposed other features that affect narrow range rules. For example, some locative verbs (verbs that describe caused movement to a location) may alternate in their syntax, for example in (6) 'spray' permits a conversion of the LCS [ACT [GO [PATH] to [ACT [GO [STATE] because of a narrow class 'ballistic spatial distance along a trajectory' feature.

(6)   a. The hose sprayed insecticide on the tree.   [ACT [GO [PATH]

      b. The hose sprayed the tree with insecticide. [ACT [GO [STATE]

However, 'spew' in (7), which also applies to a liquid, does not permit alternation, because of a narrow range class feature 'mass expelled from inside an entity'.

(7)   a. The hose spewed insecticide on the tree.   [ACT [GO [PATH]

      b. *The hose sprewed the tree with insecticide. [ACT [GO [STATE]

Juffs (1996, p. 225-227) argues that patterns of difference among broad ranges rules, their morphology, and constraints on them, might be part of universal grammar, whereas narrow range rules are so specific and idiosyncratic that knowledge of them cannot be evidence for or against

access to Univeral Grammar. It is important to note that Embick and Noyer (2006) include the feature CAUSE (=ACT) in their features in the vocabulary (form-based phonology), but are not likely to include such features as 'mass expelled from inside an entity', which are more likely in the encyclopedia.

A consensus seems to be emerging among both generative and functional linguists that decompositional theories of meaning for nouns and verbs are going to be somewhat different (Jackendoff, 2002b; Pustejovsky, 1995; Van Valin and La Polla, 1997, p. 184). Even if decompositional analysis for nouns may not work, a decompositional theory for verbs does seem to be necessary (Landau, 2000, p. 321, fn. 2).

2.5   Prototypes as a theory of concepts.

Problems with decompositional meanings of nouns have led some psychologists to solve the problem of meaning and relationships among words by claiming that words have a 'prototype' as core concepts to which other words are related (e.g. Rosch and Mervis, 1975). In other words, a concept is a prototype of some kind. For example, the prototypical bird looks more like a robin[2] than a penguin or an ostrich. A prototypical tree is a deciduous oak rather than an evergreen pine, depending on where you grew up. (The role of culture and experience in conceptual development is discussed in section 2.6).

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[2] It is interesting to note that the American robin has a rust-colored chest and was called a 'robin' by the first English settlers in north America. In fact, the American 'robin' is in the blackbird/thrush family (genus= 'turdus') and not related to the British bird called the robin, which is an old world flycatcher (genus= 'erithacus'). This observation should make it obvious that theories of semantics based on naïve mental inspection are unlikely to be worth much.

However, Fodor and Lepore (1996) and Connolly et al. (2007) also reject prototypes as a theory of concepts. First, they point out that prototypes cannot account for meaning composition in noun compounds. For example, they argue that PET FISH cannot be a combination of the prototype of PET and FISH because a goldfish, which is a typical pet fish, is neither a prototypical PET (furry, cuddly etc.) nor a prototypical FISH (e.g. trout). The issue concerns how one can gain access to the meaning of this compound through its component parts and, indeed, whether one MUST gain access to the meaning through the component parts.

The second reason that prototype theory does not work well is that features associated with prototypes are unstable. In an experiment, Connolly et al. (2007) asked American undergraduates to judge how true statements such as the those in (8) are likely to be:

(8) a. Ducks *have webbed feet*

    b. **Quacking** ducks *have webbed feet*   prototypical behaviour premodifier.

    c. **Baby** ducks *have webbed feet*   Neutral premodifier.

    d. **Baby Peruvian** ducks *have webbed feet*.   Non prototypical premodifier.

They found that participants in the experiment rated the first sentence as very likely to be true, but rated the other sentences significantly less likely to be true. Hence, a prototypical feature of duck (webbed-feet) does not remain constantly true when modified. This result is odd, they say, if that feature is an indelible prototypical 'part' of being a duck.

In the encyclopedia, the lexicon also encodes the way a culture labels artifacts and events; this information about *culture* must is created and learned through interaction with members of that culture (Vygotsky, 1987, Chapter 4). Vygotsky emphasizes three aspects of concept formation. First, he also makes a distinction betweena child and an adult sharing a form, but not having the same 'meaning'. This position should be familiar by now from Figure 1. Second, the development of what we would now call child's lexeme to lemma links depends on refinement of sets of terms that Vygotsky calls 'complexes' but which we might call words related through taxonomic groups and the need for the concept to be related to 'word' in order to complete goals in a task. He rejects simple form-meaning mapping by mere frequency of association. Lantolf and Thorne (2006, p. 108) summarize Vygotsky's position thus: 'Vygotsky argued that words do not have meanings that stand independently from other words; rather, word meanings are organized into networks that, taken together, form concepts'. An example from my own experience will serve as an example. The words 'two' and 'tooth' are basic in language – so basic in fact that they form part of the inventory that show that Sanskrit and European languages shared a common ancestor. However, in animal husbandry a 'two-tooth' ([tʰyrəθ] in Devonshire dialect) refers to a young ewe with two adult teeth grown in, and this age is usually the first time that the ewe is bred from. Since a sheep's teeth emerge in pairs, a breeding ewe ages in units of two: from two-tooth, to four-tooth, to six-tooth, to full-mouth (all 8 adult teeth grown in), second year full-mouth. (After that, the abbatoir awaits). Therefore, no such thing as a 'five-tooth' exists. I found this out when I was age 14 and working on a farm. I had heard a lot of talk by the farmer and his wife about the two-tooth and four-tooth ewes; given that in my experience you had to be 'five' before you can be 'six', I wondered aloud where the 'five-tooth' sheep were. The

