LINGUISTIC TYPOLOGY AND FIRST LANGUAGE ACQUISITION

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1. INTRODUCTION

The goal of studying first language acquisition is to determine how children learn to talk and understand, while the goal of linguistic typology is to discover deep regularities in patterns of variation across languages. Despite their different objectives, the two fields have many points of contact.

From the developmental psycholinguist's point of view, an adequate account of language acquisition must explain how children can learn any human language. Linguistic typology alerts researchers to key dimensions of language variation that might make a difference to the acquisition process, and so helps promote explanations that do justice to this diversity. Typology also provides clues to forces that may influence language acquisition. The properties of natural languages are shaped and constrained by the perceptual, conceptual, communicative, and processing capacities of human language users—capacities that young humans share and presumably draw on in working out the structure of the language they hear. So

typology can give rise to testable hypotheses about the acquisition process and suggest possible interpretations of findings.

For linguists, interest in language acquisition is often motivated by the hope that acquisition holds clues to what is most fundamental to language. Children work on language over an extended period of time, and their developmental progressions and typical error patterns could plausibly reveal aspects of the human blueprint for language. For example, children might master cross-linguistically basic (unmarked, prototypical, etc.) elements earlier and with fewer errors than their less basic counterparts, and errors might systematically deviate toward more basic structures and functions. Information about language acquisition can also help in adjudicating between competing theoretical accounts of adult linguistic knowledge. A linguistic analysis for which a plausible acquisition story can be told—one that is compatible with empirical evidence on order of acquisition and typical error patterns—is clearly preferable to an analysis that flies in the face of such evidence (Hawkins 1987).

For all their points of contact, the relationship between language acquisition and linguistic typology is at best indirect. On the one hand, acquisition is influenced by factors with no necessary bearing on adult language, such as the course of cognitive maturation and the pragmatic priorities of very small children, i.e. the kinds of interpersonal negotiations children want to carry out. On the other hand, widespread or universal patterns of adult language do not necessarily stem from deepseated cognitive or perceptual propensities that toddlers might share; they could instead reflect recurrent environmental or social experiences, or psycholinguistic forces that operate only on fluent discourse between mature speakers (Slobin 1997c). At best, determinants of language structure and determinants of language acquisition overlap only partially, and disentangling them is a complex task.

In this chapter, I examine some ways in which linguistic typology and language acquisition research have come together (see also Slobin and Bowerman 2007). I start with a look at how cross-linguistically oriented language acquisition research has come to share certain core attitudes and methodological preferences with the field of linguistic typology, and then examine some major areas of investigation and key findings.

2. THE RISE OF TYPOLOGICALLY ORIENTED LANGUAGE ACQUISITION RESEARCH

The initial inspiration for the modern study of language acquisition came from Chomsky (1959, 1965), whose work galvanized linguists and psychologists in an era when the reigning theory of learning was behaviourism. According to the

behaviourist model, learning language is just like learning anything else, and is driven by simple and domain-general mechanisms such as imitation and reinforcement. Two of Chomsky's critiques of this model were particularly influential. First, he argued, mastering a language is not a question of memorization and small-scale surface generalizations, but entails internalizing a set of highly abstract rules underlying sentence construction. Second, all-purpose learning mechanisms are inadequate for this task; we must assume instead that children are guided by inborn knowledge of linguistic universals.

These proposals spurred a flood of new language acquisition research in the late 1960s and early 1970s, including studies of children learning different languages. The immediate goal of these early cross-linguistic studies was to compare acquisition progressions in various languages, in search of universal features that would provide clues to the human capacity for language acquisition. Empirical generalizations began to appear about the early grammatical rules of children learning English, with a limited amount of cross-linguistic evidence hinting that the observed phenomena might be universal (e.g. Slobin 1970). But as work proceeded, it became clear that grammatical development was not going to give up its secrets so easily. Three initially promising hypotheses about early grammars—'telegraphic speech' (only content words, no functors), 'rigid word order' (an initially fixed order of subject, verb, and object, regardless of the flexibility of the input language), and 'pivot grammar' (a hypothesized simple grammar governing initial two-word combinations)—had to be abandoned. For instance, children learning languages with rich morphological systems, such as Turkish, turned out to use productive morphology already at the one-word stage, and children learning languages with flexible word orders, like Finnish, adopt flexible word order from the beginning (Aksu-Koç and Slobin 1985, Bowerman 1973).

At this point, child language scholars began to diverge along the emerging formalist/functionalist split still so characteristic of linguistics today. Followers of Chomsky looked for evidence that children are guided by inborn syntactic constructs and principles ('Universal Grammar', or UG; see Lust 2006 for a useful orientation and a discussion of the UG-style parameter-setting approach to pro-drop and head direction/branching direction, among other cross-linguistic differences). Others took a more learning-oriented tack. Although agreeing with Chomsky that children acquire an abstract rule system, they questioned whether this task required the assistance of innate, specifically linguistic knowledge. Behaviourist learning mechanisms were not the only alternatives. In the early 1970s, there was a new openness to 'invisible' constructs and strategies which had long been scorned as unscientific. Perhaps children could acquire language without help from innate knowledge if they commanded a richer set of cognitive capabilities than behaviourists had granted them, like concepts, mental representations, communicative intentions, problem-solving strategies, and the ability to formulate and revise hypotheses.

It was in this new, cognitively and functionally minded climate that language acquisition research began to interact with the emerging study of linguistic typology, especially as inspired by Greenberg (1966b) and his followers. Developmentalists had to have a way to disentangle properties of children's early language that are universal—hence, plausibly determined by the basic capacity for language acquisition—from properties that are shaped by the learning environment, and especially by exposure to a language with a specific structure. Typology helped in this effort by orienting researchers to dimensions of cross-linguistic variation that might matter.

Running parallel to the events just described, a sea change was also taking place in the study of phonological development. Here, it was Jakobson (1968[1941]) who provided the initial inspiration, as well as a direct theoretical connection to linguistic typology. According to Jakobson, there is a fundamental discontinuity between children's early babbling and later phonological development: during the babbling period, infants produce a large inventory of sounds, but this inventory is sharply reduced when word learning begins; from there, the child's system of phonemic oppositions unfolds according to strict rules. Further, claimed Jakobson, the rules governing the acquisition of phonology are identical to those governing the phonological structure of adult languages. Jakobson termed these the 'laws of irreversible solidarity'; today, they would be called implicational universals.

These laws set out a universal hierarchy of features arranged in a strict pattern of successive dichotomous branchings based on the principle of maximum contrast, such that the use of a particular contrast presupposes the presence of all the contrasts above it (it is 'marked' relative to these contrasts). For example, the presence of voiced or aspirated stops in either adult or child language implies the presence of voiceless unaspirated stops, and the presence of fricatives presupposes the presence of the corresponding stops; vowels and consonants that are uncommon in adult languages should be among the last to be acquired by children, and they would initially often be replaced by elements above them in the hierarchy. In these claims, we encounter ideas that still influence thinking about the relationship between language acquisition and adult language, for example, the notion of a strict order of acquisition that is predictable from the study of adult languages— e.g. marked forms will be acquired later than unmarked forms—and the hypothesis that features that are rare across languages are more difficult to acquire.

