

The continuity puzzle

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Darwin in his *Origin of Species* writes: 'If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down'. Looked at in this evolutionary perspective, human language behaviour would seem to pose a fundamental puzzle which we can term 'the continuity puzzle'. For having language would seem to be an all-or-none state. There do not seem to be any intermediate states between having language and not having it. Unlike, for example, a complex modality like vision, we seem to be unable to divide the language modality into more or less self-contained functional modules. Therefore, we are unable to envisage the evolutionary history of the human language modality consistent with Darwin's requirement of a complex modality arising out of incremental changes. Recently, Bickerton in his *Language & Species* has made a scholarly and serious attempt to come to grips with this 'puzzle'. In this paper we look critically at Bickerton's approach to resolving the 'puzzle' and argue that the fundamentals of his approach are flawed and his thesis is, hence, untenable. We suggest alternate approaches to dealing with the language modality that might provide more acceptable ways of dealing with the 'puzzle'.

DARWIN¹ in his *Origin of Species* writes: 'If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down' (p. 219). For, 'natural selection can act only by taking advantage of slight successive variations; she can never take a leap, but must advance by the shortest and slowest steps' (p. 224).

Looked at in this evolutionary perspective, human language behaviour would seem to pose a fundamental puzzle which we can term *the continuity puzzle*. Language behaviour sets human beings apart from all other animals. At the social level, communication competence is something that we may share with other animals. However, the language modality offers human beings behavioural possibilities which would seem to be unavailable to any other animal. If the characterizing aspects of behaviour in this modality are taken to be *instructability* and the capacity to *reflect*, then animal vocalizations and other means of social communication (e.g. chemical) definitely lack these two potentials.

The essence of instructability is the capacity to *tell how* to do something rather than merely *show how* to do it. The ability to reflect using language enables one to analyse one's own actions and those of others, or the state of the surrounding world, as well as one's own internal states and, thus, to reason about them, draw inferences from them, and so on. It is unclear whether, without the symbolic *representational* and *discourse* capabilities inherent in human language, instructing and reflecting, as modes of behaviour in the above sense, would be possible. There would thus seem to be a great divide between humans and all other animals. What, then, was the evolutionary history of the human language modality consistent with Darwin's thesis quoted earlier?

Some scholars have tried to dismiss this continuity puzzle as a non-issue. Pinker², for example, argues that the language capability could have developed after the human-chimpanzee split occurred in evolution. If true, then continuity could be sought for only among the species which were lineal evolutionary ancestors of modern human beings, and not among the derived species in collateral branches – e.g. the great apes. If *all* the lineal ancestral species of modern humans had become extinct, then looking for continuity among the *existing* non-human species is a pointless exercise.

This argument is facile and misses the essential point of the 'puzzle'. For, as Darwin again notes: '... We ought to find in the collateral lines of descent some evidence of such gradations; or *we ought at least to be able to show that gradations of some kind are possible...*' (p. 236; emphasis added). From the perspective of all existing human languages, having language would seem to be an all-or-none affair. At the level of human societies, there is no such gradation as having language more or less. In this sense, all human languages are equal in their potentialities. There do not seem to be any intermediate states between having language and not having it and, equally, there do not seem to be any differences between one human language and another in terms of what can be accomplished through their use, in principle. Existing inadequacies in vocabulary and grammatical structures can be readily compensated for through augmentations to meet the situational needs as they arise. (These assertions should not be confused with the developmental stages children go through in acquiring their first language. We shall consider the relevance of these stages to the continuity

puzzle later in our discussion.) It is this feature – that we seem to be unable to divide language into more or less self-contained functional modules – that lies at the root of the ‘continuity puzzle’.

Vision as a counterexample

This point about the critical importance of functional modularizability may be appreciated if we consider another complex behaviour modality, namely, vision. As Darwin himself notes: ‘To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for correction of spherical and chromatic aberration, could have been formed by natural selection seems, I freely confess, absurd in the highest possible degree. Yet reason tells me that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable to our imagination, can hardly be considered real’ (p. 217).

In engineering terms, one can modularize the visual capability along a variety of dimensions. For example, light energy discrimination into: light/shade, grey scales, colour; shape discrimination into: blobs, silhouettes, contours, textured domains, 2D, 3D, and so on; again, movement perception versus time-elapsed snap-shots; and others. For a more elaborate discussion of the actual existence and evolutionary history of gradations of vision, see Reference 3, Chap. 4. It is precisely this kind of modularization that we are unable to make with respect to the language modality.

