



## Language Evolution : What Evolved ?

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The study of linguistics is at an interesting juncture. The Chomskian claims about the Language Acquisition Device and Universal Grammar are essentially neurobiological claims and evolutionary biological claims. However, until recently our evolutionary and neurobiological knowledge was insufficient to directly address these areas. Now with what we know about the brain and with what we know about the processes involved in evolution, exploration of the biological foundations of language is much more feasible.

The study of the evolution of language was virtually silenced when it was banned by the Paris Linguistic Society at the end of the 19<sup>th</sup> century. However, the International Conferences on the Evolution of Language, held every two years since the first one in Edinburgh in 1996, have made a huge difference. Most of this recent research has focused on the sentence as the linguistic unit that must be explained in an evolutionary account of language. But is the sentence or the ability to produce, comprehend, and learn sentences really what evolved ?

On November 12-14, 2004 a Roundtable funded by the journal *Language Learning*, was held at UCLA to discuss the appropriate data on which to base evolutionary and neurobiological accounts of language. This report from the Roundtable consists of two parts. The first is a summary of each paper presented, and second is prospective developed by the convener, John H. Schumann, that suggests a possible position/synthesis on the issue of « What evolved ». All the presenters in various ways may agree and disagree with aspects of this position, but they all agreed that one « possible » synthesis was preferable to a disputable pseudo-consensus resulting from line-item approval by each participant.

As mentioned above, the overall question addressed by the roundtable was « What evolved ? » This question is important to ensure that the targets of evolutionary and neurobiological accounts of language are the appropriate ones. Just as we would not want to base an account of rudimentary human motor activity on the physiology of how an Olympic ice skater does a triple Lutz, we would not want to base a biological account of the origins of language on the kinds of forms that are used under the relaxed psycholinguistic conditions made available by reading and writing. What we want to know is what the brain had to be like for language to emerge and what that initial language may have looked like.

To address the overall question, individual presentations were organized around three more basic questions :

1. How did language evolve ?
  - Lee : *What biological developments are likely to have made language possible ?*
2. What exactly evolved ?
  - Favareau : *What semiotic relations would have to have already been in place in order to make the emergence of human language possible ?*
  - Schumann : *How do oral linguistic signs become reliably indexicalized ?*
  - Goodwin : *How autonomous is language from other semiotic systems ?*
  - Wray : *How could a pre-modern protolanguage be viable ?*

3. How does modern language reflect what evolved ?

- Tao : *How much of what we see in modern language is really as old as language ?*
- Véronique : *What clues to language evolution can we gain from Creoles and second language acquisition ?*
- Mikesell : *How complete are complete sentences ?*

## 1. The Presentations

### 1.1. How does Modern Language Reflect What Evolved ? How much of what we see in modern language is really as old as language ?

« *A Corpus-Based Analysis of Gapping Constructions in English and Its Implications for Understanding Language Evolution* »

Hongyin Tao (in collaboration with Charles F. Meyer of the University of Massachusetts in Boston) reported at the Roundtable on the implications of Gapping constructions (Ross, 1967-1986) for understanding the evolution of language. They estimate that there have been more than 160 books, papers published on this phenomenon, and the topic is featured in almost all textbooks on formal syntax. Typical Gapping structures discussed in the literature are of the following type : *I ordered a drink and my friend [ ] an appetizer*. Gapping has been analyzed for verbs, verbs and objects, adverbs, modals, auxiliaries, and determiners.

Since nearly all studies of Gapping have been done on created sentences that were analyzed according to acceptability judgments, Tao and Meyer wanted to examine Gapping in natural discourse. Therefore, they chose as their database the British component of the International Corpus of English (ICE-GB), consisting of one million words (600 000 spoken and 400 000 and written), or 500 two-thousand word samples from genres such as spontaneous conversation, newspapers, fiction etc. The researchers found that among 17 629 examples of local coordination in the corpus, only 120 tokens (or less than 0,7 %) contained gapped structures. This means that while there have been more than 160 published studies of this construction, only 120 tokens of it can be found in the million word ICE-GB corpus.

The authors conclude that in natural discourse, Gapping is an extremely rare syntactic phenomenon. In the ICE-GB corpus Gapping constructions had the following distribution (per thousand words) :

1. Dialogues of any kind (0/360 K = 0),
2. Spontaneous monologue (8/100K = 0,08),
3. Planned monologue (13/120 K = 0,11),
4. Speech-inclined written genres (14/70 K = 0,20),
5. Prototypical written genres (85/330K = 0,26).

This analysis indicates that Gapping is not an oral discursal phenomenon, and therefore, it is unlikely to have been part of what evolved in language evolution. Instead, it appears to be a product of writing, especially journalistic writing, that may have had some minimal influence on dialogic spoken language.

Tannen (1987) and Meyer (1995) both have convincingly demonstrated that discourse favors repetition to mediate its transitory nature and to promote engagement and resonance between speakers. This feature of discourse seems very likely to explain the rarity of Gapping in speech. Additionally, Gapping may be more cognitively demanding because it may increase the amount of new information in a clause. For example, in a sentence such as *I want to try to begin to write a novel, and Mary a play* both « Mary » and « a play » could be two pieces of new information. These cognitive demands are more easily accommodated in written language where revision (in writing) and repetition (in reading) allow remediation of a cognitive failure in either production or comprehension.

The authors conclude that Gapping is a feature of composed language, and is most typical of written genres. It is dispreferred in spoken discourse where it is found only in highly planned oral monologues. With respect to developing evolutionary and oral biological accounts of language, Gapping structures and similar linguistic phenomena are not appropriate candidates for explication. If language evolved 50,000 years ago and writing appeared 5 000 years ago, fully fledged

language would have existed for 45,000 years without structures like English Gapping sentences. Additionally, since Gapping seems to be only part of written language and since written genres are only acquired through instruction, then Gapping constructions are examples of what the brain can do if it is sent school, and they are not an example of what the brain evolved to do in the environment of our evolutionary adaptation. Gapping structures may be typical of many of the forms with which linguistics has concerned itself. In developing biological accounts of language, therefore, it may be wise to check large language corpora to determine whether a particular structure is likely to have appeared prior to the cultural innovation of writing.

## **1.2. How did Language Evolve ? What Biological Developments are Likely to have made Language Possible ?**

« *Biological Substrates that Contributed to Language Emergence* »

Lee and Schumann (2003, see also below) suggest that contrary to Chomsky, humans have no specific genetically based and neurally instantiated representation for grammar (i.e., no UG). Nevertheless, in order for language to evolve, substantial physiological, including neurobiological, preparation may have been necessary.

*Namhee Lee*, at this Roundtable, outlined these biological underpinnings. Agreeing with Ajaapa (2001), he suggested that for any number of reasons, language, as it is known today, would not have evolved without a vertical vocal tract made possible by bipedalism. In addition, there are some researchers (e.g., Corballis, 2002) who maintain a gesture-origin theory of language evolution. According to this theory, arms that were liberated by bipedalism became available for communication via gesture. Additionally, Lee suggested that a change in cranial base flexion allowing the head to remain upright may have paved the way for a lowered larynx which is essential for speech.

In typical mammals, including primates, Neanderthals, and human babies up to one year old, the larynx is located high in the epiglottis almost reaching the soft palate. Therefore, the pharynx is short allowing only limited vocal sounds to be produced (e.g. [a, i, u] are not possible). In human adults, the lowered larynx increased control over the expiration phase of respiration and thus allowed the production of longer vocalizations and a greater range vowel and consonant sounds. The completion of the descent of the larynx occurred about 150 to 100 thousand years ago (Lieberman, 2000). There have been arguments that modern humans and Neanderthals have the same vocal apparatus based on the discovery in the Kebara 2 Neanderthal of the hyoid bone, which is similar to that of modern humans (Johanson & Edgar, 1996). However, the hyoid bone is not connected to any other bone and floats freely ; therefore, although the hyoid bone in the Neanderthal is similar to that in modern humans, its location may be different in the two species.

MacNeilage and Davis (2001) argue that another biological substrate that may have contributed to the appearance of language is mandibular oscillation. Mandibular oscillation originally served the function of digestion (chewing, sucking, licking). Later the process was exapted by higher terrestrial primates for the purpose of facio-visual vocal communication (lip smacks, tongue smacks, teeth chatters). The oscillation cycle of mandibles paired with regular phonation may have become the basis for syllable formation in hominids (consonants with closed mandible and vowels with open mandible).

Kay, Cartmill, and Balow (1998) suggest that the expansion of the hypoglossal nerve canal may be associated with human language. The hypoglossal nerve is used to control tongue movement, and this control provides better articulation. The hypoglossal nerve canal in modern *Homo sapiens* is 1, 85 times that of common chips, 2, 44 times that of pygmy chips, and 1, 8 times that of gorillas. The canal in *Australopithecus africanus* and *Homo habilis* is about the same size as that of apes. The researchers have found hypoglossal canals that are similar to those of modern *Homo sapiens* in two middle Pleistocene hominids (300 000 years old), in two Neanderthals, and one early *Homo sapiens*.

Brain size or encephalization may also have had an effect on language. There is a positive correlation between brain size, behavioral innovation and social learning capacities in which a larger brain is thought to support better learning (Reader & Laland, 2002). Four million years ago, hominid brains were about 400 cc ; by 2 million years ago brain size had increased to 500-

800 cm<sup>3</sup> The hominids living 1, 5 million years ago had a brain size of 752-1 250 cc. By 600 000 years ago encephalization in hominids had increased to 1 500 cc (Lieberman, 2000). The brain size of animals generally correlates with their body mass ; primates brains are about 3 times larger than non-primates having the same body weight. Human brains are three times larger than the brains of chimps (Allman, 1999).

Lee proposes that there may have been a change in humans' cortico-basal ganglionic loops which may have facilitated procedural learning. Patients with Parkinson's disease and Huntington's disease both have basal ganglia damage and consequent linguistic deficits (Ullman, 2001). Lesions in the basal ganglia lead to aphasia characterized by agrammatism (Fabbro, 1999). Individuals with a particular mutation in the Fox P2 gene have basal ganglia with an underdeveloped caudate nucleus and also have language difficulties (Lai & al., 2001 ; Vargha-Khadem & al., 1998). Finally, adults language learners have difficulty with procedural aspects second language acquisition, and Lee speculates that the deficit results from interference from other motor programs implemented in the basal ganglia or from competition with the cortico-hippocampal system involved in declarative memory (Poldrack & Packard, 2003).

Lee also indicates several psychological phenomena related to language that may have biological underpinnings that supported language evolution. The first is the ability to make symbolic reference (discussed below by Favareau and by Schumann). The ability to use signs to refer to other signs (a hallmark of language) may have involved some biological change. Tomasello (2003) suggests that abilities for joint attention, imitation, intention reading, and pattern finding are all crucial to language acquisition and use. The biological substrates for these processes would also constitute part of the biological basis for language. Greenspan and Shanker (2004) suggest that human infants developed special abilities for (1) perception of stimuli with inhibitory control over action with respect to those stimuli, (2) nuanced facial expressions, 3) and extended attention to and interaction with caregivers' emotional expressions. They argue that these abilities are important for language acquisition and, therefore, would have been important for language evolution. Although Greenspan and Shanker regard the attention and interaction abilities as epigenetic and, therefore, learned ; it is also possible that the tendency to attend and to interact with conspecifics may have also involved biological changes leading to an « interactional instinct » rather than a specifically « language [grammar] instinct » as proposed by Pinker (1994).