farmer and his wife looked at me in stunned silence for a second and then collapsed laughing over my mistake/ignorance. Knowledge of the words 'two' and 'tooth' alone was not enough to participate in sheep-farming culture. I learned the appropriate counting and reference through an error in real world knowledge (how sheep's teeth grow) and the way that information determines a sheep's age. The tricky question is how such encyclopedic knowledge (sheep's teeth emerge in pairs and those 'pair years' are used to refer to a sheep's age) is linked formally to the items 'one, two, three, etc.' and 'tooth'. This knowledge is not in the *linguistic* lexicon, but it is encyclopedic and is learned through interaction.

2.7   Cognitive linguistic approaches to word meaning

Functional linguists have also addressed issues of lexical semantics in considerable detail, e.g. Cruse (1986). Croft and Cruse (2004), who do not adopt a decompositional approach, nevertheless implicitly invoke features in their discussion of how native speakers of English understand taxonomic subdivisions. They discuss examples such as for 'stallion' and associated 'horse' terms. The sort of question Croft and Cruse (2004, p. 149) address is why the sentence 'a mustang is a kind of horse' sounds fine, but 'a stallion is a kind of horse' sounds odd (to some people). They conclude that a good taxonym must have as its core a specification of the core of the hyponym. Since MALE is not part of the core specification of horse, stallion cannot be a good example type. Note that in fact this analysis tacitly assumes some decompositionality. However, among 6 native speakers who I consulted, only one agreed with the intuition that 'a stallion is a kind of horse' was worse than the phrase 'a mustang is a kind of horse'. As Jackendoff (2001, p. 375) and Lantolf and Thorne (2006) emphasize, social frames are important. In this case, knowledge of horses is key, just as knowledge of sheep farming was

important in knowing the meaning of 'two-tooth'. Cruse and Croft advocate a view that the *perspective* for stallion is SEX (e.g. male horse), whereas for mustang the perspective is 'kind of horse'. However, the judgement for this distinction is necessarily based on participation in a 'horse' culture. There is therefore a natural fit between cognitive and Vygotskyan approaches to word meaning and learning (Lantolf and Thorne, 2006).

2.8   Neurolinguistic evidence for conceptual organization

Before we move on from theory to L2 research, recent discussion by neuropsychologists, in must be considered. Caramazza and Mahon (2006) describe several conceptual deficits that a theory of semantics must account for. First, patients may be unable to name living animate objects, but are able to name living inanimate objects and vice-versa. Second, these deficits are unrelated to any perceptual or sensory impairment. Third, patients may have a 'conspecific' (same species) impairment, which means that they may suffer from a deficit that affects their perceptions of only other humans; for example, a patient may be unable to recognize very famous people, but be able to recognize faces in general. Taken together, these three properties have led Caramazza and colleagues to endorse a theory of conceptual organization that is based not on a correlation between the real world and object properties, but rather on representational constraints that are domain-specific to semantic organization, and rely on conceptual categories such as animacy and features of human emotion. (Superior sensitivity to both of these categories may be related to natural selection.) Moreover, recent fMRI studies suggest that nouns and verbs are represented neurally in different localities, with verbs being represented in the left frontal cortical network and nouns more in *bilateral* temporal areas of the brain (Shapiro, et al. 2004). Not surprisingly,

given their location in the traditional 'language' areas, verbs are more susceptible to impairment in aphasia (Bi, Han, Shu and Caramazza, 2005).

3   Acquiring form, syntax and concept

Section 2 discussed in some detail the content of a lexical entry. For a fine-grained model of word knowledge, some form of decomposition is important. It should also be clear that there are aspects of word meaning that are relevant to syntax and aspects of meaning that are not relevant to syntax. These latter elements are important for participation in a culture and also must be learned. Researchers in second language acquisition do not always distinguish which aspect of the lexicon or meaning that they are focussing on, so the discussion in this section will refer back to the relevant theoretical sections. In addition, in adult second language acquisition, one of the most important issues is the existence of a fully-developed first language and set of cultural assumptions in the mind of the learner. Questions center on the role this first language plays in developing knowledge of a second language and the lexicon is no exception.

