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FROM ONTOGENESIS TO PHYLOGENESIS: WHAT CAN CHILD LANGUAGE TELL US ABOUT LANGUAGE EVOLUTION?

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There seems to be an irrestible tendency for people to take the child as a model of the primordial state of the species. For the past several centuries, philosophers and psychologists and anthropologists have made analogies between children and animals, children and "primitive" peoples, and, inevitably, children and our proto-hominid ancestors. Advances in developmental and comparative psychology, along with anthropology, have made the first two analogies untenable. Human children are not the same as mature monkeys and apes, and preliterate societies are not childlike. But in the current scientific fascination with the origin of the species, it has become fashionable again to propose that human children are in some ways models of mature proto- or pre-hominids. Nowhere has this proposal received more circulation than in discussions about the evolution of language (e.g., Bickerton, 1990; Givón, 1998). I suggest that this recent form of the recapitualitionist argument will fail. In its classical version, the proposal was abandoned on the basis of evidence from embryology and physiological development. The current proposal, by contrast, is not compatible with what we know about the psycholinguistic development of human children and the processes of historical development of existing human languages.

There are three longstanding questions about the role of the child in language evolution and diachrony—that is, the processes whereby language arose in our species and the ceaseless changes of human language once it is present in the species. Briefly, the questions are:

1. Does linguistic ontogeny recapitulate phylogeny?
2. Does linguistic diachrony recapitulate ontogeny?
3. Do children create grammatical forms?

To anticipate my conclusion: The answer to all three questions is mainly negative. This conclusion is supported by several types of evidence:

1. Ontogeny is shaped by the particular language being acquired. That is, there is no universal form of early child language that reflects a biologically specified proto-language.
2. In historical change of existing languages, it appears that lasting innovations do not come from preschoolers but from older speakers. That is, language changes more *in use* than it does in the process of being learned.
3. Languages are sociocultural as well as individual products. Therefore, we can't expect to discover the phylogenetic origins of human language by studying the individual alone.

1. Does ontogeny recapitulate phylogeny?

The *Homo sapiens* child is different from a pre-human hominid in two critically important ways. The child is exposed to some already evolved human language and is equipped with a brain that evolved to make use of such a language. This situation was already pointed out early in the last century by a leading linguist of the times, Otto Jespersen:

> Manifestly, the modern learner is in quite a different position to primitive man, and has quite a different task set him…: the task of the child is to learn an existing language, … but not in the least to frame anything anew. (Jespersen, 1921/1964, p. 417)

Nevertheless, might it be that the earliest periods of child language reveal the workings of a cognitive and linguistic core that we might share with our hominid, and even pre-hominid ancestors? This is a tempting possibility—especially because relevant linguistic data from all other hominid species are permanently unavailable. And so, in a search for potentially useful data, it has been suggested that early child language may serve as a plausible model for pre-human language. A contemporary linguist, Derek Bickerton, has been explicit about this parallel, on the basis of two sorts of claims: The first is that there is an identifiable "proto-language" that is shared by trained apes and toddlers. This proto-language is equated with a traditional (but inaccurate) conception of the language of "under-twos": a telegraphic code lacking in grammatical morphemes, with reliance on word order as a basic grammatical device, and expressing a collection of core prelinguistic concepts. Bickerton presents the parallel in the following terms:

> We may conclude that there are no substantive formal differences between the utterances of trained apes and the utterances of children under two. The evidence of children's speech could thus be treated as consistent with the hypothesis that the ontogenetic development of language partially replicates its phylogenetic development. The speech of under-twos would then resemble a stage in the development of the hominid line between remote, speechless ancestors and ancestors with languages much like those of today. (Bickerton, 1990, p. 115)

To this proposal, Bickerton adds an argument based on the nature of human postnatal brain growth:

> Haeckel's claim that ontogeny repeats phylogeny has had a checkered career in the history of biology, and certainly cannot stand as a general law of development. However, it may have application in limited domains. In particular, no one should be surprised if it applies to evolutionary developments that are quite recent and that occur in a species whose brain growth is only 70 percent complete at birth and is not completed until two or more years afterwards. (Bickerton, 1990, p. 115)

There are, however, problems in making analogies from child language to simpler ancestral languages. And there are problems in accounting for the emergence of complex capacities on the basis of brain growth. I will point out some of the most salient issues, beginning with the nature of two-year-old language.

1.1. Trained apes, human toddlers, and proto-language

Cross-species comparisons are difficult, but the temptations to see bits of ourselves in our cousins—or to deny such similarities—are strong and enduring. Savage-Rumbaugh's reports of the accomplishments of bonobos (2001; Savage-Rumbaugh et al., 1998) make it clear that many of the prerequisites for human language were already present before the emergence of the hominid line. Bonobos can comprehend spoken English sentences—without instruction. The capacities for acoustic segmentation of speech, lexical mapping, and some levels of syntax are thus ancient. Savage-Rumbaugh (2001) even presents evidence for English-based vocal production and writing in bonobos. All of this raises fascinating questions about the evolution and functions of these capacities; but such questions lie outside of the search for

parallels in human ontogeny. Certainly, as Savage-Rumbaugh (2001, p. 24) points out: "These findings render mute old questions regarding the innate limits of the ape brain." They also make it clear that additional factors—both cognitive and social—must have been necessary for the emergence of human language.