Seen from this perspective, there is no specific biological substrate for language. Instead, language relies on the complex interaction of numerous physiological substrates and neurobiological regions, systems, and processes all of which support language behavior without representing specific aspects of language such as grammar. This point will be elaborated below the discussion of language as a complex adaptive system.

### **1.3. What Exactly Evolved ? Does the search to discover the origins of human language start by searching for the earliest instances of what we can already recognize as human language activity - or is this already a « too late » starting point for understanding language as part of an evolutionary continuum ?**

« *The Evolving Cultures of Nature* »

Donald Favareau's roundtable presentation expounded the notion that human language was not the birth of publicly shared semiotic systems, but rather, was itself birthed by the pre-existence of such publicly shared semiotic systems, which are ubiquitous throughout the natural world. Favareau's presentation briefly sketched out both the continuities and discontinuities between human language and its predecessor non-human counterpart systems in the experiential worlds of animals, fish, insects, protists and plants.

Inspired largely by the work of Terrence Deacon (1997, 2001) and by work done in the newly emerging interdisciplinary of *biosemiotics* (which is the study of sign processes as they appear variously across the biological spectrum), Favareau noted that - at a time when strictly materialist reductionist explanations of life and its evolution have become increasingly incompatible with what biologists are now conceding is the complex, adaptive and non-linear nature of organization and interaction in the natural world - the conceptual work now taking place under the aegis of the *biosemiotics* (e.g., Barbieri, 2001 ; Deely, 2001 ; Emmeche, 1999, 2000 ; Favareau, 2001, 2002 ;

Hoffmeyer, 1996, 2000 ; Kull, 1998 ; Markos, 2002, Sebeok, 1990, 2001 ; Taborsky, 2001 ; Turovski, 2000) may help us better understand the principles whereby not only our social world and its linguistic systems, but also the very biological world with its species-specific semiotic systems came into being not as a « given » in the furniture of the universe, but as a locally organized, massively co-constructed, context-creating and context-sustaining interactional *achievement* in that universe instead.

Informed primarily by philosopher Charles Sanders Peirce's (1839-1914) semiotic logic of relations, animal ethologist Jakob von Uexküll's (1864-1944) constructivist biology of perception, and physicist and chemist Ilya Prigogine's (1917-2003) explication of self-organizing systems as decentralized accomplishments, the interdisciplinary project of biosemiotics is grounded in the conviction that the living organism, too, must be understood not only in its material organization, but also in the organization of its interactions (both internal and external). Biosemiotics holds that these two *sets* of organizing relations are, in fact, interdependently bicausal, and that *sign relations* (understood in the broadest sense, as below) mediate such activity as gives rise to behavior in the world.

Favareau then went on to briefly describe how *sign processes* permeate the relations of living things. On the most obvious level, he noted, we see sign processes underlying human spoken language and written texts ; primate, canine and reptilian display behavior ; birdsong ; pheromone trails ; and the deceptive scents, textures, movements and coloration of a wide variety of symbiotically interacting insects, animals and plants. Less obviously, perhaps, there are the chemotaxic signs by which single celled animals negotiate the world and upon which the human body's immune system operates ; the chemical and electrical events that constitute the signals and messages of the brain and central nervous system ; and the nucleotide sequences that, when read by cellular mechanisms, give rise to life from the genetic code. All of these phenomena are examples of true sign processes - i.e., substitution relations whereby something is « represented » to an organism by something other than itself - and yet each of these instantiations differ from each other in a number of fundamentally important ways.

Until recently, however, no one discipline has attempted to provide a synthetic explanation of how the cultural processes of sign use and the biological processes of sign use do and do not relate. Biosemiotics employs the semiotic logic of relations developed by philosopher and scientist Charles S. Peirce in order to distinguish the various orders of sign processes ubiquitous to the world of living beings. An architectonic well beyond the scope of this presentation (and this paper), the relevant Peircean categories discussed with reference to the roundtable on language evolution were the fundamental triadic relationship of *sign-object-interpretant* which alone makes sign use possible, and the nested hierarchy of sign types *icon-index-symbol* which, as Deacon (1997) has very thoroughly and convincingly argued, both underlies the ability of human language use as well as establishes its continuity (and singular point of discontinuity) with the sign processes of the rest of the animal kingdom.

A *sign*, for Peirce, is « something which stands to somebody for something... [and] not in all respects, but [only] in reference to... [its] ground » (p. 2228). Simplifying considerably : Peirce's definition reveals that : (1) there are no such independently existing things as « signs » *per se* - instead, there are only independently existing things that are used *as* signs by the agents that act upon them as such. (2) Such triadic action (the taking of thing *x* to « stand for » *y* by agent *z*) *alone* brings the « sign relation » into being, and that (3) such action « consists in a living agent (« somebody ») in each and every instance of sign-use *actively* joining the sign vehicle (that thing *x* in the world which it will use as a sign for *y*) to its *object* (not *y* itself, but only those aspects of *y* relevant to the experiential world of agent *z* [cf. Peirce, p. 2229, p. 5401]) so as to result in an effective *interpretant* - or « proper significate effect » (p. 5475) through which agent comes to feel, act upon and ultimately reason about the world.

This nested hierarchy of *feeling* (perceiving) the world through signs, *acting upon* the world through signs and *reasoning about* the world through signs Peirce characterized as relations of *firstness*, *secondness* and *thirdness*, respectively - with the characteristic sign types corresponding to these hierarchical categories being *icons*, *indexes*, and *symbols*. Simplifying greatly (again) : to the extent that a sign « partakes in the *character* of its object, » it is an *icon* ; to the

extent that a sign is « really and in its individual existence *connected* with its individual object, » it is an *index* ; and to the extent that a sign « will be interpreted as denoting the object, in consequence of a *habit*, » convention or law, it is a *symbol* - for the agent to whom the object *is being used as* a sign of something else at all (p. 4531).

Given this understanding of « sign relations » as primarily *not* something psychological, linguistic or even human-specific but rather, as simply those relations that any living organism may stand in towards the objects in its world, biosemiotics makes relevant for our understanding of language evolution Peirce's observation that a sign is « something which stands to somebody for something... [and] not in all respects, but [only] in reference to... [its] ground » (p. 2228) through defining that « ground » in terms of animal ethologist Jakob von Uexküll's (1864-1944) constructivist notions of species-specific perception-action cycles (*Funktionkreis*) and the subjective experiential worlds (*Umwelten*) that such perception-action cycles give rise to in animals over evolutionary time and that, in turn, drive action initiation in ontogenetic time.

Noting that the world inhabited jointly by all species is perceived radically differently by each (e.g., as a world of pure sonar, smell, tactile stimulation, chemotaxis or ultraviolet radiation - or as a world of visual and aural experience wherein the ultrasonic and UV reality perceptible to one's neighboring creatures fails to show up as « reality » at all), von Uexküll's most famous example of a highly limited but perfectly species-preserving *funktionkreis* - and - *umwelt* dynamic is that of the tick.

The tick, noted von Uexküll (1934) lives in a perceptual world consisting only and entirely of butyric acid, tactile pressure and heat - and an tightly conjoint action-response schema towards the subjective experience of each of these three phenomena alone. Thus, the tick hangs deaf, blind and motionless on its branch until the presence of butyric acid (a component of animal sweat) appears in its world of subjective experience, at which point it releases its grip on the branch. Falling on to the source of the butyric acid - i.e., the body of the warm-blooded animal that was passing below the deaf and sightless tick - tactile contact in the upright position initiates running activity in the search for heat (skin). Upon registering the presence of heat, the tick begins burrowing into the animal's skin to feed (1934, pp. 10-12).

Given that the tick has no visual or aural apparatus, and gives no evidence of having even the ability of detecting anything other than the three specific aspects of the world above, it would make no sense to say that the tick « knows » that the blood it feasts on is carried by such unfathomable phenomena as horses, cows and pigs, and that it is the sweat of these animals that carries the butyric acid that alone sets the tick's « function cycle » in action, feeding it and allowing it to survive. And yet : there *are* such things as horses, cows and pigs actually existing in the world and it *is* the sweat of these animals that carries the butyric acid that alone sets the tick's « function cycle » in action, feeding it and allowing it to survive.

What this reveals to us about *sign-processes* thus is crucial : Sign processes are not, foundationally and in their *firstness*, linguaform codes corresponding to psychological conceptual categories - but are rather, just as we have described them above, « substitution relations whereby something is « represented » to an organism by something other than itself » (cf. Favareau, 2000, 2004).

In Peircean terms, the tick's *Umwelt* or experiential world « carves » out of the plenum of possible perceptual experience just the three perceptual phenomena made available to it by its evolutionary heritage (i.e., the heritage of its species' perception-action cycle success over time). Brute, immediate perception or registration of these phenomena in whatever way they are experienced (i.e., not as « butyric acid » but simply as *that* feeling or registration as opposed to *not* that feeling or as opposed to some *other* feeling) constitute the *icons* of that sign relation for the tick - the feeling or immediate registration of butyric acid, tactile pressure or temperature detection, however those things may be experienced by the tick.

What is *not* critical for the survival of the tick is for the tick to have internal « labels » for these percepts *nor* for the tick to have the psychological understanding that these percepts operate as the *indexical signs* for the objects that they represent (i.e., co-present animals, those animals' flesh and the blood meal underneath that flesh, respectively). What *is* critical is that the tick *act upon* the butyric acid, tactile sensations, and temperature changes as the *signs* for animal presence, covering

flesh and underlying blood meal. And it is the evolution of its species perception-action cycle that guarantees the veridical conjoining of these agentive actions, objects and signs.

Biosemiotics argues that what is true of the tick is true of all other living organisms, all of whom have to somehow come to « know » the world and to act in it successfully using only those signs made available to it by way of the perceptual apparatus with which it has become evolutionarily endowed (cf. Sebeok, 1977). Primitive sea creatures, as Llinas (2001) has pointed out, could survive using only the most grossly discriminating photoreceptive patches to distinguish extremes of dark and light. Yet armed with these just these two iconic distinctions, these animals could successfully exploit the corollary *indexical* relations that were « really and in their individual existence *connected* » with these icons. Food - but also increased exposure and its attendant dangers - were both physically (and thus indexically) connected with the ocean surface represented to the animal through the photoreception of its iconic light. Shelter and relative safety from predators - but also radically diminished feeding opportunities - were both physically (and thus indexically) connected with the ocean bottom represented by its iconic dark. And here again we see that what constitute successful *sign* relations in the first instance does not have as its fundament human minds or language-mediated thinking, speaking, or writing practices - but, rather, the triadic joining of objects by the agents of the world through substitution relations grounded and vetted in successful action, or *use*.