Bickerton’s attempt

Recently, Bickerton⁴ has made a serious and scholarly attempt to come to grips with this continuity puzzle relating to the language modality. Using a somewhat different terminology – *the paradox of continuity* – Bickerton argues that the principal objective served by language is not communication but *representation*, i.e. a symbolic encoding of the world available to us (both the world outside and the world inside). His strategy to resolve the continuity paradox, then, is ‘to search for the ancestry of language, not in prior animal communication systems, but in prior representational systems’ (p. 23). If we succeed in establishing that the foundations needed for articulate language were already in place before the emergence of the hominid line, we can then concentrate on determining what additional features were missing

for the development of language as it exists now. It would then be sufficient to show that just these additional features differentiate humans from our closest evolutionary neighbours – namely, the great apes.

We shall present in the next section, in some detail, Bickerton’s attempt to resolve the continuity paradox. We shall see that Bickerton’s solution envisages the evolution of language in two stages; first, a transformation of the prelinguistic representational system into a *protolanguage*; and second, a transformation of the protolanguage into *language*. Our subsequent discussions will be concerned with analysing critically this solution of Bickerton to resolve the paradox.

Bickerton distinguishes his protolanguage from full-fledged language purely on syntactic considerations. We shall argue that the stages in the evolution of language must be related not only to surface syntactic features but also to associated semantic and pragmatic capabilities. We shall see that Bickerton’s arguments do not offer any help in resolving the continuity puzzle. It would seem that radically different approaches to modelling language and language behaviour are needed. To this end, we shall list some neglected aspects of language behaviour, and some new ways of computationally dealing with language texts and speech that are coming into vogue. We shall tentatively suggest that understanding the evolutionary implications of these might enable us to tackle the continuity puzzle more meaningfully.

Bickerton’s solution to the continuity puzzle

Language as a representational system

What any animal (including human being) knows of the world, it derives from the range of information from its senses. ‘This species-specific view of the world may be called the primary representational system of a creature.... The most complex PRS derives from the same source as the simplest’ (p. 82).

Bickerton argues that in the case of non-human animals, the sensorily processed outputs are directly linked to actions evolutionarily judged to be advantageous for survival. The PRS, as a whole, constitutes, as it were, a model of reality that serves to guide behaviour.

In the case of humans, the sensorily processed outputs are mapped onto language-mediated interpretations which, via further processing at the language level, lead to action. This ‘interpreted’ additional level is the secondary representational system. According to Bickerton, the notion ‘concepts’ is properly applicable only to the language-mediated (and ‘interpreted’) views of the world.

Concept words at the lexical level in a language are determined by the way the world is ‘carved’ by language

users. And this is based on perceived evolutionary advantages in one way of carving rather than another. Concepts are not passive mirror images of the world *as it is*.

Protolanguage and language

The human language developed in two stages. First, the animal representational systems culminated in a protolanguage (PL). Through further genetic mutations PL, gave rise to language (L). PL is an articulated linguistic code (i.e. a language system) in its own right; PL is not a degenerate version of L. PL is to be contrasted, according to Bickerton, with languages associated with aphasia, which are really degenerate versions of L.

More positively, Bickerton identifies four distinct examples of language performance that are instantiations of the use of PL: (1) ape language (i.e. the language produced by chimpanzees that have been taught the use of sign language); (2) the language of under-tuos in the ontogenetic development of humans; (3) the language produced by children who begin to acquire their first language well past the critical period: (the specific instance considered by Bickerton is that of Genie's⁵); (4) pidgin languages.

We shall return to these instantiations in the next section and discuss in some detail Bickerton's reasons for classifying them as PL and the tenability of his reasoning.

Bickerton hypothesizes that PL became functional as the *Homo erectus* stage of human evolution. He believes that the transformation of PL to L took place in one step: there were no intermediate stages. Bickerton tries to substantiate these assertions by providing long, detailed evolutionary arguments. It would take us quite outside the scope of this paper to reproduce his arguments. Fortunately, as we shall see presently, for our immediate purpose we can ignore this part of Bickerton's thesis.

