

Blackwell Handbook of Language Development

Edited by

Erika Hoff and Marilyn Shatz

Blackwell Handbook of Language Development

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Contents

List of Contributors	viii
Preface	xi
1. On the Development of the Field of Language Development <i>Marilyn Shatz</i>	1
Part I. Basic Foundations and Theoretical Approaches to Language Development	17
Introduction	19
2. The Neurodevelopmental Bases of Language <i>Valerie L. Shafer and Karen Garrido-Nag</i>	21
3. Formal and Computational Constraints on Language Development <i>Helen Goodluck</i>	46
4. Domain-General Learning Capacities <i>Jenny R. Saffran and Erik D. Thiessen</i>	68
5. How Inherently Social is Language? <i>Dare Baldwin and Meredith Meyer</i>	87
6. Input and the Acquisition of Language: Three Questions <i>Virginia C. Mueller Gathercole and Erika Hoff</i>	107

7. The Emergence of Language: A Dynamical Systems Account <i>Julia L. Evans</i>	128
Part II. Language Development in Infancy	149
Introduction	151
8. Experiential Influences on Speech Perception and Speech Production in Infancy <i>Linda Polka, Susan Rvachew, and Karen Mattock</i>	153
9. Acquiring Linguistic Structure <i>LouAnn Gerken</i>	173
10. Cognitive Processes in Early Word Learning <i>Diane Poulin-Dubois and Susan A. Graham</i>	191
11. Syntactic Supports for Word Learning <i>Letitia R. Naigles and Lauren D. Swensen</i>	212
Part III. Language Development in Early Childhood	233
Introduction	235
12. Phonological Development <i>Carol Stoel-Gammon and Anna Vogel Sosa</i>	238
13. Mechanisms of Word Learning <i>Gil Diesendruck</i>	257
14. The Abstract Nature of Syntactic Representations: Consequences for a Theory of Learning <i>Jeffrey Lidz</i>	277
15. Conversational Understanding in Young Children <i>Michael Siegal and Luca Surian</i>	304
16. Bilingual First Language Acquisition <i>Fred Genesee and Elena Nicoladis</i>	324
Part IV. Language Development after Early Childhood	343
Introduction	345
17. Developing Linguistic Knowledge and Language Use Across Adolescence <i>Ruth A. Berman</i>	347

18.	Language and Literacy in Bilingual Children in the Early School Years <i>D. Kimbrough Oller and Linda Jarmulowicz</i>	368
19.	Second Language Acquisition in Childhood <i>Johanne Paradis</i>	387
Part V. Atypical Language Development		407
	Introduction	409
20.	Children with Specific Language Impairment: Bridging the Genetic and Developmental Perspectives <i>Mabel L. Rice</i>	411
21.	Atypical Language Development: Autism and Other Neurodevelopmental Disorders <i>Helen Tager-Flusberg</i>	432
22.	Reading and Reading Disorders <i>Heikki Lyytinen, Jane Erskine, Mikko Aro, and Ulla Richardson</i>	454
	Author Index	475
	Subject Index	482

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Preface

As they watch their children begin to acquire and use language, that benchmark of human behavior, parents voice both delight and wonder. Researchers, too, have expressed wonder at the children's accomplishments, and although the scientific study of language acquisition is relatively recent as topics of academic investigation go, they have made it a lively one, marked by often heated debate. Between us, we have observed nine children and grandchildren learning to talk, and we have gained much insight from them. Also, taken together, our work over three decades tallies up to more than 50 years of scientific research. We have witnessed many developments since one of us, as an assistant professor, advised the other, her first PhD student at the University of Michigan. We worked together then, investigating questions of the role of input. Now, more than 25 years later, we have collaborated again to assess changes in the field and to gather chapters into a Handbook for present-day students that conveys the current state of the science in the context of the field's history.

From the start, we envisioned a volume organized around periods of development instead of the more conventional organization around the different aspects of language. We aimed with such an organization to emphasize how the field has been changing from one that focused primarily on the logical problem of language acquisition to one that addresses not only this issue but more directly considers the development of language in actual children by examining both their ability to learn any language and also their accomplishments in learning one or more particular ones over time. An introductory chapter setting recent work broadly in its historical context, evaluating the state of the science, and raising questions for future research helps to keep the organization true to our original aim. It and the chapters that follow offer a contemporary account of the field.

Our primary thanks go to our authors, who heeded our requests for state of the art chapters that set topics in historical context, critically summarized the current state of research, and offered suggestions for the future. They graciously dealt with our prodding over deadlines, as well as our advice on revisions. We met several times over the course

of several years to work on the Handbook, sometimes at conferences we both conveniently attended, and twice in Florida, where Brett Laursen generously offered us a place to work face-to-face, a happy change from the endless e-mailings. Funds from the Consortium for Language, Society, and Thought at the University of Michigan facilitated face-to-face meetings.