From the late 1960s, researchers working on children's early phonology, like those studying early grammar, began to approach their subject in a new, more empirical way. Instead of testing models based on pre-existing theories like Jakobson's, they began to compare acquisition data directly across a range of languages. Much of this work took place in the context of the Stanford Child Phonology Project (1968–88), a project closely related to the Stanford Language Universals Project associated with Greenberg. The work revealed many deviations from the universals predicted by Jakobson (Ferguson and Farwell 1975); for example, there

was no sharp discontinuity between babbling and early word learning; there were extensive individual differences rather than a fixed order of acquisition of phonemes; and certain phonological patterns that are rare in adult language are common in child language, such as consonant harmony (e.g. /guk/ for 'duck') (see Edwards and Beckman 2008, Kiparsky and Menn 1977, and Vihman 1996 for overviews).

With these empirical outcomes, the 'implicit defining question' began to shift: instead of asking 'What linguistic theory will explain the order in which the various language behaviours develop?', researchers now began to ask 'What behavioral predispositions and abilities does the child bring to the task [. . .] and how does the individual go about solving the articulatory and phonological problems posed by the language to be learned?' (Menn 1983: 45). For phonology, just as for early child grammar, the idea gained force that children actively *construct* their own systems, albeit under constraints set by certain universal phonetic tendencies reflecting the physiology of the vocal tract (Ferguson and Farwell 1975).

In summary, in both grammar and phonology, there have been strong theoretical reasons to look for relationships between the structure of adult languages and children's language acquisition. But as work on language acquisition proceeded, it became increasingly clear that language development is influenced by a wide range of factors beyond those plausibly responsible for shaping adult language structure. How to distinguish these various influences remains a major theoretical challenge.

3. ESTABLISHING A FRAMEWORK FOR COMPARISON: THE OPERATING PRINCIPLES APPROACH

The initial wave of cross-linguistic research on grammatical development did not reveal invariants of early syntax, as had been anticipated from Chomsky's claims. The invariants that struck researchers instead were conceptual or semantic: all around the world, children's first word combinations revolved around a limited set of relational notions to do with agency, action, location, possession, and the existence, recurrence, nonexistence, and disappearance of objects (Bowerman 1973; Brown 1973; Slobin 1970, 1973). Where did these ubiquitous meanings come from? Nowadays, it is commonplace to trace them to universals of non-linguistic cognitive development, but this was not initially obvious: establishing a guiding role for cognition in early language development was one of the important research outcomes of the 1970s. A new hypothesis, often called 'the cognition hypothesis', arose: that language learning is a process of form–meaning mapping in which

children discover how to communicate by matching basic cognitive concepts established independently of language to the conventional forms of the input language (see Bowerman 2000 for a historical overview).

This hypothesis owed much of its popularity to its consistency with theoretical and empirical work on early conceptual and linguistic development by the Swiss developmentalist Piaget (1954), whose approach was enormously influential at the start of the cognitive revolution. Also important for linguistically minded child language scholars was the substantial overlap between the relational concepts expressed by children's early word combinations, as established by empirical cross-linguistic research, and the concepts Fillmore (1968) had posited as fundamental to syntax in his Case Grammar (e.g. Bowerman 1973). An understanding of the conceptual bedrock for the human language capacity appeared within sight.

The cognition hypothesis was central to the first comprehensive attempt to investigate child language within a cross-linguistic framework: Slobin's (1973) 'Operating Principles' approach. Slobin proposed that the semantic notions expressed in early child language are shaped by cognitive maturation, so they arise in children at the same rate and in the same order all around the world, regardless of the formal linguistic devices used in the local language to express them (e.g. word order vs. case endings for basic grammatical relations). If this is true, argued Slobin, 'we have a powerful research tool for probing the information processing devices used and developed by children to understand speech and to construct grammars' (1973: 187). In particular, we can measure the time lag between children's first often clumsy attempts to express a given meaning and their later mastery of the conventional linguistic form. By comparing this lag across different devices for expressing the same meanings, and by noting characteristic errors, we can also determine what is easy or difficult for learners, and so make inferences about the capacities, strategies, and starting assumptions that children bring to the task.

Using this strategy to compare children learning a wide range of languages (about 40, from fifteen major families, although the data from many of these were very sketchy), Slobin (1973) formulated a set of Operating Principles (OPs) for language acquisition. Arrived at inductively and phrased as self-instructions, the OPs were each motivated by a diverse set of phenomena. Some had to do with semantic coherence: for example, 'The use of grammatical markers should make semantic sense' and 'Avoid exceptions'. Others had to do with the surface forms of utterances: for example, 'Pay attention to the order of words and morphemes' (children make very few ordering errors, regardless of the input language), 'Avoid interruption or rearrangement of linguistic units' (structures requiring these operations give rise to many errors), and 'Pay attention to the ends of words' (children learn postpositions or suffixes to express any given meaning more easily than prepositions or prefixes). Still other OPs—especially as formulated by Peters (1985, 1997)—aimed at explaining how children segment and extract units from the speech stream for further analysis; here, prosody plays an important role.

OPs were seen as instantiations of more general perceptual and cognitive tendencies at work not only in language acquisition but also in language change, language contact, and creolization (Slobin 1977). For example, several OPs promote a one-to-one mapping between units of form and units of meaning, which typologists treat under rubrics like 'iconicity' and 'isomorphism'. Others promote processibility, along lines similar to those pursued in typology by Hawkins (this volume). These OPs were seen as especially important early in language development, as children at first tend away from synthesis, contraction, and deletion, and toward more analytic expressions. For example, an agglutinative system of inflectional morphology like that of Turkish is easier to acquire than a synthetic system like that of Serbo-Croatian (Slobin 1977).

Against the backdrop of the OP approach, Slobin and his associates carried out the Berkeley Four-Language Project, which 'may still be the largest single project aimed at specific typological comparisons in language development' (Slobin and Bowerman 2007: 218; this project is summarized in Slobin 1982). The languages investigated—English, Italian, Serbo-Croatian, and Turkish—contrast along a number of key dimensions: SVO vs. SOV; different degrees of word order flexibility; prepositional vs. postpositional; case-inflectional vs. non-case-inflectional; synthetic vs. agglutinative case inflections; regular morphology vs. various kinds of irregularity. Along with other cross-linguistic work of the same era (e.g. Bowerman 1973 on the acquisition of Finnish), this project established that children can readily acquire either word order or case-marking to express basic grammatical relations; that they adopt the word orders modelled in the input language with no starting preference for some hypothetical 'natural' order; that even before age 2, children learning flexible word order languages like Turkish can manipulate word order pragmatically to focus participants and take different perspectives; and that agglutinative inflections, as in Turkish, are easier for learners than fusional inflections, as in Serbo-Croatian (Slobin 1982).

The OP approach inspired researchers worldwide, fostering both a growing international community of cross-linguistically minded child language scholars and a tremendous amount of new work and theorizing (see Slobin's five edited volumes, 1985a, b, 1992, 1997a, b, on *The Crosslinguistic Study of Language Acquisition*, which describe and compare language acquisition in a wide range of typologically different languages). Although the approach is no longer actively pursued as such (see Bowerman 1985 for a critique of its strong and weak points), its empirical findings and much of its theoretical framework still stand, forming a shared history and set of background assumptions for researchers in this field. Two aspects of the approach are worth special emphasis.

First, the methodological problem that Slobin (1973) tackled in the realm of language acquisition is closely parallel to the one facing linguistic typologists, and he solved it in a similar way (see also Bates and MacWhinney 1982). For typology, the most important prerequisite for cross-linguistic comparison is to be able to

identify the same grammatical phenomenon across languages (Croft 2003a: 13). Structural criteria such as morphology or syntax alone cannot be used to equate phenomena, because languages differ in their application of these techniques. The ultimate solution is to identify a particular semantic/pragmatic/functional situation type, and then compare the morphosyntactic devices used by different languages to encode it (Croft 2003a: 13). Slobin used an analogous strategy in studying language acquisition—holding meanings roughly constant while comparing forms across children learning different languages—and this broke the stalemate of the initial failure to find substantive cross-linguistic universals of early grammatical development, such as fixed word order, and led to more fruitful comparisons.