1.1.1. "Proto-grammar" and early child language

We cannot predict what new surprises will come from bonobos, but for the moment at least, they have not been given the opportunity to acquire a rich morphological language such as Turkish (agglutinative) or Inuktitut (polysynthetic). Children under 2 who are exposed to such languages do not exhibit the sort of "pre-grammatical" speech described by Bickerton, Givón, and others, such as absence of grammatical morphology and reliance on topic-comment word order. Turkish toddlers show productive use of case inflections on nouns as early as 15 months of age—that is, productive morphology at the one-word stage (Aksu-Koç & Slobin, 1985; Küntay & Slobin, 1999). For example, the direct object of a verb (accusative case) is marked by a suffixed vowel in Turkish. Thus, if I see or kiss a girl called *Deniz*, I use the form *Deniz-i*. But if the noun ends with *–k*, the final consonant is not pronounced. For example, the accusative form of *bebek* 'baby' is not *bebek-i* but *bebe-i*. An error produced by a child of 15 months (Ekmekçi, 1979) indicates that already at this age—still in the one-word stage—Turkish children use grammatical morphemes. This is shown by the report that the child said *bebek-i*—a form that she couldn't have heard, yet matches the morphological patterns of the language. Beyond this early precocity, Turkish children quickly come to use multiple suffixes on nouns, and by the age of 24 months or younger demonstrate full mastery of the nominal inflectional system and much of the verbal paradigm. For example, a child of 18 months (Aksu-Koç & Slobin, 1985) produced the following two-word utterance consisting of six morphemes:

kazağ	*-ım*	*-ı*	*at*	*-tı*	*-m*
sweater	-my	-ACCUSATIVE	throw	-PAST	-1ST PERSON

'I threw my sweater.'

Similar productive use of grammatical morphology in the period of one- and two-word utterances has been documented for Inuktitut, a quite different type of highly inflected language (Allen, 1996; Fortescue & Lennert Olsen, 1992). For example, an Eskimo child of 2;6 produced a five-morpheme verb that represents an entire proposition (Allen, 2000, p. 495).

ma	*-una*	*-aq*	*-si*	*-junga*
here	-VIALIS	-go	-PROSPECTIVE.ASPECT	-PARTICIPIAL.1SG

'I'm going through here.'

Such examples are hardly possible in a "proto-language" that consists of short strings of words with no grammatical morphemes ("telegraphic speech"), yet they are typical of early utterances in highly inflected languages.

Early child speech is also not always characterized by the use of fixed word order to express semantic relations between elements. That is, not all languages use word order to distinguish the meanings of *dog bite man* and *man bite dog.* Where these relations are marked by case inflections, as in Turkish, word order variation is used for other functions. At the beginning of the two-word period, Turkish children are able to appropriately vary the orders of words. For example, Aksu-Koç and Slobin provide the following summary of the child studied by Ekmekçi (1979, 1986):

> Early control of the functions of word order is reflected in a number of contrastive uses, including the following: (1) Preposed adjectives are used in

> attributive expressions (e.g. *soğuk su* 'cold water', said at 1;7 when asking for cold water), whereas postposed adjectives are used in predicative expressions (e.g., *çorba sıcak* 'soup hot', said at 2;0 as a complaint). (2) Indefinite or nonreferential direct objects always directly precede the verb (e.g. *kalem getir* 'bring (a) pencil'), whereas definite direct objects (marked by the accusative inflection) can also follow the verb (e.g. both *kalem-i getir* 'pencil-ACCUSATIVE bring' and *getir kalem-i* 'bring pencil-ACCUSATIVE' = 'bring the pencil') [age 1;10]. (Aksu-Koç & Slobin, 1985, p. 856)

Because case inflections, rather than word order, are used to indicate who did what to whom, Turkish children do not make use of word order information in comprehension in the ways that English-speaking children do. Slobin and Bever (1982) carried out a study in which children were asked to act out the meanings of sentences containing two nouns and a verb, such as *horse kick cow* in all possible orders of subject, verb, and object: SVO, OVS, SOV, OSV, VSO, VOS. By age 2;6, English-speaking children correctly understood SVO sentences such as *the horse is kicking the cow*; however, Turkish children as young as 2;0 correctly understood all six orders of S, V, and O, relying on the ACCUSATIVE suffix on one of the nouns to indicate that it designated the patient of the action. Reliance on word order, therefore, is not a universal of early child language, although it has been proposed as characteristic of the "proto-language."

In sum, early telegraphic speech and reliance on fixed word-order patterns—the prototype of "pre-grammar"—are characteristic of child language in only certain types of languages. And even in those languages, like English, that seem to fit the characteristic, it is not clear that children begin with broad-based rules of word combination. Research on detailed corpora of very early child speech in English (Lieven et al., 1997; Tomasello, 1992, 1999) makes it clear that much of early language is item-based rather than reflecting productive combinations of the telegraphic or pre-grammatical type.

The influence of environmental language is especially evident in the case of bilingual children. A number of investigators report that such children—as soon as they begin to produce two-word and multiword combinations—differentiate the word-order patterns of their two languages (e.g., Meisel [1989] for French-German bilinguals, de Houwer [1990] for Dutch-English; Deuchar [1992] for Spanish-English bilinguals). These children do not show a standard "pre-grammar" or "proto-language" in which the two languages are differentiated only by choice of lexical items; rather, they are differentially shaped by each of the exposure languages from very early on.

Early learners are good at extracting salient grammatical devices in the exposure language, as demonstrated, for example, in my work on Operating Principles (Slobin, 1973, 1985). But this, of course, requires a human brain in an environment of already established human languages.

1.1.2. "Proto-language" and early child semantics

Another part of the recapitulationist scenario assumes that the semantic concepts expressed in early child speech, across languages, represent some sort of conceptually basic core of human notions that we may have shared with our hominid ancestors. However, if we look across the languages of the world, we find unexpected diversity in the expression of "basic" notions. For example, in the domain of spatial relations, Bowerman and Choi have compared English with Korean (Bowerman & Choi, 2001; Choi & Bowerman, 1991). Developmental psychologists have assumed that infants begin with sensitivity to basic relations such as ***containment*** and ***support***, as expressed by the English prepositions *in* and *on*. However, Korean makes a different distinction: what is important in Korean is not whether one thing is supported by another or is contained by another, but rather whether the relations between the

two things is one of ***tight fit*** or ***loose fit***. Consider, for example, the scenes represented in Figures 1 and 2.