Erika's thanks go also to Sarah Bird, who as acquisitions editor for Blackwell first suggested undertaking this Handbook, and to Brett Laursen, who shared the benefit of his greater experience in the role of editor of a collected volume. Marilyn's thanks go also to her many classes of students in her graduate language development classes at the University of Michigan, especially the students in the 2005 class, none of whom were specialists in language development, but who nevertheless brought deep interest and fresh perspectives to the topic. Her colleagues at Michigan, especially Sam Epstein, Rick Lewis, and Twila Tardif, as well as visitors to the university, particularly Lila Gleitman, Elena Nicoladis, John Trueswell, and Charles Yang, deserve thanks too for informative seminars and stimulating conversations.

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Erika Hoff
Marilyn Shatz

1

On the Development of the Field of Language Development

Marilyn Shatz

“Plus ça change, plus c’est la même chose.”

A conversation between a 2-year-old boy and his grandmother (1991):

GM: (*reading*) There were many, many buildings in the city.

C: Many, many builds.

A conversation between a 3½-year-old girl and her grandmother (2006):

GM: They’re building a house.

C: No, not “*building*.” Say “*making*.”

Speculation about how children come to know a language antedates by centuries the systematic investigation of the topic; only in the last century did the methodical study of language development explode. In roughly 100 years (dating the field’s origins from the diaries of the Sterns, 1907) there have been a myriad of studies on children’s language development and many consequent changes in both method and theory. Within this relatively short history, the field has reflected the changing “hot” intellectual trends of the times. Thus, the first half of the twentieth century saw descriptive, normative work like McCarthy’s (1930), whereas much work in the latter half of the twentieth century, influenced by theoretical work in linguistics, attempted to prove or disprove claims about predispositions specific to language (see Pinker, 1994). Now, in the early twenty-first century, much research in language development is concerned with brain development and computational skills, cross-linguistic and cultural comparisons, and bilingualism and education. This Handbook strives to capture the state of the art by bringing together chapters written by a generation of researchers who mainly address current concerns.

However, a reading of the chapters in this Handbook reveals that questions of predispositional specificity, though changed, are still with us. The first arguments for language-specific predispositions made an obviously false but simplifying

assumption that language acquisition was instantaneous (see Chomsky, 1975). Instead, more recent work makes development an important factor in the language acquisition story, thereby requiring renewed evaluation of the roles played in an ongoing acquisition process by the child's physiological, cognitive, and social status, as well as caregiver input. There is, then, increased appreciation for how multiple interacting factors may contribute to language acquisition and how weightings among them may change with development.

Moreover, it is clear that the predisposition issue can be divided into a question about what the predispositions are and a question about whether any of these are necessarily specific to the task of acquiring language. In this volume, there are chapters reporting findings sometimes relevant to one question and sometimes both. With regard to language-specific constraints, for example, Diesendruck, in his chapter, asks whether mechanisms that limit possible word meanings are specific to that domain or are more general, and Lidz, in his chapter, asks whether children's early syntactic knowledge supports evidence of early abstract grammatical representations. Whereas the evidence argues against domain-specific predispositions for word learning, it is premature to decide the case for syntactic competence (see the section *Do we still need domain-specific constraints?* for more discussion). Despite the changes the field has undergone in recent years, the continuing concern about the nature of the child's abilities is an apt instance of the idea that the more there is change, the more there is constancy.

There is other evidence of constancy in the face of change. Four decades ago, systematic research on language development was almost exclusively focused on how young children acquire English as their native language. More recently, research has expanded to include work on older children and has produced findings on how linguistic knowledge develops with experiences such as learning a second language and learning to write, and how earlier developments in oral language are related to the later acquisition of reading (see chapters by Oller & Jarmulowicz and by Paradis on second-language learning, by Berman on later language use, and by Lyytinen, Erskine, Aro, & Richardson, on learning to read). Researchers have also asked whether and how the course of acquisition changes as a function of cultural differences or differences in language types (see, e.g., Slobin, 1985, 1992, 1997). Work in this vein revealed some interesting facts about early language development. For example, child-directed language is not necessary to acquisition (e.g., Ochs & Schieffelin, 1984), and children are sensitive very early on to language-particular features, even those encoding such basic notions as space, time, and manner (e.g., Bowerman, 1996; Bowerman & Choi, 2001). Children acquire a language under many different conditions of exposure; yet regardless of those conditions, they seem to make ordered decisions about the particular language to which they are exposed (Baker, 2005).