As evolution endows animals of increasing complexity with correspondingly fine-grained perceptual apparatuses, such apparatuses, in turn, allow the animal to engage in more complex and fine-grained interactions with the world - a world not only of objects, but of other agents also. Yet before we see the kind of classic « animal communication behavior » of mating calls, dominance displays, territory marking or even pheromone trailmaking, sign use for survival crosses not only individual, but also species, *umwelten* in the mindless, brainless morphology of animal camouflage and in the multisensory mimicry of plants. In both these latter cases, successful survival for organism A is predicated on its exploitation of the icons and the indexes integral to sign processes employed for survival by organism B.

An elegant example of this is the morphology of a thermogenic Mediterranean lily called *Helicodiceros muscivorus* or, more commonly, the Dead Horse Arum (Angioy & al., 2003). Found on gull colonies where rotting bird corpses and their attendant carrion blowflies are abundant, these gruesome smelling arums precisely mimic the smell, sight, texture and even temperature of a rotting corpse in order to attract the blowflies into its prison-like chambers, deposit its pollen on them, and then finally release them to carry its seed and thus reproduce (Kite, 2000 ; Stensmyr & al., 2002).

Examples of such fine-grained mimicry abound in nature, but what is most relevant to our present discussion is the acknowledgement that the Dead Horse Arum cannot in any psychological or conceptual way « know » what a rotting gull corpse looks like, smells like, feels like, or what its body temperature is upon recent expiration - an important « sign » that the arum uses in exploiting the carrion fly (Angioy & al., 2003). Nor can it subjectively experience, « see » or in any self-reflectively cognitive sense, « know » even of the existence of the carrion flies - much less « understand » their role in the process of disseminating pollen. Yet because (non-psychological, non-conceptual) *sign relations* are integral to the blowflies' successful negotiation of the world - the success of the plant's survival is predicated not on its (non-existent) endosemiotic « psychology »--- but on the exosemiotic action in the world that results as its evolved biology interacts with the subjective sign experience of the fly.

Favareau then went on to argue for the ubiquity of sign processes in nature using a variety of examples of semiotically interacting animals, fish, insects and plants. He maintained, with Hoffmeyer (1996), Stjernfelt (2002) and Kull (2000) that all organisms are born into an unlabeled world of things and must use some of those things in the world as signs by which to know how to live and to survive in that world. Knowledge is built from signs, claims Favareau, and communication is a way that agents use signs to build knowledge together.

For by carving up the unlabeled world of time and space into iconic relations and in setting up indexical relations across entities, organisms begin effecting the material world causally based on the immaterial mediating relationship of using things as signs. Indexes can be chained to other

indexes so as to result in incredibly complex long chains of purposively adaptive behavior - and internal states such as hunger and exhaustion come to manifest in the organism's phenomenology as icons which can be brought into indexical relations with other icons.

Such acts of semiotic mediation take place recursively not just at the locus of the individual, however, but perhaps most generatively on the level of aggregate, interacting agents. There, such relations can themselves be embedded in even high-order systems of substitution relations - and the history of human culture, it has been argued (Deacon, 1997 ; Deely, 2001 ; Donald, 1991 ; Tomasello, 1999) consists in just this recursive representative strategy wherein « each subsequent representation in the semiotic chain represents the prior object-sign relation, *taken itself* as a higher-level semiotic object » (Parmentier, 1996, p. 5).

Deacon's (1997) discussion of the *culture* of symbolic reference underlying human language use makes it clear that the primary phenomenon to be accounted for in an evolutionary account of language is not so much the faculty of a human brain or the linguistic facility of a species (much less of an individual), but rather, the development of a multiply-embedded semiotic way-of-being in the world. Characterized by a Peircean notion of *thirdness*, this way of being is predicated on a network of sign relations that are being held for use in perpetuity *outside* the agent - i.e., in a public domain of interactively-constituted sign-exchange whereby meanings can be created, negotiated and co-operatively sustained. *Participation* in this system alone enacts and enables « meaning, » claims Favareau - both here and in the animal world - and in this sense, it is the natural history of agents and their actions in the world that is the proper starting point for undertaking a natural history of signs - only one of whose multitudinously various end-products is human language.

#### **1.4. What Exactly Evolved ? How could Premodern Language be Viable ?**

« *Units of Meaning at the Dawn of Language* »

*Alison Wray* addressed the topic of « What evolved ? » from the point of view of the role that pragmatics plays in making good shortcomings in different types of communication. In most kinds of animal communication there appears to be an absence of specificity in calls : a food signal almost never includes referential information about what or where the food is (the bee dance is an exception), nor does a warning signal normally specify the nature of the threat (except possibly in vervet and Campbell's monkeys). In short, the onus is on the receivers to make good the missing information, so as to understand how the call relates to them. This is achieved by applying knowledge of the world, past experience and immediate contextual information. Without such interpretative augmentation, the value of the message is much reduced. Although natural selection would be expected to settle on a reasonable balance between the burden on sender and receiver, the holistic nature of animal calls is a substantial constraint on the sender's potential to be explicit.

Humans also use pragmatics to handle absence of specificity in formulaic utterances (Wray 2002a). If we hear « look out ! » we cannot take appropriate evasive action until we have ascertained the nature of the hazard. When we encounter input like 'Could you put the whatd'yamcallit onto the what's it' we similarly use context and pragmatics to complete comprehension. Humans also use pragmatics for a different kind of message completion. If we read *Dock monk bolts* we will use our contextual knowledge to extrapolate a meaningful relationship between the words. If it is a newspaper headline we might understand that a monk undergoing a legal trial has absconded, whereas in a technical machine assembly manual the same words might constitute an instruction.

Do animals also have the capacity to use pragmatics to disambiguate relationships between referents ? If the predator calls of monkeys are translated as names, then we might infer that the « Eagle » call requires the hearer to work out why the eagle has been named. However, this denies the functionality of the call, as a warning/instruction, e.g. « behave in a way consistent with my having seen an eagle ». Only if the item really is a « name » can there be ambiguity as to why it might be being uttered. Kaminski, Call & Fischer (2004) have shown that dogs are capable not only of associating names with objects but also an unfamiliar name with an unnamed object. Again, however, dogs associate the name with a command to fetch the named object, so there is no opportunity for pragmatics to play a role in disambiguating the purpose of the naming event. Rather, the « name » entails the instruction to find and fetch that item.



Bonobos in captivity (e.g. Savage-Rumbaugh, Shanker & Taylor, 1998) have shown a remarkable ability to understand spoken English, but very little ability to produce more than single words or agrammatical pairs. It could be that their comprehension relies heavily on pragmatics to infer likely relationships between referents. If so, bonobos, like humans, have the capability to use pragmatics both to make good reference in a known manipulative message (in the wild) and to make good the relationship between referents when these are given (when comprehending English). If bonobos can do both, then we can reasonably infer that our ancestors could. In both cases, the latter role for pragmatics would have to remain latent until naming began. Thus, the emergence of naming is key to releasing pragmatics into the new role.

Of three published models of human protolanguage, two already have naming, and one does not. Bickerton's (1998) scenario gives concatenations like « run mammoth » and « man stone ». These require pragmatics to disambiguate the relationship between the referents, since there is no word order and the arguments of protoverbs are not compulsory. Meanwhile, such a protolanguage, being based on referential items, appears to relieve pragmatics of its more ancient role in disambiguating reference, though, since we have it today, it could not have disappeared.

Wray's (1998, 2000, 2002b) protolanguage has no independent words for things or actions, only holistically expressed complete messages. Wray proposes different holistic forms for « give this to him », « give this to her », « give that to her », etc. but less semantic differentiation is also possible. Forms meaning « give something to someone » ; « stay away from someone/thing », etc. would effectively be equivalent to verb frames. Without the pronouns of Bickerton's scenario, however, pragmatics would remain necessary to provide information about the actor, patient, etc. Wray's scenario is more « primitive » than Bickerton's, and fits more seamlessly with a progression from a single use of pragmatics to the modern dual use.

Jackendoff's (2002, p. 246ff) protolanguage has naming and a protogrammar in which linear position signals semantic relations : Agent First, Focus Last. Naming and grammar between them provide both types of disambiguation, reducing the role of pragmatics to its modern level.

It seems reasonable to propose that the capacity to use pragmatics to disambiguate relationships between named entities and actions is part of 'what evolved'. If it is a latent ability in bonobos, its emergence may not need independent explanation, being contingent on the emergence of naming. Wray excludes naming from protolanguage, and has argued that referential underspecification would constitute a steady state inhibiting innovation. In contrast, it might be conjectured that in Bickerton's and Jackendoff's models, the introduction of pragmatics to disambiguate the relationships between named objects and actions would pressure the communication system into developing more explicitness about these relationships, rendering the protolanguage transient. Whether Jackendoff's scenario supplies sufficient explicitness to create a steady state is difficult to judge. Absent in his protolanguage are phrase structure, embedding, and the constraints contingent on embedding : traces, subjacency, etc. However, structural embedding is not universally attested in unwritten languages (see Wray & Grace forthcoming for a full account). If Jackendoff is right, then naming and order came early, and phrase structure later. In contrast, Wray's account builds up semantically complex messages to bursting point, so that when naming finally emerges, grammar immediately follows, as forms maps onto existing semantic representations. Wray's position makes it clear that an evolutionary account of language must consider holistic language and not simply analyzed units composed into sentences. Therefore, we must know how the brain chunks linguistic input.

### **1.5. How does Modern Language Reflect what Evolved ? What Clues to Language Evolution can we Gain from Creoles and SLA ?**

« *Second Language Acquisition and Creolization : A Small Window on Language Evolution* »

Daniel Véronique addressed the relevance of second language acquisition and creolization for the issue of « what evolved ? » He noted the characteristics of protolanguage : utterances are organized by functional considerations ; null elements are recoverable from knowledge of the situation and from world knowledge ; verbal arguments may not be expressed ; complex structures are absent and there is a lack of function words and inflectional morphology. It is interesting to observe that with the exception of the final characteristic (lack of functors), these

properties correspond to what Mikesell (see below) and others have described of normal conversational interaction in fully-fledged language. If protolanguage and conversational discourse operate in similar ways, then the study of conversational interaction may provide some clues to how language evolved.

As Lee & Schumann note (see Part 2 below), early second language acquisition and early pidginization may provide, at least, oblique reflections on the evolution of language, Véronique's Roundtable presentation allows us to also include creolization because all three forms of language development can occur among adults. This notion reflects a new perspective on creolization in which some creoles are now viewed as having developed without an antecedent pidgin (Parkvall, 1995 ; Arends, 1995 ; Mufwene, 1996). Atlantic as well as Indian Ocean French related creoles appear not to have had a preceding pidgin stage. They developed under conditions in which the contributors to the Creole were adult speakers of nonstandard varieties of the target language or non-native speakers of the target language. Each speaker provided an idiolect with features that differed to some extent from other idiolects. Mufwene (2001) argues that this collection of idiolects provided a feature pool out of which forms were selected for broader use within the community. As Lee and Schumann have argued, the vetting process inherent in the interaction among speakers of these idiolects would allow for the selection of those forms that were most efficiently producible, comprehensible, and learnable (Kirby, 1998). Thus the language would emerge as a complex adaptive system from the massive interaction among varying idiolects.