3.1   Psycholinguistic research on the relationship between L1 and L2 word forms and meaning.

Psychologists interested in the bilingual lexicon have carried out some of the most influential research on the relationship between L1 and L2 forms for nouns, but these have usually been written forms rather than phonological entries. However, it is sometimes possible to infer relations among L1 and L2 phonological forms based on research with written stimuli. Research began with a focus on adult bilinguals who learned both languages as children. Of interest is

whether bilinguals organize their lexicon in a co-ordinate structure (that is two separate lexicons), or in a compound structure, where the lexicon of the second language is somehow dependent on the structure of the first (Weinreich, 1953). The research has more recently concerned adult learners of a second language. Following the model in Figure 1, they assume that a form can be dissociated from its meaning (see Kroll & de Groot, 1997; Kroll & Sunderman, 2003; and Kroll and Tokowicz, 2001 for recent overviews and discussion).

The experimental methodology for investigating these issues consists of a variety of naming tasks, translation tasks, or lexical decision tasks. A computer presents images to name, words to translate, or words to make a decision about, and also records the time taken to carry out these tasks. Some important research in this area is summarized in Table 4.

Table 4. Selected psycholinguistic bilingual lexicon studies.

Authors	Year	Participants	Task	Main Result
DeGroot and Poot	1998	60 Dutch-English. 3 groups, Low, Medium and High Proficiency	Translation task: words varied according to 'imageability', cognate status and frequency	Same pattern across groups
Talamas, Kroll, and Dufour	1999	16 Spanish-English 34 English-Spanish	Translation manipulates Closeness of forms, e.g. man-hambre vs. hombre	Less fluent bilinguals show more form interference; more fluent bilinguals show more meaning interference
Kroll, Michael, Tokowicz, Dufour	2002	Experiment 1 Beginning vs. fluent L1 English learning L2 French (59) Experiment 2: 18 L2 Spanish 13 L2 French	Word naming Translation	• Less fluent learners slower in L1 word naming: not mediated by working memory • More fluent rely less on forms • Translation asymmetry lower for

				fluent bilinguals
Jiang	2002	18 Chinese-English (+Controls)	Lexical decision of semantic relatedness of word pairs, e.g. problem-question = wenti	• Learners' lexicon are affected by the L1 lemma since semantic decisions for one English words with different translations result in longer reaction times and higher error rates.
	2004	15 Korean-English		• 2004 replicates 2002 findings
Sunderman and Kroll	2006	63 low proficiency 44 medium proficiency English learners of Spanish	Translation equivalent decision task, cara = face with distractors, e.g. cara- card cara- fact cara- head	• Beginning learners showed more interference from competing *forms* • NEW: All learners showed effects for word class, i.e. form interference is modulated by grammatical class, N, V etc.

With regard to the representation and processing of lexemes, one important result is that in fluent bilinguals lexical forms are activated in both languages; the activation is bidirectional in that L2 can affect L1 and vice-versa. Kroll and Jared (2001) found that once an L2 is activated through a simple naming task, the L2 triggers activation of closely related items in the L1. For example, in the following language pairs, words which share 'chance' forms, would activate their 'false' friend forms.

(9)   a. English: Room   Dutch: room   (cream)

      b. English: red   Spanish: red   (net)

      c. English: net   German: nett   (nice)

This activation *increases* with proficiency, presumably because the L2 lexicon is more robustly represented the higher one's proficiency. One can conclude from these results that L1 and L2 forms are stored according to similarity of form (written certainly, phonological probably) and not meaning, especially for beginning bilinguals. This finding on 'form' acquisition preceding lemma acquisition is consistent with research by Schmitt and Meara (1997) who found that beginning learners are more likely to associate words even within the L2 based on form only, associations they call 'clang associates'. To illustrate, in a recent study of L2 lexical learning, Juffs et al. found beginning learners making the errors in (10) when asked to write a sentence using the word 'cease'. The word is an uncommon one and was misidentified as 'scene', 'case', and 'sees'. This last error suggests a phonological error as well as a form error.

(10)   a. i watch the last cease of the movie and i didnt undersand it. [scene]

        b. i am investigation in very difficault cease [case]

        c. My boss geive me a important cease, he will I can finish that. [case]

        d. he cease me at midnight   [sees]

In addition, links are stronger for words that are concrete rather than abstract (e.g. 'stone' vs. 'trust') and for words that share similar forms in the L1 and L2. For example, cognates such as 'tomato' in English and 'tomate' in French will prime each other more reliably than forms that share less phonological material such as 'forest' and 'forêt'. Results of translation to and from pairs of languages have shown that as proficiency increases, there appears to be a shift from *form* activation to *meaning* activation. In other words, in the early stages, 'flesh' would activate

'flèche' for a beginning francophone learner of English because of lexical links, but the prediction is that more proficient bilinguals will show effects of 'arrow' for 'flèche'.

