Language Universals and Child Language Acquisition

Peter M. Skaer

1. Overview.

In this paper, I seek to ask, rather than answer, several basic questions concerning the study of the development of language in very young children. We begin by raising a few fundamental questions about what it is that we start with when we are born, in terms of language capability. We then address our central concerns involving language universals, and discuss where these ideas originated, what they meant then, and what I think they mean now. From here, we consider the development of a human, from embryo to early adolescence, with an emphasis on the earliest stages of development. We consider this development from the standpoint of three different perspectives; neurological, biological and linguistic. We then look into data taken from children at these earliest stages of development, considering both similarities and differences, inter- and intra-linguistically. We conclude by attempting to answer some questions regarding language universals, and language development in general, while raising several others to be considered for future research.

2. Dilemma.

How, without innate structures in the brain that are pre-disposed for the purpose of language processing, can we account for the fact that a typical child in any culture milieu, in less than five years, gains relatively efficient mastery of a system as infinitely complex as human language? Research has ranged far and wide on this question, including views assuming Herodotus's completely developed, albeit suppressed, fully fleshed out "mother tongue" (original language) resident in the infant's brain, Plato's (and later Descartes') "ghost in the machine" (the soul or spirit of a person housed in the mind), and Aristotle's "blank slate" (*tabula rosa*, where the mind is completely devoid of any structure, or preset information--also variously attributed to Rousseau and Locke, among others). Of the three views listed, the "blank slate" has endured at least in some circles of investigation, while clearly Herodotus's view has long since been disposed of. Plato's "ghost in the machine", though empirically speaking is without merit, continues to at least suggest the confusion investigators have over exactly what it is that governs language development, even if we were to assume that the mind was relatively free of pre-existing linguistic structure. In attempting to come to terms with the nature of the human mind at birth, and the apparent disposition humans have towards developing the mind rather rapidly while facilitating the emergence of language, a myriad of alternatives have been offered recently to shed light on this phenomenon, including Pinker's (1994, 2002) suggestion that the infant's brain is "pre-wired" for language purposes (which he equates to a kind of pre-programmed language "instinct"). In this paper, I consider a few such representations, marking a change over the last half century or so, in how our ideas of child language acquisition have developed.

3. Birth of the Modern Era of Linguistics: Jakobson's Language Universals.

In many ways, the advent of the theories of Roman Jakobson marked the birth of modern linguistics, at least from the perspective of phonologists; old traditions were abandoned, and new ones born. While Jakobson's contributions are both significant and numerous, for the purposes of this paper, I will concentrate on his contributions concerning *linguistic universals*.

The concept of Jakobson's language universals followed closely on the heels of Trubetzkoy's (1939) notion of markedness. In creating languages typologies, Trubetzkoy saw sounds in opposition to one another, where one member of a contrast bore some feature, or property (a 'mark'), that the other member of the contrasted pair lacked. Thus, one sound was marked, while another not. From this, Jakobson extended the concept of marking somewhat, in order to make broader cross-linguistic generalizations. From this point, the notion of a marked segment indicated that it was rarer than an unmarked segment, or, the former was less universal than the latter.

In general terms, a linguistic universal is a descriptive statement about the property of language that holds true for all languages. The most commonly cited example here is that 'all languages have both consonants and vowels'. Further, universals may be either *absolute*, where the statements apply to all languages, or *implicational*, which suggests that if one feature exists in a given language, then by implication, it suggests another related feature must also be present. For example, for absolute universals, we again can say that all languages have consonants. For implicational universals, if a language contains nasalized stops (such as /b̃/, /t̃/, /g̃/, etc.), we assume by implication that the language also contains nasals (such as /m/, /n/, /ŋ/, etc.). For further implications, we can have the following[1]:

(1) Implicational Language Universals

1. the presence of fricatives ⊃ the presence of stops
2. the presence of nasal consonants ⊃ the presence of oral consonants
3. the presence of palatal stops ⊃ the presence of velar stops
4. the presence of voiceless nasals ⊃ the presence of voiced nasals
5. the presence of voiced fricatives ⊃ the presence of voiceless fricatives

(from Brasington, 2003)

Adding to these two types of universals, we have a third type; *tendencies*. Here, a tendency refers to language structure that is found in most, but not all, languages. So, for consonants, there is a tendency that most languages contain nasal consonants, though not all do. There are in fact a very large number of competing tendencies in the various languages of the world. For most modern linguists, language universals, and the notion of markedness, underlie all forms of language change, including first language acquisition. Unfortunately, many do not seem to differentiate between the three types of language universals discussed above, lumping them all together in a rather unwieldy and discordant jumble.

Returning now to Jakobson, through observation of patterns of language usage common to both linguistic disorders and language acquisition, he noted both the systematic *form* of phonological structures in emerging child grammars, but also a systematic *order* in their emergence. Essentially, Jakobson envisioned phonological growth as guided by a tendency to maximize contrast, and to "make maximally effective use of available phonetic space whatever the system or the size" (Brasington, 2003). An abstract representation of this can be seen in Figure 1.