PL versus L: Characterizing features

Bickerton enumerates five principled differences between PL and L.

1. The surface sequencing of constituents (e.g. *words*) may vary both in PL and L. But in L, the particular sequencing used is determined by structural considerations which convey differences in semantics, emphases, thematic roles played by constituents, and so on. However, in PL, there is no underpinning of utterances by structural considerations and, therefore, the ordering of constituents is idiosyncratic and not motivated.
2. In the case of L, even though a constituent is not overtly present, the underlying syntax identifies the

notional presence of such null elements. There is no principled way of inferring the presence of such elements in PL.

3. L has principled ways of identifying the subcategorized arguments of verbs (e.g. agent, patient, instrument, etc.). PL has no such means.
4. There are syntactically well-motivated mechanisms for the expansion of utterances in L. For example, phrases can be expanded in principled ways: *man*, *the man*, *the tall man*, *the tall man in the black coat*, *the tall man in the black coat at the street corner*, and so on, open-endedly. Similarly, one can expand utterances by adding subordinate clauses. In PL, on the contrary, such productive mechanisms are not available. Complex phrases that occur in PL function like idioms and are possibly rote-learned.
5. In PL, function words (i.e. grammatical terms) are either wholly absent or are found only as part of rote-learned phrases. PL seldom uses auxiliary verbs to express tense, aspect, class membership, etc. The reverse is the case with L in all the above instances.

Bickerton's argument is that ape language, the language of under-tuos, the language of children whose first language acquisition is delayed beyond the critical period, and pidgin languages, are all characterized by features that are peculiar to PL, as listed above.

Bickerton's basic belief is that the PL/L distinction mirrors the 'natural' decomposition of language (L) into a lexical component (together with its hierarchic semantic underpinning) and a syntactic component, whose rule-based operations enable the generation of complex-structured utterances. (Bickerton seems to accept explicitly the correctness of the Chomskyan GB-model to characterize the syntactic component.) The utterances of PL consist of mere stringing together of words from the lexical component (without any underlying rule-governed structure). Utterances of L, on the other hand, are explicitly rule-governed in their structure and make use of both lexical and syntactic components.

Validity of Bickerton's thesis

As remarked earlier, we shall not concern ourselves with the second part of Bickerton's argument which deals with the transformation of PL to L in the evolutionary development of the present-day human species. In the following sections, we shall offer some general criticisms of the foundations of Bickerton's thesis that we have summarized above. The main thrust of our critique will focus on the distinction that Bickerton makes between the communicative function of language and its representational function. We shall then assess critically the tenability of the PL/L dichotomy and analyse whether, in fact, the language behaviours exhibited by chimpanzees, under-tuos and delayed first-language

learners are of the same kind as Bickerton asserts and are exemplifications of their dependence on PL (rather than on L). Our critical assessment will lead to the view that the bases of Bickerton's resolution of the continuity puzzle are flawed and cannot be sustained. Since, according to our critique, the PL/L dichotomy cannot be maintained, problems relating to the transformation of PL to L in the evolutionary context do not arise.

Some general criticisms of Bickerton's solution

Communication versus representation using language

As we discussed in the last section, the starting point of Bickerton's solution to the continuity puzzle is the assumption that language is a representational system and not a medium of communication primarily. This polarization is based on a fundamental confusion. Language is *both* a communication medium and a representational system, at the same time. This is equally true of animal vocalizations. The difference between them resides in their potentialities. As emphasized earlier, *instructability* and *reflection* are modes of behaviour which are essentially predicated on the availability of the full potentials of language. As such, these modes of behaviour are available only to human beings and not to other animals.

Closely related to the ability to instruct is the ability to *describe* or *specify*. All animals have capabilities of varying sorts to *recognize* the situational aspects of their environments. The sophistication of this recognizing capability varies over a wide spectrum – from the rigidly programmed to the highly flexible. However, animal vocalizations incorporate very restricted means for describing to others what an animal perceives, recognizes or feels. Vocalization among animals is made use of to indicate need states (e.g. hunger), affect states (e.g. anger), or for purposes such as warning of predators, ensuring mother-child bond, maintaining social organization and cohesion, announcing the availability of food, and so on. The vocalization, thus, serves to *manipulate* the environment (i.e. other members of the community and foes) as well as to describe it. However, animal vocalizations seem always to relate to aspects of the world (external or internal) that are present here and now. We do not have any evidence that an animal uses (or can use) vocalization to caution another animal (say, its young one) of *potential* threats: for instance, 'when you go near the water-hole, watch out for tigers'.