The early stages of second language acquisition have been studied extensively, and the language produced during this period is referred to as the Basic Variety (Klein & Perdue, 1992, 1997). This period in L2 learning is characterized by utterance structure in which the entity with highest control comes first (generally an agent) and the information that is in focus comes last. Véronique argues that both the early stages of French as a second language (FSL) and French based creoles (FBC) are characterized by iconicity (Croft, 1990) which is defined as an attempt to maintain a one-to-one relationship between form and function such that syntactic structure directly reflects semantic structure. In Peircean terms, this may be viewed as a search for an indexical relationship in which words, as directly as possible, refer to actions and things rather than accruing their meaning by reference to other words or morphemes. This concept-word indexicality is used to refer *inter alia* to existence, possession, and time in both FSL and FBC.

In this discussion, the traditional terminological distinctions among early SLA, early pidginization, and early creolization have been maintained. However, Véronique indicates that for him and others in the field (Becker & Veenstra, 2003), all three processes may be one and the same thing. Such unification affords a conceptual perspective on adult language development that may facilitate thinking about adult-adult interaction in language evolution.

The following examples of existential structures and of structures for expressing temporality from French as a second language and from French based creoles offer some perhaps oblique insights into the kinds of processes that may have involved in the evolution of language.

### **1.5.1. Existentials in FSL and FBC.**

#### **1.5.1.1. Il y a (There is) and c'est (It is) in FSL**

One of the phrasal constraints posited by Klein and Perdue 1997 for the Basic Variety runs as follows :

- {V } - NP2.  
Cop

It is in this type of string that *il y a* (there is) and *c'est* (it is) are found in FSL. These items share propositional functions such as :

- clefting,
- acting as a carrier of negation and of temporal information, and discursive functions such as :
- topic introduction,
- contrasting foreground-background in texts.

*il y a* expresses mainly existence and possession whereas *c'est* is identificational (Duff, 1993).

*a- In early grammar*

One of Véronique's subjects, Malika B. (MB), a speaker of Moroccan Arabic L1 produces the following utterance in a picture description. The utterance involves code switching between her L1 and French (see 1994) :

[1] : I = Investigator  
I : et ça qu' est-ce que c'est ça ? [What is this ?]  
MB : /se/ al bajda [It's eggs]  
-----  
I : voilà où est le chat ? [where's the cat ?]  
MB : /e/ le table [is the table]

/e/ + X is a productive device in early FSL grammar.

/jãna/ + X (there is) is used to mark existence and possession (see Duff, 1993).

[2]  
I : tu travailles chez Madame F ? [You work at Madam F.]  
MB : Madame F + Madame F [Madam F + Madam F]  
I : oui [yes]  
MB : moi /li/ bar [me (the /she) bar]  
I : hm hm  
MB : /li/ bar moi +++ toi /jãna li/ café [(the) bar me you have (the/ she) coffee]

### 1.5.1.2. *Il y a* and *c'est* in learner language development

*il y a* or rather *jãna* is found in all learner varieties. It marks possession as well as existence, although the existential value tends to predominate in the more advanced learner varieties. In 3, the first token of *jãna* is an existential and the second expresses possession :

[3]  
AE : voilà /jãna/ deux personnes /iveni/ /terte/ avec quelqu'un /jãna/ des drogues +  
[Ok there are two personnes (they) come search with somebody has drugs]  
voilà /eveni/ euh voilà /ja/ rien /itrap/ avec l'autre qui /mãz/ à côté de  
[Ok come there's nothing catch the other who is eating besides]  
(Cycle 2, encounter 5 = 2.5).

*jãna* is used extensively for clefting in more advanced learner varieties leading to proto-relatives (see Véronique, 1997), as in the following example where the contrast between *jãna* and *se* is quite striking :

[4]  
AB : /jãna une femme /se/ une vieille /iladi/ non /se/ pas le monsieur /se/ le fille (3.5)  
[there's a lady it's an old (woman) (she) says no it's not the man it's the girl]

### 1.5.1.3. *Il y a* [There is] and *c'est* [It is] in FBC

In early texts from Mauritius, the marker expressing existence and possession is *y en a* [there is/have]. First tokens of the item are found in texts dating from ca. one century after the settlement of the island (1721).

[5] : 1804  
Mo y en a femme  
[I have a woman] (Chaudenson, 1981, p. 81).

[6] : 1804  
Y en a ça qui bon y en a ça qui mauvais  
[There are those who are good, there are those who are bad] (Chaudenson, 1981, p. 81).

In the course of evolution, *Mau.y en a* is eroded to *iéna* (Baissac, 1880) and to contemporary *ena* (Chaudenson 1981, p. 59).

Se [c'est] is quite rarely found in texts from Mauritius, or Réunion :

[7] : 1828

Péchés qui y-en-a dans licaire, sé quand moi oblié Bon Dieu  
[Sins I have in the heart, it's when I forget God] (Chaudenson, 1981, p. 109).

It is more frequent in Seychelles Creole, although this marker is different from se in Atlantic FBC (Baker & Corne 1982, pp. 40-41). Note that the equivalent of *Mau.ena* in Seychelles Creole is *ana*.

The use of *y en a* and *ana* in Indian Ocean FBC provides an example of reanalysis in creole genesis. Subsequent erosion provides a clue as to the grammaticalization of the reanalyzed forms.

Se in Atlantic FBC occurs in equational sentences and seems to have been reanalyzed along different lines from Indian Ocean Creoles. In contemporary Atlantic FBC, it is analyzed either as a copula (Valdman, 1978, pp. 237-240) or a resumptive pronoun (DeGraff, 1992, pp. 168-209).

### 1.5.2 Temporality in FSL and FBC

#### 1.5.2.1. The development of time reference in FSL : from pre-basic varieties to post-basic varieties

##### *i)- Temporality in pre-basic and basic varieties*

Previous work shows that pre-basic varieties make use of lexico-pragmatic means and discourse principles before any emergence of verbal morphology (Andersen (ed.), 1984 ; Pfaff (ed.), 1987 ; Bardovi-Harlig, 1999). Despite progress in L2, these first indirect means are maintained.

- a) Recourse to scaffolding by the TL speaker and reliance on contextual inference
- b) Use of the iconic principle of natural order

[8] (Abdelmalek recounts his arrival to France, 1.1)

- I : tu peux/oui alors tu peux me dire quand c'est/depuis combien de temps tu es là ?  
[Can you/yes O.K can you tell me when/since how long you are her ?]
- AE : comment le problème comme /âtre/ la France ?  
[how the problem for coming to France ?]
- I : ouais par exemple ouais  
[Yes eventually yes]
- AE : ah ouais parce que moi /liâtre/ la France /jana/ pas de passeport /jana/ pas de rien  
[Oh yes because me (I) enter France there's no passport there's nothing]
- I : ouais  
[Yeah]
- AE : parce que /âtre/ la France /e/ la montagne  
[because enter France (is/and) the mountain]
- I : tu es passé par la montagne ?  
[You went through the mountain ?]
- AE : ouais  
[Yeah]
- I : ah
- AE : /jana/ cinq jours /e/ la montagne après /lâtre/ la France /lepase/ la douane de  
[There's five days (in) the mountain then come to France go through the customs of  
France /komjes/ ? quinze kilomètres  
[France how much ? Fifteen kilometres]
- I : à pied ?  
[On foot ?]
- AE : ouais /lapje//e/ après /ilaparte/ l'autoroute /jana/ pas des sous /jana/ rien après  
[yeah on foot after go with the speed way there's no money there's nothing then]  
/jana/ /e/ le stop après /leveny/ le gendarme  
[there's hitch-hiking then come the police]

Explicit reference to a time span preceding time of speech (+ Anterior) is mainly marked through the questions and the scaffolding provided by the investigator. The iconic principle of natural order applies and [+ anterior] time intervals are marked by connective *après* (after). Chronological order is also fostered through the use of calendaric information /jana/ cinq jours (there is five days) and through indirect lexical means like motion verbs /âtre/ (enter), /lepase/

(pass), /ilaparte/(go away) /leveny/(come) and specific nominals montagne, douane, autoroute. The action verbs exhibit long forms (li/e) +Ve. Only one stative verb /jana/. (there is) is present in this extract. The verbs exhibit formal variation either in pre-verbal position Ø/le/ila/li (which corresponds to the position of the clitic pronoun and the auxiliary in TL) or in post-verbal position (corresponding to the verbal ending in TL) Ø/e/i/, without any explicit correlation between form and meaning (see also Dietrich, Klein & Noyau, 1993, pp. 171-172).

ii)- *Complexifying the expression of temporality*

More grammaticalised means may also be used such as :

a- *Expression of TT (Topic Time) through temporal subordinate clauses as in 9 :*

[9]

- Z : ton mari ta copine /eleparti/ le Maroc à vacances le/ la dame ne /se/ pas  
 [(the/ your) husband of (your/ my) friend has left for Morocco on holidays the lady does not know]  
 /e/ tous les papiers à la maison /e/ ton mari la femme tous les papiers passeport  
 [and all the official documents at home and (your/ the) husband the woman all the documents passport]  
 /e/ après /kølø/ /parti/ le Maroc  
 [and after when he arrives in Morocco]  
 -----  
 /kølø/ /ilparti/ au Maroc /e/ après le /kominis/ /e/ après /saje/  
 [when he arrives in Morocco and then (he will visit) the judge and then it's over]

b- *Verbal morphology*

Inflection is explored from the start by learners but they master TL verbal morphology very slowly. By the end of the third cycle of data collection, most Moroccan Arabic learners have identified the copula, the auxiliary e / a and at least two basic verb forms V+Ø et V+e, which express different aspectual and temporal values. In 10,

[10]

- I : vous n'y allez pas souvent ? (à l'école)  
 [you do not visit (school) often ?]  
 Z : une fois pour hanan /töbe/ à l'école (...) mais /jãna/ les os /gõfil/ comme ça  
 [Once for hanan fallen in school (...) but bones swollen like this]  
 après moi /parti/ avec hanan pour /levwar/ l'institutrice  
 [then me go with hanan to meet the teacher]  
 -----  
 Z : après moi /le parti/ mon docteur pour /il a fe/ les radios pour ma fille  
 [then me go (to) my doctor for he x-rays my daughter]

### 1.5.2.2. Temporality in FBC

i)- *Verb morphology*

In the first sentences of Atlantic FBC noted by travellers, colonists or priests, verbs are written in the infinitive form like tenir in this sentence from Saint-Christophe (Mongin Ca., 1682 quoted by Jennings, 1995, p. 72).

[11]

Si moi pas tenir Louis moi mourir de faim  
 [If I did'nt have Louis, I would die of hunger]

or in an ambiguous Ve form as *iurer*, *dérober* and *aller* in the following text from Pelleprat (1655) :

[12]

Seigneur, toy bien sçave que mon frère luy point mentir, point luy iurer, point dérober, point aller luy à femme d'autre  
 [Lord, you know very well that my brother hasn't lied, hasn't sworn, hasn't stolen hasn't been with woman of another]

Note also in this text sçave which exhibits a Vstem form.

The same holds true for Indian Ocean creoles where in the first written quotations of the language (see Chaudenson for 1981 for IOC texts). verbs appear in V stem form or in long form Ve or in the infinitive.

**[13]**

Moi voulé baiser ça négresse la  
[Me want (to) make love (to) that negress] (1777).