Investigations of semantic links typically use the more complex 'masked' priming task (e.g. Forster and Jiang, 2001). As shown in (11), The participant in such an experiment sits in front of a computer, and focuses on the center of the screen. The first screen is a 'mask' of nonsense characters, often '########'. This is followed by a 50 to 80 millisecond 'prime' of a word that participant does not consciously perceive; this 'flash' of a word is then followed by the 'target' word. The target word is always in a different form (upper vs. lower case) in order to counter act the effect of exactly the same forms (Forster and Jiang, 2001). The learner must make a 'lexical decision', that is, they must decide whether the word is a word or not.

(11) Hypothetical masked priming experiment (without control stimuli for non-words)

Fixation 500ms	Invisible Prime 50ms	Target	1000 ms.	Is this a word?
a. ###########	house	maison	Primed word	Faster RT
b. ###########	magazine	maison	Unrelated word	

Notice that in this case, the *form* of 'house' is not similar to 'maison'. The prediction is that if the 'house' is related semantically to the L2 'maison', then the decision about whether 'maison' is an English word or not should be faster than the other condition. Some investigators claim suggest that the L1 semantically primes the L2, but not vice-versa (Jiang, 1999); this result has led to the conclusion that the L2 lexicon is dependent on the L1 lexicon at the early stages of development, and perhaps even permanently for some aspects of word syntax and morphology (Jiang, 2002,

2004). However, in a recent paper, Wang (2007) has suggested that the timing in the experiment underestimates L2 priming of L1 and that L2 semantics may in fact prime L1 semantics.

Kroll and her colleagues in a number of papers have suggested the lexical mediation model, in which L2 concepts are initially accessed via L1, but as proficiency increases direct links from L2 forms to L2 meanings are established. In other words, L2 lexical entries are initially just lexemes (c.f. Jiang, 2000), without the lemma semantic and syntactic content listed in Figure 1. Only later do direct L2 form-concept meaning links become established (Talamas, Kroll, and Dufour, 1999).

Figure 4. Revised hierarchical model. Kroll and De Groot (1997, p. 178)
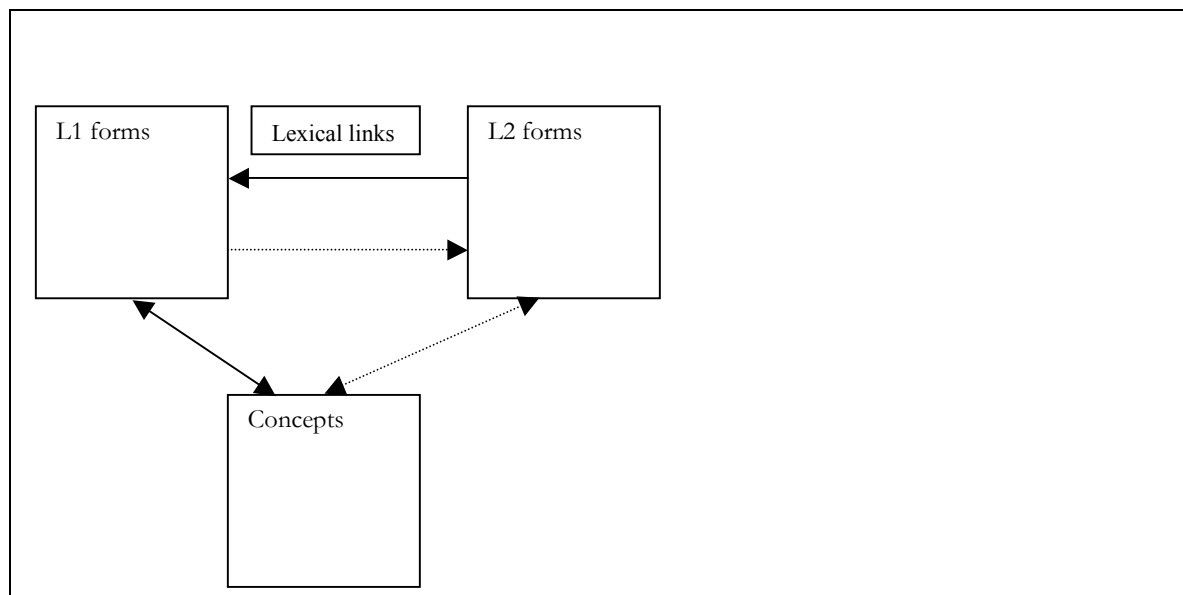
The model in Figure 4 accounts for the asymmetry and development among L1 and L2 items. Strong links exist between L2 and L1 forms (lexical links), but L1 forms are linked more weakly to L2 forms. Meaning links between L2 forms and concepts are developed only later.