Moreover, children learning the same language in different times and under different conditions also exhibit similar concerns during development. The quotes above, from two children who were learning English in different decades and rearing conditions, reveal that both children by age 3 were troubled by the potential ambiguity in grammatical class of the word *building*, although they apparently had previously analyzed the word in different ways. One seemed concerned that the morphological ending *-ing* be non-ambiguous in indexing verbs, whereas the other seemed to have coded the word as

a noun, regardless of ending, and refused to accept a usage that would result in an ambiguity of grammatical class. Such anecdotes suggest that, at least by age 3, young children do not mindlessly accept the language they hear, but they think about it somewhat abstractly and creatively.

Thus, while the field has expanded to address a broader range of topics concerning language development and use, it is important to note that the central phenomenon needing explanation has not much changed – children acquire a great deal of the language of their community in a comparatively short time without much direct tuition and with remarkable commonality in the concerns they have. Both the similarities and differences in their patterns of development require explanation.

Also, it is common, though not often recognized by scientific researchers, that current states of knowledge rest on the contributions and efforts of prior generations. In the abstract, science proceeds via the falsification of theories; but in practice, wholesale changes or substitutions of alternative world views are rare. Instead, increasingly sophisticated empirical investigations provide the engine for theoretical change. While debates within a field are often portrayed as dichotomous – with positions declared to be either formalist or functionalist, black or white, right or wrong, proven or disproven – the reality is often not so discontinuous, and progress in a field typically comes via rapprochement, as both earlier questions and earlier answers are modified to accommodate more recent findings. As much as language development research has progressed in recent years, the footprints of its past are still visible.

In this chapter, I elaborate on these observations by addressing some themes of language development research, taking note of some of the precursors to the more recent work, and suggesting promising research topics for the future.

The Enduring Question about Language Development

Every human language is a complex system. Each includes regular ways of combining a limited set of signs or sounds to create an unlimited set of meanings. Any relatively normal child born into a relatively normal language-using community will, even without formal education, develop the ability to use that community's language. How this feat is accomplished so readily has been and still is the central question of the field of language development.

The legacy of theories of syntactic formalism

Are areas of language autonomous? The work of two language theorists greatly affected the organization of twentieth-century research in the field of language development. First, the philosopher and semiotician Charles Peirce described four distinct components of language: phonology, semantics, syntax, and pragmatics. Second, linguists, most notably Chomsky, reified these distinctions by offering compelling theories, particularly of syntax, that assumed for analytic purposes the autonomy of separate parts. Scholarly

work and curricula in linguistics departments came to be organized around the distinctions, and even handbooks and textbooks of language development (e.g., Fletcher & MacWhinney, 1995; Hoff, 2005) commonly organized the field around them.

Peirce's distinctions help even today in understanding the complex phenomena of language and its acquisition. After all, children learn the signs or sounds of a language, they learn words and word meanings, they learn how to combine words into meaningful and acceptable sentences, and they learn how to interpret such sentences in a variety of circumstances. A reasonable, scientifically sound, first approach was to analyze all these accomplishments separately and to see how far one could go with the simplifying assumption of autonomy of components. The autonomy approach fueled a lively community of researchers in syntactic theory, and its application to the field of language acquisition did have some success, perhaps most clearly with regard to the knowledge gained about the capacities of infants to analyze the sound patterns of their language (see Polka, Rvachew, & Mattock, this volume).

Yet, the autonomy assumption was made for analytic purposes; it is an empirical question whether children necessarily abide by it when developing language. Increasingly, researchers propose interactive theories, where one kind of linguistic knowledge can influence, or is even crucial to, the development of another (see, e.g., Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005). In addition, formal linguists are increasingly recognizing that the ways in which the components interface, and even interact, are crucially important to analytic characterizations of adult language (e.g., Chomsky, 1995).

To capture this trend, as well as to emphasize the factor of development in the acquisition of language, we chose to organize the sections of this volume according to an age continuum rather than by components of language. Although the chapters within each Part by and large still reflect the fact that researchers focus more on a specific component of linguistic knowledge than on interactions among components, the growing tendency to account for the phenomena of one with explanations partly dependent upon another is nevertheless well represented. Currently, the topic of word learning is the best example of an area in the acquisition field where researchers propose that knowledge of one language component helps to account for development in another. So, in this volume, a chapter by Naigles and Swensen, one by Stoel-Gammon and Sosa, and one by Diesendruck argue for syntactic, phonological, and pragmatic knowledge, respectively, as factors aiding word learning.