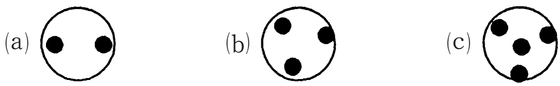

Figure 1. Maximum contrast postions for (a) two elements, (b) three elements, and (c) four. (Brasington, 2003)

Now, considering specific phonological contrasts that Jakobson noted, we have the following contrasting structures in phonology, listed in the order of their observed emergence.

(2) The Order of Phonemic Acquisition

a. /p/ versus /a/ (consonantal contrasted with vocalic)
b. /b/ versus /m/ (oral contrasted with nasal)
c. /p/ versus /t/ (contrast by place)
d. /p/ versus /f/ (contrast by manner)
e. /p,b,.../ >> /k,g,.../ ("front" precede "back")

(Jakobson, 1941)

It is of course difficult to argue against descriptions that represent the common forms of observed child language grammars. Facts are facts. Jakobson did recognize the importance of phonetic space, and maximum contrastiveness, and he indeed clearly characterized some of the important structures that can be found in the grammar of virtually any young child, and the sequence of events that the child will likely go through in acquiring the target language. However, the order itself is just a description of events, a chronicle of what we see as common facts (cf. Hume, 2004)—it does not tell us anything about how, or *why*, things happen[2].

Jakobson's universal order of acquisition represents a less than desirable view of the world—it in fact represents a stereotyping of cognitive/linguistic development, and designates any exceptions to these observations as deviant—usually not a good thing for the developing child. What Jakobson does not do is tell us *why* the order of phonological acquisition proceeds in the way it does, and as a result, is incapable of making any kind of *predictions*[3], or insights, if any factors are altered, or if the order of acquisition is in fact deviated from. Related to this issue is Jakobson's broader notion of "markedness". To explain, in terms of "markedness" for a given sound, we see experience and predictability (markedness) based on two basic factors; (1) whether a certain sound is in a given language's inventory, and (2) to what extent these sounds are used. As Hume, 2004, notes

> "...even articulatorily complex sounds or sequences with low salience can be predicted within a system provided that they are used a great deal. The reason why articulatorily simple sounds and perceptually salient sequences are typically unmarked is then simply because, due to their inherent phonetic nature, they tend to occur more frequently in systems and, as a result, are used more." (pg. 8)

Hume tells us that the task is a bit more complex than Jakobson assumes, and that indeed several factors compete against one another in meting out what will be predictable or not in a child's emerging grammar. A further shortcoming, perhaps, is that universal observations, such as Jakobson offers, are limited to the *quality*, or type, of productions, with *no references whatsoever to quantitative* measures.

Still another major design flaw in Jakobson's observations has to do with what he used as allowable data. Notably, he discounted the earliest productions from the babbling period (usually occurring between 5 months to 11 months) as illegitimate, and therefore irrelevant in the study of speech development. He noted that during the babbling period forms emitted were as a result of experimentation, or exercise, resulting in a wide range of rather unrestrained output. As a result, all studies concerning this period of development were rejected. I suggest later that in fact this earliest stage of the development of the child is indeed quite relevant to the study of child language development, and offers much in coming to terms with resolving exactly what it is when we are talking about language universals, otherwise known as the pre-existing cognitive structures in the brain that facilitate human language development. Before dealing with the various shortcomings of a list of language universals such as Jakobson proposed, however, let us look a bit more carefully at the general ideas that followed the introduction of the notion of language universals.

Clearly the research that followed Jakobson was very much the whole of generative phonology, where underlying grammars were characterized to generate, or to derive, a surface grammar, through an interaction or rules, constituent primes and so forth. The 70s and 80s saw a movement away from rule-generated grammars towards basic principles and parameters, governed by constraints, where we essentially remain to this day. This was also a move away from purely descriptive characterizations of language phenomenon to a view that attempted to be somewhat predictive in nature. Whereas the early days of phonology were best characterized by rules that told us what we could do[4], later trends were more and more concentrating on telling us what we couldn't do[5]. Underlying these later trends were the basic notions of *language universals*. In these later years, then, it was these universals that were being tamed, in order to produce a target language grammar, while in the earlier stages, underlying grammars worked somewhat independently, and were governed, or ruled, in order to produce a possible surface grammar, all along, or at least at the final stage, having to obey the basic patterns of universal grammar. In other words, in the early stages of generative phonology, language universals governed the end-point of the phonology, while in later years it came to serve as the starting point. As I will point out in later sections, it is not necessary to abandon contributions of those such as Jakobson, at least in theory, as they are in fact based on solid firsthand observation of actual language occurrences, an approach which characterizes most of the recent research on emerging child language grammars. I will suggest, however, that a broader perspective must be assumed, and the parameters of what merits our attention be expanded.

Let's review what we know so far about universals. Above, I provided some brief definitions of language universals, as they are seen from the eyes of the generative linguist. Here, I suggest a somewhat different view, in the spirit, if not the form, of Magnus, 2001, that there are at least two ways[6] that we can view universals, from a linguistic-functional perspective.