Secondly, the description provided by animal vocalizations lack structure. The almost limitless particularizations possible in human languages are lacking in animal vocalizations. This is analogous to Bickerton's

distinction no. 4 between PL and L that we discussed earlier.

Language, according to Bickerton, constitutes an 'interpreted' secondary representational system. A long time ago, Pavlov characterized language as a second signalling system. Without the language modality, one has merely the sensory-motor behaviour complex that directly relates to the external world and can deal only with 'now' and 'what is out there'. But with language behaviour, one is able to separate out the sensory and motor complexes and mediate them via language. That is, one is able to refer to the sensorily apprehended aspects of the world and one's own actions independently and talk about them in the language modality. In this way, language becomes a second signal: a signal of signals.

Through language behaviour, then, one is able to deal with a world not necessarily immediately present to the senses. Through language behaviour, human beings are able to deal with worlds distanced from them in space and time. Moreover, they are able to deal not only with the actual world out there that is given, but also with (imagined) possible worlds and even counterfactual situations. With language behaviour, one is not restricted to performing actual experiments but can take recourse to 'gedanken' experiments. These are the essential aspects of the reflective mode of behaviour.

Natural language, thus, serves both as a representational medium and as a discourse medium. As a discourse medium, language makes it possible to discourse on what has been represented using that very language. Natural language has a limited representational capability if we demand that the represented content must be interpretable through fixed, pre-given interpretational techniques. But the discourse capability of natural language compensates for this representational limitation by allowing new conventions to be introduced for interpretation assignment. Besides, other notational schemes and other representational techniques (e.g. diagrams, charts, maps, etc.) can be embedded in natural language to extend its representational capability. (It is important to realize that these kinds of extensions of the representational capability of natural language are not restricted to the written mode, but can also be carried out to a limited extent in the oral mode.)

A given language, then, relates to a given world. Natural language behaviour at the naive level relates to the behavioural aspects of the commonsensical world of everyday-living of human beings. Artificial languages (e.g. predicate calculus) are constructed to cope with (i.e. describe, manipulate and explore) artificially constructed worlds. In scientific theorizing, for example, artificial worlds are constructed as formalized abstractions of the aspects of phenomenology of the natural physical world.

In Bickerton's terminology, we have so far been concerning ourselves with his language L. If his

protolanguage, PL, is a language in the sense we have been discussing here (although restricted in its scope), then we would be justified in enquiring what is the nature of the world PL refers to. What are the kinds of descriptions, manipulations and explorations that can be carried out in PL with respect to the world it relates to? Since Bickerton identifies PL with ape language, language of under-tuos, language of delayed language learners and pidgin languages, it would be appropriate to investigate whether the worlds of concern to all these four categories of PL-users are comparable, and whether the semantics and pragmatics associated with PL-usage is comparable across these four categories of PL-users. We shall discuss these aspects in the rest of this section.

Ape language

In the last 30 years, several chimpanzees (and at least one gorilla) have been trained to determine whether they could be taught language-like behaviour. In two of these studies, the chimpanzees were trained to acquire artificially constructed languages exhibiting some of the fundamental characteristics of natural languages. In the rest of the studies, the experiments were based on the use of signs somewhat resembling ASL (American Sign Language), which serves as a natural language for interaction among the deaf in the United States. Detailed descriptions of these experiments have been published and are now available for comparative study. For references to these publications and also for a critical analysis of the more important studies, see Reference 6, Chap. 3.

Is the behaviour exhibited by these great apes which have been taught ASL and other languages really language behaviour? This is a highly contentious question and the answers vary from the most optimistic to the most pessimistic. For example, Patterson⁷, the trainer of a female gorilla, Koko, claims that the latter used her signing behaviour to tell lies, to express her emotions and to refer to states and events displaced in time and space. On the other hand, Terrace *et al.*⁸, basing their claims on their carefully documented experiments with a male chimpanzee, Nim, conclude that although Nim succeeded in learning individual signs, sequences of signs produced by Nim were highly repetitive and were not based on any underlying syntax.