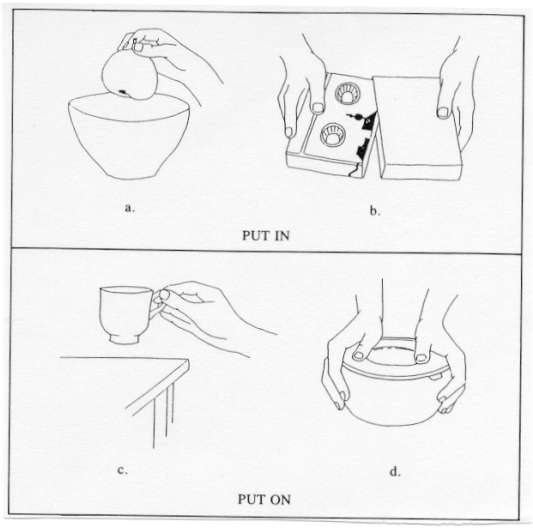

Figure 1. Classification of four actions as instances of containment (a, b) versus support (c, d). (Bowerman, 1996, p. 152)

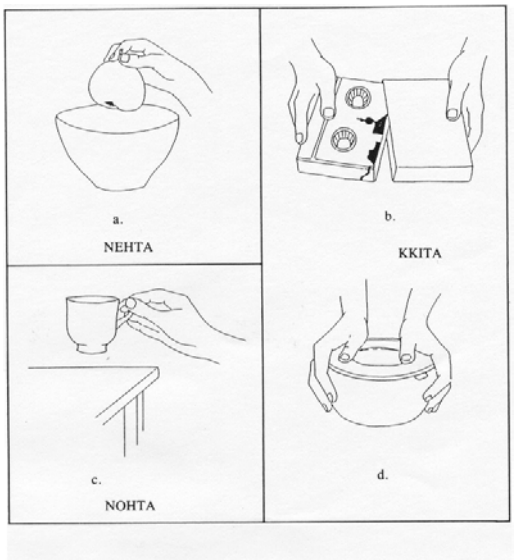

Figure 2. Classification of four actions as instances of loose fit (a) versus tight fit (b, d) versus loose surface contact (c). (Bowerman, 1996, p. 153)

These figures show part of a larger set of contrasts between English and Korean. English distinguishes ***containment***—using *put in* regardless of tightness of fit, and ***support***—using *put on* regardless of tightness of fit. Korean uses *nehta* for ***loose fit***, *kkita* for ***tight fit***—whether containment or support, and *nohta* for putting something ***loosely on a horizontal surface***. In a preferential looking experiment with American and Korean infants aged 18–23 months, Choi et al. (1999) found that American babies, when looking at pairs of videos and hearing *put in*, preferred to look at scenes depicting containment, whether the fit was loose or tight. Korean babies in the same task, when hearing *kkita*, preferred to look at scenes depicting tight fit, whether the fit was one of containment or support. That is, the two groups oriented to language-specific categories in comprehension, early in the one-word period. In one- and two-word speech in the two languages, there were comparable differences in the semantic categories encoded by early words. For example, Figure 3 schematizes part of the domain of spatial relations expressed by children of 16–20 months of age in the two languages (Choi & Bowerman, 1991). The core notions that receive early expression do not line up between the two languages. Bowerman concludes (1996, pp. 169-170): "[I]t is striking how quickly and easily children adopted language-specific principles of semantic categorization. There was little evidence that they had strong prelinguistic biases for classifying space differently from the way introduced by their language."

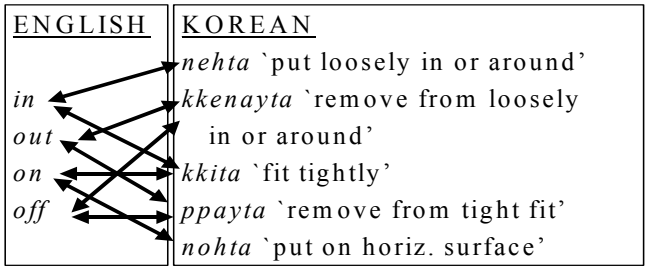

Figure 3. Early semantic categories in English and Korean child speech, 16–20 months. (data from Choi & Bowerman, 1991)

It is clear, then, that continuing research on both chimpanzees and human children casts doubt on characterizations of "proto-language" or "proto-grammar" as a sketch of the linguistic capacities of our ancestors. To be sure, chimps and human infants use reduced varieties of full human languages. But, as Jespersen emphasized long ago, all such reduced varieties are derived from an already developed exposure language. The child or trained chimpanzee is sampling from an existing language, and not creating without input. The structures of early language production are not independent of the structures of the exposure language. (Proposals about creation without or beyond input are taken up with regard to the third question.) While the ways in which children sample from existing languages tells us a great deal about the workings of the human mind, it is not evident that any generalizations can be drawn about pre-human minds from such evidence.

1.2. Heterochrony

Another obstacle to comparing chimps and human babies—despite the huge genetic overlap between the species—is the difference in ***timing*** of onset and offset of abilities. A quarter-century ago the late Steven Jay Gould, in *Ontogeny and Phylogeny*, argued for "the evolutionary importance of ***heterochrony***—changes in the relative time of appearance and rate of development for characters already present in ancestors" (Gould, 1977, p. 2) In his conception, human development is retarded in relation to other primates. However, more recently, Jonas Langer (2000, 2001) has examined heterochrony with regard to several dimensions of cognitive development that are critical for our topic. He applied comparable tests of physical cognition (causality) and logicomathematical cognition (classification) to human infants, two species of great apes (common chimpanzees, bonobos), and two species of monkeys (cebus, macaques). There are two important findings for our purposes: (1) Human cognitive development is accelerated in comparison to the other species (that is, we are not simply neotenized primates). (2) The two sorts of cognition develop in parallel in humans, but asynchronously in apes and monkeys. These heterochronic relations are evident in Figure 4.