(3) Types of Universals

1. Some universals are *innate* (internalized general cognitive capabilities). They are part of any communication system that is used to convey information orally by human beings. These consist of most of the usual things that we think of when we think of a language grammar from the linguist's point of view—the language universals we described earlier. These have to do with the form and nature of message—essentially, the mathematics of its presentation (the rules (principles and parameters) of language).
2. Some universals are *imposed* (from external sources), and may differ somewhat from one cultural milieu to another. These may come in the form of physical limitations, such as the

> nature and state of the vocal apparatus, the maturity of the individual, externally imposed conditions (such as social criteria marking contrasts and declinations for things like color, time, and so forth). These have to do with real-world attributes of the message; the body that processes it, and the social milieu that engenders it—essentially, the biologies that are employed governing and constraining the presentation (the organic components of language transmission).

As Magnus argues, innate universals express human capacities, while imposed universals are conditions of overt form, and they "arise as a result of function or language usage." (Magnus, 2001). Going back to phonology, then, we still have language universals such as "all languages have consonants and vowels", and "the syllable canon CV is favored." However, other linguistic tendencies, which correspond to issues such as ease of articulation, minimization of energy, and so forth, are better characterized as being related to imposed universals[7], limitations that result from the system in which they are produced. So, from a biological point of view, a string of consonants with no intermediary vowels will violate basic abilities for the human vocal apparatus to produce. In simple terms, not all notes can be played as easily in one order as in another—the more difficult ones to play (using the human vocal system), violate the restrictions controlled by imposed universals. Now that we have a basic idea of language universals from both a traditional and modern perspective, we are prepared to consider some of the important issues that relate to the developing cognitive and linguistic skills of young children.

4. Early Stages of Development—What the Scientists Say.

In this section, we consider very briefly the earliest stages of human cognitive development from several different viewpoints, including neurological, biological and linguistic. In this way I hope to demonstrate that at the very least, what goes on in the child's first year of life, contrary to Jakobson and the countless others that continued in his tradition, is in fact not only relevant to the study of child language development, but in many ways, essential.

4.1. Neurological Development.

Neurological development is both rapid and robust during the first two years of development. The brain goes through several overlapping phases, beginning in the embryonic period (prenatal). During the early stages of fetal development, Adams, 2003, notes that there are three main processes which are acting to develop the human embryo, including proliferation (replication of cells; birth of cells), migration (movement of cells to their destined location) and differentiation (specialization of cells into their destined type). Within about three weeks of conception, brain tissue begins to form (the process of neurolation). In a very short amount of time, there are as many as 100-200 billion neurons[8]. At four weeks, interestingly, a human embryo looks very similar to any other vertebrae embryo (bird, reptile or mammal), (Eliot, 2000)—perhaps we can say the structure is "universal" with that of all warm-blooded creatures? By six weeks, however, the embryo resembles other mammals, and by seven weeks, only other primates (Eliot, 2000).

The number of neurons continue to increase rapidly; by the second month of gestation neurons are being formed at the rate of about ¼ million every minute. The neurons migrate to predetermined regions of the brain, where they are in turn connected, or linked, into a larger network, from the age of about 10 weeks, with each neuron capable of having 5000 to 100,000 synaptic connections. These synapses create pathways for communication (cf. Rakic et al., 1986). Lateralization of the cerebral hemispheres is undertaken. By the third trimester, no new neurological processes are introduced. The pre-natal infant at this point has developed many behaviors, such as being stimulated and irritated by sounds, light, pain, and so forth. It is clear that as early as the first trimester of the embryonic period, a significant amount of brain development (neurolation) occurs, and by birth, the child is already pre-disposed for various language functions, in particular, emerging at birth with a relatively intact and functional hearing apparatus.

During the period of infancy, from birth to the age of six or seven months, synapses critical to language development are established. The largest number of neurons and synapses that the individual will ever have are present. By the infant's fifth or sixth month of life, maximum synaptic density is reached, and there begins the first instances of "cell death"—the elimination of unused pathways. Cells continue to grow in size, but not number. The order of cortex development corresponds with the emergence of various developmental capacities, while retaining plasticity. The "speech" of infants, despite the cultural context, is *universal* (more about this later).

From approximately eight months (to about 12 months), synaptic pruning eliminates unused synapses, purging the brain of atrophied pathways (there is a gradual loss of plasticity as the neuronal connections become specialized (cf. Boysson-Bardies, 1999)). Language development follows the patterns established by the family language, and specialization of the cortex continues. Later stages develop balance and control over body movement, increased attentiveness, and eventually, (by about the age of ten years) lateralization, when hemispheric dominance is completed.

4.2. Biological Development.

Clearly, in the first trimester of the embryonic period, the most interesting developments involve the brain. However, there are other things going on that are important to a child's development, even at this early stage. As neurolation progresses, the child develops a sense of touch by around the 5th week, and the first movements of a baby are also recorded. Between the 9th and 12th week, the nervous system is more or less organized, and networked. The child now demonstrates thumb sucking, kicking, the opening of the mouth and other semi-coordinated reflexive gestures. As noted above, the child, by second trimester, demonstrates both stimulation and irritation at external sounds, light and movement. By the third trimester, the child demonstrates preference for the tone and rhythm of the mother's voice.