However, the picture is made more complex by variation in the nature of the words themselves. Research by De Groot and colleagues suggests that although the revised hierarchical model accounts for much of the data, within the lexicon different features of words may make representation in the L2 easier or harder, regardless of level of proficiency or stage in L2 development. De Groot and Poot (1997) manipulated fairly coarse conceptual categories of imageabilty, frequency and cognate status. For example, for Dutch-English bilinguals 'hand' and 'hand' are highly imageable, very frequent, and exact cognates, whereas 'compulsion' and 'dwang' have very low imageability, low frequency, and zero cognate relationship, even though they 'mean' the same. In a study of forward (L1-> L2) and backward (L2->L1) translation, findings showed effects for imageability at all levels of proficiency, with more concrete nouns being translated more easily than more abstract nouns, and more frequent nouns being translated more easily than less commonly-occurring nouns. In addition, cognate status showed a reliable main effect. Naturally, the more lexical forms shared by words, the easier it is to translate them. Contrary to the revised hierarchical model, however, findings suggested that L1-L2 translation was easier than backward translation from L2-L1. Kroll and Tokowicz (2001, p. 61) suggest that this might be because for abstract L2 words several L1 equivalents exist that might compete, causing reaction times to be slower. Hence, for each lexical entry, a set of form features will be matched with a set of conceptual features. The greater the overlap, the greater the ease of semantic and lexical representation will be. Discrepancies among studies may therefore be due to the materials used and variation in the type of lexical and conceptual features involved. Progress in this area may be made by a more detailed theory of concept (see section 2.3) and concept acquisition than is currently being assumed in this research program.

Jiang (2002, 2004) points out that it is often assumed that L2 meanings (concepts) are acquired at the same time as L2 forms (phonological entry), but as we have seen this is unlikely to be true except perhaps for the most common non-abstract terms that share meaning, e.g. 'stone'. Jiang (2002, 2004) conducted two experiments based on a well-known fact that in some cases the translation of one word one language must be translated by at least two in another language. For example, 'marry' in English can be translated into Chinese as 'jiehun', but also has two other translations which are expressions from the point of view of the giving and receiving family of the woman: 'jia' is used when marrying a daughter *out* of the family and 'qu' is used when a daughter marries *into* a family. Jiang's recent work investigates a similar split in the translations of the Chinese and Korean words that in English must be translated into two words (e.g. expense-cost, doubt-suspect). Chinese and Korean learners judged pairs (over 20) such as that have one translation only more quickly than pairs that have two translations in the L1. Jiang interprets his findings as evidence for the continuing influence of L1 semantic mediation of the L2 lexicon at the level of semantics. This finding for nouns suggests that L1 lexical conceptual structure for verbs might also transfer.

These findings are consistent with the research on conceptual development of more 'encyclopedic' knowledge summarized by Lantolf and Thorne (2006) that suggests that conceptual information transfers from the L1 even when an L2 form has been acquired. They report on research by Pavlenko that suggests Russian speakers transfer their understanding or lack of it of the word 'privacy', but immigrants do develop this concept once they have participated in US culture. However, studies of L2 concept development remain rare, have

focused on a limited number of words/concepts. As Lantolf and Thorne (2006) point out, much remains to be done in this area of L2 learning.

To summarize this section, learners seem to go through stages in which forms in the L1 and L2 are closely related even if these links are the wrong ones to make such as in 'false friends'. Except perhaps for some basic words, forms are acquired earlier to, and separate from, fully developed concepts. More complex encyclopedic entries for nouns are elaborated through participation the the L2 culture, and need to be refined through encountering the word in numerous contexts for the form-conceptual mappings to be firmly established.

3.2   *Collocation and 'arbitrary' word associations*

As McCarthy (1990) points out, there are some totally idiosyncractic facts about which words are used with which other words. For example, 'strong' can be used with 'tea' and 'argument' but not with 'car'; instead, we talk of a 'powerful car'. We have seen already in section 2 that generative researchers such as Jackendoff have conceded the need for knowledge of language to include constructions and not just rules for combination of items chosen from the lexicon. For example, 'dance' is typically not transitive except with nouns like 'tango' and 'waltz', but it can be used in the structure 'dance the night away' (Jackendoff, 1987). This fact about language has led some to claim that **all** there is to knowledge of language is sets of chunks and links between those chunks in a connectionist network (N. Ellis, 2002; 2005). N. Ellis (2002) maintains that frequency is the key to understanding the nature of the acquisition from everything from lexis to morpho-syntax. Unfortunately, for reasons of space, this aspect of the lexicon will not be

discussed further at this point. Readers are referred to an extended summary in DeKeyser and Juffs (2005).

3.3   Verb meaning and morphosyntax

This section focuses on the acquisition of links between verb meaning and morphosyntax. Verbs might pose even greater challenges for learning than nouns, because the lexicalization of concepts into verbs has implications for clause structure. As already mentioned in section 2.4, Talmy (1985) identified lexicalization patterns of manner and movement with verbs of directed motion that vary among languages. Hence, knowing that 'swim' means to move through water and translates as 'nager' in French and 'you-yong' in Chinese might not help when using the verb in a sentence. Pinker's (1989, p. 166) claim that a subset of linguistic system-specific meaning primitives explains the morpho-syntactic behavior of verbs has been extensively discussed and researched (Juffs, 1996; 2000). The growth of interest in this area of the lexical knowledge is reflected in increased coverage in SLA texts. In White (1989, p. 30), subcategorization was referred to as 'idiosyncratic', taking a back seat to abstract principles such as subjacency and binding; in contrast, White (2003) devotes a whole chapter to the issue of verb-meaning correspondences.

