The Role of Affect in Language Development[*]

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ABSTRACT: This paper presents the Functional/Emotional approach to language development, which explains the process leading up to the core capacities necessary for language (e.g., pattern-recognition, joint attention); shows how this process leads to the formation of internal symbols; and how it shapes and is shaped by the child's development of language. The heart of this approach is that, through a series of affective transformations, a child develops these core capacities and the capacity to form meaningful symbols. Far from being a sudden jump, the transition from pre-symbolic communication to language is enabled by the advances taking place in the child's affective gesturing.

Key words: Functional/Emotional hypothesis; affective transformations; usage-based linguistics; pattern-recognition; joint attention; learning-based interactions; nativism; autism

1. The F/E View of Language Development

Chomsky began *Cartesian Linguistics* with the following quotation from Whitehead's *Science and the Modern World:*

> A brief, and sufficiently accurate, description of the intellectual life of the European races during the succeeding two centuries and a quarter up to our own times is that they have been living upon the accumulated capital of ideas provided for them by the genius of the seventeenth century (Chomsky 1967*).*

Chomsky was certainly right: both in regards to the accuracy of Whitehead's observation, and in regards to the significance of this outlook for Chomsky's whole approach to language acquisition. But as important as this Cartesian inheritance was for the evolution of psycholinguistics, by the end of the 20th century psychologists and philosophers were struggling to transcend this legacy, to develop new techniques and concepts for studying the development of language.

In *The First Idea*, we presented the framework for such a post-Cartesian approach (Greenspan & Shanker 2004). Our functional/emotional (f/e) view of language development is characterized by the following fundamental themes:

1. It rejects the Cartesian view of language acquisition as an internal mental process and language itself as a code for transmitting one's thoughts

2. It rejects the nativist corollary that, given that this system is too complex to be acquired inductively, a child must know its most abstract principles *ab initio*

3. It insists on a *developmental* explanation of language development, both in regards to its origins and in regards to each child's mastery of language skills

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4. It rejects the *discontinuity* assumption that there is an unbridgeable gap between pre-linguistic forms of communication and language proper

5. It rejects the Cartesian modularity outlook that our faculties are autonomous and, instead, embraces the dynamic systems principle that language acquisition must be situated in the context of a complex developmental matrix

6. It rejects the Cartesian exclusion of affect from cognitive and linguistic development, seeing affect as not just involved in, but, indeed, as the chief architect in the development of the mind and language.

The heart of this f/e approach to language development is that language skills emerge from a series of affective transformations that enable an infant, first, to self-regulate and take an interest in the world; and then, through a series of additional transformations, participate in complex social problem-solving interactions; engage in joint attention; perceive subtle social and communicative patterns; 'read' other people's intentions; imitate increasingly sophisticated actions; develop a sense of 'self'; and construct symbols (*The First Idea* chapters 1 and 2). The present paper takes this argument a step further by relating this framework to recent advances in the study of language development.

The emphasis here is very much on the word *advances*, which have occurred in a number of areas, both empirical and theoretical. On the empirical front, there have been important studies on the role of pattern-recognition (Elman et al. 1996; Saffran, Aslin & Newport 1996), joint attention (Tomasello & Farrar 1986; Tomasello 1988), and 'mindreading' (Tomasello 1999) in language development. There has also been a wealth of research on the gradual and piecemeal fashion in which children master linguistic constructions (Tomasello 2003). Furthermore, striking studies have occurred in what we have described elsewhere as 'borderline' areas of language research (Shanker 2002a): e.g., the remarkable results obtained with language-encultured apes (Savage-Rumbaugh et al. 1993); or the recovery made by young children with serious language delays as a result of intensive speech language therapy (Greenspan & Wieder 1998; Tallal et al. 1996).