At birth, the child's behavior is primarily reflexive, or automatic, in response to various forms of stimulation. There are apparently three types of behaviors being employed: (1) survival (sucking, hand grasping, etc.); (2) enabling precursor (basic behavior that will lead to the development of a more complex skills such as hand-eye coordination, walking, etc.); and (3) interactive (essentially, getting attention). Over time, as the brain matures, the child gains voluntary control over these involuntary reflexes.

From the age of eight months to a year, the child becomes able to grasp items with either hand, control the coordinated use of thumb and fingers, and in some early instances, maintain balance, and coordinate feet and legs in order to walk. Others following a more relaxed developmental sequence that may delay walking as long as 24 months. During the second year of life, there is general continued development of balance and control of body movement.

4.3. Lingustic Development.

We will first add a bit of the biology (that we left out of the previous section) to our discussion here. Namely, what about the development of the organs related to speech production? Note that we have already mentioned that in many ways, the hearing ability of the infant is relatively complete in its development at birth, and that there is ample evidence to suggest that the child can and does hear quite a bit even during the second prenatal trimester. What about the productive speech organs? In this latter case, the child is quite under prepared, in terms of language production, at birth.

At birth, the human vocal tract looks quite different from that of the adult. There is no characteristic solid, “square” jaw underlying and supporting the tongue—rather, the jaw is relatively retracted and unimposing. The curve of the oropharyngeal canal (back of the throat) is gradual rather than the straight vertical form of the adult. The soft palate is closer to the child's tongue than that of the adult's. See Figure 2.

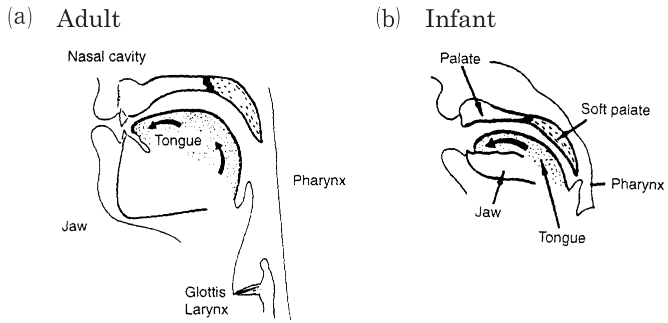

Figure 2. Vocal tract of the adult (left) and the infant (right). (from Boysson-Bardies, 1999)

The tongue of the child is relatively uncontrolled at the earliest stage of infancy. In fact, breathing, brought about by the limitations just described, must be done through the nose for the infant, as the child's oral cavity is restricted in both size and in access to it. As such, at birth, the child is not capable of producing speech vocalizations of any kind (Boysson-Bardies, 1999).

The vocal apparatus in the young child does develop, of course. By around the age of three months, for example, the child can manipulate the soft palate in such a way as to close off air passage through the nose, allowing controlled air to be transmitted through the oral cavity— a necessary perquisite to human speech production. The tongue's musculature has also developed, and the pharynx has acquired more space. By five months, the child is capable of breathing, and control air input and output, essentially as adults (Koopmans van Beinum and Van der Stelt, 1979). However, at this early stage a child is still not capable of producing anything that could be attributed to early linguistic output.

At this point, the articulatory apparatus is still not complete. There is the issue of coordination, which assumes the orchestration of several different articulators in the production of a speech sample. This constellation of articulators includes the tongue, the lips, the pharynx, the larynx, amongst others. This process in fact takes several years, as described by Boysson-Bardies, 1999:

> "...not until the age of five or six does control of all the articulators become possible. Their maturation begins with the most central organs, extending next to the peripheral organs. Gross movements are mastered before specific movements, and control of the tip of the tongue and of the lips is the last to be acquired, shortly before the age of five or six." (pg 17)

Based on these facts, we can see that the child, both neurologically and biologically, must progress through various stages of development that are reflected in the "licensed" oral output. At the earliest stages, productions are restricted by both biological factors (limited control and state of the vocal apparatus) and neurological (simple orchestration of gestures must necessarily precede complex orchestrations), so it is predictable that "front" stops (labials) and low vowels emerge as the earliest stages of production, followed by more complex ("marked") structures later on. However, other issues naturally bear on this situation (many of which are beyond the scope of the present paper), such as saliency of the target, experience and exposure with it, degree of attentiveness, and so forth. Let us therefore look at what the child is actually doing during these early stages of language development.

5. Early Stages of Language Development--What the Children Say.

We have already indicated that children come into the world with a relatively intact hearing apparatus. This has been demonstrated convincingly with various prenatal studies as well as early infant studies. I will summarize a few of these findings here, restricting myself to those studies that focused on the abilities of children after birth.

Amongst a review of several investigations dealing with very young children, Boysson-Bardies, 1999, discusses a study in which a group of children were familiarized with a series of syllables ([bi], [si], [li], [mi]), and after repetition, introduced a new syllable, such as [di] or

[bu], where the children were able to distinguish that such new syllables were “different”. Specifically, the babies noted that [bu] was different than [bo], [ba], and [be], and was also different from [du]. The children were thus able to note both contrasts in vowels occupying otherwise identical syllable frames, as well as the difference between two voiced stops, also occupying otherwise identical syllable frames. In fact, there is substantial evidence that children have a rather dramatic and comprehensive ability to distinguish between numerous phonemes at this early stage—where the fact that the phoneme target is part of the native language repertoire or not is *irrelevant* to the their ability to distinguish them. Other studies have shown convincing evidence that the child also perceives subtle changes in tone, register, rhythm, pitch and so forth, at these early stages, and can show a preference both for one's own mother's speech patterns, as well as for one's own family linguistic codes (cf. Boysson-Bardies, 1999). They can distinguish their mother tongue from other foreign languages, and their mother's voice from other mother's speaking the same language.