Bickerton asserts that 'no evidence produced to date gives any support to the idea that apes could acquire syntax' (p. 108). According to him, ape language sequences are mere strings of lexical items. Hence, he concludes that ape language is PL and not L.

Two serious methodological problems have consistently plagued all these ape language experiments. Firstly, the practice adopted by the experimenters in

transcribing the sign vocabulary into English and presenting it in terms of English words gives rise to misleading implications. For example, to gloss a particular sign used by an ape as 'please' in English, and then actually to *equate* it with that English word, gives the impression that the signing ape actually *intended* that sign to convey the implication of a polite request. In other words, to what extent did the signs that the apes had learned play a second-signalling role in determining their signing behaviour? Taking an extremely negative view, Seidenberg and Petitto⁹ argue: '... a large proportion of ape signs can be interpreted without any special knowledge of apes or ASL because they are unlearned gestures and activities that are seen in the behaviour of wild apes.... [The training has merely resulted in the apes' learning] a standardized system of gestures....' (pp. 199–200).

The second methodological problem was a pervasive one in the structuring of the very experiments. Fairly early on, the experimenters realized that (unlike human children) apes did not (could not?) acquire the signing behaviour of their human partners through *observation learning*. Each specific sign had to be taught laboriously through an extended sequence of training sessions using operant conditioning techniques. Does an ape which has gone through years of intimate handling like this by human beings still remain a typical representative of its species? Hediger¹⁰ has dealt with this question at great length in the context of the *clever Hans phenomenon* and makes many interesting observations. He claims, for example: 'Through the catalytic efforts of man, extraordinary latencies have been activated [in the signing apes]. All these surprising activities would never have manifested themselves in the wild'. Again: 'Through the catalytic effects of man, surprising changes and an increase in behaviour may be caused which surpass by far the genetically given ethogram of a species'. And finally: 'With all wild animals with which we try to enter into conversation, we do not deal with primary animals but with anthropogenous animals – so to speak with artefacts – and we do not know how much of this behaviour may still be labelled as animal behaviour...'

All these training and data limitations notwithstanding, the language behaviour of these signing chimpanzees did differ in significant ways from that of human children of comparable age. Language was hardly ever used as a tool for exploration; it was hardly ever used to describe on-going activities; it was hardly ever used to express anything more than their own immediate physical wants, and to a limited extent, their current affects. Needless to say, language was never used by these signing apes for any strategic purpose (e.g. to plan, reflect, socially manipulate, and so on).

We have considered ape language in some detail because the possibility or otherwise of language acquisition by the great apes – especially, by our closest

neighbours, chimpanzees – is of central significance in tracing the evolutionary history of human language. In what follows, we shall deal with the cases of under-tuos and delayed learners quite briefly. As far as pidgin languages are concerned, the users involved are adults who are already well-versed in a first language. From the viewpoint of behavioural pragmatics in the language modality, they must be as adept in their own first language as any normal language-using adult. The fact that pidgin displays peculiar features cannot make the pidgin-users PL-users. We shall, therefore, not consider this case any further here.

Language of under-tuos

Bickerton claims that among humans, the language of under-tuos does not formally, as well as materially, differ from ape languages. Under-tuo languages tend to be interpreted to form the initial segments of full-fledged languages because it is tacitly assumed that there should be a continuity in the underlying language mechanisms. Any shortfalls are exclusively attributed to 'maturational' limitation. Bickerton's assertion, on the other hand, is that under-tuo language is PL and not L at all. He sees this as a clear example of ontogeny recapturing phylogeny.

In the last 30 years and more, enough work has been done in children's acquisition of first language in a wide spectrum of language communities (including ASL learners) to disprove Bickerton's contentions. To begin with, unlike chimpanzees, children acquire their first language without any systematic tuition. Children are adept at observation learning not only in the sensory-motor modalities but also in the language modality.

Child development studies have established that from the very earliest stages of their lives, children engage in intentional behaviour. Towards the third quarter of the first year of their lives, children are proficient in engaging in planned actions made up of a complex sequence of subactions with well-defined means-ends relationships. They can seek the assistance of adults to perform actions beyond their capability. Their perceptual-motor repertoire is rich before they start to acquire their first words. They can recognize objects and agents, many of their properties, some of the relationships between their properties, recognize events, some of the relationships between these events, and so forth. Once they start acquiring language (in the 9th or 10th month of their lives), they very rapidly build up their vocabulary and use two-word and three-word utterances to mediate their interactions with all the above situational aspects of their world.