The second aspect of the OP approach worth emphasizing is its inductivist, empiricist character, along with its orientation to substantial comparative databases. Here again, there is a close parallel to the typological approach to linguistics, as well as a strong contrast with the UG approach. Universals are not what you start out with as hypotheses to support deduction and hypothesis testing; rather, they are what you hope to end up with after careful analysis of data from a suitably large and diverse number of languages. In recent years, the empirically minded approach to language acquisition has, like linguistic typology, been inspired by, and also contributed to, usage-based, constructional approaches to language structure (e.g. Tomasello 1998, 2003a), and has tended to look for explanations of widespread patterns in factors 'external' to language, such as processing strategies, conceptual structure, and interaction patterns.

4. CHILDREN'S SEMANTIC PREPAREDNESS FOR LANGUAGE

4.1 Emergent categories

The meanings stressed by early cross-linguistically minded child language researchers were general conceptual notions often discussed by developmentalists, such as 'agent', 'action', 'object acted on', 'location', and 'possessor'. But proposals soon became more specific to language structure. In particular, children's lexical and morphological errors were noted to be surprisingly well motivated, in the sense that they revealed a sensitivity to semantic categories and distinctions that are often important in languages, even if not for the form on which the child errs.

For example, Clark (1976) found striking similarities between children's overextensions of object words—e.g. *ball* for a pincushion—and the semantics of

numeral classifiers in languages around the world.[1] In both, 'objects are categorized primarily on the basis of shape, and the same properties of shape appear to be relevant in acquisition and in classifier systems'—roundness and length above all. Overextension patterns and classifier semantics are similar, hypothesized Clark, because both reflect fundamental properties of the human perceptual system. Parallels were also noted between children's acquisition of words for body parts and typological patterns in the lexical classification of the body (Andersen 1978, Bowerman 1980; see section 6.2.1). Clark (2001: 380) coined the term 'emergent categories' for semantic categories that receive no conventional expression in the target language, but that 'surface fleetingly in children's speech and then vanish again or evolve into something else'.

In some emergent-category errors, children extend forms across semantic boundaries that must be honoured in their own language, but are collapsed in many other languages. For instance, learners of English sometimes overextend spatial morphemes to temporal meanings (e.g. BEHIND *dinner* to mean AFTER *dinner*; *Do we have* ROOM *for . . .* to mean *Do we have* TIME *for . . .*) (Bowerman 1982). This is a pattern common in both polysemy and language change (Traugott 1978). Children also overextend the preposition *from*, associated most basically with spatial source, to mark agents of actions (*This fall down* FROM *me*—i.e. 'I dropped it'), possessors (*That's a finger* FROM *him*), and standards-of-comparison (*This ear is longer* FROM *the other ear*) (Clark 2001). The extension of an ablative marker to some or all of these meanings is conventional in many languages. In a third example, children sometimes interchange *make* and *let* in periphrastic causatives (e.g., MAKE [=LET] *me watch it*; *Don't* LET [= MAKE] *me go to bed*) (Bowerman 1978). In many languages, although not in English, there is a single causative morpheme that covers both active (*make*) causation and permissive (*let*) causation (Comrie 1981).

In other emergent-category errors, children sometimes briefly introduce distinctions that are not observed in their own language, but are common in other languages. For example, a learner of English used different adjectival derivations to contrast inherent properties with temporary ones (e.g., *crumb-Y* for a crumbly cookie vs. *crumb-ED* for a foot covered with crumbs)—cf. the obligatory choice in adult Spanish between two copulas, *ser* and *estar*, which draw roughly the same distinction (Clark 2001).

As these various examples show, errors of both overextension and category subdivision are often surprisingly 'sensible', and suggest a semantic preparedness for language learning.

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[1] Numeral classifiers are elements that are obligatory in noun phrases in the context of quantifying objects (e.g. counting them or asking how many there are), for instance, 'two LONG.RIGID.CLASS pencil' (= two pencils). These forms often have anaphoric (pronoun-like) uses as well.

4.2 The 'grammaticized portion' of language

Strong claims about children's spontaneous organization of meanings have focused in particular on the meanings learners associate with the 'grammaticized portion' of language, such as case endings, verb inflections, and adpositions. Linguists have often argued that such meanings are special. Talmy (1983, 1988), for instance, proposed that grammatical meanings constitute an innate conceptual framework that scaffolds the conceptual material expressed in the cross-linguistically more variable open-class lexical items. Drawing on Talmy and on data from learners of a wide variety of languages, Slobin (1985c: 1161) argued that children orient toward a universal core set of meanings that are 'privileged' for mapping onto grammatical forms: although the surface forms vary, 'what is constant are the basic notions that first receive grammatical expression'. These 'basic notions', along with the regularities imposed on morphosyntax by the workings of the Operating Principles, meant, according to Slobin, that children's first grammars are essentially alike: they are all variants of a 'universally specified "Basic Child Grammar" which reflects an underlying ideal form of human language' (Slobin 1985c: 1160). A similar hypothesis was advanced by Bickerton (1981), who argued on the basis of creolization studies that children are guided by an innate 'Language Bioprogram' to introduce certain grammatical distinctions into their developing grammars even when these distinctions are not modelled in the input.

A domain of grammatical marking that has received particular attention in work on first language development is the expression of temporal relations. Drawing on research by various authors, Slobin (1985c) argued that the most salient temporal contrast for children everywhere is the distinction between 'result' (punctual, completive) and 'process' (non-punctual, non-completive, ongoing). The evidence is in children's selective collocation of certain temporal markers with verbs expressing certain classes of events; in particular, past tense or perfective forms (e.g. English -ed, Slavic perfective verb forms, Turkish 'witnessed' past -dI, Japanese -ta) with telic verbs like 'break' or 'drop' to comment on an immediately completed event with a visible change of state; and progressive, imperfective, or present forms (e.g. English -ing, Slavic imperfective verb forms, Turkish present tense -Iyor, Japanese -te i-) with atelic, durative verbs to comment on ongoing states of affairs. The result/process distinction is, suggested Slobin, neutral and superordinate to the categories needed for a particular language, such as perfective or preterite, imperfective, progressive, or iterative, but over time it can develop into them. In his Language Bioprogram hypothesis, Bickerton (1981) also stressed certain temporal distinctions as basic to children, although his proposed contrasts were process/state and punctual/non-punctual.

In general, accumulating evidence has favoured the salience of result/process over other temporal distinctions in children's early grammars (Shirai, Slobin, and Weist 1998). But at the same time, there has been a retreat from the claim that this or other

grammatical distinctions are programmed into the learner ahead of time, as opposed to learned on the basis of linguistic experience. There are several reasons for this shift.