Kuhl, 1993 (see also Werker and Tees, 1984), observed that in the earliest stages of infancy, children are capable of perceiving virtually anything on a universal psychoacoustic spectrum. Kuhl arbitrarily divided up a grid space to show a multitude of possible locations for phoneme targets (Figure 3, left), and noted that children less than six months old were able to perceive virtually any vowel target assigned them, and distinguish it from others, consistently, However, he found that after six months of age, the children's discrimination abilities were decreased, and the children demonstrated diminished abilities to recognize and distinguish sounds that fell outside the range of the native language, and had begun to partition their sound space into sections that corresponded to the language specific of their host community (Figure 3, right, for English).

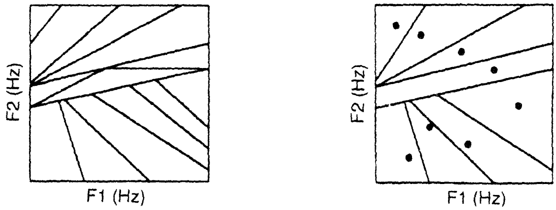

Figure 3. Hypothetical partition of acoustic space underlying phonetic distinctions in a universal way (left) and boundaries of vowel space in spoken English (right). (from Kuhl, 1993)

Boysson-Bardies, 1999, similarly noted that prior to six months of age, children responded to the very general properties found in most languages (prosodic markers such as duration of pauses, segments and syllables), but the prosodic organization is established by around the age of six months, after which the child becomes much more attuned to, and comfortable with, the characteristics of the host language. Jusczyk, Cutler, and Redanz, 1993, further supported these observations by noting the child had only a general bias for weak-strong tempo relationships at six months, but by 9 months, favored the tempo pattern predominate in the host language. Additionally, Jusczyk, Friederict, Wessels, Svenkerud and Jusczyk, 1993, found that children at six months of age showed no particular preferences for consonant clusters that were licensed by their host language (such as [pl]) as opposed to those that were not (such as the Dutch [sz]), but by 9 months, showed a clear preference for only those structures licensed by their native languages.

Clearly, by even this early age, irrelevant features were no longer even being considered—the skill for discrimination disappears as rapidly as the need for such skills are diminished. It is worth pointing out here that it is precisely at this time that neuron development terminates, and synaptic pruning begins to trim away unused synapses. We can therefore suggest that unused synapses related to discrimination of sounds irrelevant to the child's native language are thus trimmed away at this early stage in the child's development, lost forever, to the chagrin of second and foreign language learners, later in their life. We suggest that the child has moved from the surface level, dealing with all input superficially, piece by piece, and feature by feature (where all features are equally important), to a level embedded, or organized, around parameters that determine relevant features (assigning them a high value) and irrelevant ones (assigning them a low value, which eventually leads to complete lack of recognition).

Around the age of 5-6 months we see the emergence of the first speech-like productions in the form of babbling nonsense syllables. Many have suggested (including Jakobson) that babbling is a kind of preparatory phase, or rehearsal stage, before “true” language production begins. Oller, 1980, for example, notes that infants appear to be practicing scales by mixing sequences of [ai], [ei] and [ae] in their babbling sessions. He notes that they use the same forms and try them with different pitches, intonations, sequences and durations. These early attempts at vocal productions have no real consonants per se, but rather, simply a gross operation of opening and closing the mouth, thereby interrupting the air stream.

The first truly language-like sounds emerge in a child's babbling between the ages of seven and ten months. These are usually in the form of simple CV syllables, such as [pa], [ba] and [ma]. The typical consonant is a “front” stop or a nasal, and the typical vowel is usually a low vowel, such as [a], [æ] and [ʌ]. These canonical forms are often strung together in babbling, such as in [bababa] or [mamama]. Interestingly, both here and later in the first true words a child speaks, children seem to demonstrate preferences of one sound, or sequence, over another, such as one child always using [b], for every consonant, while providing some vowel variation, or another child using several different stops, but always with the same low vowel, [a]. At the onset of words, there are differences amongst children in both *quality*, as just described, but also in *quantity*. For example, at eight months, Bates, 2002, noted that the mean number of words understood was 20, while those children in the lowest 10^{th} percentile recognized none at all, and those at the highest 10^{th} percentile understood as many as 80 words[9].