What these borderline areas of language research highlight is the importance of co-regulated affective interactions for the development of linguistic skills (Shanker & King 2002). Language does not suddenly appear at some pre-determined age in some pre-determined fashion but rather, emerges after the ape or child has begun to engage with his or her caregivers in such co-regulated activities as sharing, requesting, imitating, playing, naming, describing, apologizing, etc. The ape or child is increasingly motivated to use and develop these communicational tools so that he or she may achieve context-dependent, interactional goals: goals which themselves develop as a function of the ape or child's developing communicational environment and his or her growing abilities and increasingly differentiated affects. By stipulating on the basis of a formal definition of 'language' that such research *cannot* reveal anything about the processes involved in language development, the nativist denies *a priori* the possibility of learning

anything about the role of affect in the development of language: which, of course, is one of the defining features of Cartesianism.

On the theoretical front, the most important advance has been in the rise of usage-based theories, according to which language structure emerges from use and not, as nativists would argue, the other way round. Cognitive-functional linguists have made considerable inroads over the past decade in identifying the caregiver-specific and language-specific processes whereby children slowly master, first item-based, and then more abstract linguistic structures. This material is masterfully surveyed in Tomasello's *Constructing a language, A usage-based theory of language acquisition*: a book that will come to be seen as a seminal event in the overthrowal of the nativist paradigm that so dominated psycholinguistics in the 1970s and 1980s (Tomasello 2003).

The importance of this learning-based approach for a post-Cartesian paradigm cannot be stressed highly enough. In place of the nativist paradigm that insists that language acquisition must be guided by an innate universal grammar, usage-based theorists have tried to show how language development can be explained in terms of the same set of cognitive, social-cognitive, and learning processes that are used to account for other types of cultural learning. In particular, usage-based theorists have shown how language-learning builds on pattern-recognition and joint attentional skills. But these core capacities are 'downstream' abilities that occur relatively late in human development, typically between 7 and 9 months. Unless one can explain how they develop, nativists can respond that it is only the specifics and not the essence of Cartesianism that has been altered; that is, that if not a 'language gene' then it must be these core capacities that are genetically determined and that categorically separate nonlinguistic from linguistic forms of communication.

In order to develop a truly post-Cartesian account of language development, therefore, we need to understand:

1. The process leading up to these core capacities
2. How this same process leads to the formation of internal symbols
3. The manner in which this process then shapes and is shaped by the child's development of language skills.

It is precisely here where the f/e hypothesis plays a vital role in the pursuit of a complete theory of language development; for the crux of the f/e hypothesis is that the answer to these questions lies in the affective transformations that a child undergoes as a result of particular types of nurturing interactions with her caregivers. That is, the abilities for pattern-recognition, joint attention and understanding the intentions of others are a downstream result of the initial stages of affective transformation described in detail in *The First Idea*. Through affective transformations, the child develops these core capacities and the capacity to form meaningful symbols, which, together, are requisite for the transition from pre-symbolic forms of communication to language. Far from being a sudden jump, this transition is enabled by the advances taking place in the child's affective gesturing. But how does this process play out in the actual mastery of words, and then, increasingly abstract linguistic constructions? In

the remainder of this paper we will look more closely at this third of the questions posed above: viz., the question of how affective gesturing shapes and continues to be shaped by the child's development of language skills.

2. The Child's Entry into Language

Cartesianism casts the problem of the initial stages of language acquisition in terms of what, at the beginning of *Philosophical* Investigations, Wittgenstein presents as the classic 'Augustinian' problem of how a child with no language is able to infer what a word means by observing the actions and utterances of the adults around her (Wittgenstein 1953, §1; Baker & Hacker 1980). That is, the child has to map the appropriate term onto the appropriate referent that constitutes its meaning, whether this should be an object, an activity, a state, a social act, etc. The first part of the *Investigations* is designed to demonstrate the incoherence of such a picture, in order to undermine the referential theory of meaning on which this picture is based: namely, that all words function as names whose meanings a child must infer.