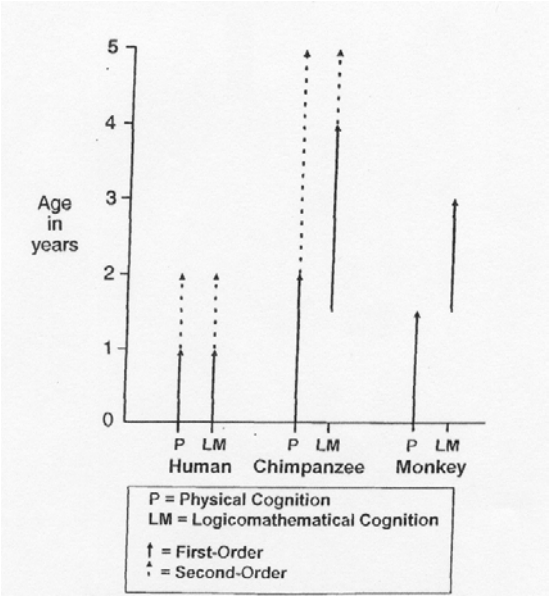

Figure 4. Comparative cognitive development: vectorial trajectories of developmental onset age, velocity, sequence, and organization (but not extent or offset age). (Langer, 2001, p. 31)

The consequence of heterochrony is that physical and logicomathetical cognition can interact from the start in human babies, whereas logicomathematical capacities are not available to apes and monkeys during the early phases of establishing physical cognition. Note also that second-order cognition appears early and synchronously in both domains for humans, allowing for immediate interaction between two types of cognition at a higher level. By contrast, second-order cognition in chimpanzees emerges for physical cognition when the animals have just begun to work out first-order cognition for classification (and second-order cognition has not been observed in monkeys). The opportunities for ontogenetic interaction between cognitive capacities thus varies significantly across species, due to heterochronic effects. Langer's work provides a strong critique of recapitulationism:

> Such phylogenetic displacements in the ontogenetic covariations between the onset, velocity and offset of cognitions in relation to each other … disrupt potential repetitions (i.e. recapitulation) of phylogeny in ontogeny. Thus, human, and for that matter chimpanzee, cognitive ontogeny does not simply recapitulate its phylogeny. Instead, heterochronic evolution reorganizes primate species cognitive development. Significant consequences for their respective potential growth follows.
>
> Heterochronic evolutionary reorganization of asynchronic into descendant progressively synchronic development … opens up cascading possibilities for cognitions to influence each other and to be influenced by similar environmental influences. (Langer, 2000, p. 374)

Within our species, temporal covariation of cognitive and linguistic abilities shapes the emergence of language. Developing constraints of memory and attention, along with available cognitive structures of all sorts, are responsible for the nature and course of language development. These constraints and their timing vary from species to species, and we cannot know how such factors might have played themselves out in extinct ancestors. Furthermore, as argued below, I suggest that modifications of existing languages generally do not come from very young learners, but from more mature participants in social and linguistic interaction. That is, in humans, much of linguistic innovation is due to individuals who are advanced in cognitive and social development. Comparisons of human toddlers with apes and monkeys are therefore of very limited applicability to the task at hand. (And the long line of more relevant species is, alas, extinct.)

1.3. Answering Question 1

Question 1 asks whether linguistic ontogeny can be conceived of as a recapitulation of linguistic phylogeny—that is, whether phenomena of child language can provide clues about the evolutionary origins of the human language capacity. I conclude that linguistic ontogeny does not recapitulate phylogeny because the form and content of "under-two" child language is shaped by the form and content of an already existing exposure language. Further, if we compare the rates of development of various cognitive capacities in contemporary primate species, heterochronic relations between various developing capacities indicate that any particular set of capacities, such as those underlying language, pattern in distinctly different ways across species. Therefore processes of human language development are not likely to mirror the phylogenetic origins of such processes.

2. Does diachrony recapitulate ontogeny?

Question 2 asks about a different kind of possible recapitulation: Do patterns of historical change of existing languages mirror the ways in which human children acquire existing languages? This position has been advanced repeatedly over the last several centuries, due to striking parallels between patterns of language development in individual children and repeated diachronic changes in languages. One is tempted to propose that similar cognitive processes underlie both sorts of development. For example, the linguist Paul Guillaume proposed early in the last century—about the same time that Otto Jespersen was warning against a simple answer to Question 1—that Question 2 can be answered in the affirmative:

> The facts that we cannot examine in the history of languages are available to us in the child. … There are certain easy routes…: they are frequently the same ones that languages have followed in the course of their evolution and that the child, in turn, takes up in learning his language. (Guillaume, 1927/1973)

In contemporary linguistics the child learner is seen as the source of various sorts of language change, both in generative accounts (e.g. Lightfoot, 1988) and functional approaches (e.g. Gvozdanović, 1997). Why would one propose such an explanation for historical language change? It is based on a simple set of propositions: (a) Children are imperfect learners. Their "errors" tend toward regularization. (b) Languages are imperfect systems. They tend toward regularization. (c) Child learners are responsible for changing the language. Propositions (a) and (b) are true; but the evidence suggests that (c) is false.

Most changes of the sort carried out by young children are a matter of "cleaning up" an existing grammar, rather than introducing new forms or constructions. Furthermore, for a linguistic change to have a lasting effect, it has to be maintained into adulthood; that is, the childish revisions must come to sound normal and acceptable. Sociolinguistic studies, however, show that lasting changes are more likely to be due to usage in adolescent peer groups, rather than in early childhood (e.g. Romaine, 1984).