Individual differences, and preferences, are even more evident in the next period of development, between the ages of ten and twelve months. Here, complex syllables are experimented with, such as Pierre's nonsense (and unlicensed by L1) syllables [apff] and [pepff], noted by Boysson-Bardies, 1999. She also described more examples of variability among children:

> "Carole's babbling contained many series with the velars /g/ and /k/: these represented half of the occlusives she produced. Charles, by contrast, produced hardly any velars. Noel produced no /l/ in his babbling, while Laurent included them in more than a third of his productions. No labial occlusives (/p/, /b/) were found in Laurent's babbling at ten months, which is rare; for Charles, Carole, Marie and Noel, series introduced by [p] and [b] were very frequent." (pg 50)

Bates, 2002, also noted that there were difference in "language style" amongst babies observed, with extremes at 9-10 months of age ranging between "word babies" (those focused on segmental babbling) and "intonation babies" (those primarily exercising the prosodic aspects of speech). She notes later emergent styles, between the ages of 12-18 months, such as "referential" (babies primarily focused on naming objects in their surroundings) and "expressive" (babies using words interactively in the environment, such as "wannit—gimme"). She goes on further to note that there is great variability in the patterns both within, and across, languages. The word order may or may not be fixed (irregardless of the host language), timing durations for both phonemes and syllables may be inconsistent (even for those languages where timing is distinctive) and where certain structures emerge "out of order" as evidence against 'markedness'.

Clearly, there is much in the way of language development that is going on in even these early stages of "babbling". Just as clearly, though, the language spoken by the child is influenced by the language spoken by his community, even at this early stage. Boysson-Bardies, Halle, Sagart and Durand, 1989, demonstrated that the vowel spaces for speakers of English, French, Algerian and Cantonese differed from one another in regular ways, answering the question—"Do babies babble differently depending upon the language of their host community?"—the answer is yes, of course (see Figure 4).

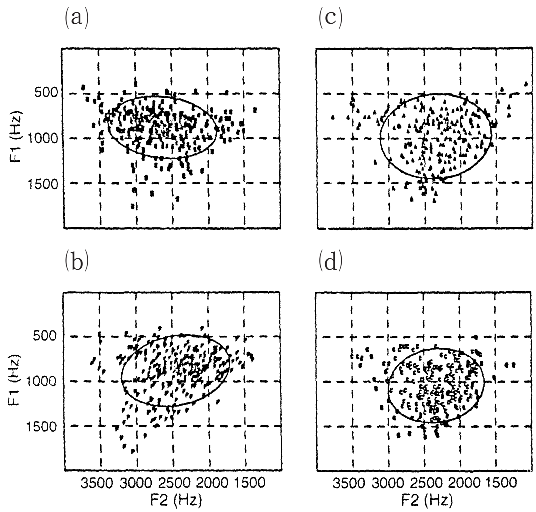

Figure 4. Vowel space of ten-month-old babies: (a) English, (b) French, (c) Algerian, (d) Cantonese. (from Boysson-Bardies, Halle, Sagart, and Durand, 1989)

They noted that babbling produced values of the first and second formants which differed remarkably from one language to another, in a regular way, and that the composite value differences, by language group, in fact were strongly correlated to the actual differences in values for the corresponding formants of the target language vowels spoken by adults (see Figure 5).

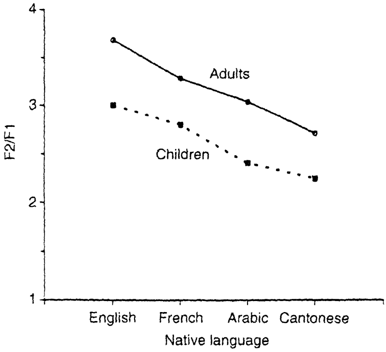

Figure 5. The relationship between the second and first vowel formants in the babbling of children of ten months from different linguistic groups corresponding to the relationship found in their native language. (from Boysson-Bardies, 1999)

In yet another study, Boysson-Bardies and Vihman, 1991, came to a similar conclusion regarding consonant distributions for the four languages they studied (French, American English, Japanese and Swedish). The ten-twelve month old children used proportionately the same number and type of consonants in their babbling as were used by adult speakers of their language.

In later stages of learning, between two and five years of age, where Jakobson's universal order of language acquisition directly relates (since this is during the period he considers relevant to his investigation), we see further examples of evidence counter to his universal order of acquisition. Yoneyama et al. 2003, for example, notes that Japanese-learning children made twice as many *backing* errors, where /k/ was produced for the target /t/, as they made *fronting* errors, where /t/ was produced as /k/. In other words, /k/ was produced correctly more often in its target position, than /t/ was, and /k/ was also used in place of /t/ in many instances. This counters the claim (shown earlier in (2)) that front consonants universally appear before back consonants. Yoneyama et al. point out that this pattern is consistent with the adult target grammar, where the adult lexicon contains many more words containing the back consonant /k/, as opposed to front consonant /t/. Beckman et al., 2003, lends support to this conclusion, and further establishes that the higher frequency usage of /k/ in the Japanese community correctly predicts the earlier acquisition of /k/ for young Japanese children, and a higher incidence of errors in producing /t/. These factors of course relate to predictability as a result of experience, one of several factors left out of the earlier language universals approach to early child language such as proposed by Jakobson.