3.3.1   Current issues in verb meaning, verb argument structure and morphology

White's (1987) early work drew attention to learnability and markedness with the dative alternation, which at the time was seen more as a syntactic rather than a semantic operation. She showed that English-speaking learners of French as a second language overgeneralized the

English double object dative to French, as shown in (1), where English allows double objects for animate recipients (1b, c), in contrast to French, (2), which does not.

(1) a.   Mary sent a letter to John.
     [X CAUSE Y TO GO TO Z] – Prepositional dative

  b.   Mary sent John a letter.
     [X CAUSE Z TO HAVE Y] Double object dative

  c. Mary sent a package to the house/ ?? Mary sent the house a package.

(2) a. Henri a donné   des fleurs à Lucie.
      Henri AUX given some flowers to Lucie
      'Henri gave some flowers to Lucie.'
    b. *Henri a donné Lucie des fleurs.

A key concept in this analysis is that English is a more general grammar than French, since it allows two syntactic patterns with the dative, but French only allows one. English is thus said to be a superset of French. Several situations have been investigated in which differences between languages or overgeneralizations with verb classes means that learners have to make their grammar narrower, which is thought be harder than expanding a grammar because it requires negative evidence. Other verb classes that have been investigated in this context are are locatives (pour, fill, load, spray, etc., Juffs, 1996), verbs of movement (jump, run, Inagaki, 2001, 2002), causative/ inchoative alternations (melt; freeze, open; close), 'pure' unaccusatives (e.g. arrive, happen, die), and unergatives (usually volitional verbs of sound, e.g. cry, shout) (Hirakawa, Montrul, Yuan, Toth, Zyzik). Datives and locatives involve alternations within the VP, whereas the causative, unaccusative and unergative involve both VP internal and external patterns and alternations. Much of the research has focused on English and as a second language, but

Hirakawa and Yuan have investigated Japanese and Chinese as a second language. Montrul and Toth have examined the acquisition of causatives and 'se' in Spanish from a linguistic perspective. More recently, Zyzik has argued that learners are sensitive to the input that is in instructional materials for 'se' constructions in Spanish.

Reviews of early research are included in Juffs (2000) and White (2003), so this section concentrates on some recent issues. The first concerns the 'initial state' of the lexicon for verbs and the role of transfer. This is important for the theory of full transfer full access since Schwartz and Sprouse (1996) argue that it is the whole of the L1 that transfers. In an important series of papers, Montrul (1999, 2000, 2001) argues that learners begin not by transferring argument structure (by which I assume she means PAS and not LCS), but by assuming a default pattern of argument structure for any verb, e.g. SVO in English. This default PAS results in an overgeneralization pattern in which L2 learners, like children, think sentences such as 'the dentist cried the patient' and 'the magician disappeared the rabbit' are possible in their L2 even though the equivalent sentences in the L1 are also ungrammatical. Helms-Park also found students that Vietnamese and Hindi speaking learners of ESL overgeneralized with English in this way. Although Montrul argues against transfer of argument structure at the beginning stages, she does argue for the transfer of morphology that relates to argument structure. The basis of this claim comes from Montrul's Spanish-speaking learners of ESL who judged sentences such as 'the glass broke' as less acceptable than sentences such as 'the glass got broken'. The latter type of sentence allows the Spanish-speakers to morphologically mark a semantic undergoer (object) that appears in a syntactic subject position, satisfying a morphological constraint in Spanish by equating 'got' with the Spanish morpheme 'se'.

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Similarly, Montrul notes that Turkish-speaking learners of English rate sentences with 'make' more acceptable than Spanish-speakers because the morphological causative in Turkish is 'transferred' to the 'the wind <u>made</u> the glass break' structure, even though the Turkish morpheme is a bound suffix rather than a free morpheme. Montrul's results are consistent with data and analyses by Hirakawa and Juffs in their studies which show overgeneralization of transitive structures and morphological transfer effects.

Advocates of complete full-transfer-full access have challenged the failure of argument structure transfer (Whong-Barr, 2005). Their counter-argument is that PAS transfers at the very early stage, but mismatches in morphology causes the system to overgeneralize in some verbs classes. However, given the complex nature of linking of forms to concepts, it is not clear that an L2 learner at the beginning stage of language learning is able to clearly recognize an L2 form accurately and associate it with an appropriate L2 concept/PAS. Hence, Whong-Barr's argument that PAS transfers makes an assumption about accuracy for acquisition of LCS-PAS-Morphology mapping that is too simple and not supported by the literature reviewed in section 3.1. In addition, it is not clear in her discussion whether it is LCS that transfers or PAS. Where LCS is concerned, one may get this wrong, but still get PAS right. The problems that learners have are often at the conceptual level, which is why the usage is often wrong.