As the last written sentence suggests modals like voulé are found earlier in verbal predicates in creole texts than other pre-verbal markers (see Véronique, 1995 ; Hazaël-Massieux, 1996, pp. 209 -220).

As far as it can be assessed, it would seem that in the first FBC texts temporality is mainly expressed by the very means identified for pre-basic and basic learner varieties in SLA : reliance on context and pragmatic means, on diagrammatic iconicity (the principle of natural order) and the lexical meaning of verbs. Possibly, aktionsart explains the distribution of V stem and Ve verb forms as in learner varieties. The development of the expression of tense, aspect and modality is a late development where both reanalysis and grammaticalization played their part.

*ii)- FBC pre-verbal markers*

Time reference in FBC is mainly expressed through a set of pre-verbal markers derived from periphrastic verbal means in use in dialectal varieties of French (Goodman, 1964 ; Gougenheim, 1929). However, different French based creoles have reanalyzed these forms in differing ways, leading to partially different systems for conveying temporal information (Goodman, 1964 ; Valdman, 1978 ; Hazaël-Massieux, 1996).

a- être/été (à) > *te, ti*

b- The grammaticalization of French periphrastic verbs and its subsequent evolution  
*pour/être pour > pu* and *aller/va > alé/va*

These data, Véronique argues, support the idea that the organizational principles that underlying the Basic Variety may have also been active in the FBC continuum. In their early grammars, FSL and FBC share common properties under the partial influence of the iconicity leading to a simple form-function relationships in the domains of reference to existence, possession, and time inter alia.

Thus, based on what occurs in a creolizing community, we can imagine a possible scenario in which large numbers of hominid speakers of disparate protolanguages may have, at some time in history, come together and interacted intensively, the result being the emergence of communication system which was similar enough across idiolects to constitute a community language. Since creole languages are the result of convergence among idiolectal interlanguages, a window on language evolution may be derived from the study of adult second-language acquisition and incipient creolization.

However, because meaning and structure- building work in language evolution is done in conversational interaction among speakers, the best window on language evolution would come from the study of conversational interaction among second-language speakers within and across a communities. This would at least allow a micro inspection of the vetting process that takes place as various forms are proffered from this linguistic selection pool provided by the idiolects of interlanguage speakers.

**1.6. What Exactly Evolved ? How Autonomous is Language from other Semiotic Systems ?**

« *The Multiplicity of Semiotic Resources in Conversational Interaction* »

Charles Goodwin offers a perspective on language based on semiotic analyses in discourse. He points out that both traditional linguists and laymen unproblematically consider language a system, process and/or mental faculty that produces a rich and novel collection of complex symbolic objects such as sentences. Linguists argue that this entity is the proper and distinctive subject matter of their field. They generally believe that it and its evolution can be analyzed as isolated self-contained systems quite separate from social organization. Thus language is seen as simply a psychological process rather than a social one. Goodwin argues that language is not just

a symbolic system but a primordial form of human social organization ; indeed, the distinctive social organization that defines us as species. The basic unit required for the evolution of human language is not linguistic structure as a self-contained system, but instead a multi-party, multi-modal construction of distinctively human forms of action. This process encompasses not just language structure but an ecology of interacting sign systems clustered around the bodies of multiple participants building action together by attending to each other, the detailed organization of the talk in progress, the larger activities interlocutors are pursuing together, and frequently the relevant structure in the environment (Goodwin, 1981, 1994, 2000, 2003b).

Goodwin's study of the interaction among an aphasic person and normal interlocutors within a family brings into stark relief the multiple semiotic resources that are available for the brain to use as participants build action together within situated human interaction (Goodwin, 1995, 2003a). Because of a stroke in his left hemisphere Chil, can produce only three words : **Yes**, **No**, and **And**. **Yes** and **No** are what conversation analysts call Second Pair Parts (Sacks, 1995 ; Sacks & al., 1974), utterances that respond to a prior action constructed by someone else. Chil's vocabulary thus presupposes that he inhabits a world that has already been structured by the semiotic activities of others. By indexically using both the structure of prior talk, and the field of action and meaning it has made relevant (Schegloff, 1968) as a point of departure for his own action, Chil is able to get others to produce the talk that he needs to say what he wants to say.

The following, analyzed in more detail in Goodwin (in press) provides an example. Chil's son Chuck and daughter-in-law Candy are talking with him about the amount of snow the winter has brought to the New York area where Chil lives. After Candy notes that not much has fallen « this year » (which Chil strongly agrees with in talk omitted from the transcript), in line 11 she proposes that such a situation contrasts markedly with the amount that fell « last year ». Initially, with his « °yeah- » Chil seems to agree (in the interaction during the omitted talk Chil was strongly agreeing with what Candy was saying, and thus might have grounds to expect and act as though that process would continue here). However, he ends his agreement with a cut-off (thus visibly interrupting and correcting his initial agreement) and moves to strong, vivid disagreement in line 13. Candy immediately turns to him and changes her « last year » to « the year before last. » Before she finishes Chil (line 15) affirms the correctness of her revised version.

### The participants have been discussing snow in the area where Chil Lives

1 Candy: You haven't had **that** much this year have you.

...((8 lines omitted))

10	Candy:	But <b>la</b> [ <b>st</b> year. Whooh!
11	Chuck:	[ °mm
12	Candy:	[ In the l [ ast year-
13	Chil:	[ °yeah- [ <b>No No. No.:</b>
14	Candy:	er the year before la [ -st.
15	Chil:	[ Yes.



Despite his severely impoverished language Chil is able to make a move in the conversation that is both intricate and precise : unlike what Candy initially proposed in line 10, it was not « last year » but the « the year before last » when there was a lot of snow. Chil says this by getting someone else to produce just the words that he needs. The talk in line 14 is semantically and syntactically far beyond anything that Chil could say on his own.

Despite his sparse vocabulary Chil in fact has access to a wide and important range of meaning making resources. These include gesture, body posture which can be used to construct participation frameworks with others, gaze, and frequently structure in his surrounding environment, as well a wealth of knowledge and experience shared with consequential others such as his family. He also uses affective prosody over nonsense syllables to display meaningful stance.

Intersubjectivity is accomplished by Chil and his interlocutors as practical action, that is as methods for constructing the shared meanings required to build in concert with others those actions that make up the lifeworld of a local community. This is done within interactively organized multi-party, multimodal participation frameworks, within which different kinds of signs can mutually elaborate each other. Misunderstanding and repair (Schegloff & al., 1977), within the framework of collaborative action, provide resources for establishing and holding each other accountable for congruent public interpretation of the signs used in interaction. Thus communication is achieved by embedding all available semiotic resources to build an ecology of meaning making processes. This and similar research, of course, does not capture the evolution of language, but it does allow the observation of the evolution of a communication system from which it may be possible to accrue at least an oblique understanding of what was involved in language evolution.

Goodwin demonstrates how eye gaze and phrasal breaks serve as semiotic resources in conversational interaction (Goodwin, 1981). Speakers' use listeners' eye gaze as an index of attention. If a speaker detects the absence of an attentional gaze and looks at the nongazing hearer, he/she will typically interrupt the prosodic contour of the utterance and abandon its emerging syntax. The hearer will then begin to move his or her gaze to the speaker who then begins a new utterance. If the speaker has not yet gazed at the nonattending listener, the speaker will normally pause, and the hearer will then move his or her gaze to the speaker.

Goodwin also shows how repair in conversational interaction may serve as a semiotic resource for language learning. In self repairs such as « we went t- I went to » ; « if he-(0.4) could- if you could » several facts about the language are implicitly displayed. From the rephrasing, information is given in about what forms may appear in a particular position and how these forms may contrast. In the repair, « my ;,son- my oldest son » a noun phrase is highlighted and information is provided about how it may be expanded with an optional adjective. Goodwin points out that in traditional linguistics such repairs would be discarded as performance failures, and if the utterance were to be used in a linguistic argument, it would be sanitized to remove the repair. But such « degenerate input » may in fact provide parsing information essential for acquiring the language. Thus, from this perspective, repairs are not noise ; they are semiotic resources that facilitate both language acquisition and language use (Goodwin, 1981).

Goodwin's perspective shows that brains involved in conversational interaction have many resources for making meaning. Brains are not required to interpret isolated sentences. For producing and comprehending conversation, brains can use eye gaze, facial expression, body movement, phrasal breaks, repair, and the environmental surround. A biological account of language that disregards these semiotic resources is by definition an inadequate account.

### **1.7. How does Modern Language Reflect what Evolved ? How Complete are « Complete Sentences » ?**

« *Examining Argument Structure in Conversation : A Matter of Index Grounding* »

Lisa Mikesell's presentation concerns the presence or absence of overt arguments in conversational utterances. It is very much in the tradition of the research on oral discourse undertaken by Chafe, Hopper, Thompson, and others (discussed in the Convener's Perspective in Part II below). It also deals with issues of formulaicity presented in at the Roundtable by Alison Wray. Additionally, Mikesell's analysis reflects Goodwin's position that brains engage multi-semiotic resources to produce and to comprehend language.

Mikesell notes that English argument structure is generally assumed to consist of subject/agent-verb-object in which the subject and verb must be expressed, and if the verb is transitive, the object must be overtly expressed. This appears to be the case when the unit of analysis is the isolated sentence. However, when the language is examined in its discourse context, it becomes apparent that any of these forms may be absent/elided. What seems to be required is that the referent for the elided item be understood from context. Here the context might be prior speech in the discourse, the ecological surround in which the discourse takes place, gesture, eye gaze and/or shared background knowledge. Such recovery of reference is referred to as the indexical ground.



Mikesell offers a position on argument structure that is based on three tenets. First, the language that constitutes relevant data must be embedded in context. Second, the representation of semantic roles is considered available before grammaticalization occurs. Third, these representations can exist in the context outside the utterance. In the following example we see subject/agent ellipsis.

[1] JS : II61 [Pomerantz, 1984, p. 67]

- 01 E : ...n she said she- depressed her terribly  
 02 J : Oh it's [terribly depressing].  
 03 L : [Oh it's depressing].  
 04 E : Ve[ry  
 05 L : [But it's a fantastic [film.  
 06 J : [It's a beautiful movie.

In line 01 of this excerpt, the event or object that is causing the depression is not realized. Because this excerpt is incomplete, it cannot be determined whether the elided element is indexically grounded in the context. However, the excerpt is interesting because we are able to clearly see how the participants in the conversation have no difficulty understanding what the referent is or how the elided element may be indexically supported in context, even if it is not clearly apparent for an outsider. The speaker changes the utterance mid-stream to a construction containing a verb, *depress*, which requires a subject, i.e. something that causes the depression. Once again, the elision of the subject goes unnoticed by the participants, and it is evident to observers as the conversation continues that the elided subject refers to a film.

It is important to note that the « elided » element in this particular excerpt is a minimally phonated element ; thus it is possible that it may have been uttered but not heard by the transcriber. While this is unlikely given the expertise and meticulous training these analysts receive, from the perspective of the hearer, which is our primary interest, the element might as well have been unspoken. Further, the presumed « elided » element is uttered in lines 02, 03, and 04. It was suggested that a possible reason for the « elision » of the element in line 01, but the occurrence of it in lines 02 through 04, may be that in these latter occurrences there are two morphemes, i.e. *it's* rather than one, *it*.