The idea of interaction across components of language has found more advocates in recent years, and so has the idea of interaction among areas of development. Currently, infants' social abilities play a large role in some language development theorists' thinking (e.g., Baldwin & Meyer, this volume), and the question of the separateness of language and cognition is receiving renewed interest (see Saffran & Thiessen, this volume). There are several ways to achieve more interaction among areas of development. Basing language acquisition on cognitive or social knowledge (e.g., Tomasello, 1992) is one way, but that has been argued to be troubled (see Poulin-Dubois & Graham, this volume; Shatz, 1992). Another way is to integrate language intimately into the very fabric of a system of development and thereby provide a more unified account of how the child moves toward adulthood (Shatz, 1994, in press). While the question of how children

acquire the complex system of language is still central, an increasingly common goal among researchers in the field of language development is to take more account of other areas of development; theoretical accounts of acquisition that recognize neither a broader picture of language development nor the child's ability to operate across areas are waning in influence.

The poverty of the stimulus. Another argument about acquisition that was generated by the dominance of work in syntactic theory was the one from the poverty of the stimulus (see Chomsky, 1980). The claim here was that infants and children do not hear language which sufficiently or directly reveals to them the underlying and abstract grammatical structure governing all and only the grammatical sentences of a particular language. Without such information, children cannot converge on the correct structure of the language they do hear. The idea that language acquisition was constrained by innate universal grammatical principles guiding their acquisition filled this input gap.

Early controversy over the poverty of the stimulus argument concerned whether the environment or the child provided the engine of development (see Shatz, 1987, for early arguments in favor of the child). Decades of research on the language spoken to the child, beginning in the 1970s, attempted to find evidence against the poverty of the stimulus argument, first by showing that child-directed speech was largely grammatical, and then by proposing that it was richer in structure than earlier envisioned (see Baldwin & Meyer; Gathercole & Hoff; Gerken, this volume, for more history on this topic).

Recently, the arguments against the poverty of the stimulus claim have been changing in an important way. Input theorists no longer argue simply for a much richer overt input to a relatively passive child. Rather, the argument now is that the child has general capacities for extracting over time from a range of input sentences a deeper set of relations than are revealed superficially in the input (see, e.g., Elman, 2003). Thus, that the child provides the impetus for acquisition is more readily accepted, but the characterization of the child is also changing, from a child endowed simply with an abstract blueprint for grammar to one with a broader complement of sensitivities and capacities applicable to the language development task.

Nonetheless, the critical issue remains how to characterize the capacities the child needs to traverse the developmental landscape efficiently (see Baker, 2005). Whatever those capacities, the linguistic environment will have to be sufficient in both variety and quantity to offer the child so equipped what it is she needs to abstract her particular language's structure; and there are consequences for the rate and quality of development if it is not (see Hoff, 1999, 2006). Still controversial are questions of whether any of the capacities are domain-specific and which are innate or emergent during development. On the one hand, some researchers have provided evidence that children have general abilities for extracting information from input (see Gerken; Saffran & Thiessen, this volume). On the other hand, some researchers offer particular acquisition phenomena as evidence of the continuing need for language-specific constraints (see Lidz, this volume). At least as yet, there are no explicit general accounts of these (see also Lidz & Gleitman, 2004), although there are those who believe that such general capacities ultimately will account for all of language development (e.g., MacWhinney, 2004; Tomasello, 2003; but see Hoff, 2004; Legate & Yang, 2002).

No negative evidence. Related to the poverty of the stimulus argument is the no-negative-evidence-in-input argument. If, when children make mistakes of grammar as they acquire language, they neither get corrected nor pay much attention to corrections, how do they recover from their mistakes? One early proposed solution to the no-negative-evidence problem was the subset principle: Children are constrained to consider first only those grammars that generate a subset of grammatical sentences so that upon hearing in input the positive evidence of the broader set of sentences, they can adjust their grammars (Berwick, 1986). Alternatively, a generation of researchers sought to find evidence against the whole idea of the no-negative-evidence problem by showing that children had at least probabilistic information from parental responses as to the grammaticality of their utterances, but such efforts proved to be inadequate (see Marcus, 1993). In this volume, Goodluck does not eliminate the no-negative-evidence problem. Instead, she tries to avoid Berwick's otherwise unmotivated subset principle by arguing for the possibility that the processing system responsible for comprehending and producing language itself provides a developmental constraint on the workings of the linguistic system. Namely, limited processing ability constrains access to universal grammar, and this accounts for errors and omissions under a variety of circumstances. As is made clear in the next section, how processing constraints are construed can have deep implications for a basic tenet of formalist theory.