It is not correct to maintain – as Bickerton does – that under-tuo languages consist merely of structureless sequences of lexical items. Studies have repeatedly shown that children's early two and three word

sequences already mark well-determined semantic relationships between aspects of the world referred to in their speech. Also, the developmental sequence for the semantic relationships encoded in children's utterances have been shown to be universal across languages, including ASL. A very detailed description (with references) of these and other features of first-language acquisition may be found in References 6 and 11.

This universality of the developmental stages in children's first-language acquisition is a clear indication that maturational factors play a determining role, despite Bickerton's assertion to the contrary. If this were not true, one would expect to find idiosyncratic developmental stages – possibly depending upon culture, accidents of the learning contexts and so on. While it is tempting to believe that ontogeny recaptures phylogeny, it is difficult to see how the developmental stages of children's language as we find them now could have made any evolutionary sense phylogenetically.

Given all the evidences that we have now, we cannot but accept that the language of under-tuos is the initial segment of L and *is not* PL.

Language of delayed learners

Genie, whose case⁵ Bickerton considers as a paradigm case of a delayed language learner, was locked up in a room from the 20th month of her life till she was past her 13th year. She was totally isolated from human companionship during this entire period. Subsequent to her release, she had to start acquiring language behaviour more or less from the beginning. The details of her language learning have been described in detail in Reference 5.

Bickerton claims that Genie's language rehabilitation was arrested at the level it was because that level corresponds to the PL-level. The PL-level was a ceiling to her language acquisition because her language development started only after the critical period. Genie's utterances, although they may seem more sophisticated, are no more structurally advanced than the language of apes and under-tuos.

The case of Helen Keller is an immediate counter-example to Bickerton's 'ceiling' hypothesis. Helen was 7 years old when the famous episode at the water-pump took place which could be considered the actual start of her language learning process. She went on not only to master the full-fledged English language but to read and write and acquire a University degree.

It is worth noting here what would seem to be critical differences in the language learning experiences of chimpanzees and of human children. Ann Sullivan, Helen Keller's teacher, emphasizes three aspects of Helen's use of her newly acquired language skills from the very early stages of her language learning. These are: (1) the impulse to imitate; (2) the urge to tell others

one's experiences; and (3) the capacity for role-playing. These three types of behaviour were precisely the ones not exhibited by the language-learning chimpanzees.

Hewes¹⁷ (see ref. 12) notes: '... It seems unlikely that pongid language can become self-sustaining without an environment providing consistently rewarding results for language use.... In the *Homo sapiens* ... language became self-rewarding, coming to function in greeting and leave-taking, play, ritual, etc., even where it had little propositional or predicative purpose....' This is an important and insightful observation. Primitively, what is possibly of fundamental importance is the functional relationship between language behaviour and affect – between language behaviour and emotional and motivational states.

Curtiss⁵, in her dealings with Genie, describes how one day to cope with the latter's violent temper tantrums, she began to talk to Genie. She writes in her diary: '... To my amazement, Genie really began to listen to what I was saying... Our talking about what was upsetting her seemed to calm her down and ease her anger. She paid close attention to what I said, repeated my statements after me, reflected on them aloud, and let their import help her deal with her feelings...'

There is no evidence that one can reach to the emotional core of chimpanzees through talk. It is this fact – that through language one is able to control the affect states in the one case, and one is unable to do so in the other – which, perhaps, profoundly differentiates human children from chimpanzees in their capacities for language learning.

The validity of PL/L distinction

We seem to have succeeded in knocking down one by one all the props holding up Bickerton's PL/L distinction. If utterances in PL, as Bickerton claims, are mere strings of lexical items lacking any underlying structure, then these cannot give rise to anything more than animal vocalizations in semantic and pragmatic import. As we saw earlier, animal vocalizations do not have the full-fledged potentials of human language that are needed for instruction and reflection – the two fundamentally important social and cognitive capabilities language endows human beings with. In this case, by merely mapping the primary representational system onto a protolanguage, there could not have been any evolutionary gain. It is difficult to accept, therefore, Bickerton's thesis that PL was a phylogenetic stage in the evolution of L.