6. Conclusion.

There are complications and controversies in the study of early child language development. Here, we entertain answers to questions you didn't know we asked, and questions which we cannot answer, but suggest they are worth considering. Questions such as what to study invariably crop up. Should we study what children *understand*, or perceive? Should we study what they *produce*? Are there stages, that are *irrelevant* to study, such as Jakobson and Chomsky suggest for the child's first year of development, and are there viewpoints that are not worthy of consideration, such as the differences a single child demonstrates in the face of overwhelming trends that point in opposite directions, or where an entire language seems at odds with a proposed universal? Are issues of *quality* (of phonemes, syllables, words and so forth) our only interest, at the expense of *quantity*? Are there *critical periods* of language development that if tampered with (through injury, isolation, or whatever) cause long term or permanent damage to the eventual language grammar of the developing individual? Are language universals nothing more than labels for those things most common to our experience, or do they offer true insights into our predisposition at birth to facilitate our emergence into the social milieu in which we were born?

Let us consider two of these questions in more detail here, first, a difficult idea that is easy to prove: Are there critical periods for language development?; and the second, a simple idea that is difficult to prove: Are there (innate, "pre-wired") language universals?

Recently, studies in other fields outside of linguistics have provided us with an answer to the question regarding the critical period hypothesis (cf. Lenneberg, 1967), at least in its most primitive form. Specifically, advances in neurology and other fields of medicine involved with brain research have offered decisive clarity on the issue of critical periods in the development of the brain for various cognitive activities such as language processing. Through MRIs, CAT scans and a host of other methods employed to study brain activity in humans, it is easy to see how trauma does in fact have long-lasting impact on cognitive functions, in predictable ways, particularly if it occurs at certain stages of development and to specific regions of the brain. Keeping in mind our discussion of the earliest stages of neurological, biological and linguistic development, let us consider the impact of brain trauma on a very young child. Boysson-Bardies, 1999, notes:

> "...whether victims of a perinatal injury to the left side of the brain or of a disease requiring surgical removal of the left hemisphere (lobotomy), [children] more completely recover the capacity to speak the earlier the accident or operation. When the lesion occurs before the age of one year, recuperation is total. In the case of later lesions, deficits are observed over the long term in certain aspects of [language] processing." (pg. 31)

While I have not attempted to come to grips completely with Lenneberg's 1967, Critical Period Hypothesis, nor consider his many detractors, I will leave this point as clear scientific evidence that the developmental period of the first twelve months of life is an important period in terms of linguistic posturing that suggests flexibility and adaptability on the part of the developing child, and that when applied to a given context, readily adapts to its surroundings. After this early stage of adaptability, as we have seen above, for loss of phoneme discrimination abilities at least, there appears to be a trend towards developing language and cognitive skills to fit the particular demands of the surrounding language community, while trimming away atrophied strategies (pathways) that are irrelevant to the community—the pruning of unnecessary cognitive links, or synapses if you will, following the adage, "out of sight, out of mind"—an overall loss of "plasticity".

On the other hand, the question of universal grammar appears even more elusive than ever. Much of what is called universal is simply what has been determined to be the most common. Commonality, alone, tells us nothing about *why*. Clearly there is a competition between at least the two somewhat counterposed forces of internal (innate) and external (imposed) universals. The view in this paper aligns itself more with the cognitive psychologist's view of the world (such as Bruner), which assumes that linguistic development is the natural product of the developing intellect of the social beast (the human), and such development follows natural extensions of the building of basic cognitive blocks, used for problem solving, face recognition, and so forth, and with these developing tools, children begin by attending to the surface constructs of the language spoken around them, and end by internalizing the appropriate principles, parameters and paradigms that make up the grammar of the language spoken in the relevant community.

To assume that the "hard-wires" contain anything of content, anything pre-designed, or pre-programmed, with a set of linguistic fundamental determinants, seems idealistic, while at the same time, such an assumption appears to discount the basic neurological and biological aspects of human development, and for all practical purposes, simply resorts to envisioning the infant's brain as little more than a "magic box", governed by an ethereal and ever elusive "ghost in the machine". By using modern day nomenclature ("hard-wiring") to label an age-old problem does little to answer any useful questions, and does much to distract us from discovering the real answers.

The real answers, I suggest, are a combination of known factors, added to insights that still remain elusive. We know that the embryonic human child at the earliest stages of life looks like just about any other animal on the planet. We know that the human program of development provides us with more raw material to work with in the brain, relative to other species, in the form of neurons and synapses, and we know that the human "incubation" (dependency) phases, both before and after birth, are quite long, allowing for the staged development of all cognitive faculties, including language. We also know that at birth, our hearing excels our ability to speak, and that our speaking apparatus progresses in a predictable way, and along this progression, certain oral outputs, licensed by the limits of both the cognitive and biological components of speech production, are expected to follow observed parameters ("universals"), though governed by community-enforced parameters. We also know that the very young child is capable of adapting to virtually any situation, but over time, this adaptability is greatly diminished. The transition from maximum flexibility/adaptability to language specificity appears to start as early as six months, and concludes as late as one year, based on the discussion above. It is at this point, however, that linguists such as Jakobson, and all those that have followed in his footsteps to Chomsky and beyond to the present time—all have primarily assumed that the first year is not worthy of investigation, in terms of "real" language development.