Stringer (2006, 2007) takes another look at research by Inagaki (2001, 2002) in the acquisition of verbs that conflate motion and PATH and motion and MANNER. Inagaki assumed that 'parametric' conflation difference exists between English and Japanese in lexical 'syntax', which is a framework adapted from Hale and Keyser (1993). (See Juffs, 1996: 72-73, for problems with

this syntactic approach to conceptual structure.) Inagaki argues that English incorporates PLACE into PATH, but Japanese does not. This explains the fact that the English sentence 'John swam under the bridge' is ambiguous between a locational and directional meaning in English, but can only be locational in Japanese. English-speaking learners of Japanese L2 therefore have to narrow their grammar to one that allows only a locational meaning for prepositional phrases with motion verbs. He shows that even advanced learners make errors in allowing motion interpretations with sentences such as 'John wa gakko-ni aruita', ≠ 'John walked to school'. Stringer argues that L1 acquistion data by Japanese-speaking children undermine the claim by Inagaki that Japanese does not allow a directional meaning for PPs with motion verbs. His data show strong tendencies along the lines suggested by Inagaki, but 15.7% of the motion events with PPs in his Japanese data show evidence of a directional meaning for the prepositional phrase with manner of motion verbs, e.g. 'sotto e hashitta' (outside to run-PAST) = 'he ran outside'. Stringer thus reverts to the more classic 'conservative' item learning approach, suggesting that many words are acquired one-by-one. He also advocates the position that the whole of the L1 transfers, including the L1 lexicon, 'with all its idiosyncratic combinations of sound (phonemes, phonological features) and meaning (lexemes [sic], and semantic features). This position would seem to be too strong given the extensive psycholinguistic experiments described in section 3.1.

Recall that the lexical conceptual structure of verbs comprises both broad range conflation rules, and narrow range constraints. In this context, Bley-Vroman and Joo (2001) and Joo (2003) investigated the acquisition of locative verbs in English by Korean-speaking learners. They show that Pinker's broad range rules, reviewed in section 2.4.2, are acquired along with constraints on

wholistic interpretation; for example, in the sentence 'John sprayed the door with paint', the door is understood to be fully covered, whereas in the 'John sprayed paint on the door' the door is not necessarily fully covered. However, they also show that learners have not acquired the narrow range constraints on locative alternation, i.e. the difference between such features 'ballistic trajectory' and 'mass forcefully expelled'. Hence, Joo (2003) does not deny that some aspects of verb meaning-syntax correspondences are driven by LCS-PAS rules, but her data do show that it is the refinement of narrow range constraints that is highly problematic for learners and that an item by item LCS-PAS link is not made. In other words, the learners do not transfer L1 narrow range rules into the L2 representations. The results that show that the L1 narrow range features do not transfer, contradicting the strongest version of Full transfer/full access, and is consistent with them being part of encyclopedic knowledge, thus heavily dependent on input and context. This finding is consistent with Juffs' (1996, pp. 225-227) point that narrow range constraints are unlikely to be part of UG.

The results of SLA research in this domain point to success in establishing the conceptual structure – PAS – syntax links in the L2 after adequate exposure. However, narrow range disinctions in both nouns (e.g. question vs. problem) and verbs (e.g. spray vs. spew) seems much harder. This finding is consistent with some recent research in English that points to the need for both verb class information and frequency/exposure information in learning meaning. For example, Ambridge et al. (in press, p. 35) investigate how children learning directed motion (fall/tumble), appearing/disappearing, and verbs of semi-voluntary emotion (laugh/giggle). They conclude that item learning and learning by verb class is important: "... , our findings have provided compelling evidence in support of both the semantic verb class hypothesis (Pinker,

1989) and the entrenchment hypothesis (Braine & Brooks, 1995). However, our findings have also demonstrated that neither hypothesis on its own is sufficient to account for the pattern of data observed, and that the answer to the question of how children learn to restrict their argument-structure overgeneralization errors will necessarily include elements of both proposals." This position will probably be one that will turn out to be true for second language learning also. There is no reason to believe that learners cannot acquire new narrow range constraints over time, but it is important to acknowledge that the process of acquisition will take exposure. Future research will need to look once again to the more sophisticated methods of first language acquisition researchers.

A final issue concerns the relationship between data from fine-grained analysis of verb – clause structure links such as Montrul and Juffs and the claims by Jiang's model of lexical learning for nouns and Joo's data for narrow range features that suggests that L2 learners never fully 'get' conceptual structure in the L2. First, note that the model established for nouns by Kroll and Jiang say nothing about verbs, and does not predict lexeme (morphological transfer) – at least not for nouns. In addition, the Levelt/Jiang/Kroll model, which divides information into lexeme and lemma stages is probably not fine-grained enough to capture differences among word classes. It is clear that conceptual structure for causativity and state changes in verbs can be acquired by very advanced learners (Juffs, 1996), and that learners are able to reconfigure broad range rules in their L2.