Additionally, Bickerton is confronted with the problem of establishing structural correlations at the level of brain mechanisms for the distinctions he postulates between PL and L. He has very little to say about this issue in his book. Also, his assertion that PL to L transformation took place in one step without any

intermediate stages, makes this problem of establishing correlations of PL and L with underlying brain mechanisms even more intractable.

Bickerton's approach to resolving the continuity puzzle seems to have led us to a dead end. I suggest that to come to grips with the puzzle, we have to ask some radically different questions. For example: (1) Can we look for precursors of language in some other non-linguistic modality? (2) From an evolutionary point of view, how relevant are grammar-based models of language? (3) Can we think of non-rule-based models of language processing? (4) Can we find empirical supports to such alternate models and approaches to dealing with language behaviour?

In the next (and concluding) section, we shall try to look for answers to some of these questions and tentatively suggest alternate approaches to come to grips with the continuity puzzle.

Back to square one?

Language versus language behaviour: the inadequacy of grammar-based models

Bickerton is surprised that, while specialists in disciplines such as anthropology, philosophy, ethology, psychology, and so on, have been willing to speculate on the origins of language, linguists (who are centrally concerned with the study of language) have not bothered to examine this question. But the problem with many of the linguists – especially the more articulate and influential ones – is that they have a tendency to deal with language as an abstraction divorced from language use or language behavioural pragmatics. Chomsky, of course, has reified this distinction by postulating a divide between competence and performance, and arguing forcefully that competence (or, what he calls the knowledge of language) can be studied and formalized independently of language use. Grammars are formal systems that encapsulate this knowledge of language.

Malinowski (the social anthropologist), on the other hand, a long time ago drew a clear distinction between the philologist's approach to language as a vehicle for communicating thoughts and ideas, and the ethnographer's approach to human speech as a social action, as a mode of behaviour. It is important to remember that when children acquire proficiency in the language modality, what they acquire is not language as a decontextualized formal entity, but language behaviour as a socially and culturally determined skill. Language behaviour enables one to describe various aspects of the world, both external and internal (i.e. express one's own intentions, desires, wants, etc.), explore them, and command and control behavioural aspects (of others' as well as one's own). It is important, in this context, to note that the purely linguistic aspect constitutes only one

aspect of language behaviour. Prosody, gestures (including facial expressions), contextual clues, shared presuppositions, and a variety of other factors play determining roles in the successful use of language behaviour. The main flaw in Bickerton's thesis is that he looks for a solution to the continuity puzzle exclusively in the linguistic domain. Maybe, the associated paralinguistic aspects are more important from the evolutionary point of view than mere words and sentences, dealt with in a decontextualized fashion by linguists' grammatical models.

Linguists' grammatical models have other inadequacies when looked at from an evolutionary viewpoint. Grammar is an all-or-none construct. It is not evident how a grammar could be built up by stages, in incremental steps, such that every member of a converging sequence of grammars is itself a valid (partial) grammar. It is also not clear how grammars could be augmented or modified incrementally in terms of particulars, that is, in terms of feedback from experience. These are precisely requirements a framework must meet if it is to model adequately the developmental stages children go through while acquiring language. These are also boundary conditions that must be met for natural selection in evolution to be effective.

It has also been pointed out that linguistic theories do not explain how people understand ungrammatical sentences. This is something that we presumably do all the time. Clearly, the paralinguistic factors, the accompanying context, shared background, and so on, help us to cope with 'ungrammaticality' in the linguistic domain. A grammar intended for actual real-life applications cannot afford to dismiss these accompanying facets of language use as irrelevant.

Alternate approaches to natural language processing

Computer scientists concerned with natural language processing (NLP) applications (particularly, mechanical translation (MT)) have become increasingly disillusioned with grammar-based (or rule-based) approaches.

More than ten years ago, Nagao¹³ argued that 'man does not translate a simple sentence by doing deep linguistic analysis' and proposed an analogy-based paradigm for mechanical translation. Nagao's ideas during the last decade have led to the active exploration of a variety of non-rule-based approaches to MT. The most innovative of these is the 'memory-based' approach to NLP¹⁴. In this approach, rule-based *analysis* is replaced by *recognition* based on memory search. Input sentences are matched against all relevant data to find similar sentences in the database. If such sentences encountered earlier had gone through some kind of context-based analysis, then that experience can be sought to be analogically extended to cope with the

newly encountered sentence. The learning involved here is example-driven and not based on abstract rules. Such memory-based approaches clearly can be incrementally grown and also incrementally modified.