Nativists responded to Wittgenstein's intricate arguments on the indeterminacy of reference (further elaborated in Quine 1960) by insisting that the child must therefore have a number of 'constraints' built into her mind that enable her to identify the appropriate referent of a word. But apart from the worry that such a strategy represents "the advantages of theft over honest toil" (Russell 1919), we must be careful that we do not overlook the point of Wittgenstein's critique, which is to shift us from reifying the concept of *meaning (*e.g., thinking of the meaning of a word as the object or idea it denotes) to thinking of 'meaning' as a reflexive term that language-users employ to regulate linguistic behavior (see Taylor 1992, 1997). On this Wittgensteinian approach, the acquisition of first words is seen as the gradual mastery of a set of practical, interactional techniques whereby a child engages with those in her social environment (learns how to refer to things, express intentions, describe states-of-affairs, make promises and excuses, etc.), and acquires such reflexive skills as being able to explain what the word means, correct misuses, etc. (Shanker 2001; Shanker & Taylor 2001).

Usage-based theorists have taken this message to heart (as is reflected in the quotations from *Philosophical Investigations* that serve as epigrams at the start of several chapters in *Constructing a Language*). In usage-based theories, language is first and foremost a social activity, which, as such, can only be acquired in the context of social interactions. The key to developing this insight in a truly post-Cartesian fashion, however, is to avoid falling back on the Cartesian view of language acquisition as an inferential process (e.g., where the child's inferences would be said to be enabled by her 'mindreading' abilities and constrained by interactive experiences and the child's developing language skills rather than built-in processing biases).

The central premise of the f/e hypothesis is that it is affect that prevents this social-cognitive approach from collapsing into a mentalist thesis; for it is affective transformations that lead up to a child's ability to understand a speaker's communicative intentions and co-regulated affective gesturing that shapes this understanding. Without such a developmental perspective, there is not only a tendency to treat this capac-

ity as innate, but further, there is a danger that the ongoing role of co-regulated affect gesturing in language development will be overlooked (a point that is also reflected in novel word experiments, which require the adult to speak in heightened affective tones if the child is to attend to the use of and thus learn the meaning of the nonce word (Akhtar, Carpenter and Tomasello 1996)).

For Cartesianism, the problems involved in first word acquisition are those that have long troubled logicians (Mill 1843; Frege 1891; Russell 1904; Quine 1973): viz., how is a child able to isolate the appropriate segment from a speech stream, select the appropriate features of a referent, and map this name onto its referent – a problem that is especially perplexing when the 'referent' in question is, e.g., an activity, property, or process. Cartesianism limits us to the problematic alternatives that either there are innate biases for selecting the appropriate linguistic term and referent (Macnamara & Reyes 1994), or else it is caregiver behavior that facilitates this mental mapping (Gallway & Richards 1994). The problem with the former strategy is that such constraints function as a way of building in from the start the properties of the language code that the Cartesian view of language stipulates (Shanker 2001); while the problem with the latter is that, on the Cartesian framework, even the most die-hard of empiricists is forced in the end to concede that "Any behaviorist account of the learning process is openly and emphatically committed to innate beginnings. The behaviorist recognizes the indispensability, for any kind of learning, of prior biases and affinities" (Quine 1970).

Initial attempts to develop a non-nativist view of a child's entry into language sought to explain the order in which first words were acquired in terms of their frequency of use and their semantic complexity (Nelson 1977; Owens 1996). But while frequency and complexity are clearly critical factors, they cannot be the whole story; for it takes a child a considerable amount of time to learn some of the most frequently used words (e.g., determiners). Conversely, some of a child's first words may have a relatively low frequency in caregiver utterances, or, can be relatively complex. Thus, as usage-based theorists have pointed out, saliency must be a critical factor as well; but then, what determines the saliency of a word?

There are several cognitive and social elements involved: e.g., the ability to perceive patterns and segment speech; the fact that in many situations the structure of an interactive experience highlights the use of a word (as is reflected in novel word experiments). But as Tomasello has shown, one of the most important factors in what determines the saliency of a word for a child lies in the child's ability to engage in *joint attentional frames*, in which the child looks where her caregiver is looking and imitates her caregiver's actions (Tomasello 2003: 21ff). Typically, this ability emerges around the age of 9 months. But the very fact that this is such a relatively late phenomenon in the momentous first year of life tells us that there must have been a number of key developmental events leading up to it.