In this paper, I have sought to suggest that not only are the earliest stages relevant to our investigation of the development of human language, but rather, essential. In fact, by ignoring these earliest stages of human development, we lock ourselves into traditions of the past, with no relevancy to the present, such as the possibly archaic notion of "language universals" which are often little more than a way to say, "I don't know what they are" on the one hand, or "they are important because they are", on the other. In neither case does the recognition of a language universal add anything to our understanding of human behavior or language development and/or competence.

The questions we need to ask here are "*Why* do all languages have consonants and vowels?", "*Why* are stops more prevalent that fricatives?", "*Why* are single consonant onsets favored over clustered onsets?". While modern linguists continue to grapple under the entrappings of modern grammar content to merely describe *what* language is, and as phonologists endeavor to apply the latest algebraically-defined constraints to fine tune candidate generation in Optimality Theory (a theory based on "language universals"), I believe much useful energy is lost searching for answers to the wrong questions. I believe we now know enough about what language is so that we can take the investigation to the next step, and start to consider questions about why certain things are common, and others not. Clearly, in closely related fields, this work is already well in progress.

The study of child language development does not have to be as abstract as tradition dictates. Rather, it seems appropriate at this stage in the investigation, to give at least some consideration to what the other scientific disciplines have to say on these issues. By noting the clear path of biological and neurological development, described above, for the very young child, it is clear why the child first begins with labial consonants, low vowels, and canonical syllable forms of CV. This all follows from the integrated data concerning the development and control of the speech apparatus, the cognitive orchestration of physical movements in the event of speech production, and the social situation in which the event occurs.

That at the earliest stages of cognitive development all humans develop similarly in all cultures is not surprising, given our fundamental genetic make-up that we all share. The fact that all children gradually adapt to their surroundings, and learn the language of their communities is also not surprising. The fact that children manifest structures that are consistent with the common, universal structures of languages, and that languages themselves proportionately reflect the inventory of "language universals" is also not surprising, nor very interesting.

What is interesting, however, is that in fact, not all children employ the same strategies for development, some prefer certain phonemes over others, some prefer certain syllable canons over others, some prefer certain interactive strategies over others—the study of these differences, I suggest, can be at least as enlightening, if not more so, than simply studying the patterns common to most individuals, most of the time. The same can be said for languages that seem out of step with the mainstream generalizations, such as those that have a predominance of "marked" structures over "unmarked" ones. Generalizations in and of themselves are rarely insightful—they simply state what we already know. Far more useful are statements that point us in the direction of new insights and new explanations that take us a little further in our search for understanding the complexities of the human brain and the emergence of spoken language in the young child, and help us to understand the complexities of language in general.

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1 Though there is little we can do to extend these relationships any further (we cannot, for example, suggest that implication "1" precedes "2", on the basis of the present discussion, we can see that in general we have a relationship where the presence of a small group of constituents implies the presence of a larger group of "host" constituents.

2 The concept of contrastiveness only maximizes distance between possible candidates, it does not in any way suggest which of any number of possible candidates are optimal, thus cannot suggest or predict what sounds will be produced first (or last).

3 As Hume, 2004, points out there are several factors that come into play in determining the predictably of a given linguistic event (not all of which we have fully come to terms with yet), including "salience, articulatory simplicity, functional load, social factors ...and the speaker/hearer's experience with the usage of the linguistic elements, e.g. sounds, words." (pg 4) Experience is important because it is strongly correlated with expectation, which processes, organizes and records information within a context of meaning, becoming filters, in some cases, and benchmarks in others against which new information can be tested. (cf. Hume, 2004).

4 Such as the rules for creating English plurals: "Place the voiceless segment /-s/ after /p,t,k,θ,f/; place the voiced segment /-z/ after /V,b,d,g,v,ð,l,r,y,w,m,n,ŋ/ and place /-əz/ elsewhere" (cf. Wardhaugh, 1972).

5 Such as the English Morpheme Voicing Rule (-vc/→[+vc]/[+vc]&__) which is essentially a repair to the unlicensed surface structure ("what we can't do") of sequences such as *[...+vc&-vc#]—see Skaer, 1995.

6 She in fact suggested three; (1) innate, (2) imposed and (3) those resulting from dispersion. Entertaining these notions in there full form is beyond the scope of this paper. I have, for our purposes here, reduced her three to my two, assuming that dispersion was closely aligned with externally imposed phenomena.

7 Here, I am talking about Articulatory Phonology, where issues such as force, effort, momentum, ease and other factors are included in the theory of language production, a very different view than most OT-inclined linguists take. See Skaer 2003, 2002 and 2001 for related discussions.

8 The following discussion of neurological development offers a very brief and somewhat simplified overview of the findings of Anderson, et al., 2001, unless otherwise noted.

9 These differences can be traced throughout development, with the median of 50 words at twelve months, but the lowest percentiles at 10 and the highest at 150, and later at 16 months, with a mean at 150 words, the lowest understood 90 words, and the highest, 320. Similar differences were noted for children's productions; at twelve months the mean number of produced words were 12, with low and high ranges at 0 and 25, respectively, and at age 16 months, the mean was 40, with a low of 10 and a high of 180 (cf Bates, 2002).