2.1. Changes in past-tense forms of the English verb

As a small case study, consider historical changes in the past tense forms of English verbs. We now say *helped* as the past tense of *help* and *thrived* as the past tense of *thrive*. That is, these are regular verbs in contemporary English. But earlier the past tenses of these verbs were *holp* and *throve*. This looks suspiciously similar to errors made by modern-day children, who say *telled* and *drived* instead of *told* and *drove*. Might it be that child learners have been regularizing the system over generations? To examine this possibility, Joan Bybee and I carried out a study of changes in the English past tense, with the title: "Why small children cannot change language on their own" (Bybee & Slobin, 1982). We looked for innovations in past-tense verbs forms, such as *breaked, hitted,* and *weeped*. The data came from three age groups: (1) spontaneous speech records of preschoolers aged 1;6–5, (2) elicited past-tense forms from school-age children aged 8;6–10, and (3) past-tense forms produced under time pressure by adults. All three age groups produced innovative forms (errors, overregularizations), however only the forms produced by school-age and adult speakers mirrored ongoing changes in the English verb system. The preschoolers made errors on high-frequency verbs, such as *breaked, catched,* and *flied*—but these are not forms that are on their way to becoming standard in the language. That is, most of the preschool errors were transient. By contrast, many of the errors produced by older speakers showed some chance of becoming part of the language. They overregularized low-frequency verbs, producing forms such as *weeped* and *kneeled,* which ***are*** moving into standard English. Most interesting was the finding that it was only the older speakers who tended to regularize verbs that end in a final dental consonant, such as *hit–hitted*, reflecting an ongoing tendency in English to regularize verbs of this class. For example, verbs such as *started, lifted, fasted, roasted, sweated* did not use to have these overt *-ed* past tenses; the earlier past tense forms were *start, lift, fast, roast, sweat*. The study suggested that, at least in this part of the grammar, early learners are not the innovators:

> The conclusion that must be drawn from the facts is that there is nothing particularly special about the relation between small children's innovative forms and morpho-phonemic change. The innovations of older children and adults … may also serve as predictors of change. In fact in some cases where adult innovations differ from early child innovations, such as with the *hit*-class, the adults and older children, who are in better command of the entire system, innovate in ways that manifest more precisely the on-going changes in the system. Thus it appears that both socially and linguistically the older children and adults are in control of morpho-phonemic changes. (Bybee & Slobin, 1982, pp. 36-37)

2.2. Answering Question 2

Question 2 asks whether historical changes in language mirror ontogenetic changes. The past-tense case study suggests that children in the early stages of acquisition are not the ones who push the language forward. Other work in developmental psycholinguistics also suggests that children are not the ones to create new grammatical forms.[1] In brief, preschoolers are at work sorting out the regularities and irregularities of subsystems of the language, on the basis of limited information. Older children, having established a working knowledge of the language and using a larger database, are able to apply patterns at the level of the language as a system. That is, they have a sufficient grasp of the overall structure of the language to allow them to adjust particular parts of the system. Again, the immature learner does not serve as an appropriate model of the processes of change.

3. Do children create grammatical forms?

There are three sorts of situations in which we can ask whether children can create grammatical forms on their own: the emergence of creole languages, the invention of "homesigns" by deaf children with hearing parents, and the emergence of a new sign language in Nicaragua. With regard to each situation it has been proposed that children have the capacity to innovate structure, suggesting that this is an innate capacity that arose in the evolution of our species. Again, I suggest caution in evaluating these proposals.

3.1. From pidgin to creole

The classic definition of a creole is "a pidgin with native speakers." That is, it has long been claimed that children can take an imperfect input language and "nativize" it. In the process, it is proposed, grammatical structures emerge that were not in the pidgin input. Therefore the structures must result from an innate language-making capacity or "bioprogram" for language. I will not attempt to summarize the large and contentious literature on this topic (see, for example, Bickerton, 1981; DeGraff, 1999; Foley, 1988; McWhorter, 1997; Muysken, 1988; Romaine, 1988; Thomason & Kaufman, 1988). Arguments in the pages of the *Journal of Pidgin and Creole Languages*, going on since its inception in 1986, provide evidence and counter-evidence for a variety of theories of creole genesis. As I read the literature, there is evidence for considerable influence of substratum languages on emerging creoles, particularly influences of various African languages on Caribbean creoles. This is not surprising when one considers that African slave mothers and caretakers would probably have spoken an African native language to their infants, rather than the colonial pidgin. Thus the input must have been richer than a pidgin. Furthermore, demographic data strongly suggest that languages that are considerably more complex than pidgins can arise in interaction ***between adults***, before there are native speakers. That is, adult pidgin speakers can produce grammatical innovations. Bickerton's proposal that creole genesis reveals an innate bioprogram for language seems far less plausible than when it was introduced twenty years ago. (Personally, I am not convinced by any of the evidence or arguments for the bioprogram.)

Most of the world's creole languages arose in the past, under linguistic and social circumstances that will always lack full documentation. But we have at least one contemporary example: the emergence of Tok Pisin as a developed language in New Guinea. Tok Pisin arose out of Melanesian Pidgin, and in the course of some 150 years of use

[1] See Slobin (1994) for a discussion of illusory parallels between the development of the PRESENT PERFECT in the history of English and in contemporary English-speaking children. See Slobin (1997) for a similar discussion of the historical development of direct-object markers in various languages and false parallels with starting points in children's cognitive and language development.

developed a number of grammatical features before it became anyone's first language (Keesing, 1991).[2] Much of this development can be attributed to the fact that Tok Pisin was called upon to serve as a standard language of public communication, business, and education, as well as serving as the official language of government proceedings in Papua New Guinea after 1964 (Romaine, 1988, p. 33). Gillian Sankoff was on hand to study the first native speakers of Tok Pisin—a process that she and Suzanne Laberge have aptly referred to as "the acquisition of native speakers by a language" (Sankoff & Laberge, 1973). There are two important findings for the purposes of the present argument: (1) A pidgin language can evolve into something like a creole without requiring the hypothesized special intervention of child learners. (2) The first generation of native speakers "smoothes out" the language, rather than innovating new forms. Let us briefly consider the second finding.

The children studied by Sankoff in the 70s were learning Tok Pisin in families and social situations in which it served as a second language, spoken with some fluency, but also with some grammatical fluidity. The child learners apparently did what children are good at: making a system regular and automatic (what John Haiman [1994] has referred to as "ritualization"). This is evident on the level of speech production, as in the following example (Sankoff & Laberge, 1973, pp. 35-36):

> The children speak with much greater speed and fluency, involving a number of morphophonemic reductions as well as reduction in the number of syllables characteristically receiving primary stress. Whereas an adult will say, for the sentence "I am going home,"
>
> (1) Mi gó long háus;
>
> a child will often say
>
> (2) Mì gò l:áus;
>
> three syllables rather than four, with one primary stress rather than two.