One need only look at those children that initially experience a great deal of difficulty engaging in joint attentional frames, such as children with autism, to appreciate the full significance of this point. There is now extensive evidence to show that the

more constricted a child's attentional abilities the more severe their language deficits (Mundy & Sigman 1989; Mundy, Sigman & Kasari 1990). Even more important, it has been shown that if such children receive early intervention programmes that are designed to help them go through the same affective transformations as children developing normally, they frequently develop age-matched joint attentional and language skills, and form warm affective relationships with their caregivers and peers (Greenspan & Wieder 1998; Siller & Sigman 2002). In fact, a sub-group of children diagnosed with autism that underwent such a programme and are now in middle or late adolescence have been shown to have reached levels of empathy and creative and reflective thinking formerly thought to be unobtainable by even the highest functioning of children with autistic spectrum disorder (Greenspan & Wieder 2005).

For a joint attentional frame to occur, the baby needs to have been wooed into a warm pleasurable relationship with one or a few caregivers, so that there is another human being toward whom she experiences deep emotions and, therefore, with whom she wants to communicate. She also needs opportunities to act intentionally, to express an emotion or need by making a sound, using a facial expression or making a gesture with her arm, and to have her efforts become part of a co-regulated interaction. This is precisely what we saw in our example in the first section. S. initiates the action with a vocalization and expresses his annoyance through a more emphatic version of the same vocalization with a pronounced facial expression. He and his father enter into a finely tuned, back-and-forth interaction, through their vocalizations and facial expressions, in what becomes a co-regulated solution of the problem for which S. sought his father's help.

It is only on the basis of these affective experiences that a child is able to *establish and maintain* joint attentional frames. This latter point is critical. Joint attentional frames are not a fixed cognitive event, like the moment when two fax machines get linked up. A joint attentional frame is an *ongoing communicative process* that is established and sustained by back-and-forth affective gesturing involving a number of modalities (e.g., facial expressions, hand and arm gestures, tones of voice, posture, etc.). In the context of these back-and-forth affective exchanges, the child is not simply 'reading' a caregiver's intentions and imitating her actions; she is engaged in a co-regulated activity that shapes her actions and her emotional understanding of whatever it is to which both members of the dyad are attending. These multi-modal affect gestures include, not just the expansions, extensions, recasts, repetitions, etc., that are a prominent feature of Child Directed Speech, but also, changes in facial expressions, eye gaze, tone of voice, arm movements, etc. (Fogel 1993).

It is this emotional dimension of the child's first words that is totally missing – indeed, excluded – on the Cartesian paradigm, which treats word acquisition as *purely* a cognitive (or social-cognitive) phenomenon. But in order for a child to master first words – as opposed to memorizing labels or scripts — they must be invested with emotional significance for that child. Indeed, words themselves can be seen as a more complex type of affect gesture, embedded in a more complex social-communicative practice than, e.g., declarative gestures (Agar 1994; Armstrong, Stokoe & Wilcox

1985). Such a point is perspicuous when one is dealing with a word like 'mommy' (which is why it is so frequently amongst a child's earliest words); but it is true for even the simplest of common nouns. Thus, 'apple' is not simply the name of something with a number of distinctive 'features' (round, red, has a stem): it is the word you use to ask for your favourite snack because it's sweet and juicy and makes a crunchy noise when you bite it. 'Truck' is not just the name of a rectangular metal box sitting atop four round objects; it is the toy that is so much fun to push around the floor while making the sounds 'vroom, vroom'. Without this emotional dimension, 'apple' and 'truck' would simply be markers paired with an object: which, as such, would have extremely low salience for the child. This point is familiar to all speech language therapists who work with children with severe language disorders; for the first step in any effective therapy is to find those words with which the child resonates most strongly.