It has been pointed out by workers in this field that rule-based models were favoured earlier not necessarily because, objectively viewed, they were the most appropriate models to cope with the task on hand, but the tool (namely, the von Neumann type of computer) was most effective in handling such models as opposed to memory search approaches. A clear case of the tail wagging the dog! But, with the availability of massively parallel systems and extra-large memories, it is becoming feasible now to investigate seriously memory search approaches.

The importance of gesture

In an interesting and highly significant review article, Goldin-Meadow and Mylander¹⁵ discuss observations and experiments involving a set of profoundly deaf children of hearing parents who, during their very initial stages of first-language acquisition, had neither a hearing model nor a signing model available to them to guide their language development. Nevertheless, they improvised their own signing behaviour to communicate and also as a *metalinguistic medium* to refer to their own signed acts. The authors claim that this gestural medium improvised by these children displayed internal structures similar to those found in children's early language behaviour (both of normal children and hearing-impaired ones learning ASL). The implication is that children have an intrinsic capacity to develop language-behaviour-like communicative and metalinguistic skills.

It is significant to note that in the absence of speech, gesture is the natural alternative mode for developing systematized language-like behaviour; in other words, gesture is marshalled to play a *symbolic*, rather than a mere miming, role. It is also highly significant to note that in the case of these children, the gestural communication efforts of their mothers did form a base for the children to build their own gestural systems on. In normal circumstances, gestures accompanying speech play a paralinguistic role and do not constitute a linguistic system. What does not seem to have been carefully analysed by the authors in the case of these children is whether the gestural means adopted by the mothers to 'talk' to their children were consciously moulded to play a more nearly *linguistic* role. Even if this had been the case, it is significant that the children innovated on this base to evolve an elaborate linguistic system in the gestural mode.

In normal conversational interaction in the speech mode, gestures involving hands and facial expressions play a very important paralinguistic role. That is, they

aid in the coding/decoding of syntax, semantics and pragmatics at the same time. It was noted by Yerkes and Yerkes¹⁶ – quoted in Seidenberg and Petitto⁹ – that the apes' modes of affective expression include:

'position, pose, and movements, often termed gestures, of the hand, trunk, limbs, extremities... . Particularly noteworthy are the so-called gestures made with the hand, limbs and extremities... .'

Seidenberg and Petitto⁹ add: 'Existing naturalistic studies do not make clear whether these gestures involve pointing or other types of indexical reference'. It has, of course, been claimed¹⁷ that gestures were precursors of speech, and gestural systems, precursors of speech-based language systems.

Vygotsky¹⁸ has argued that 'gesture is the initial visual sign that contains the child's future writing as an acorn contains a future oak. Gestures, it has rightly been said, are writing in air, and written signs are frequently simply gestures that have become fixed... '.

In the recent past, there has been much emphasis in aphasia literature on the need to study systematically and in detail how aphasics compensate for their inadequacies in their normal language performance in order to ensure successful accomplishment of their goals. For this purpose, it has been suggested¹⁹ that detailed case studies of individual aphasic's behaviour in various life-like pragmatic situations are likely to be more valuable than statistical group studies. It would be of much significance to study to what extent and in what manner gesture is involved as a replacement for speech to play a linguistic role.

Are we back in square one, then?

Yes. We are back in square one insofar as the continuity puzzle continues to remain very much a puzzle. It is not a puzzle that can be wished away. For, as Pinker² quoting Dobzhansky points out: 'nothing in biology makes sense except in the light of evolution'. The biological bases of language and their development in the evolutionary context are unresolved issues of central importance.

On the other hand, our critique of Bickerton's solution to the puzzle has thrown up many promising alternative approaches to come to grips with the puzzle. But the

lesson to learn is that, to tackle the puzzle meaningfully, wide interdisciplinary studies are needed. The puzzle is unlikely to be resolved by linguists *qua* linguists. For, in the ultimate analysis, it is not a purely linguistic puzzle in the narrow sense.

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