Grammatical morphology also changes with native speakers—but, again, they are not the innovators. For example, there was a well-established future marker, *baimbai* (from English *by and by*), which began as an optional adverbial to establish the time frame of a stretch of discourse. But long before there were native speakers, the form was reduced to *bai* and moved to preverbal position within the clause, where it tended to be used redundantly in a series of future predications. What the children did was to make the future marker obligatory, while also reducing it in substance and stress. That is, the child learners played a significant role in accelerating an ongoing process of grammaticalization, in which a preverbal clitic, *b* ★, moves along a well-established path from a particle to an inflectional prefix (see Hopper and Traugott [1993] for discussion of grammaticalization in historical language development). Thomason and Kaufman provide an apt reformulation of the role of the child:

> When Bickerton poses the question of how a child can "produce a rule for which he has no evidence" (1981: 6), he is, in our view, asking the wrong question. We prefer to ask how the child can create grammatical rules on the

[2] John McWhorter (1995) has made a similar suggestion about Atlantic English-based creoles, suggesting that they derive from an established and elaborated West African pidgin used early in the 17th century. He concludes that this ancestor language "was by no means a rudimentary pidgin, but was, on the contrary, already relatively elaborated by the time of its exportation to the New World. … Hence, this contact language exhibited a structural expansion analogous to that of Tok Pisin before creolization, as opposed to the rudimentary structure documented in pidgins of limited social function…" (p. 325).

> basis of input data which is much more variable than the input data received by a child in a monolingual environment. (Thomason & Kaufman, 1988, p. 164)

Given the available evidence, I conclude that learning processes of this sort are normal, and do not reveal special capacities of the language-learning child beyond what is already known about the acquisition of "full-fledged" languages. A creole language develops over time, in contexts of expanding communicative use of a limited pidgin language. Child learners help to push the process forward, arriving at a grammar that is more regular and automated—but they do not appear to be the innovators.

3.2. The creation of homesigns by deaf children

Most deaf children are born to hearing parents and, unfortunately, most hearing parents do not learn a sign language in order to communicate with a deaf child. Such children create their own systems of gestural communication, called homesigns. Over many years, Susan Goldin-Meadow and her colleagues have documented the systematicity of homesigns in a number of deaf children, growing up in several countries (see Goldin-Meadow, 2002, in press; Goldin-Meadow & Mylander, 1984, 1990; Goldin-Meadow et al., 1994; Goldin-Meadow, Mylander, & Butcher, 1995). Here we have a real opportunity to observe the language-making capacity of the child. The studies demonstrate that individual deaf children systematically use a limited set of handshapes, combined with motion, to refer to objects on the basis of specific physical properties. For example, Goldin-Meadow, Mylander, and Butcher (1995) carried out a detailed analysis of components of handshapes in four homesign systems created by children between the ages of 2;10 and 4;11. All four children used a set of basic handshapes, described by the researchers as Fist, O, C, Palm, Point, Thumb, V, and L. Components of hand breadth and finger curvature systematically mapped onto features of the referenced objects: Point and Thumb handshapes referred to manipulation of very narrow objects, Fist and O referred to wider objects, and C and Palm were used for the widest objects. For example, all four children used a large C-handshape to represent handling an object greater than 2 inches/5 cm in width. All of the children used Point (index finger) for straight thin objects, such as straws, candles, pencils. Three of the children used a flat palm for vehicles. Overall, handshapes could be placed in systematic paradigms or matrices of contrasts for each child. In addition, most handshapes were combined with one or more type of motion. Goldin-Meadow et al. conclude:

> Thus, the gesture systems of the deaf children in our study appear to contain a subset of the handshape and motion components found in ASL. The similarities between sign forms in ASL and gesture forms in our subjects' gesture systems suggest that our subjects' set may reflect the units that are "natural" to a language in the manual modality—units that may form part of the basic framework not only for ASL morphology but also for the morphologies of other sign languages. … Whatever the details of the gesture systems, the fact that the gesture systems of all of the deaf children in our study could be characterized as having a morphological structure suggests that such structure is essential to the young communicator—so essential that it will evolve even in the absence of conventional linguistic input. (Goldin-Meadow, Mylander, & Butcher, 1995, pp. 243-4)

Homesigners also uses consistent orders of signs, thus indicating a sort of beginning grammar. The following three orders appear to be typical across homesign systems:

- patient + act (e.g., CHEESE EAT)
- actor + act (e.g., YOU MOVE)
- patient + act + agent (e.g., SNACK EAT YOU)

In the case of homesign it appears that we do, at last, have evidence for a primordial human language-making capacity. Homesign systems have some of the characteristics proposed for a proto-language: referential symbols and meaningful symbol order. They also go beyond the proto-language proposals in that they appear to have morphological structure, that is, a level of meaning that is smaller than the "word." It is striking that very young children can create such systems—though we do not know if childhood is a prerequisite for the accomplishment. (It's hard to imagine a scenario in which a language-deprived deaf adult, with no prior communicative experience, would invent a homesign system.)

In any event, with regard to Question 3, we can conclude that—without a language model—children can create a gestural language that has systematic patterns of reference and sign order. But there is an important caveat to be added: These children are growing up in a world of human culture, with its social patterns of interaction and its systematic use of artifacts. Goldin-Meadow has made this clear in a recent paper discussing the implications of homesign for theories of language evolution:

> The deaf children are creating their gesture systems without the benefit of a language model and, in this sense, are like the original creators of language. However, their language-creation situation is clearly not a simulation of the situation in which language was created for the first time. The deaf children are developing their communcation system in a world in which language and its consequences are pervasive. It may not be necessary for a child to be exposed to a language model in order to create a communication system with language-like structure. However, it may well be necessary for that child to experience the human cultural world. (Goldin-Meadow, in press)

Although homesign systems have some elements of morphology and word order, they stagnate; they do not develop further into full human languages. Apparently more is needed—and this additional factor seems to be an interacting community of signers. The opportunity to study this factor has been made available by the emergence of a new sign language in Nicaragua, allowing us to ask a final part of Question 3: Can a group of children using homesign arrive at a common grammar?