One reason is research showing that the meanings of grammatical morphemes are less uniform across languages than had been thought, and that children are far more sensitive to the semantic organization of grammatical meanings in their local language than the Basic Child Grammar hypothesis predicts. Much of this evidence comes from the domain of space, where the meanings of early-learned grammatical morphemes such as English *in* and *on*—long assumed to reflect universal concepts such as 'containment' and 'support'—have been shown to be language-specific in both adult language (e.g. Bowerman and Pederson 1992, P. Brown 1994, Levinson and Meira 2003, Levinson and Wilkins 2006) and very early child language (Bowerman and Choi 2001, 2003, Choi and Bowerman 1991; see also section 6.2.3). But also in the domain of tense and aspect, children's use of grammatical markers has turned out to be language-specific. For example, in the early speech of children learning Japanese, just as in adult speech, the durative marker *-te i-* marks not only progressive aspect on activity verbs but also resultant states on achievement verbs; this is a different notion from the progressive notion marked by *-ing* in the speech of children learning English. (See Shirai, Slobin, and Weist 1998 and other papers in their special issue for this and further examples.)

Three further sets of findings have undermined the hypothesized role of special grammaticizable meanings in language acquisition. First, it has turned out that the association between tense–aspect morphology and verb classes is present not only in children's speech but also in child-directed adult speech, although less dramatically (Shirai et al. 1998). This suggests that children's usage patterns reflect not built-in semantic biases but rather an ability to pick up on—and a tendency to sharpen—statistical patterns in the input. Second, research on processes of grammaticalization has shown that closed-class forms arise gradually from open-class forms through piecemeal loss of syntactic flexibility, phonological erosion, and semantic bleaching; at any one time, a form may fall somewhere between being fully open and fully closed (Hopper and Traugott 1993). This finding weakens a theory of acquisition that assumes a strict dichotomy between open- and closed-class forms, and that appeals to fundamentally different learning procedures for forms of the two kinds. Finally, support for the notion of special grammaticizable meanings coming from Bickerton's Language Bioprogram hypothesis has been eroded by research showing that there is more generation-to-generation language transmission in creolization than Bickerton had assumed, and also more influence from substratum languages (Traugott and Dasher 2002).

After reviewing the mounting evidence along these various lines, Slobin (1997c) retracted his claim for Basic Child Grammar, in particular for meanings privileged for mapping onto grammatical morphemes. He now suggested that the seemingly special semantics of grammatical morphemes should be attributed not to children's starting semantic biases, but to psycholinguistic processes at work in the discourse of fluent speakers.

Despite these shifts in theorizing and interpretation, we should not lose sight of the 'emergent errors' discussed earlier in this section. Although toddlers are clearly semantically less biased and more sensitive to the input in their initial form–meaning mappings than was previously supposed, such errors remind us that children do not simply passively await the imprint of the input language; they have some good ideas of their own about the possible organization of meaning. Determining the nature of children's semantic predispositions, and how these interact with properties of the linguistic input, remain important priorities for further research.

5. LINKS BETWEEN SYNTAX AND SEMANTICS

Across languages, there are consistencies in the way semantic functions are linked to syntactic categories and relations; for example, words that name objects are typically nouns and elements that specify agents are often sentence subjects. The role of linking consistencies in language acquisition is controversial.

5.1 Are linking rules innate?

Recall that according to the 'cognition hypothesis' (section 3), children start out by mapping elements of language onto basic cognitive concepts. In this view, children at first know nothing about syntactic categories and relations. They start the learning process by associating the morphosyntactic properties of the nouns, verbs, subjects, and direct objects in the input to core meanings or prototypes like 'concrete object', 'action', 'agent', and 'patient', and then they gradually abstract away to the more formal grammatical constructs they need for their target language (e.g. Bowerman 1973, Tomasello 2003a). This view of the development of semantic–syntactic linking is compatible with modern constructivist approaches to linguistic typology, such as Croft's (2001) Radical Construction grammar.

A second approach, which follows UG logic, presupposes that the existence of linking regularities can best be explained by appealing to children's inborn capacity for language. If knowledge of linking is innate, it would be available to children to solve important acquisition puzzles. Two influential proposals along these lines are known as 'semantic bootstrapping' and 'syntactic bootstrapping'. Linguistic typology contributed initially to the rise of the bootstrapping hypotheses by suggesting that linking is cross-linguistically consistent enough to plausibly be considered innate. But typology has been recruited more recently to challenge the bootstrapping hypotheses.

5.1.1 Semantic bootstrapping

Theorists working in the UG tradition have long assumed that children come equipped with innate knowledge of word classes and syntactic relations. But, as Pinker (1984) noted, this knowledge would be useless unless learners have some way to identify concrete instances of these constructs in the speech stream. To solve this problem, Pinker proposed that for each syntactic construct, there is a semantic cue: for example, 'if a word names a person or thing, assume that it is a noun' and 'if a word names the agent of an action, assume that it is the sentence-subject' (similarly, for actions and verbs, patients and direct objects, and so on). These semantic–syntactic correspondences are imperfect in adult grammar, of course—for example, not all agents are subjects—but they are good enough, argued Pinker, to allow learners to establish the order of subject, verb, and object in their language, along with the morphology associated with nouns and verbs and other basic properties of phrase structure. These properties could then be used to identify further instances of the syntactic constructs even when the canonical semantics are absent. Pinker dubbed this use of meaning to predict syntax 'semantic bootstrapping'.

5.1.2 Syntactic bootstrapping

In syntactic bootstrapping, the posited inborn knowledge of semantic–syntactic correspondences is exploited the other way around—syntax is used to predict meaning (Gleitman 1990). The goal here is to explain how children home in quickly on the meanings of verbs despite the considerable ambiguity in typical contexts of use. If syntax and semantics are systematically linked, in the sense that a verb's meaning projects how many arguments it has and how these arguments are syntactically arranged, then a child could make a sensible first-pass prediction about the meaning of a novel verb by noticing the syntactic frames in which it occurs. For example, a verb with one argument (*Mary GORPS*) is likely to express a single-participant event (e.g. 'Mary laughs'); a verb with two arguments (*Mary GORPS John*) suggests a two-participant event, perhaps an event of contact or causation; a three-argument verb (*Mary GORPS the ball to John*) may well denote an event of transfer, such as 'put' or 'give'; while a verb with a clausal complement (e.g. *Mary GORPS that the ball is red*) is likely to be a verb of perception or cognition, such as 'see' or 'think'. Once the hypothesis space has been narrowed down in this way, observation of contexts of use can help the child identify the verb's more precise meaning.

By now there is considerable experimental evidence, mostly from learners of English, that young children can indeed use syntax to make sensible guesses about a new verb's meaning (see Fisher and Gleitman 2002 for a review). But whether the linking information on which this ability depends is innate or learned is controversial, for reasons we now examine (see Bowerman and Brown 2008b for a more detailed discussion).

5.2 Typological challenges to innate linking rules

A basic prerequisite for both of the bootstrapping hypotheses is that syntactic categories and relations, like noun, verb, subject, and object, must be universal. This issue has been hotly debated for many years (e.g. Croft 2003a, Dryer 1997a, Fillmore 1968), and we will not examine it further here. Instead, we can ask whether children behave as if they had a priori knowledge of linking regularities, and whether the specific linking assumptions that bootstrapping hypotheses rely on are viable in cross-linguistic perspective.

Bowerman (1990) hypothesized that if children have innate knowledge of syntactic linking rules, they should start to combine arguments earlier and more accurately with verbs that link relatively consistently across languages (e.g. proto-typical agent–patient verbs) than with verbs that link more variably (e.g. verbs of possession, cognition, and perception). In a detailed study of two English-speaking children, Bowerman found no advantage for canonically linked verbs: as soon as the children began to combine verbs with subject or object arguments at all, they did so equally accurately for verbs of all semantic types. Linking errors did eventually occur, especially with Experiencer and Stimulus arguments (e.g. *I saw a picture that enjoyed me* [= that I enjoyed]), but only at relatively late stages of language acquisition. Bowerman attributed these errors not to starting biases in linking but to the overgeneralization of a statistically predominant pattern of English whereby Stimulus arguments link to subject position (Talmy 1985: 99).