In English, an argument in object position can also be elided :

[2] Carsales 5 [Ono & Thompson, 1995, p. 18]

- 1 D : I got to leave her on her own,  
 2 .. let her see=,  
 3 you know.  
 4 G : ...(.) yeah,  
 5 D : ...even if she goes out with other men,

In this excerpt, the verb *see*, should take an object, yet there is no object present ; however, one can be inferred from context, i.e., it has indexical grounding. While it is not entirely clear what the object of the verb is or should be, the scene can be filled by the interlocutor who can interpret the appropriate meaning without the complete structure that we are accustomed to in written discourse or that we interpret in linguistic research. D is discussing how he should let his ex-girlfriend find out what she really wants without his interference. When he says, *I got to leave her on her own, let her see=*, from context we can provide a sufficiently accurate index, perhaps *let her see D as the man for her* or *let her see her decision as a bad one*. While the argument is not realized in the structure, an argument can be provided with indexical support. Thus, while it is true that many verbs occur in scenes that seem inappropriate from a theoretical framework, context often provides the indexical ground needed to fulfill these scenes, emphasizing again that structure should not be our sole focus when it comes to the study of language, or at the very least, the study of argument structure.

This instance of the verb *see* is different from intransitive *see*, which is fairly common in English. For instance, the following intransitive uses of *see* are structurally acceptable : *let me see, let's see, wait and see, I'll have to see*, etc. These uses of *see*, however, are not of the same category ; they seem to be formulaic in nature and highly restricted. This claim could be explored

in future research by examining *let me see* and *let her see* in a corpus in order to determine the frequency with which both constructions occur.

The following examples illustrate topic elision.

[3] [Nair, 2003, p. 43]

576 a : I'll tell you a friend of yours I met recently...  
577 C : you **TOLD** me  
578 a : oh

[4] Joyce & Stan [Schegloff, 1995]

35 S : [Any changes of uh : party affiliation er °>anything like  
that(t) ? <  
36 J : Uh : not at this moment. (u)When do I haftih : **tell** you by ?  
37 S : Well the last day is May fifth. Fer the Ju :ne uh fourth  
primary.

In excerpts, 3 and 4, we notice an extension of the usual topics locally selected by the verb *tell* which requires a subject (the teller), and object (the person being told), and a topic (the thing being told). In both instances, the topic is elided but it is supported indexically in line 576 in excerpt 3 and line 35 in excerpt 4.

Similar to the verb *see* discussed above, the verb *tell* also occurs both intransitively and as a formulaic expression : *how can you tell ?*, *time will tell*, *you're telling me*, etc. The *tell* that occurs in line 576 is such an instance where *I'll tell you* is a fixed expression often used to open up a conversation or change of topic. Again, these instances are highly formulaic and restricted in use and could be examined in corpora. *You told me* in excerpt 3 could also arguably be an instance of a formulaic realization whereby the topic is no longer required structurally and is therefore only « elided » semantically. However, whether this instance is viewed as a structural « elision » or as a formulaic realization, the point is still made that structure is flexible and dictated by use as long as indexical ground is maintained throughout discourse, i.e., it is not the structure that is most crucial but the indexical ground that the structure (or lack thereof) provides.

What Mikesell's discussion suggests is that an evolutionary or neurobiological account of language is not necessarily constrained to assume that structure is fixed. Semantic completeness may be achieved without full explicitness in the linguistic output. Furthermore, if semantics drives structure, rather than the reverse, it may not be necessary to account for 'missing' material in terms of a departure from some structural template. Rather, structure is contingent on what needs to be expressed. This approach will naturally result in inherent fuzziness regarding what the structures are in their own right, since their realization will be subject to contextual conditions. The brain will rely on indexical grounding through context to infer arguments. And if, as stipulated earlier, conversation is the primordial form of language, then in doing conversation, the brain does not operate under a requirement that subject and object arguments be realized. When context is removed, the structure may be necessary for meaning to be conveyed. When there is support by ecology, it is simply a matter of maintaining the indexical ground that is necessary for the communication to be effective.

If oral language for conversational interaction is what evolved, then the research reported here by Tao and Mikesell and earlier research by Hopper, Chafe, Thompson, Kalmar, and Mithun (see Part II, Convenor's Perspective, below) demonstrates that the language which we are responsible to in an evolutionary account is very different from the language that has been the prime concern of most mainstream linguistics.

### **1.8. What Exactly Evolved ? How do Oral Linguistic Signs become Reliably Indexicalized ?**

« *Indexicalizing Language* »

*John Schumann's* Roundtable presentation is concerned with how we can come to know the nature of the invisible, nonmaterial phenomenon called language in order to understand its evolution and its neurobiological underpinnings. Language is an aspect of human behavior, and as Handy & Harwood (1973) argue, « human behavior involves transactions wherein something is regarded as

standing for or referring to something else. This process we name « sign behavior », or simply « sign ». Note that « sign » is not the name of the thing that is regarded as standing for something else ; « sign » is the name of the transaction as a whole » (i.e., is the short name for « sign process ») (p. 21). Understanding all phenomena means understanding via signs. An account of language, a system of signs, requires the use signs to refer to language itself. Thus in this section, we turn again to a discussion of sign relationships based on the work of Charles Sanders Peirce.

Peirce distinguished among three broad categories of sign : icons, indexes, and symbols. As Favareau has shown, sign behavior takes place across the biological spectrum, but here our analysis is limited to human sign use in order to simplify the discussion. Icons emerge as the human infants learn to distinguish items in their unlabeled world. An entity (a chair, a ball, a cookie) is a primary icon because it is totally similar to itself. Icons involve relationships not only of identity but also of similarity. Something may be interpreted as iconic of something else because of similarity in shape, color, or function to the original object. A child might, for example, see the stopper of an olive oil cruet as an ice cream cone (the rounded ahead and canonical base of both objects). Clouds are often interpreted as being iconic of other objects if the cloud formation resembles that object. The relationship of iconicity involves an interpretation of similarity between objects or events.

An index is a sign that has become associated habitually with something in the world. In biology, a peahen examines details of the peacock's tale as an index of the quality of the male's genes. In language, a pronoun indexes a previously expressed noun or a known person, place, or thing. A red traffic light indexes the requirement that traffic stop. The word « table » or « neuron » indexes the entity, table or neuron.

A symbol, in Peircean terms, is a sign that refers to another sign. For example, the word motivation refers other words such as desire, goal, incentive. Thus words can be indexes or symbols depending on whether they are interpreted as referring to things in the world or other words. Deacon (1997) has pointed out that when signs refer to other signs, and most particularly when words derive their meanings via reference to other words, a virtual world is created that moves beyond the physical world. This level of existence, where words refer to other words, has been called the symbolosphere (Schumann, 2004). Symbolic relationships consisting of word-word relationships are inherently relativistic because the words themselves may have multiple meanings and connotations that refer for their interpretation to other words with multiple meanings and connotations.

The most successful sciences appear to be those in which the phenomena of interest are easily indexicalized. If a phenomenon can be observed with the naked eye or with some visual prosthesis (e.g., telescope, microscope), and if words can unambiguously refer to the phenomenon, then facts can be accrued and some degree of certainty can be attained. Therefore, in science we are always looking for indexicalization ; we are trying to move from symbolic conceptualizations to indexical reference where the words we use can, as directly as possible, refer to phenomena and processes in the world. The kind of indexicalization we seem to prefer is through vision ; if we can see it, we are more likely to consider that we have truth than if we hear it, feel it, or taste it, or know it merely via definitions built on other definitions (e.g., symbolic conceptualizations).

An example of indexicalization through vision leading to a verifiable fact and therefore truth can be found in the history of neurobiology. At one time there was a debate as to whether the cortex was composed of a reticulum in which all units were connected without breaks between them and an opposing theory in which it was hypothesized that individual units were separated from others via small gaps. Golgi represented the former theory and Cajal the latter. Both received the Nobel Prize and presented their Nobel lectures proclaiming opposite points of view. Some years later the light microscope was invented and then the electron microscope that allowed us to visualize (i.e., see) actual neurons, and it was discovered that Cajal was correct. The brain was not a reticulum ; it consisted of billions of individual units (neurons) that were connected across spaces called synapses.

In physics a major task has been to « see » subatomic particles. This was first made possible in the 1950s and 60s by bubble chambers. These chambers were large tanks filled with hydrogen in which atoms collided and the particles which comprise them created trails of bubbles that could

then be photographed (Amato, 2003). This allowed an indexicalization of subatomic particles in which the tracks of the bubbles served as reliable indexes of the particles that they produce.

Moving in the other direction, telescopes have allowed us to indexicalize (i.e., see) large bodies at great distances. Speculations about the structure of the solar system have been settled by telescopic observations. The amazing images provided to astronomers via the Hubble Space Telescope are well known. Amato (2003) describes a less well-known telescope called The Chandra X-ray Observatory that can capture x-rays that penetrate the clouds and dust of the Milky Way. This telescope can detect x-rays from galaxies beyond the dust of the Milky Way. Thus the x-rays indexicalize for the scientists the existence of astronomical bodies at enormous distances and through galactic regions obscured by clouds and dust.

When we move from science to engineering, indexicalization becomes virtually automatic. Any technology that we produce is visible one way or another. Thus we can generate words to unambiguously refer to the various components of any piece of technology. Therefore, with the right expertise, it is possible to understand completely how some technological instrument operates. We make it from visible parts, and we observe its visible processes, and therefore, the technology is thoroughly indexicalized, and we can say we know it ; we understand it. If we confuse the production of technology and the certainty we have about its components and processes with what should be expected of all scientific endeavors, we become greatly disappointed. In the social sciences it is very difficult to get clear indexicalization ; frustration with this fact, and implicit comparisons of social scientific endeavors with those of engineering, frequently leave us feeling that the enterprises of sociology, anthropology, and psychology are either less deserving of the label « science » or that they must be done more rigorously so that they can behave like the sciences and technologies that are lucky enough to be easily indexicalized.

An example of a construct in the social sciences that is difficult to indexicalize is « motivation ». How do we point to motivation. We can certainly point to behavior that we assume is motivated, but we will still have not identified motivation. The problem with indexicalizing something like « motivation » is that the term can only be understood as it relates to and participates in a web of other terms such as : intention, incentive, desire, goal, reward, approach, avoid, motive, incentive motive, action tendency, wanting, liking, emotion, arousal, valence, appraisal, attitude. We come to understand motivation in relation to some or all of the things just listed. In other words, « motivation » makes symbolic reference to these words and these words have intrinsic symbolic relationships with « motivation ».