Competence and performance. Obviously, scientific study requires that the phenomena under investigation be identified. Chomsky identified his topic of linguistic interest not as human language use, but as the knowledge of grammar adults possess; and the evidence of the nature of that knowledge was to be found not in utterances but in judgments of grammaticality. In consequence, what is known became divorced from what is said, and errors of speech were argued to be subject to chance factors – vagaries of the moment that might afflict any speaker at any time, and of no relevance to questions of linguistic competence or knowledge. With regard to language development, the issue of how to assess competence and not just performance was a particularly knotty one, since no matter how clever the experimenters, they still were left with only overt behaviors by which to assess underlying knowledge. With very young children, there are no opportunities to obtain judgments of grammaticality. Unsurprisingly, then, the latter half of the twentieth century saw many controversies about what constituted evidence for or against linguistic competence and what could be discounted as reflecting “only” performance variables.

Recent work in psycholinguistics has sought to bridge the gap between competence and performance. If, for example, a language processor is constrained by limitations of human working memory, that processor itself may have an impact on the very nature of syntactic structure (see Lewis & Vasishth, 2005). Such a processor apparently differs from Goodluck's proposal because it influences the very nature of language structure itself and not just access to it. Its effects, then, would be constant, not developmental. Possibly there are several sorts of processing constraints, some accounting for structural characteristics and others for how children at different levels of development handle various kinds of task demands (see Werker & Curtin, 2005, for an example of the latter). In any case, what seemed like a clear formalist distinction between competence and

performance has become blurred. Indeed, doing away altogether with the distinction is the radical solution proposed by dynamic systems theorists (who do away with the standard notion of representation as well). By integrating knowledge and performance in favor of real-time processing, Evans argues in this volume that language is “performance in context.”

There is still the question, however, of just what is meant by “processing.” Is there a domain-specific processor that affects the very structure of language? Is there as well a more general processor with additional limitations that also affects processing of linguistic as well as non-linguistic information? Are there unique limitations on processing due to immaturity? What is the relation between processing and representation? The increased interest in “processing” – and the attendant demise of the competence–performance distinction – is indicative of the promise of processing arguments, although such arguments are in need of more empirical support and more theoretical clarification.

What constrains the acquisition of language?

In 1965, Chomsky proposed a language acquisition device (largely for syntax) that was endowed with a universal grammar such that it received specific-language input which was underdetermined with regard to that language’s underlying structure but nonetheless could instantly output any and only grammatical sentences of that language. The universal grammar itself consisted of both constraints on allowable human languages – what they could not be – and specifications of what they could consist of, thereby limiting the allowable conclusions the device could draw from the input received about the nature of the particular language to be learned.

We knew in 1965 that the device had to be flexible enough to acquire any human language. As a result of subsequent research on the acquisition of sign languages, we now know that the device is not limited even to one modality (e.g., Petitto & Marentette, 1991); and as a result of research on bilingual development, we know that it is not limited to acquiring one language at a time (Genesee & Nicoladis, this volume). Also, by applying new genetic and neurobiological techniques to the study of language development, we have discovered that various atypical outcomes can arise from genetically based, neurodevelopmental disorders (Rice; Shafer & Garrido-Nag; Tager-Flusberg, this volume).

We have also seen that the question of what constrains the acquisition of language receives a much broader answer today. Not only do researchers in language development generally accept a broader scope to the field, but they also accept the fact that language acquisition is not instantaneous but is subject to development, with the weightings of various influential factors changing as the child’s knowledge states change. Interactions among components of language knowledge, as well as among different areas of development – in particular the physiological, social, and cognitive spheres – are increasingly recognized as relevant to the complex process of language acquisition. Currently, the “language acquisition device” can be described as a probabilistic thinker, capable of making inductive inferences across utterances over time based on a broad array of cues changing with development.

In the next section, I consider some of the trends in past research that foreshadowed the current, more comprehensive, view of the language learner, and I ask whether the current view suffices to do without the idea of domain-specific abilities.

The Nature of the Child Developing Language

The active, social child

The field of language development can thank Jean Piaget for the notion of a child actively navigating a course of development. Beyond that important but general view, however, Piaget's characterization of a child progressing through stages of cognitive development governed by dialectical mechanisms of assimilation and accommodation offered little help in explaining the phenomena of language development. Indeed, attempts to find cases in which language milestones could be based directly on cognitive developments bore relatively little fruit (see Poulin-Dubois & Graham, this volume, for discussion). Bruner's attempts to base language development on the child's active social interactions similarly met with failure (see Baldwin & Meyer, this volume, for a review). It is not because language development is autonomous that such attempts failed. Rather, it is because they did not recognize how integrated these areas of development are for the child; the divisions of social, cognitive, and language development are divisions of the researcher, not of the child. The task of a developing child is to become an active, knowledgeable participant of a language community. To do so, she uses whatever predispositions and knowledge she has to increase her understanding even as she engages in it. It is in this sense that she bootstraps her way to adult competence as an active, social child (Shatz, 1987, 1994).