Challenges to the bootstrapping linking assumptions have also come from studies of relatively unfamiliar languages (see Bowerman and Brown 2008a). For example, (a) Danziger (2008) shows that in Mopan Maya (Belize), the predicted link between action word semantics and verbs is confounded: many everyday single-participant action concepts, such as 'run', 'fly', 'jump', 'yell', 'laugh', and 'move', are encoded as *nouns*, as in 'My <u>running</u> continues' (= 'I run'). (b) Wilkins (2008) discusses how Arrernte (an Arandic language of central Australia) violates the syntactic-bootstrapping expectation (Gleitman 1990) that verbs of object transfer, like 'put', will have different argument structures from verbs of perception, like 'see'—three arguments for 'put' and two for 'see'. In Arrernte, verbs of both classes share identical three-argument frames. (c) Essegbey (2008) shows that in Ewe (a Kwa language spoken in Ghana), the contrast between intransitive and transitive constructions is often associated not with one- vs. two-participant events, as syntactic bootstrapping presupposes, but with a single participant's degree of control over the action (one argument indicates lack of control, two indicates control). In their efforts to understand how such linking systems could be acquired, most of the authors in Bowerman and Brown (2008a) hypothesize that linking regularities are learned over time through an input-driven constructional process in which neither semantic nor syntactic information serves unilaterally to predict the other, but both are continually played off against each other.

5.3 Ergativity

The most celebrated challenge to the hypothesis that linking biases are innate is undoubtedly the phenomenon of ergativity. In an *ergative* pattern, the subject of an intransitive verb (S) is treated like the object of a transitive verb (O) (both being morphologically unmarked, typically), while the subject of a transitive verb (A) is treated distinctively (e.g. marked with ergative case). In the *accusative* pattern, in contrast, S and A are treated alike and O gets distinct treatment (e.g. marking with accusative case). Usually, it is only morphological marking that is affected by ergative patterning, and usually only under certain conditions ('split ergativity'), with the split between ergative and accusative marking conditioned by factors like person, tense–aspect, mood, clause type, or case-marking vs. verb agreement. When morphology is ergative, syntactic patterns such as control relations often remain accusative. But some languages are also syntactically ergative to varying degrees. Ergativity of either kind presents a problem for theories of language acquisition because it violates the often-postulated link in acquisition between agents (a concept that plausibly encompasses the initiators of both transitive actions, like 'killing', and intransitive actions, like 'walking') and subjects.

In his proposal for Basic Child Grammar (see section 4.2), Slobin (1985c) hypothesized that children crack into grammatical case-marking with an 'opening wedge' that is neutral between the accusative and ergative patterns. In particular, he argued that regardless of the input language, grammatical markers associated with transitivity are initially found in utterances encoding 'prototypical transitive events', in which an animate agent intentionally brings about a physical change of state or location in a patient by direct bodily contact or with an instrument. Initial evidence suggested that children learning an accusative language tend at first to restrict the accusative marker to the objects of verbs encoding such events (e.g. 'break', 'take', 'throw'), and extend it only later to the objects of less dynamic transitive verbs, such as 'see' or 'read'. Children learning morphologically ergative languages seemed to show a similar pattern, but in their case, it is the ergative marker on transitive subjects that is underextended. This pattern, noted Slobin, echoes synchronic and diachronic patterns of transitivity marking in adult languages (Hopper and Thompson 1980).[2]

Slobin's test cases were limited—only Russian for an accusative language and Kaluli for a (morphologically) ergative language. By now, data are available on the acquisition of several more languages with ergative or partially ergative patterning (e.g. K'iche' Maya, Georgian, West Greenlandic, and Warlpiri (all reported in Slobin 1992); Inuktitut (Allen 1996); Hindi (Narasimhan 2005)); and data from

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[2] Notice that this pattern is the one predicted by theories specifying that case-marking is associated with the semantic transitivity of the clause, rather than those positing that case-marking serves primarily to disambiguate agents and patients when they are potentially confusable, as when a direct object is animate or an agent argument is inanimate (see Mallinson and Blake 1981: 92ff. on the distinction).

learners of accusative languages have been studied in more detail. In general, these studies show that ergative morphology and accusative morphology are equally easy to learn, just as Slobin predicted, but that learning patterns are relatively error-free and hence language-specific from the beginning (for reviews and analysis, see Pye 1990 and Van Valin 1992). In particular, the predicted initial restriction of ergative and accusative case-markers to the A and O arguments of prototypical transitive verbs has not proved to be general. Nor is there any tendency for children learning morphologically ergative languages to inappropriately extend ergative markers to agentive intransitive subjects (e.g. 'Mommy-ERG walk'), as we might expect if children are working with a general cognitive notion of 'agency' (Narasimhan 2005).

These various studies also show that children are remarkably quick to home in on the factors that condition split ergativity in their language. This suggests that they are using a fine-grained distributional learning procedure rather than the coarser semantic and syntactic categories typically invoked both by the bootstrapping hypotheses and by the cognition hypothesis (Narasimhan 2005, Pye 1990, Van Valin 1992).

As yet, there has been little exploration of the acquisition of syntactically ergative patterns, but the available evidence suggests that syntactic ergativity—in contrast to morphological ergativity—is difficult and gives rise to errors (Pye 1990). Pye argues that a thoroughly syntactically ergative system would be unlearnable (see Marantz 1984 for a parameter-setting account of the acquisition of syntactic ergativity, which, according to Pye, is untenable). Pye suggests that all children construct a syntactically accusative phrase structure, and then acquire syntactically ergative constructions piecemeal as exceptions to this pattern.

6. SEMANTIC TYPOLOGY IN LANGUAGE DEVELOPMENT

Semantic typology is 'the systematic cross-linguistic study of how languages express meaning by way of signs' (Evans, this volume). We have already considered a number of applications of semantic typology to language acquisition, although not explicitly by that name: for example, children's ready use of either word order or case-marking to express basic grammatical relations (section 3), explanations for toddlers' semantic overextensions and underextensions of words and bound morphemes (section 4), the meanings children associate with temporal and spatial markers (section 4), and the role of syntactic–semantic linking in language

acquisition (section 5). In this section, we consider some additional intersections between semantic typology and first language acquisition research, concentrating on issues of information packaging and lexicalization.[3]

6.1 Learning to talk about motion events

The jumping-off point for much research on the acquisition of lexicalization patterns is Talmy's (1991, 2000) well-known distinction between *satellite-framed languages* (S-languages) and *verb-framed languages* (V-languages). This distinction is based on how information about motion events is 'packaged' or distributed across a clause, especially where and how the Path of movement is characteristically expressed—in a particle, prefix, or other element associated with the main verb in S-languages like English, and in the verb itself in V-languages like Spanish. These differences are associated with a number of other differences, such as the morpho-syntactic handling of information about the manner or cause of a motion.