It is precisely because of this emotional dimension that a model of 'text processing' that applies to computer programs has such limited bearing on how a child actually masters language skills. It was only because of the bifurcation of reason and emotion that AI scientists, whose thinking was grounded in this Cartesian framework, could assume that word-acquisition is solely a process of 'feature-detection' and name-referent mapping (Shanker 1998). Interestingly, such a model has its greatest applicability when this aspect of emotional experience is missing or derailed. In such cases a child's first words are highly mechanical, almost automaton-like. This is what we see in some children with autism. They just repeat words, or, perhaps, can be trained through intensive behavioral techniques to use a word appropriately in some circumscribed context, without any real sense of what the word means or how to use it in wider contexts.[1] If they have little affective response to something (i.e., neither positive nor negative) they have a great deal of difficulty using that word spontaneously. But if they love the sweet taste of a marshmallow or hate the sour taste of yoghurt, they can quickly master even these phonetically difficult words (or at least, near approximations). What we are learning from the study of such children goes far beyond the creation of effective therapy programmes for language disorders, however; rather, we are beginning to understand the developmental pathway that leads to the emergence of language skills.

3. Future Research

The crux of the f/e approach to early word development is that affective experience provides the critical missing piece in the cognitive and social factors that determine the salience of a word for a child. But it is not simply in regards to a child's first words

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[1] This was precisely the issue that concerned critics in their initial response to Sue Savage-Rumbaugh's research with Kanzi; it was only when she proved that Kanzi had not simply been trained on a number of lexigram-object pairings but was actually using these lexigrams in a meaningful manner, which includes the reflexive skills that are an essential element for describing a subject as 'knowing what "w" means', that critics were prepared to concede that Kanzi had indeed mastered words (see Wallman 1992, Kako 1999; Taylor & Shanker 2002).

where this affective dimension is so important. As her language learning progresses, the child acquires more and more domain-specific skills. For example, linguistic context comes to play an ever more significant role in word acquisition (i.e., situations in which the child's familiarity with other words helps her to understand the meaning of a new word). So too does *lexical contrast*, according to which a child assumes that closely-related words in the same 'semantic field' must have subtly different meanings; i.e., the child uses lexical contrast as a source of information about the meaning of a newly encountered word (Clark 1993). But affect gesturing remains a vital component of these more advanced word-learning processes.

The key to seeing the importance of this point is to remember the Wittgensteinian attack on the Cartesian reification of 'meaning'. It is not a symbol itself that picks out a particular way of viewing a phenomenon: on its own as it were, such that it causes a child to see a segment of reality in the manner "embodied" in that symbol. (Such an argument would be reminiscent of what Orwell said about 'Newspeak' in *1984*.) Rather, it is the way language-speakers *use* near synonyms (and the context in which they are used) that shape the child's understanding of these words. These language-games may have deep historical roots; but the subtle differences between closely-related words are learned anew from one generation to the next through subtle variations in affect signals, which a child learns implicitly and then in turn passes on. Just think of how, in English, we pronounce words like 'slow', 'fast'; 'dawdle', 'hurry'; 'linger', 'rush'; 'loiter', 'dash'. Try saying each word in these pairs with the opposite intonation and tempo and you quickly realize how important these affect overtones are for how we learn and use these words. The same point applies to closely-related words in the same semantic field; for example, we utter words like 'rushing', 'hurrying', 'bustling' in subtly distinctive ways that summon up, in the same sort of way as programme music, images of these different activities.[2] The critical distinction that we're making, therefore, is that it is not the comprehension of the word that leads the child to make the distinction between slow, dawdle, etc., but the affective rhythm within which the vocal tones are originally used that lead the child to comprehend the meaning of the word. (see also the contrast between the mother's vocalizations of 'gentle' versus 'hard' in example below of the 2 year-old playing with the dog on p.??)