This chapter is not a review of pedagogy on the lexicon, but it is important to understand some concerns of language teaching, especially for the importance that issues of frequency and corpora raise for learning. One comprehensive recent book and an important reference on the topic of vocabulary, semantics and instruction is Hatch and Brown (1995.[3] Schreuder and Weltens (1993) contains papers on pedagogy and psycholinguistics, and Folse (2004) is a very accessible guide for teachers of second language vocabulary.

It is estimated that children learn approximately 1000 words a year and know about 8000 words by the time they are 8 (Carey, 1978, cited in Jackendoff 2002b), and well over 15,000 by the time they reach age 18. This rate of learning implies that children learn approximately 5 words per day from ages 2-8. The task faced by the adult L2 learner for the lexicon is therefore daunting. In contrast, it is rare for second language learners to acquire so many words. Although applied linguists believe that knowledge of approximately 3000 word families is enough for most reading tasks, Cobb (2006) notes that even these 3000 word families may not be adequately learned by many learners in foreign language contexts. West (1953) developed a list of 2000 essential words known as the General Service List. Knowledge of this list is supposed to be a pre-requisite for progress in learning other words, since these words are the key to understanding about 80% of texts in an L2.

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[3] Given its coverage, it is surprising that this book is not cited more. In a search of 100 citations in Google Scholar, Hatch and Brown (1995) is not once cited by mainstream researchers in the second language psycholinguistics literature. Strangely, Nation (2001) does not refer to their work either, even though his book is specifically on the same subject and published by the same company, Cambridge University Press.

The work on corpora has been particularly informative for teachers developing curricula. However, the suggestions do not really attack the problems that the psychology and linguistics literature bring up. A new phonology for the L2 learner means that sound labels for items must be processed and matched with new items. Whether words are in fact associated with lemmas in a way similar to the L1 remains an issue of research. Jiang has suggested that L2 learners may never develop lexical entries that are more than 'episodic' memory traces of words, without full linguistics specification in the L2. However, the research on lexicalization in verbs indicates that this may be a rather too pessimistic a view, since learners do seem to be able to acquire new patterns of lexicalization. Moreover, the Ellis (2005) also suggests that implicit knowledge can be developed from input after multiple exposures.

Paul Nation (Nation, 2001) has been one of the most influential researchers in establishing, for English as a second or foreign language, how many words and which words a learner needs to know in order to be able to successfully read texts in English. (See also McCarthy, 1990; 1994; see Biber et al. 2004 for words and structures occurring in written and spoken academic discourse). It is generally accepted that a learner needs to know between 2000 to 3000 word families in order to be able be able to read most texts. (Nation (2001, p. 8) defines a word family as 'a head word, its inflected forms, and its closely related derived forms'). This view is somewhat like that of Jackendoff for those words that are very frequent, but not for infrequent words. Thus, the grouping of words into word families does not really address the fact that for some learners morphological variants are not well-understood and recognized (see also Schmitt and Meara, 1997), and that there is more to word learning in production than frequency measures (Meara, 2005).

The lexicon is a complex field of study that requires a heterogeneous set of theoretical constructs to understand clearly In early and later bilinguals, L1 and L2 forms clearly have a significant influence on one another. Lemmas in the form of conceptual features, conflation patterns, and projection of clause structure seems to rely heavily but not exclusively on the L1 early in development for adult SLA, but need not fossilize into L1 transferred patterns. We have seem that at the lemma level, 'meaning' needs to be separated into those parts of conceptual structure that can affect clause structure, and those aspects that are more 'encyclopedic' in nature. Decompositional theories of nouns will need more careful analysis so that more fuzzy notions such as 'abstractness' (e.g. stone vs. compulsion) can be broken down into more carefully defined properties, perhaps suggested by qualia structure for the encyclopedic component.

Until the 1990s, formal linguists treated the acquisition of the lexicon and concepts as uninteresting. Lantolf and Thorne (2006) suggest that this view has its roots in the development of linguistic theory in the 20th century from Saussure through Bloomfield to Chomsky, who by separating semantics from syntax, drew attention away from meaning. Presently, the lexicon is (back?) at center stage, but Jackendoff (2002b, p. 377) cautions that 'It should be recognized that there are fundamental methodological and expository difficulties in doing lexical semantics. … Perhaps there is no way out: there are just too many goddamned words, and so many parts to them. … *Next to lexical semantics, the acquisition problem for grammar pales by comparison.*'

Researchers are going to need to focus more on the contexts in which words are encountered and in some cases the cultural baggage that goes along with it, otherwise we risk believing that there are sheep with five teeth out there.

Computers have been a powerful aid in establishing which forms might be taught early because they account for large portions of text that students read (Nation, 2001). Computers are also helpful in providing exposure to those forms and for the development of weak links between L2 forms and concepts. However, by comparison our understanding of the development of the conceptual and morphosyntactic knowledge that goes along with those forms is poor, especially for nouns.

The task ahead will involve creating an interface between theoretical advances from psycholinguistic experiments and linguistic research with scholars who are involved with pedagogy and testing. The what of learning the lexicon – which set of words and how they might be psychologically represented needs to assist the how of learning and instruction.

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