Two decades ago, I summarized the evidence available then for active child language learners who "use what they have to learn more" (p. 1), and I proposed a set of capacities a normal language learner would use to control the process of acquiring a native language (Shatz, 1987). The capacity to elicit speech in referentially transparent situations through gesture and eye gaze, and eventually, simple utterances, was an ability that I suggested served the function of eliciting data potentially rich, not only in syntactic information, but also in pragmatic and semantic information ("elicitation operations"). Second, I suggested that the capacity to store strings in units large enough for off-line comparison and analysis was necessary ("entry operations"). Finally, I proposed a set of "expansion operations" that provided the child the opportunity to explore and analyze what she knew of language – its structure and use – through language play, practice, and organization, thereby to generalize and self-repair.

Much of what appears in this volume is not only compatible with these proposals, but supports, elaborates, and clarifies them. New findings on children's statistical learning abilities (Saffran & Thiessen, this volume) and sensitivity to form (Gerken, this volume) give added specification and substance to the ideas of entry and expansion operations. Evidence for pragmatic and syntactic bootstrapping (see Diesendruck; Naigles & Swensen, this volume) is consonant with the claim that children use what they know

to learn more, and so is evidence that children, by virtue of their immaturity, inexperience, or incomplete knowledge, sometimes make inaccurate syntactic self-repairs (Shatz & Ebeling, 1991) or inappropriate pragmatic inferences (Siegal & Surian, this volume). Research on language disorders also supports and expands on my argument that different disorders result from the disruption of different kinds of operations the child can carry out (see Rice; Tager-Flusberg, this volume). An active child, then, is one who brings a variety of capacities to the complex task of language acquisition, and based on whatever her capacities and knowledge at the time, she makes inferences about her linguistic situation at that moment.

What role remains for the environment? In a comprehensive review of the influences of variable social environments on language development, Hoff (2006) provides considerable evidence for the myriad social factors that affect development, from the amount of time children spend in conversation to the contexts in which they hear talk. Hoff proposes that, regardless of differences in such social circumstances, all environments supportive of language must provide two things: opportunities for communicative interaction and an analyzable language model. However, as Hoff notes, no matter how rich an environment is in such opportunities, it cannot by itself be effective as a support for language development if the child does not take advantage of them.

To optimize their learning opportunities, then, children have to be social beings, interested and able to engage in communicative interactions involving language, very possibly using the proposed elicitation operations to maintain and enhance the learning environment, as well as having the skills to analyze the language model it offers. How much opportunity they have to exercise their skills, and how well their language model matches their abilities for analysis will have an effect on the rate and course of their particular language development.

None of this seems especially arguable. Infants typically engage with their interlocutors early and often; infants and toddlers who don't do so have problems with language development, sometimes very severe ones (see Baldwin & Meyer; Tager-Flusberg, this volume). Yet, even some children who don't engage normally can acquire a fair amount of language, including a vocabulary of reasonable size (Diesendruck, this volume). How sociable does a child have to be to acquire any language at all?

If indeed children use what they know to learn more, one possibility is that children who are less sociable substitute other skills when learning language. For example, when learning new words, children with autism may make few inferences (or none at all) about the speaker intentions that apparently inform typically developing children about word meaning; rather, they may focus more on associations or distributional cues. This view fits well with the argument that there are multiple clues to the nature of language. Individual differences in quality and rate of acquisition would depend, then, not only on differences in social environments but also on which clues children with varying skills could use in varying environments to access them. Social-linguistic environments need to provide multiple cues a child can use to discover how to act and interact both linguistically and non-linguistically in her community. But the developing child actively and selectively attends to the cues as she grows in both brain (Shafer & Garrido-Nag, this volume) and mind (Poulin-Dubois & Graham, this volume).

Do we still need domain-specific constraints?

Conversations as information conduits. Infants have a preference for speech sounds over non-speech sounds. This attentional bias toward language suggests that the human child may be prepared to engage with conspecifics via language, the benchmark behavior of humans. Such a bias may be the initial entrée into developing one's own language competence. Also, it may facilitate a very early infant behavior – engaging in reciprocal interactions involving vocalizations, which is typically rewarding for both caregiver and infant. Such “proto-conversations” become increasingly sophisticated, and conversations are major sources of information for the developing child (see Shatz, in press; Siegal & Surian, this volume). There are many ways young children can learn – by observing others, or by trial and error, for example. But no ways other than conversation provide information via indirect experience, or what Harris (2002) has called “testimony.” Moreover, the richness and variety of information that can be conveyed in relatively short time is unmatched by other means. In short, engaging in conversations via language is a powerful tool for learning and not just learning language.