These semantic/affective nuances, which earlier logicians referred to as a word's connotation and post-Fregean philosophers as the 'sense' of the word, are a function of those elements of speech referred to as paralinguistic and nonlinguistic cues. These affect gestures constitute an essential element in the different uses of words, and thus, in the child's 'representations' of those words. In *The First Idea* we outlined how complex reciprocal emotional interactions lead to the ability to separate perceptions from

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[2] Criminal lawyers are quite adept at exploiting these affective differences and devote considerable thought to the terms they use in their questioning. For example, just asking a witness what they thought when they saw the defendant leaving the store can produce a very different response than if the witness is asked: 'What did you think when you saw the defendant *darting* (*hurrying*, *dashing*, *tearing*) from the store', adjusting their own gestures, intonation, facial expression, etc., to highlight the images associated with each of these words.

actions (i.e., a stimulus does not trigger an automatic response). Such a developmental advance enables the child to form what have traditionally been referred to as stable 'mental representations', which can then be imbued with many emotional experiences. For example, if a child thinks of her mother she might think of playing, eating, being comforted, and so forth. In such a fashion the child's mental representation' of her mother acquires emotional "meaning" and texture. But it is not just in regards to semantics where this point is so important; it also applies to the child's mastery of grammar. For example, a child who is beginning to acquire pivot schemas has not simply memorized that 'more' is the name of a quantity-term; 'more' is another helping of something tasty, 'no more' is a dose of nasty medicine; 'big' is the slightly menacing older child who is charging around the room; 'little' is the toddler who is my size and isn't scary.[3]

In other words, the f/e approach accords closely with the basic usage-based principle that the same factors that apply to word-learning apply to more complex constructions. On this reading, a child's initial acquisitions are, as Tomasello argues, concrete and item-based (Tomasello 2003 chapters 4,5); but what makes them so concrete is precisely their affective dimension. This can be seen particularly clearly when working with a child who has not progressed beyond the level of first words. One may try to foster these preliminary grammatical skills by drilling the child over and over on some specific pivot schema, but such forms of speech-language therapy prove highly frustrating for both child and therapist alike. The problem here is that one has focused too much on the specific construction and entirely ignored the affective processes that lead up to the ability to master that construction. It is far more effective to work on these building-blocks – i.e., on the child's ability to engage in long chains of co-regulated affect gesturing – than to attempt to install a grammatical construction when these building-blocks are not yet in place.

We will shortly be publishing the results of the first in a series of studies that support this developmental hypothesis. In one study of a representative sample of typically developing infants and children, and different clinical populations ranging from Downs Syndrome to Pervasive Developmental Disorder and Autism, we observed a very strong correlation between levels of presymbolic emotional interaction and symbolic capacities. For the normative population (n= 456) r = 0.59, p<.0001; for the clinical populations correlations ranged from r = 0.51 for an At-Risk group (n = 94, p<.0001) to r = 0.7 for the PDD group (n = 64, p<.0001) to r = 0.93 for the Autism group (n = 12, p<.0001). In another study on infants and young children with autism receiving a comprehensive developmental intervention programme (Greenspan & Wieder 1998), we found that the rate of improvement in the first four levels of affective interaction strongly predicted the rate of change in symbolic functioning. The correlation between pre-symbolic and symbolic scores was 0.72, t (7) = 2.77, p = .028. Approximately, 52% of the variance of the symbolic scores was accounted for by their

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[3] The very way we say words like 'more' and 'big' versus 'small' and 'little' reinforces these associations; try, e.g., clipping the vowels of the first two and elongating the vowels in the latter.

linear relationship with the pre-symbolic scores. This strong correlation between the first four levels of f/e development and language ability meshes closely with research by Michael Siller and Marian Sigman that showed that caregivers of children with autism who were more responsive in their synchronization and continued interaction during play with their children enabled them to develop better joint attention skills and language over a period of one, ten, and sixteen years than did children of caregivers who were less emotionally responsive and interactive (Siller & Sigman 2002).

We are engaged in additional studies that are looking more closely at how the contours of affect gesturing help shape the different parts of speech that a child masters. We already know that when caregivers recast utterances that are missing some particular grammatical morpheme this helps their child acquire that morpheme (Farrar 1990). But, as we can see in the following example, long before CDS becomes a significant factor in a child's language-learning, caregivers are using subtle shifts in intonation and rhythm to highlight the salience of morphological markers that are used to indicate agent-patient relations.