In second language acquisition it is recognized that motivation is important in becoming bilingual. Therefore, much research has been devoted to trying to understand motivation in second language acquisition. Researchers have investigated motivation from many perspectives with respect to second language learning : intrinsic motivation, extrinsic motivation, instrumental motivation, integrative motivation, value expectancy motivation and so on. They do this by devising questionnaires that elicit subject responses to items that the researchers believe reflect motivation. These questionnaires typically ask about the subjects' behavior, imagined behavior, or beliefs. For example a subject might be asked « If you had the opportunity, would you go to see a French movie ? », « Do you believe that French culture has contributed to North American life ». Based on responses to such questions, researchers attempt to quantify and categorize the subject's motivation. As is easily seen, in this process motivation is never indexicalized ; it is never seen. A motivation is merely inferred from the subjects expression of actual behaviors, imagined behaviors, beliefs, desires, and preferences. The phenomenon at issue remains embedded in webs of symbolic reference and inference. In these situations, as we have seen in all studies of motivation, closure or final answers are virtually impossible. And therefore research on motivation in second language acquisition continues ; each well-designed study provides an illumination of the phenomenon in an oblique way, but it never provides a final answer. Questionnaires cannot allow us to see motivation ; they simply provide another symbolic representation of it. No indexicalization occurs.

Now the question becomes how do we indexicalize language ? This is rarely seen as a problem. It is implicitly assumed that if one writes down something they want to say or that they believe they heard, then that representation provides an indexicalization of authentic language

which can be used for scientific inquiry into the nature of language. Such activity assumes that writing and spoken language have a strong correspondence. However, as we have seen, extensive research on spoken language by discourse and conversational analysts has shown that spoken language is quite different from that seen in written texts. It is less complex, often lacking subordinate clauses. Units of spoken language do not necessarily correspond to phrases and clauses as they are defined in written language. Spoken language largely consists of fragments, formulaic expressions, backups, repetitions, rephrasings etc.

Many of the characteristic aspects of oral language have been dismissed as disfluencies of performance. In other words, they are viewed as poor reflection of more systematic « grammatical » abilities. Thus normal linguistic behavior is seen to be deficient and degraded manifestation of an underlying competence. But in most of the history of linguistics, a distinction between spoken language and written language has not been maintained and in fact has become confounded. The primacy of the written form is characteristic of many linguistic traditions. For example, in Russian grammar texts, utterances that are illustrative of particular grammatical principles are taken from literature and are referenced by author (e.g. Tolstoy, Chekov, Lermontov etc.). The obvious implication here is that the written language contains the grammar of the language, and the spoken language is what is authentic.

Now how do modern linguists try to capture language, i.e., try to indexicalize it? Field linguists typically elicit utterances from participants in order to find instances of particular grammatical functions. Generative linguists create a sentence and then ask themselves whether it is well formed. In these two instances, we have language that either is elicited or created by the researcher. But how do we get language that actually occurs? Access to authentic language only became available with the development of audiorecording technology in the middle of the 20th century. However, the initial technology was large, cumbersome and expensive and was not amenable to the recording of natural conversational interaction. The technology began with wire recorders, moved on to reel-to-reel tape recorders, then to portable cassette recorders, and now video recorders that can capture both sound as well as visual aspects of the context including eye gaze, body position and the surrounding physical environment.

Indexicalizing language involved creating ways to visualize language, to see it, not just to hear it. In the '70s methodologies were created for transcribing data from the audiorecordings to written transcripts. These methods included microanalysis of the audio information through the careful transcription of utterances, repetitions, after thoughts, filled clauses, false starts, pauses, and incomplete phrases. All these so-called « performance problems » or deficits were maintained in the indexicalizations and not removed as they would be in writing. The question then becomes which is the canonical form of language. Which is the form of language that we must responsible to in neurobiological and evolutionary accounts of language? During the last half-century, the argument has been made that the sanitized sentence constitutes the linguistic competence appropriate for the proper study of language. But since that enterprise has not yielded satisfactory results, modern discourse analysts and conversational analysts start with carefully transcribed speech of actual language use with all its warts, and then ask the question, « what in this linguistic performance allows appropriate reference to be made by the speaker and to be understood by the hearer ».

This effort, however, merely indexicalizes language behavior. What we also want to do is to indexicalize language processing. Efforts in this direction are now being made using various neural imaging technologies. However, for those efforts to be successful, we must first be sure we have indexicalized the appropriate behavioral phenomenon. The relevant indexicalization is recorded natural conversation transcribed according to the procedures of conversational analysis.

## **2. Convener's Perspective**

In attempting to answer the question, « What evolved in language evolution? », we must distinguish between what the brain evolved to do vis-a-vis language, and what it can do. The brain is capable of reading and writing, but clearly it did not evolve to do those things. The most reasonable guess is that the brain evolved to engage in conversational and perhaps narrative discourse. Language appears very different when researchers look at it horizontally and when they

look at it vertically. From the horizontal perspective, what has to be explained is the evolution of the sentence and its grammar. From the vertical perspective what has to be explained is the evolution of conversational or discourse structure. The content of common talk might reasonably be seen to involve exchanging information about social relations and about the states, attitudes, and properties of oneself and others. Such conversational interaction would be the primordial form of language, and much of this conversational interaction would also involve formulaic speech and simple topic-focus structure.

Lee and Schumann (2003, and see full discussion below) expand on an emergentist view of language evolution with the following scenario : Hominids interact verbally using a protolanguage lexicon. Attempts to express meanings consistently over time generate a complex adaptive system that structures utterances of the language. Through the vetting process inherent in verbal interaction among agents, grammatical structure is altered to fit the human brain. This obviates the need for the genetic assimilation of the UG. What ensues is the production of a series of cultural artifacts (technologies) : spontaneous oral language, composed oral language, and written language. The relaxed psycholinguistic conditions that exist during the production of composed language (oral or written) allow for the development of complex morphology and syntax. Spontaneous oral conversational interaction then is the primordial form of language, and it is what must be accounted for by theory of the evolution of language.

### **2.1. What does Oral Language look like today ?**

In a review of two recent books on the evolution of language, Bickerton (2001) makes note of those « who write about language evolution in blissful ignorance of what it is that evolved » (p. 590). What evolved is a crucial question in the study language evolution. But it is not clear that at this point that we have an answer to this question.

I hypothesize that oral conversational interaction is what evolved, but since many linguists are unfamiliar with spontaneous oral language (« language in the wild »), we will begin with a short review of the literature which characterizes such language. Conversational analysts see the basic unit of language as the turn constructional unit. Turns are not isomorphic with sentences or with any unit of grammar, although sentences and their concomitant grammar can appear within turns and across them. So to understand what it is that evolved, it is necessary to explain the ability to do conversation. From the perspective of complex adaptive systems (Lee & Schumann (2003), and below), studying conversation is studying the interaction from which grammar is an emergent property. Grammar emerges as an epiphenomenon of conversational interaction.

Hopper (1998) sees grammar as emergent in the sense that it is the product of communicative interaction and not the cause of it. In conversational interaction certain forms (words, morphemes, word order) become frequent. These forms, in Hopper's view, are temporary solutions to the communication of certain meanings. They are always open to change, although such change may be diminished as a result of arbitrary standards set by a literary language, grammars, and dictionaries. What constitutes grammar are the frequent but temporary patterns in the language.

According to Hopper, much of grammar is formulaic, prefabricated, and routine. The patterns in language are subject to local variations and future alteration. Forms are not wired into the individual but exist among individuals as past and present patterns of communication. In discourse, utterances are not necessarily sentences, but instead they are frequently concatenations of words that have been encountered by the speaker frequently in the past and those that have been used by the speaker and his interlocutor previously in the current discourse. From Hopper's perspective, learning a language involves acquiring such routines, holistic constructions, patterns and their variations and coming to be able to use them effectively in discourse -- stringing them together, mixing them, creating them, altering them in different genres, and incorporating them from one genre to another. The process is never completed ; there is no end state ; grammar is never « in ».

Based on an analysis of dinner table conversations, Chafe (1985) argues that spoken language consists of idea units made up of about 7 items, which therefore closely matches short-term memory capacity. He notes that words per idea unit in writing average about 11. His comparison of oral and written texts demonstrates that in spoken language there is relatively little subordination, and

idea units are either expressed independently or are linked by coordinating conjunctions. He observes that sentences are, in fact, difficult to identify in spoken language. Mithun (1984) in an analysis of several languages found that subordination is rare in the discourse of those languages that have not developed literacy. Kalmar (1985) observed that the Eskimo language, Inuktitut, subordination (i.e. relative clauses) only appeared as it developed a writing system.

Thompson and Hopper (2001) present evidence that in conversational discourse, utterances are low in transitivity and frequently have only one participant, and those clauses with two participants are low in transitivity as measured by a set of ten transitivity parameters. The authors' data indicate that English conversation is overwhelmingly characterized by three types of constructions : intransitive verbal clauses (« I don't remember. I was belly-aching ».), copular clauses (« Trish is pregnant again. That's the whole point. She's still at home »), epistemic/evidential clauses (« I guess we are, I don't think it's workable ») (pp. 38-39). The authors argue that the structures that are typically considered in current linguistic research are extremely rare in normal conversation. Most ordinary talk is not about events or actions, but instead it is about states, attitudes, properties of people and situations, and assessments of people and situations.

In trying to determine what it is that evolved, it is necessary to imagine language before it was influenced by writing. Written language is language transformed by a cultural technology, and may be similar to foods that have been genetically altered (McWhorter, 2001) to have a longer growing season, to resist insects, or to last longer after harvesting. If sometime in the future, scientists were to try to explain how such food evolved and were unaware of the artificial genetic alteration, their accounts of the food's evolution would be inaccurate. The capacities needed to produce language for conversational interaction may be very different from those necessary to produce isolated grammatical sentences. Nevertheless, such sentences appear today in human speech, but they may be the result of the influence of writing on speech (Kalmar, 1985). Human brains may have evolved the psycholinguistic abilities to do conversation, but they may be also able to incorporate into the spoken language forms developed under the very different processing constraints that obtain in reading and writing. This is especially true when society provides individuals with years of exposure to and training in the altered forms of language - via grammar school, high school, university, and pervasively through the media.

Kalmar (1985) has pointed out that language can be altered not just by writing, but also by oral texts that have been composed (verbal rituals, chants, prayers, songs, spells, incantations, narratives, epics, etc.). Such composed texts are held in memory and could be grammaticalized overtime in ways that make them different from spontaneous speech. The altered forms in such nonspontaneous language would then gradually influence spoken language.

The upshot of this research is that oral language as it evolved in conversational interaction is very different from language that is planned, composed and written. Therefore, it would appear the kind of language that is mediated by the brain and that constituted the earliest forms of linguistic behavior would have been oral. Current linguistic research that does not strictly distinguish between oral and written language may provide accounts of grammatical structures that are perhaps marginally relevant to an evolutionary perspective and a neurobiological perspective on language.

The challenge facing scholars of language evolution is to find current situations of language use that more closely match what we imagine the conditions of language use were in its earlier evolution. Kalmar (1985) suggests that analyses be made of unwritten languages in societies that have not generated large numbers of composed texts. Pidgin languages and signed languages are obvious candidates, but in both cases the analyses would have to be of conversational interaction with all its warts, not simply sanitized sentences extracted from their natural habitat of multiple turns with the overlaps, repetitions and repair.

## **2.2. The Evolution of Language as a Complex Adaptive System : From Lexicon to Grammar**

Diane Larsen-Freeman (1997) showed how Chaos Theory and Complexity Theory can address some questions in Second Language Acquisition (SLA). Lee and Schumann (2003) argue that these theories can also provide an account of the evolution of language. From the perspective of

Complexity Theory and emergentism, languages and the rules of languages may have emerged purely through interaction among hominids, without the need for language genes or grammar modules to evolve.