In a pioneering cross-linguistic study of narrative development, Berman and Slobin (1994) compared how child and adult speakers of two S-languages (English, German) and three V-languages (Spanish, Hebrew, Turkish) told a picture-book story about a boy searching for his frog. Already by age 3, the youngest age group studied, learners of the two types of languages differed strikingly in their selection and organization of information about motion, in ways also characteristic of adult speakers. (This was also true of other semantic/functional domains, such as temporality, perspective-taking, and discourse connectivity.) These differences can be detected even earlier in children's spontaneous speech about motion: before the age of 2, or around the time of earliest word combinations, learners of S- and V-languages already differ system-atically both in the information they select for encoding (e.g. much less attention is paid to manner of motion by V-language learners) and in their semantic categoriza-tion of Paths (Bowerman 1994, Bowerman, de León, and Choi 1995, Choi and Bowerman 1991, Slobin, Bowerman, Brown, Eisenbeiss, and Narasimhan forthcom-ing; also see section 6.2.3 on Path categories).

Berman and Slobin's frog story project inspired much further research, and adult and child frog stories have now been collected and compared across a broad range of languages (Strömqvist and Verhoeven 2004). This more recent work confirms that the typology of motion event packaging is a major determinant of narrative style, but goes on to show how typology interacts with many additional factors to shape style, including differences in the morphological expression of typologically

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[3] Other interesting semantic-typological work has looked at the acquisition of *spatial frames of reference* (relative vs. absolute; Brown and Levinson 2009); *epistemic markers* (Aksu-Koç 1988, Choi 1995, Öztürk and Papafragou 2008); and the notion of *time stability* (Stassen 1997) as a determinant of English-speaking children's use of adjectives as modifiers or predicates (Saylor 2000). The relevance of the *animacy hierarchy* to first language acquisition is considered in section 7.

equivalent Path elements (e.g. Germanic particles vs. Slavic verb prefixes as satellites), paralinguistic factors like voice quality and gesture, and cultural practices (Slobin 2004, Wilkins 1997).[4]

Two important theoretical constructs to come out of the frog story project are the notions of 'thinking for speaking' and 'typological bootstrapping'. Struck by the very different semantic demands that languages make on their speakers, Slobin (1996, 2003) argued that in acquiring a language, children also take on a particular way of 'thinking for speaking': they learn how to align their way of conceptualizing events with the linguistic frames and encoding devices available in their language. This proposal has sparked tremendous interest and debate, and led to a number of new findings about the relationship between language and cognition (see Slobin 2004 for a review, and Guo, Lieven, Ervin-Tripp, Budwig, Özçalışkan, and Nakamura 2009: part IV for recent work).

The notion of 'typological bootstrapping' was proposed by Slobin (1997c, d) to highlight the speed and ease with which children appear to home in on the typological characteristics of their language. The idea is that because individual languages are typologically relatively consistent in their handling of given semantic or morphosyntactic domains, children can use what they have already learned to make accurate predictions about what they have not yet learned. Typological bootstrapping was first applied to the learning of motion event encoding, but it is relevant to a number of other domains as well. For example, in lexical learning children seem to grasp very quickly whether newly encountered nominals are likely to refer to bounded objects or to the substance of which they are made (Gathercole and Min 1997: Spanish vs. Korean; Imai and Gentner 1997: English vs. Japanese). These studies were inspired by Lucy's (1992) claim that languages with and without numeral classifiers differ systematically in their nominal semantics. Typological bootstrapping also plays a role in morphological development: children exposed to richly inflected languages with large morphological paradigms acquire inflections and case endings strikingly earlier and faster than learners of poorly inflected languages, even though they have more to learn (Laaha and Gillis 2007, Voeikova and Dressler 2006).[5]

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[4] On the basis of this work, Slobin (2004) has proposed expanding Talmy's two-way typology with a third type: 'equipollently-framed' languages, which express Manner and Path with equivalent grammatical forms, such as bipartite verbs (as in Algonquian and Athapaskan), Manner or Path preverbs (as in Jaminjung), and serial or compound verb constructions (e.g. Sino-Tibetan). See Chen (2008) on the development of motion event expressions in the 'equipollent' language Mandarin.

[5] Just as we saw for motion event typology, the morphological 'type' of a language does not shape morphological development in isolation; rather, it interacts with other factors, such as individual differences in whether children orient more to the 'tune' or to the segmental properties of the input (Peters 1997).

6.2 Language specificity in lexical partitioning

Languages differ in how they semantically partition particular conceptual domains for expression with words. Work on how children master the partitioning of the input language has often asked whether acquisition is somehow related to linguistic typology.

6.2.1 Body parts

In an important early study along these lines, Andersen (1978) investigated the lexical structure of words for human body parts across languages, and found a limited set of patterns that also seemed to play a role in children's acquisition of body-part terminology (see also Schaefer 1985 on verbs of dressing). For example, she found that terms for upper body parts are linguistically unmarked relative to terms for lower body parts, and they are also acquired earlier. More recent typological work has challenged a number of Andersen's universals of body-part terminology (Majid, Enfield, and van Staden 2006; see Evans, this volume), but the implications of these challenges for language acquisition have not yet been explored. Recent cross-linguistic work on the acquisition of body-part terms has focused on a different question, also with typological relevance. In many languages, body-part terms have become grammaticized and serve as locative markers (e.g. 'belly' = 'in', 'foot' = 'under'). Do children learning such languages begin with the body-part meanings and only later—following the diachronic path—extend these forms to spatial relations? Evidence from Zapotec suggests that the answer to this question is no: locative meanings and body-part meanings are learned independently (Lillehaugen 2004). (See Slobin 1994 for a more general discussion and critique of the idea that children's progress through language often recapitulates a language's diachronic changes.)

6.2.2 Colour

Interest in the acquisition of colour terminology was sparked by Berlin and Kay's (1969) ground-breaking cross-linguistic work in this domain. Primary concerns are whether Berlin and Kay's implicational hierarchy, which specifies the order in which languages add colour terms, also accurately predicts the order of acquisition of colour words, and whether Berlin and Kay's 'focal colours' are especially salient to children. These questions have been studied repeatedly from the 1970s to the present, mostly with negative results. Roberson, Davidoff, Davies, and Shapiro (2004) provide a good recent review of this complex literature, along with new evidence from learners of English vs. Himba, a language of Namibia. Consistent with most earlier acquisition studies (e.g. Pitchford and Mullen 2002), neither the English nor the Himba speakers showed a predictable order of acquisition, nor was there an advantage for focal colours until the children had already acquired colour terms. Roberson and her colleagues conclude that colour categories are learned from the linguistic input, rather than unfolding along a biologically predetermined schedule.

6.2.3 Events and relationships

According to the cognition hypothesis (section 3), children map their early words onto universal categories that arise in non-linguistic cognition. This assumption has been challenged in recent cross-linguistic research, which focuses especially on variation in categories of events and spatial relationships and explores when and how children work out the categories of the local language. This work shows that, in general, children tune in to language-specific event classification remarkably early.

For example, toddlers show sensitivity to language-specific Path distinctions by 18 months to 2 years, with learners of English distinguishing between containment and support relations ([put] in vs. [put] on) and learners of Korean making a cross-cutting distinction between snug fit (*kkita* 'fit tightly together') and various kinds of 'looser fit' topological relations (Bowerman and Choi 2001, 2003; Choi and Bowerman 1991). By age 2, learners of English use verbs like *put on* (clothing), *eat, carry,* and *cut* productively for actions involving a wide range of objects. By the same age, learners of Korean and Japanese already observe several obligatory distinctions between putting clothing on different body parts; learners of Tzeltal Mayan distinguish appropriately between eating foods of different types (crunchy, squishy, grain-based); learners of Korean and Tzeltal Mayan use different verbs for carrying in different ways (in arms, on back, on shoulder, etc.); and learners of Mandarin and Dutch honour an obligatory distinction between cutting with a single-bladed tool, such as a knife, and a double-bladed tool, such as scissors. These studies suggest that even at a very young age, children are not limited to mapping words onto pre-established concepts. Rather, they are capable of *constructing* semantic categories—different for different languages—by observing how words are used by fluent speakers (see Bowerman 2005 for an overview, references, and discussion).