So far, the picture we have of the optimally successful language learner is one of an active, social child equipped with early attention to language, possessing probabilistic inferencing skills, and engaged in frequent communicative interactions rich with linguistic information. Can a child so equipped traverse the linguistic landscape efficiently enough to learn the substance of any of thousands of human languages by school age?

Language typologies as a constraint on the learning task. Whether the learning problem, especially with regard to the acquisition of syntax, can be settled solely by recourse to the kind of child described above is far from clear (see Baldwin & Meyer, this volume, for more discussion). Chomsky's early insights led him to argue for an innate universal grammar based on abstract principles underlying all human languages. A later proposal clarified how both the commonalities and the differences among languages could be accommodated in such a system: All human language can be described in terms of a small number of dimensions or parameters having a limited number of settings, with each setting potentially accounting for apparently disparate superficial characteristics. Any specific language, then, can be described by its particular combination of set values; and the vast numbers of languages result from the various possible combinations of settings on those parameters (see Chomsky, 1981). According to this view, the learning task is more manageable because, rather than considering a virtually unlimited number of hypotheses, a child equipped with knowledge of that small number of parameters would have only to determine which of the possible parametric values pertain to the particular language to be learned. Despite the elegance of this approach, attempts to apply it directly to account for the data of language acquisition have been controversial at best (see Goodluck, this volume, for more on parameters and their application to the problem of language acquisition).

Baker (2001, 2005) has offered a version of parameter setting that seems more compatible both with recent findings on universals of grammar and, at least on the surface, with the picture of the child as a probabilistic thinker who learns language over time, keeping track of correlational properties and making inferences from them. Rather than

couching parameters in terms of formal universal principles, Baker bases them on generalizations from implicational universals. These are descriptive statements about language commonalities and differences with respect to the ways linguistic properties correlate with one another, and they are stated in terms of probabilities; for example, 70% of languages do one thing and not another. He notes that some parameters can have a greater impact on a particular language's form than others, and he orders the parameters hierarchically according to their ability to affect one another; parameters higher in the hierarchy than others have at least one setting which eliminates the need to consider other parameters at all.

If children first set the parameters higher in the ordering, they would not, depending on the language they were learning, necessarily need to consider lower-ordered ones at all, thereby narrowing still further the learning task. If the language to be learned did require further parameter setting, the errors children made would be consonant with not yet having considered parameters lower in the hierarchy. Baker's ideal learner is one who, in developing a grammar, observes the ordering. Baker provides some preliminary evidence from children's errors at early stages of grammatical development showing that they do appear to observe that ordering.

Baker explicitly leaves open the question of whether the particular learning mechanisms needed to account for what he proposes are domain-general or domain-specific. In either case, the particular-language input, or what Baker refers to as the "primary linguistic data" (p. 119, footnote 9), must contain the information the child needs so as to learn according to the ordering. This requires, then, a symbiosis between the input and the child's learning abilities. Recent work on sensitivity to the frequency of linguistic information and its consistency in the input suggests that frequency and consistency monitoring are within the ken of young children (see Gathercole & Hoff, this volume). If different types of information in the input vary enough on these dimensions, the input may "order" appropriately the apparent parametric decisions children seem to make. The reported ordering evidence may be explainable, then, as a consequence of a child, sensitive to the frequency and consistency with which the input displays particular phenomena, repeatedly operating over such input and inferring structural relationships in a manner consistent with the hierarchy. This sort of explanation helps to dispense with any need for prior knowledge of the parametric hierarchy.

However, before one can conclude that domain-specific knowledge is not required, one must ask what the entities themselves are that are being monitored for frequency and consistency. Are they abstract linguistic concepts, and if so, how can the abstractness be accounted for? Implicational universals are typically written in terms of abstract grammatical entities like *verb* and *direct object*, and even the most general description of them, as in Baker's parameters, utilizes some linguistic abstractions like *word* or *phrase*. Baker's solution does not seem neutral with regard to the source or kind of representational abilities needed to deal with the abstractions. Baker suggests that children have "an innate phrase building mechanism, which stands ready to group whatever words the child happens to learn into useful larger phrases" (Baker, 2005, p. 104). So, his proposal relating typological data and acquisition relies on an innate structure-building device handling abstract linguistic representations. In this regard, it seems little different from and hardly more plausible than earlier claims for innate, language-specific abilities.