> S., a 2 year-old, is playing on the floor with the dog. Suddenly the dog yelps and Mother, who is cooking at the stove, turns round in time to see S. hitting the dog with a soup strainer. She hurries over and, taking the strainer from S., kneels on the floor and in a tender voice says: 'gently sweetheart. You see, you have to stroke Mundy gently. (As she says this she gently strokes the dog.) Not hard (which she says in a harsh voice with her face tigthening). Gently (which she says in a soft lilting voice, her facial features relaxing). S. listens to her intently and moves his hand in rhythm with her hand and voice and begins to vocalize to the rhythmic contours of her vocalization. Peace restored she returns to the stove but, a few seconds later, Mundy yelps again. This time without turning round she murmurs 'gentleeeee' and S. starts to stroke the dog in the manner he'd just been shown.

What is so striking about this example is not simply that the caregiver places so much emphasis on the grammatical morpheme, but that the manner in which she does so accentuates the actual stroking action that she wants the child to perform. It is through episodes such as this, repeated countless times, that a caregiver highlights grammatical constructions long before motherese becomes a significant factor in the child's language development. Typically, when a toddler is mastering a linguistic form, the caregiver is repeating a particular affect gesture with subtle variations in many different contexts (such as when the child is playing a little too boisterously with his baby sister and mother softly utters 'gentlee').

There are two further aspects of the f/e hypothesis that shed important light on this process: one concerning the development of a child's processing abilities, and a second that concerns the socioaffective history that frames a child's mastery of linguistic constructions. Current research indicates that when children have trouble mastering grammatical morphemes, it is primarily because of their low perceptual salience and reduced communicational weight (Leonard 1998). It is now well established, however, that if begun early, traditional speech language therapy can enable up to half of such children to acquire age-matched morpho-syntactic skills (Shanker 2002b). An even higher rate of success has been obtained when, in addition to heightening the affective salience of specific linguistic constructions, the therapy is designed to enhance

the child's ability to sustain affective engagement in prolonged co-regulated interactions (Greenspan & Lewis 2002).

Rather than construing such results as an artifact produced by enhancing the child's cognitive abilities (Gopnik et al. 1997), the f/e hypothesis takes as its starting-point the importance of establishing the role of affect gesturing in such therapies (Shanker 2002). This point even applies to the recent research on the temporal aspects of auditory processing, which has shown that by presenting text at a speed that a child with a language disorder can process, her temporal processing abilities can be significantly enhanced (Tallal, et al., 1996). Too slow a presentation, however, may make pattern recognition more difficult. Research in progress on the Interactive Metronome (Shaffer et al. 2001) is revealing an optimal range below which sound patterns are very difficult to perceive. This research is also identifying differences in the degree to which individuals with different processing challenges can perceive these patterns.

The three primary causes of such challenges appear to be that a child is born over-reactive or under-reactive to sounds; has difficulty in discriminating subtle nuances in sounds; and difficulty in sequencing sounds. Before one jumps to the conclusion that all such deficits must be biological, however, it is important to note that the same processing deficits can be caused by caregiver neglect or abuse (Greenspan et al. 1987). Furthermore, there are many situations where a child's processing deficits appear to be a function of a synergistic effect between these two factors. But regardless of whether the processing deficits are constitutional, environmentally caused, or a combination of the two, it has been shown that tailoring the temporal and rhythmic dimensions of one's speech to suit a child's sensory and processing strengths and weaknesses can significantly enhance his or her ability to master linguistic constructions (Greenspan & Wieder 2002).

Such a finding reinforces the f/e hypothesis outlined in the opening section of this paper that the ability to perceive subtle linguistic patterns is part of a gradual developmental progression in which co-regulated emotional interactions serve as the instrument for more and more refined pattern recognition abilities. That is, through the continuous flow of affective interactions with her caregiver, a toddler becomes able to perceive more and more complex interactive patterns and to discriminate subtle recurrent elements within and across patterns. Thus, the ability to perform the types of linguistic analysis that played such a prominent role in generativist thinking, such as distributional analysis, are not innate but are part of a developmental progression that proceeds from the child's earliest affective interactions with her caregivers. Furthermore, such 'distributional analysis' is enabled by affective patterns that are used to mark constructions (e.g., a falling tone and diminuendo for '-ly', a falling tone and glottal stop for '-ed', and so on).