3.3. From homesign to Nicaraguan Sign Language

A new sign language emerged in Nicaragua in the 1980s, when deaf children were first gathered together into schools. Before that, deaf children were isolated from each other, each using some kind of homesign. What happened when they came together was remarkable: From the collection of homesigns a common language was formed (Kegl & McWhorter, 1997; Morford & Kegl, 2000; Senghas, 1995; Senghas & Coppola, 2001; Senghas, Senghas, & Pyers, this volume). Nicaraguan Sign Language has attracted much attention, leading to claims such as Pinker's assertion: "The Nicaraguan case is absolutely unique in history. We've been able to see how it is that children—not adults—generate language… And it's the first and only time that we've actually seen a language being created out of thin air." (*New York Times*, 1999). Careful examination of the facts, however, leads to a conclusion that is very much like my evaluation of Tok Pisin: Linguistic structure emerges

when people are put together and begin to communicate about a range of topics, using limited resources.

Documentation of the emergence of grammatical forms in Nicaraguan Sign Language can be found in Ann Senghas' dissertation (Senghas, 1995). The critical comparisons are between the "first cohort"—that is, the original group of deaf students who were brought together in a school in Managua, and the "second cohort" who entered later and joined an existing community of signers. (Defined in terms of year of entry, the first cohort entered in the period 1978-1983 and the second cohort entered after 1983.) The situation for the second cohort was thus similar to that described for the nativization of Tok Pisin: learners exposed to a language that is not yet fully developed. And, again, we can ask if new grammatical forms arise in the process of "nativization." Senghas and Coppola have summarized the development of the language from the initial resources provided by homesigns and gestures:

> These initial resources were evidently insufficient for the first-cohort children to stabilize a fully developed language before entering adulthood. Nevertheless, over their first several years together, the first cohort, as children, systematized these resources in certain ways, converting raw gestures and homesigns into a partially systematized system. This early work evidently provided adequate raw materials for the second-cohort to continue to build the grammar. (Senghas & Coppola, 2001, p. 328)

Of relevance to the present discussion about language origins would be evidence that it was the ***second*** cohort—that is the ***first-language learners***—that was responsible for the creation of grammar. However, Senghas's published data show that all of the grammatical innovations that she studied were already present in the first cohort. Consider three types of grammatical forms that emerged in Nicaraguan Sign Language:

1. the use of space to indicate ***person***: person inflection on verbs to indicate SUBJECT, DIRECT OBJECT, and INDIRECT OBJECT;
2. the use of space to indicate ***coreference***: same locus to refer to a person or object in successive utterances;
3. ***aspectual modulation*** of verbs: movement patterns superimposed on verbs to indicate such aspects as CONSTANTLY, REPEATEDLY, or RANDOMLY.

Table 1 presents figures on the use of these grammatical forms by the two cohorts based on narrative data gathered by Senghas (1995). In each instance, the second cohort uses the forms more frequently than the first. But note that, for each grammatical issue, the forms were already present in the first cohort; that is, there is no evidence here that innovations arise in the process of early language acquisition.

Table 1. Use of grammatical forms by Nicaraguan signers by cohort (age of entry). (Senghas, 1995)

Grammatical Form	**Cohort**	
	First Cohort (1978–83)	**Second Cohort (1983-)**
Mean number of person inflections per verb	.50	.56
Mean number of person coreferences per sign	.215	.292
Mean number of aspectual modulations per verb	.332	.457

Senghas carried out a more detailed analysis, considering both year of entry (cohort) and age of entry. This make it possible to separate signers both by the amount of time they have been using the language and the age at which they were first exposed. There are three categories of signers in each cohort, according to age of entry: young: age 0–6;6, medium: age 6;7–10, and old: age 10;1–27;5. The findings are especially interesting, as shown in Figure 5. As in Table 1, we see that all of the forms in question are already attested in the signing of the first cohort. At the same time, we see an age effect: For the young and medium groups, members of the second cohort use the forms with greater frequency. For the old group, it doesn't matter whether they entered with the first or second cohort.

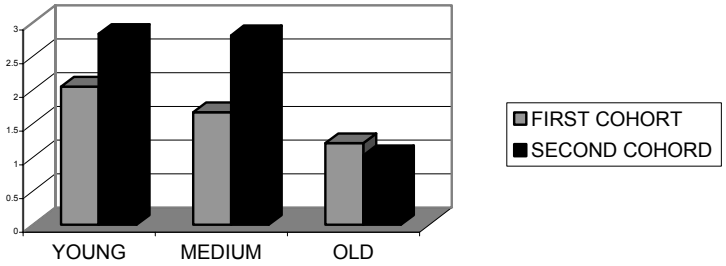

Figure 5. Mean number of inflections per verb (person, number, position, aspect) by cohort and age at entry. (data from Senghas, 1995)

How are these findings to be interpreted? To begin with—contrary to claims in the literature and the media—linguistic structure was not the invention of the "second cohort." Rather, what seems to have happened was that younger signers—that is, those who entered a community that already had a developing communication system—use the existing grammatical elements more frequently and fluently. This account of the Nicaraguan situation matches Thomason and Kaufman's response to Bickerton with regard to the emergence of creole languages (with the exception, of course, that the starting point in Nicaragua was a collection of individual homesign systems, rather than two or more existing languages):

> [A]n entirely new language—without genetic affiliation—is created by the first members of the new multilingual community, and further developed and stabilized by later members, both children born into the community and (in many or most cases) newcomers brought in from outside. (Thomason & Kaufman, 1988, p. 166)

In short, as regular forms begin to develop in a group, younger learners ***automate*** the language. Morford's (2001) discussion of the Nicaraguan situation, as well as her work with late learners of ASL (Morford & Mayberry, 2000), shows that efficiency in online processing is a critical factor in language mastery. And it is on this dimension that early learners have an advantage, rather than having a special, age-linked capacity "to create language." (Senghas and Coppola [2001] report that children who acquire Nicaraguan Sign Language before the age of 10 sign at a faster rate and are more skilled in comprehending grammatical forms.)