First, the authors introduce some general principles of complexity and emergentism, and then examine how the principles are compatible with languages and their rules. They then take a macroscopic perspective and explain how hominids equipped with an increasingly large lexicon may have evolved grammar.

### **2.2.1. Complex Adaptive Systems**

Spontaneous pattern emergence is pervasive throughout Nature. There are ample examples that illustrate patterns that emerge spontaneously through self-organization, not dictated by any grand design or preordained rules. For example, the Bénard Convection, is a grid of hexagons that appears when a thin layer of water or oil in a pan is heated to a certain point. Neither the liquid, nor the pan, nor the heat has a hexagonal pattern in its natural state. The pattern emerges spontaneously through self-organization. A flock of geese forms a V-shaped flight pattern. No individual goose has this design in mind. Even though each individual interacts only with its immediate neighbor, this V-shaped pattern emerges. These examples show that patterns emerge from interaction among individuals, and these patterns transcend any individual's goal or design. The spontaneous emergence of patterns is a feature of Complex Adaptive Systems (CASs).

CASs emerge spontaneously, dynamically, unpredictably, and nonlinearly through local interaction among the components of the systems or the agents of the systems. Examples include slime molds, ant colonies, the immune system, the central nervous system, flocks of geese, ecosystems, climate, stock markets, economies, cities, countries, etc.

Lee and Schumann argue that languages are also CASs. Rules of grammar, phonology, and pragmatics are all patterns in languages, and these patterns have emerged spontaneously through linguistic interaction among humans. There is no theoretical need for us to have language genes in our genome or grammar modules in our brains. Languages are not part of our biology. They are not genetically transmitted but are, instead, culturally inherited. They are simply cultural artifacts.

But are languages really CASs? If languages conform to the principles of CASs, we will have strong justification for our claim. The first principle of CASs is that they are all open systems. Open systems are those that receive constant energy input from the outside. Conversely, a closed system is a system that does not get energy input (Prigogine, 1988). For example, a glass of water in a vacuum is a closed system. But a layer of water in a pan in the Bénard Convection is an open system into which heat energy input is constantly fed.

The second principle is that open systems evolve. When there is no energy input, the system maintains an equilibrium state in which no pattern emerges. This is the initial state of the Bénard Convection. When liquid in a heated pan has not yet reached the boiling point, energy flows into this system and it evolves to a near-equilibrium state, but the spontaneous pattern still does not appear. However, when the amount of energy input crosses a threshold, the system plunges into a state far from equilibrium, a state in which dynamic, spontaneous, and unpredictable patterns emerge nonlinearly. This is the state in which the grid of hexagons in the Bénard Convection emerges.

The question, then, is whether languages are open systems and whether they evolve. Our answer is that all living languages are open systems and that they do evolve. Because energy input to language systems comes from linguistic interaction among people, dead languages such as Latin or Sanskrit are closed systems. In the case of a pidgin, where there are no native speakers and interaction is limited, only minimal patterns may emerge. As the number of speakers increases and the pidgin is used in wider social functions, interactions increase. Diverse and unpredictable grammatical patterns dynamically emerge, and the pidgin can evolve.



Here we will list only a few of the other principles governing CASs, but we are confident that languages conform to all the principles of CASs so far identified by scientists (Holland, 1995 ; Johnson, 2001) :

- 1- A CAS contains a large number of agents.
- 2- CASs have multiple levels, and an agent acting at one level can serve as a building block for agents at a higher level.
- 3- Agents act locally and randomly in CASs.
- 4- Bottom-up control is realized through local and random interaction.
- 5- Agents in CASs have pattern-matching abilities.
- 6- CASs have positive feedback systems, and patterns are magnified by this feedback.
- 7- When a pattern is magnified, it can become locked in.

These principles of CAS are compatible with languages (for detailed discussion, see Lee, 2003)

### **2.2.2. The Emergence of Language**

Earlier Lee outlined the biological prerequisites for language evolution. Once these prerequisites were in place, sounds could be concatenated into words, freeing hominid communication from reliance on holistic calls. Bates and Goodman (1997) have shown that the degree of grammatical development in children acquiring their native language is tightly linked to the number of words they know. This link is maintained throughout the major period of grammar growth, which extends from 16 to 30 months. At the end of this period, children have achieved the grammatical complexity that qualifies them as having moved beyond protolanguage to full-fledged language (Bickerton, 1990). At this point, the children have a lexicon of about 600 words.

Now let's imagine a hominid group that has attained all the prerequisites for language presented by Lee at this Roundtable. It develops a basic lexicon that allows it to produce a protolanguage. The speakers continue to develop new words and use them in interaction with one another, with the goal of communicating a wide range of meanings. As the lexicon increases, the conversational interaction generates massive feedback with respect to successful and unsuccessful communication. Feedback of this magnitude typically results in a self-organizing structure as an emergent property (Weber & Deacon, 2000 ; Steels, 1998 ; Batali, 1998 ; De Boer, 2000).

The emergent structure is grammar. It develops so that meanings are expressed in consistent ways, making the language easy to produce, easy to comprehend, and easy for children to learn (Kirby, 1998). It is much easier to mold language to the brain than to change the brain to accommodate language. Thus, the verbal interaction among agents in society leads to the development of a cultural artifact--grammar. This artifact is nonmaterial and invisible ; nevertheless, it exists in the world in the same way as other artifacts (e.g., canoes, buildings, carpets, dances, rituals). Grammars, like other cultural artifacts, vary enormously, but there are constraints on this variation. These constraints are the products of the architecture of the brain, the architecture of the body, and the architecture of conversational interaction among humans.

Language is neither *of* the brain nor *in* the brain. However, the brain processes the external world ; it produces behavior in the world. Language is of the world ; it is « out there. » Therefore, as with material things in the world, the brain can acquire language and use it (i.e., comprehend and generate verbal behavior). Language is not in the brain, but exists instead as a cultural artifact or technology between and among brains.

If language is a CAS, then grammar is not subserved by a dedicated neural module. Instead, it is an emergent property of a large number of human agents attempting to communicate with a large number of items in the form of words. Those interactions generate a powerful and pervasive vetting process in which individuals proffer forms (i.e., strings of words) in an effort to express meaning consistently over time. Successful attempts would be accepted and spread, and unsuccessful attempts would be rejected and forgotten. A polysynthetic grammar might result, or syntactic grammar might emerge. The grammar may be head-last or headfirst, pro-drop or non pro-drop, or adjective before noun, or the opposite. These outcomes would be various attractor states

into which the grammar would fall as a result of the massive positive and negative feedback generated. The grammar would then exist in the environment whenever people spoke and would be mediated by the brain (i.e., learned, comprehended, produced). Grammar would emerge from the feedback generated by communicative interaction. It would not be the result of a special neural linguistic module.

As Diane Larsen-Freeman (1997, p. 148) put it, « Language grows and organizes itself from the bottom up in an organic way, as do other nonlinear systems. While rules can be used to describe such systems, the systems themselves are not the products of rules. » Thus, we cannot ask, for example, *where* in the brain language, tennis, or the waltz reside. All these processes require the interaction of two or more humans and some material artifacts. In the same way, we see grammar (and language, in general) to be a collection of non-material artifacts processed by an individual's brain to communicate.

Let's briefly consider four types of evidence for this position :

- *Pidgins*-In pidginogenic social situations, to use McWhorter's (2001, p. 131) words, language is « crushed to powder. » Generally, pidgins arise when people speaking different native languages are thrown together with very limited access to a target language. This was the typical situation in American plantation societies. Initially, the speakers may have shared only a few dozen words from a superstrate language. Under these conditions, they stretched, altered, and interacted with that shared lexicon to eventually evolve a full-fledged language. In the regard, it is important to remember Véronique's hypothesis that pidginization, early second language acquisition, creolization, and grammaticalization (see below) may all be aspects of the same overall process.
- *Signed Languages*-Signed languages are a genuinely polygenetic phenomenon that has emerged many times in the past (Purlmutter, 2002). Within one or two generations, through interaction, signed languages develop into fully grammatical languages.
- *Grammaticalization*-In the process of language change and the development of pidgin and creole languages there is a general tendency for content words to become grammatical items, then clitics, and finally even inflectional affixes. It is likely that this progression also occurred in language evolution. This process involves a product of one stage of language evolution being fed back into the language system and altering the system itself. Such a feedback mechanism is a major characteristic of complex adaptive systems.
- *Simulations*-There have been several successful computer simulations of the emergence of language as complex adaptive systems (Kirby, 1998 ; Batali, 1998 ; Steels, 1998).

### 3. Conclusion

Based on the discussion above, the foundational questions that motivated the Roundtable, and the data and arguments in the various presentations, I believe the following considerations should inform evolutionary and neurobiological accounts of language.

*How did language evolve ?*

- 1- Although many biological changes may have been necessary for language to appear, it is possible that none of these changes involved genetic assimilation or neural instantiation of representations promoting or constraining grammar.
- 2- The structure of language as manifest in grammar may be a complex adaptive system that emerged as a cultural artifact and that exists between and among brains as they mediate its production, comprehension, and the acquisition.

*What exactly evolved ?*

- 1- As a research heuristic, I assume that the language, as it has evolved and as it was originally processed by the brain, was oral. The brain, with appropriate training, can acquire and mediate language as expressed in decontextualized print, just as it can acquire other knowledge and skills. However, the primordial form of language in our environment of

evolutionary adaptation was most likely spoken conversational interaction. The generativist tradition in linguistics never made a strict distinction in their data between speech and writing ; therefore, analyses are frequently of structures that probably did not face the brains of the initial users of fully fledged language. Understanding how the brain acquires and uses the language of literacy is certainly an important goal, but it is a different goal than that trying to understand what originally emerged as language and how the brain, then and now, processes that language.

- 2- Sign systems characterize communication throughout the biological world. The ability to make symbolic reference may be unique to human language, but it is unlikely to have spontaneously « appeared » within the species as a unique biological endowment. Rather, the ability for symbolic reference both emerged from and remains contingent upon the more primitive abilities of iconic and indexical sign exchange that are characteristic of organisms across the biological spectrum.
- 3- Language as it evolved and as it is used today incorporates multiple semiotic resources (eye gaze, facial expression, body position, gesture, phrasal breaks, repair, and the environmental surround etc.). Evolutionary and neurobiological accounts of language are in defect if they do not incorporate the plenum of the semiotic affordances on which interacting brains rely.
- 4- As iconic and indexical sign systems developed, it is likely that at some point, holistic language was characteristic of hominid communication. Modern language is a mixture of both holistic and analytical forms. Any biological account of language must deal with holistic language both as it might have existed in our environment of evolutionary adaptation and as it is currently processed, along with analytical forms, by the brain
- 5- Given that language likely evolved to serve conversational discourse, the appropriate indexicalization of language is found in transcripts that provide a microanalysis of natural conversation and that include a record of all the semiotic components involved in the interaction.

*How does modern language reflect what evolved ?*

Notions of « gapping » and « sentences » may only be marginally relevant to evolutionary and neurobiological accounts of language. More pertinent data and constructs may be found in databases of oral language corpora, the analysis of natural conversation, and in data on early SLA, pidginization, creolization, and grammaticalization.

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