Despite the issue of their implausibility, is it nonetheless necessary to grant innate domain-specific capacities to the learner? A “yes” answer may be premature. Saffran and Thiessen (this volume) make several important arguments relevant to the question. First, they note that questions of innateness and domain-specificity are orthogonal issues: Logically, either kind of abilities, general or specific, can be innate or emergent. Second, they offer evidence that “domain-general learning abilities” should not be construed as completely unconstrained; rather, they are limited by specifically human perceptual and cognitive constraints, and those constrained abilities can shape a specific domain like language to include just those properties (such as phrase-based structures) needed to mesh with the learning capacities. When coupled with the notion of development in which such abilities operate repeatedly over inputs themselves previously modified by virtue of cycles of increasingly sophisticated organizations, this proposal suggests a powerful mechanism, able to account for the emergence in the learner’s competence of linguistic notions like “verb” or “phrase” (see Saffran & Thiessen, this volume). The symbiotic relationship between language typology and acquisition may thereby be preserved without the need to stipulate innate, domain-specific abilities to account for domain-specific representations.

However, at this point in the course of research into language development, the questions of whether and how a resolution to the domain-specificity debate will bring us closer to a true understanding of language development remain unanswered. Because the constraints on human domain-general abilities are not fully understood, it is as yet unclear how substantive are the differences between the domain-general view and the domain-specific view. The commonalities among languages attest to the existence of constraints somewhere, but whether to situate them in language because of the nature of the learner or in the learner because of the nature of language may turn out simply to be a question of perspective, reminiscent of the controversy between proponents of Chomskyan and Gibsonian theories about whether constraints on our view of the world are situated in our minds or in the world. The unhappy possibility here is that this question is merely a metaphysical one, not amenable to serious empirical inquiry capable of resolving the issue. The hope that it is not rests on the expectation that further empirical investigations into constraints on domain-general abilities will reveal that their differences from a domain-specific view are not merely superficial. If the differences are substantive, then how the views weigh in on two scientific criteria should help to decide in favor of one or the other: namely, whether one view accounts for more phenomena than the other, and whether the explanatory constructs offered by one rather than the other are more compatible with constructs at other levels of explanation. The goal of domain-general theorists seems to be to win the day on both those counts.

Tasks for Future Research

Many of the authors of chapters in this volume note gaps in our current understanding of language development and make specific suggestions for future research. Here I note several general concerns that have emerged in this review.

Above all, we need an explanatory theory of language development in which language acquisition neither stands alone nor is said simply to result from other kinds of development or knowledge – cognitive or social. If we take seriously the claim of interactions among areas of development, then language knowledge cannot simply emerge out of, say, social development, although various aspects of social understanding, of intention and mind, can come into play to expand language knowledge. We need to expand our understanding of how various areas of development interact mutually to sustain development, and we need as well to continue to address how areas within language knowledge impact development of one another. Only then can we expect to have a truly comprehensive, explanatory theory of language development.

Another obvious goal for the future is a more complete understanding of human information processing abilities. We need to know how these human abilities differ from those of other creatures, what unique characteristics ours may have, whether and how they change with development, and how human processing characteristics may influence the very nature of human languages.

We also need to know more about the genetic basis of human abilities. Surely, increasing knowledge about how genes work will help us to discover more about the genetic bases of language, but already our growing understanding of human genetics suggests that the idea of a single “language gene” is a journalistic fantasy. Genes multi-determine behavior, including language behavior, and deficits in single genes typically have multiple consequences, some on the linguistic system, some not. Increasingly, efforts to dissociate language from cognition seem as infelicitous as earlier efforts to correlate language milestones with Piagetian cognitive developmental ones.

Our knowledge of the development of the human brain is itself in an infant stage. We need to know more about the developing human brain, and to have more evidence on the limits brain immaturity imposes on the functional ability to extract information from the environment. We also need to know whether, when, and how different aspects of the environment, such as the availability of more than one input language, have an impact on the developing brain.

As we become more knowledgeable in these areas, we will gain even more understanding than we now have about how the predispositions that human infants bring to the task of developing language interface with their language communities to produce mature language knowledge. Recognizing their intimate relationship, we nowadays pay little attention to the nature–nurture dichotomy that for so long characterized debates in the field of language acquisition. In the future, we may very well discard the domain-general versus domain-specific dichotomy, as we learn more about how human information processing capacities are innately constrained and how they in turn constrain the structure of language. We may even decide that the best characterization of the course of language development is that there is no single course, but instead multiple paths through varying epigenetic landscapes determined by a particularly endowed child acquiring a specific language in a specific cultural context. Still, what constrains the number and kinds of those paths will be the limited ways a genetic program interacting with an “expected” environment in order to build a functional human adult can be modified by accidents of nature or nurture.

The chapters in this book represent the state of the art early in the second century of systematic work on the question of how language is acquired by human infants. They summarize the history of the field and its progress to date. To their credit, regardless of their theoretical bents, the authors have by and large eschewed an antagonistic tone in favor of presenting and interpreting data reasonably even-handedly, recognizing gaps, and noting continuing challenges. Such open-minded candor itself presages well for a field with very old questions and still-developing answers.

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