It seems clear from the evidence available thus far that individual deaf children can innovate linguistic forms, but that it takes an interacting community to push those innovations towards automated, efficient linguistic systems. Therefore, as Morford points out, "the emergence of Nicaraguan Sign Language is better described as a process of ***grammaticization*** than of innovation" (2001, p. 4). We would do well to pay close attention to the stages that Morford proposes:

> Thus, the implication of this work is that there may be three distinctive stages in the emergence of language: 1) the emergence of the lexicon, 2) the emergence of system-internal grammatical properties, and 3) the emergence of properties that are dependent upon the development of expectations of co-occurrence patterns in the communicative productions of conspecifics. (Morford, 2001, p. 9)

This schematized formulation gives us a promising way of thinking about the emergence of language in evolutionary time, without making false analogies from the capacities and activities of already-evolved *Homo sapiens* children. It also requires us to pay as much attention to the emergence of structure in communicative practice as to the cognitive capacities of the individual—whether innate or developing, whether language-specific or general (Slobin, 1997). Senghas has made this point forcefully:

> Homesigners develop little more than a small lexicon and basic word ordering strategies. An important component missing in these cases is the dynamic interaction of a peer group whose constant attunement allows the members to converge upon a new grammar. Without a peer group of language users, a rich language does not emerge. (Senghas, 1995, p. 160)

3.4. Answering Question 3

So do children create grammatical forms? To some extent they do, but within limits. At least in the gestural modality, deaf children with no sign language input can create a gestural language that has systematic patterns of reference and sign order. Children who acquire a partially structured language—either a pidgin language or an incipient sign language based on homesign—are skilled at making the language into a more efficient and regular system. But these processes go beyond the individual. On the plane of evolution, whatever scenario one might be attracted to, complex social products such as language can emerge, in part, in processes of interpersonal use.

Attention to these two factors—individual and social—gives us a way out of the apparent insolvable problem that led Chomsky and his followers to appeal to an innate syntactic module. Consider, for example, a typical formulation of the nativist program:

> The claim, then, is that some aspects of our language capacity are not the result of learning from environmental evidence. Aside from divine intervention, the only other way we know of to get them into the mind is biologically: genetic information determining brain architecture, which in turn determines the form of possible computations. In other words, certain aspects of the structure of language are ***inherited***. (Jackendoff, 1987, p. 87)

There is a jump in the nativist argument (and the quote from Jackendoff is but one of hundreds that could have been chosen): The claim begins with a discussion of language ***capacity*** but ends up with a claim about language ***structure***. There can be no disagreement that aspects of the capacity to acquire and use language are inherited: this is a general truth about species-specific behavior. (And the ongoing debate about domain-specific and domain-general capacities remains open.) However, the nativist claim is limited because it does not

look beyond the genes and the brain of ***the individual*** for sources of linguistic structure. The evidence considered in this paper repeatedly points to an interaction between the emergence of linguistic structures in the processes of communication and the capacities of human individuals who can learn and use such structures. As I have argued previously:

> [The] ***structure*** of language arises in ***two*** diachronic processes: biological evolution and the ever-changing processes of communicative interaction. The structure of language could not have arisen in the genetically determined brain architecture of an individual ancestor alone, because language arises only in communication between individuals. That is, after all, what language is for. As soon as we free ourselves of this confusion of levels of analysis—the individual and the social—many of the puzzles of language structure appear to have solutions beyond divine intervention or genetic determinism. The traditional attempt to account for linguistic structure is rather like trying to locate the law of supply and demand in the minds of the individual producer and consumer, or the shape of a honeycomb in the genetic structure of the individual bee. (Slobin, 1997, p. 297)

The present paper appears in a publication dedicated to Jean Piaget's *Biology and Knowledge*, therefore it is worth remembering that Piaget, too, was well aware of these two levels of analysis. For example, in that book, he pointed explicitly to the role of social factors in genetic epistemology:

> [F]rom the psychogenetic point of view, … interindividual or social (and nonhereditary) regulations constitute a new fact in relation to the thought processes of the individual… (Piaget, 1971, p. 361)
>
> Society is the supreme unit, and the individual can only achieve his intentions and intellectual constructions insofar as he is the seat of collective interactions that are naturally dependent on society as a whole. (Piaget, 1971, p. 368)

4. An interim conclusion

I have briefly examined three longstanding proposals about possible contributions of child language study to questions of linguistic diachrony and evolution, with mainly negative conclusions. My field of developmental psycholinguistics provides insights into the capacities for language, thought, and communication in our species. Children's early formulations of grammar and semantics provide a window into basic operating principles and organizing factors of the human mind. Therefore, ontogenetic theory and data are useful in pinpointing some of the basic concepts and processes that are needed in order to evaluate neo-recapitulationist proposals. In addition, comparisons with other surviving primate species—their capacities and developmental patterns—give clues about the road that had to be traversed by our ancestors. All of this growing information provides material for a range of speculative scenarios. At best, close attention to biology, development, and linguistic behavior can heighten the plausibility of some of those scenarios. Children's creation of homesign systems suggests a human capacity to create something like a proto-language (of course, using a human brain in a human sociocultural environment). However, for such a language to develop further, a community of users is needed. This would have existed for pre-humans, of course. And more complex structures could have emerged as a social product, like so many other achievements of human social and material technology. I would suggest, though, that such structures are emergent and are not prespecified. They can be learned and refined, using various capacities—not necessarily language-specific. But here I am launching into another sort of scenario building, beyond the aims of this paper. In any event, we can never have sufficient evidence to scientifically evaluate such narratives, however appealing

and plausible some of them may be. I hope that my largely negative conclusions can at least serve to reasonably constrain our irresistible speculations about who we are and how we got here.

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