6.2.4 Semantic features and semantic maps

If children can construct categories, what do they construct them out of? This is a notoriously difficult question. According to an early influential answer, children compose word meanings bit by bit from smaller components based on cognitive/perceptual capacities shared by all human beings (the 'Semantic Features Hypothesis', Clark 1973). But this proposal ran into many theoretical and empirical difficulties and was eventually discarded (Clark 1983). A more recent approach that also assumes semantic primitives and procedures for combining them is Wierzbicka's (1996, Goddard and Wierzbicka 2002) 'Natural Semantic Metalanguage' (NSM; see Evans, this volume). NSM theorists regard NSM as applicable to first language acquisition, but there has not been much research yet along these lines.

An alternative to semantic primitives is the semantic map model, which is used increasingly in semantic typology (e.g. Croft 2003a, Haspelmath 2003, Majid, Bowerman, van Staden, and Boster 2007). In a semantic map, the extensions of language-specific forms are represented as bounded regions in a two- or

multidimensional conceptual space. The structure of the space is seen as universal, reflecting a set of shared conceptual gradients along which semantic similarity is computed, but the partitioning of the space—number of categories, placement of boundaries between them—is language-specific. So far, the semantic map model has been applied primarily to language acquisition to visually display variation in semantic categorization across languages and across age groups (Bowerman 1996, Bowerman et al. 1995, 2004, Chen 2008), but it can also be used to predict patterns of acquisition. (For an application to learning spatial prepositions in English and Dutch, see Gentner and Bowerman 2009, which also explores whether a cross-linguistically common partitioning is easier for children to learn than a rare one.)

7. FIRST LANGUAGE ACQUISITION AND THE ROLE OF ICONICITY, RELEVANCE, MARKEDNESS, FREQUENCY, AND IMPLICATIONAL UNIVERSALS

Let us now look at two basic questions about first language acquisition that intersect centrally with the concerns of linguistic typologists: what determines the difficulty of different elements of language for children, and what guides the order in which a set of related forms is acquired?

One common hypothesis is that difficulty is conditioned by the cognitive complexity of the meanings expressed, with the order of acquisition largely paced by the cognitive maturation of these meanings (although it is also influenced by the relative difficulty of different formal devices for children; see section 3 on the Operating Principles approach). Cognitive maturation has been used to explain, for example, the order in which children learn spatial adpositions (Johnston and Slobin 1979) and conjunctions (Clancy, Jacobsen, and Silva 1976). A second proposal, which focuses on changes over time in how children apply a form they have learned (e.g. a word, tense–aspect marker, or case-marker), appeals to prototypicality: children will start out with more prototypical exemplars; for examples, see section 5.3 on prototypical transitive events and Taylor (2003). The pragmatic preoccupations of very young children can also play a role: forms that might be expected later on grounds of maturation or prototypicality are often learned surprisingly early if they are central to helping children accomplish their communicative goals (e.g. Demuth 1989 on the early emergence of the passive in Sesotho).

In addition to cognitive complexity, prototypicality, and communicative usefulness, researchers have often appealed to iconicity, relevance, markedness, frequency,

and implicational hierarchies—all notions of central importance to linguistic typology (Bowerman 1993).

7.1 Iconicity and relevance

According to the principle of iconicity, the structure of language should resemble the structure of experience as closely as possible. For example, each unit of meaning should be mapped onto a unit of form, the complexity of a form (word or construction) should reflect the complexity of its meaning, and the order in which events are mentioned should mirror the order in which they occur (Clark and Clark 1977, Croft 2003a). In adult speech, the principle of iconicity competes with the principle of economy (Croft 2003a): iconicity pulls for explicit marking, whereas economy pulls for minimizing expressions wherever possible. In language acquisition, iconicity and transparency often win out over economy. For example, if a semantic category such as plural, past tense, or transitive agent is marked only some of the time, children will at some point tend to replace the zero marking with an overt form (e.g. *sheep-s, put-ED*). To capture such phenomena, a number of Slobin's Operating Principles for early grammatical development promote a one-to-one mapping between form and meaning (see section 3). (Of course, what constitutes a unit of form or a unit of meaning for a child may change in the course of development—Slobin 1985c.) Another example of the influence of iconicity on language development is that children mention events in the order in which they occur, at least until they learn words like 'before' and 'after' (Clark and Clark 1977).

A special case of iconicity is the principle of relevance (Bybee 1985). This has to do with how much the meaning of a grammatical category affects the inherent meaning of the lexical stem with which it is associated: the more 'relevant' a category is for a stem, the closer to the stem it will be positioned. Slobin (1985c) applied this principle to language acquisition through an Operating Principle called 'Relevance'. According to OP:Relevance, 'If two or more functors apply to a content word, try to place them so that the more relevant the meaning of a functor is to the meaning of the content word, the closer it is placed to the content word'. This OP was used to explain certain ordering errors. For instance, in conditional sentences in Polish, the personal endings should be attached to the conditional particle, but Polish children often attach them to the verb instead. This is because, according to Slobin, the endings are more relevant to the meaning of the verb.[6]

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[6] Many of Slobin's examples of OP:Relevance are subject to a simpler explanation: competition in the child's grammar between alternative orders modelled in the input (Bowerman 1985). For example, personal endings do regularly affix to the verb in Polish unless there is a conditional particle, so children may simply be following this well-established pattern.

OP:Relevance has also been applied to children's acquisition of telicity entailments. Van Hout (2008) shows that learners of Polish and Russian understand the telicity entailments of sentences like 'The mouse ate cheese/ate the cheese' (did the mouse eat all the cheese?) at a younger age than learners of Dutch, English, and Finnish. Van Hout proposes that this is because in the Slavic languages, telicity is expressed directly in the verb (perfective vs. imperfective stems), a form for which it is semantically highly relevant, whereas in the other three languages, it is expressed compositionally on forms that are semantically less relevant—the direct object noun for Finnish (accusative vs. partitive case) and the article for Dutch and English.

7.2 Markedness and frequency

The notion of linguistic markedness first arose in the context of phonology, but was gradually extended to morphology, syntax, and semantics. Depending on the application and the theorist, the notion has been interpreted in different ways; it is often now taken to mean 'little more than unusual or not expected vs. usual or expected, both within a language and across languages' (Bybee, this volume). Whether defined precisely or in more general terms, markedness has often been invoked in the study of language acquisition: the expectation is that children will acquire unmarked forms before marked forms, and may initially substitute unmarked forms for marked forms (see also section 2 on the early influence of Jakobson).

This expectation is indeed usually met—for instance, learners of English acquire singular nouns before plurals, and they learn unmarked dimensional adjectives like *big* and *long* before their marked counterparts like *little* and *short* (Bybee, this volume, Clark and Clark 1977). But interpreting these findings is difficult. Children might learn unmarked forms first because they are conceptually or structurally easier or more natural, but they also might learn them first simply because they are more frequent in adult speech (see Bybee, this volume, and Croft 2003a on the relationship between markedness and frequency).