This developmental perspective on the pathways leading up to more complex pattern-recognition abilities sheds important light on the fundamental usage-based principle that "constructions are nothing more or less than patterns of usage" (Tomasello 2003: 100). Extensive research on caregiver utterances is starting to reveal some unexpectedly robust patterns in caregiver speech. Also highly important here is the body of

work that has been done on the familiar routines that Bruner referred to as 'formats' (Bruner 1983). The formats that Bruner describes, in which a caregiver and child engage together in a familiar activity, such as "peek-a-boo," getting dressed, bathing, or playing with toys, are a means of entering language and culture simultaneously; indeed, the two cannot be meaningfully separated. They are simple game-like microcosmic versions of the everyday means by which competent members of a culture cooperate in integrating their vocalizations and actions for the purpose of achieving some shared goal. But while some formats may have a particular purpose, such as bathing or dressing, many are performed simply to amuse a child, or to occupy her, or just for the fun of it. As Bruner pointed out, formats serve as the nursery for language/cultural development. They are crucially adaptable to the child's developing skills; indeed, this adaptability is exploited by the caregiver as she encourages the child, step-by-step, to try more sophisticated communicational means of participating in their interactions.

Because the affective dimension of these formats has hitherto been overlooked, there has been a strong tendency to construe them as facilitative devices that enable a child to infer the grammatical properties of language or the reference/use of a term (where 'collections of rules' takes the role played by objects and ideas in earlier referential theories of meaning). Far more illuminating is to view formats in terms of the notion of 'communicative musicality' (Thomson 2004; Dissanayake 1995). That is, through the sorts of temporal, rhythmic, and tonal elements that we refer to in *The First Idea* as affect signals, caregivers gradually facilitate the child's active participation in co-regulated 'musical interactions'. It is through such interactions that the child gradually makes the transition from concrete routines to more abstract syntactic constructions. In the dog-patting example above, the caregiver does several things to calm down a child who is being a little boisterous, while murmuring 'gently'. With time the word 'gently' starts to take over for the original behavioural routine (similar to the way in which, e.g., in *The Ring,* Wagner is able to recall a motif with just a few notes). Thus, the child becomes increasingly able to generalize from the original socioaffective context into an infinite number of other possible contexts in which the construction is embedded. What continues in this gradual process of linguistic abstraction is the continuance of the affective experience that originally gave rise to the grammatical form in question.

Such an argument provides an interesting twist on the original Fregean Context Principle. In place of the compositional interpretation of this principle (viz., as stipulating that the semantic value of a word consists in the contribution that it makes to the overall semantic value of an utterance), we have the f/e principle that a child's mastery of a word or construction has a developmental history: i.e., a word or construction has meaning only in the context of a formative socioaffective pattern. Herein lies a further reason why language therapies that ignore the role of affect are so difficult to implement; for in simply trying to drill a child on the use of a construction, one is bypassing the critical affective history that plays such an important role in shaping a child's mastery of a linguistic construction.

To be sure, we are still in the very early stages of the transition to a post-Cartesian framework. But already one can see the great importance of the shift to a paradigm that:

(a) insists on a *developmental* explanation of language development, and

(b) sees affect as providing the central thrust in this developmental trajectory.

Rather than continuing to live off the accumulated capital of 17th century ideas, we are striking out in new, non-mechanistic directions. The exciting potential of this post-Cartesian framework has already been demonstrated in borderline areas of language research, where we can observe in close detail how affective interactions promote the development of the core capacities that underlie language. The next step in the formulation of a complete theory of language development is to understand how these core capacities continue to shape and be shaped by a child's ongoing linguistic development.

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