In the 1970s, input frequency was downplayed as an important determinant of order of acquisition, partly in a 'cognitive revolution' reaction to behaviourism, a theory in which frequency had played a major role, and partly because of an influential study (Brown 1973: 356–68) showing that frequency could not account for the order in which learners of English acquire grammatical morphemes such as plural -s, past tense -ed, and articles *a* and *the*. With the recent rise of usage-based approaches to language, however, frequency has been rehabilitated as an important determinant of both adult and child language (e.g. Bybee 2006), and it is now seen as a major influence on the order in which new forms enter children's speech (Rowland, Pine, Lieven, and Theakston 2003, Tomasello 2003a). Linguists must, of course, ponder why certain forms should be more frequent in adult speech than

others. But for children, higher frequency could simply mean more learning opportunities; i.e. the structural or conceptual differences between marked and unmarked forms could be irrelevant. The confounding between markedness and frequency in the input to children, along with renewed respect for the power of frequency to drive acquisition, has diminished the attractiveness of markedness as an independent explanatory principle in language acquisition research.[7]

7.3 Implicational hierarchies

Markedness relations stated in degrees form implicational hierarchies. These are implicational sequences constructed out of typological statements that are chained together (Corbett, this volume): for example, in the sequence $a > b > c > d > e$, the presence of property d in a language implies the presence of all the properties to its left (a, b, c), but not necessarily the property to its right (e). (Property d is more marked than a, b, c, but less marked than e.) Implicational hierarchies are one of the most powerful theoretical tools available to linguistic typologists (Corbett, this volume), and as Hawkins (1987: 454) points out, they 'incorporate intrinsic predictions for language acquisition'. For example, in the sequence $a > b > c > d > e$, property d is predicted to emerge in the child's speech either after c or at the same time, but not before. Thus, even when a learner's grammar differs from those of adult speakers, it should always fall within the set of attested language types.

Relatively few implicational hierarchies have been examined in any detail in research on first language acquisition, and findings are mixed. (Hierarchies have played a much larger role in second language acquisition research; see Eckman, this volume.) In section 6.2, we saw that the order in which languages add colour terms (Berlin and Kay 1969) does not successfully predict the order in which children learn these terms. Also disappointing as a predictor of first language acquisition is Keenan and Comrie's (1977) NP accessibility hierarchy, which specifies the relative accessibility to relativization of nouns with various syntactic roles within the relative clause (SUBJ > DO > IO > OBL > GEN; see Corbett and Eckman, both in this volume). For thorough reviews of this large and complex literature, see Song (2001a) and Clancy, Jacobsen, and Silva (1976), but the bottom line is that at best, the NP accessibility hierarchy plays a very minor role in children's acquisition of relative clauses.

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[7] Markedness still features importantly in first language acquisition research within the framework of Optimality Theory, an approach usually considered a development of generative grammar (see Croft 2003a: 84 on similarities and differences between OT and linguistic typology). OT research on language development, like OT research more generally, has focused primarily on phonology. Kager et al. (2004) provide a useful orientation. A paper in their volume of particular interest for readers of the present chapter might be Levelt and de Vijver (2004), which examines syllable types cross-linguistically and tests an OT model of acquisition against data from learners of Dutch.

A third important hierarchy to receive the attention of child language scholars is the animacy hierarchy (AH; see Comrie 1981, Corbett, this volume, Croft 2003a). The AH—which is actually a combination of several distinct but interacting dimensions—runs from 'more animate' to 'less animate' in the following order: first and second person pronouns > third person pronouns > proper names > human common nouns > non-human animate common nouns > inanimate common nouns. Across languages, this hierarchy constrains a large number of distinctions, such as agreement, plural marking, and treatment of direct objects, with the exact cut-off point between 'more' and 'less' animate being specific to the language or to the particular form within the language.

If children are sensitive to the AH, a straightforward prediction would be that if they sometimes use, say, plural marking or agreement when it is required by the adult grammar, but not yet always, their usage will conform to the hierarchy (Bowerman 1993). So if children apply plural marking to non-human animate common nouns such as 'dog', they should use it equally or more consistently for human common nouns ('girl'), to the left on the hierarchy, but possibly less consistently or not at all for inanimate common nouns ('cup'), to the right. To my knowledge, this simple prediction has never been tested. A more complex test of the AH has been carried out by Demuth, Machobane, Moloi, and Odato (2005) among learners of Sesotho. In this Bantu language, the order of NPs in double-object applicative constructions is governed by the AH (and not e.g. by thematic roles, as in 'benefactive precedes theme'). If the two nominals differ in relative animacy, the 'more animate' NP will occur after the verb and precede the 'less animate' one; if they do not differ (e.g. both refer to humans or to inanimate objects), either order is possible. Using a forced-choice elicited production task, Demuth et al. found that even the youngest children tested (4-year-olds) were sensitive, in making their choices, to the distinction between animate (human or animal) and inanimate NPs, and even to degrees of animacy (human vs. animal).

In other work that draws in part on the AH hierarchy, Gentner and Boroditsky (2001: 222) propose that the AH serves as a rough guide to 'individuability'—the ease with which humans can conceptualize an entity as an individual. They relate individuability in turn to ease of acquisition: by hypothesis, children learn nominals for 'more individuable' entities earlier than for 'less individuable' entities. Thus, children should learn nominals for highly individuable entities (e.g. humans, other animates, complex bounded inanimate objects) earlier and more readily than nominals for less individuable entities (simple bounded objects, substances). There is cross-linguistic evidence from both spontaneous speech and experiments in support of this hypothesis (Gentner and Boroditsky 2001, Imai and Gentner 1997; but see Carey 2001: 198–200 for a counterview).

8. CLOSING REMARKS

In a review chapter, many important and relevant topics and studies must be neglected, and I have inevitably made a selection based on both my sense of what is interesting and my own areas of expertise. Recent typologically relevant phonological work is not well represented, and the interested reader is referred to Edwards and Beckman (2008), Demuth (2006), and Vihman (1996), as well as to Kager, Pater, and Zonneveld (2004; see note 7 above). The reader may also wonder at the limited attention given to word order in this chapter, given its importance in the typological literature more generally. This is due not to neglect, however, but to children's remarkable ability to home in on the word orders displayed in their local language. Word order errors are relatively rare, and they show no clear relationship to typological generalizations.

As stressed in the introduction to this chapter, linguistic typology and first language acquisition show points of contact, but their relationship is indirect: each field has its own concerns and explanatory principles. So far, interactions between the two fields have been mostly one-way: child language researchers have benefited from the insights of typologists, but it is less clear what typologists have learned from developmental studies (Slobin and Bowerman 2007).

For child language scholars, the most important contribution of typology has been to call their attention to important dimensions of cross-linguistic variation, which helps them guard against parochial explanations of language acquisition and steers them toward theories that do justice to language diversity. Beyond this, developmentalists have also been inspired by the sense that patterns of language acquisition—for example, typical errors—are reminiscent of typological patterns. But with some notable exceptions, there have been few rigorous tests of the match between first language acquisition and typological findings; hits are attended to, but misses are less often noted.

An important goal for future research, then, is to clarify how much and what kind of correspondence there is between typological patterns in adult languages and patterns in the acquisition of a first language. The outcome of research along these lines could, in my view, make an important contribution to linguistic typology by helping to establish the causes of typological patterns (Bowerman 1993: 14). For example, typological patterns that are echoed in the progress of even very young children may well reflect basic human conceptual or communicative predispositions. In contrast, patterns with no reflection in first language acquisition are more likely to have causes that affect only fluent speakers, such as the requirements of language as a rapid, online system of communication.

FURTHER READING

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