

## **Linguistic Anchors in the Sea of Thought ?**

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### **Biographical Sketch.**

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### **Abstract.**

Language, according to Jackendoff (How Language Helps us Think -- this issue), is more than just an instrument of communication and cultural transmission. It is also a tool which helps us to think. It does so, he suggests, by expanding the range of our conscious contents and hence allowing processes of attention and reflection to focus on items (such as abstract concepts and steps in chains of reasoning) which would not otherwise be available for scrutiny. I applaud Jackendoff's basic vision, but raise some doubts concerning the argument. In particular, I wonder what it is about public language that uniquely fits it to play the functional role which Jackendoff isolates -- why couldn't expression in a private inner code induce the same computational benefits? I suggest a weaker position in which the communicative role of public language moulds it into a suitably expressive resource, such that natural language emerges as the logically and technologically contingent filler of a functional role which could, in principle, be filled by other means. I also compare and contrast Jackendoff's position with some related ideas due to Daniel Dennett and others, concluding with a sketch of my own view of language as an external artifact whose computational properties complement those of the basic biological brain.

## **0. Beyond Communication.**

Jackendoff's powerful and thought-provoking paper (How Language Helps us Think, this issue) belongs in the camp of what I will call supra-communicative views of language. These are views which depict language as substantially more than just a means of communicating ideas and promoting collective learning and endeavor. Language, on the supra-communicative view, is also some kind of computation-transforming instrument: a tool which allows biological cognition to

confront and solve an expanded class of problems and thus actually expands the realm of the thinkable.

Supra-communicative views, though relatively rare, are not unknown in the literature, and one of my aims in what follows is to try to focus the ways in which Jackendoff's position is special. At the same time, I have some worries, largely concerning the considerable distance which remains between Jackendoff's intriguing ideas and any concrete computational model. Closely related to this issue is a worry about the repeated claim that it is only through language that such and such becomes possible. I shall try to tease out a few different ways of understanding such claims, and suggest that only a fairly weak reading can currently be justified.

I begin (Section 1) by rehearsing some of the concrete questions which I think any supra-communicative view needs to address. Sections 2 and 3 are a critical reconstruction of Jackendoff's argument, which highlights the points at which these questions need to be raised and pursues the precise contrast between Jackendoff's position and those of other supra-communicative theorists such as Dennett and Vygotsky. I end (Section 4) with a rough sketch of my own, perhaps slightly different, take on some of these matters.

## **1. Some Issues.**

A supra-communicative view of language, as I define the term, holds that the availability of linguistic encodings enhances our problem-solving capacities by somehow transforming the kind of computational space in which we operate. This vague and wide definition can be filled out in a number of different ways. Three ways are especially worth noting:

1. It might be held that exposure to linguistic inputs actually causes some kind of profound re-programming of the brain, creating a new kind of on-board computational device. This, as I understand it, is Daniel Dennett=s view in Conscious Explained. Dennett depicts our exposure to linguistic bombardment (in the context of some small and subtle differences in initial hardware) as causing the development of a special kind of on-board computational device viz. a kind of classical serial processor implemented in the substrate of massively parallel, broadly connectionist, neural machinery (see Dennett (1991) pp. 218-219, Dennett (1995) pp. 370-373).
2. It might be held that the power of language lies in the fact that we quite literally think (sometimes) in words, and that it is the intrinsic properties of this representational medium which makes the difference (see Carruthers (to appear)). This view is compatible with, but independent of, the Dennettian image of the construction of a new kind of on-board computational device.
3. Or it might be that language, considered as an actual external resource (subsisting in speech sounds and real texts), provides a manipulative arena which allows operations which complement those of the basic biological brain, but are not replicated by it. This kind of view (which happens to be the one I endorse -- see Section 4 below) needs, of course, to tell a special story about the obvious phenomenon of inner rehearsal. The brains job, on this view, is to interface with linguistic media, but we need not assume either that thinking is literally conducted in words, or that linguistic bombardment

creates any profoundly different kind of computational device in the head.

Which of these views, if any, is Jackendoff's? I don't think the text provides a clear answer, except insofar as we find a crisp rejection of option (2). We return to this issue in Section 3 below.

Other questions which a supra-communicative view needs to resolve include:

C Is language essential to whatever range of computational benefits are being claimed, or is linguistic encoding merely one way to achieve e.g. a certain kind of precision, abstractness or manipulability? (Here, Jackendoff claims that linguistic encoding is essential -- but the issue is not, I believe, fully resolved as we'll see).

C

C Does the ability to manipulate and use language itself demand a special kind of on-board resource? Or is language use ultimately supported by the same type of neural machinery (e.g. recurrent neural networks) used for other perceptual and motor tasks? In other words, how deeply computationally different must the language-user already be, before the new tool can be exploited as Jackendoff's suggests?

In the next several sections, I offer a partial reconstruction of Jackendoff's argument, noting when and where these issues arise, and suggesting some possible lines of development.

## **2. Attention, Resolution and Anchoring.**

Jackendoff clearly aims to go beyond a merely communicative view of language (in which its only role is to express thoughts), and usefully isolates a number of (what he calls) indirect effects of language on thought. The effects are termed >indirect= to signpost the fact that Jackendoff emphatically rejects the idea that thought needs language. Instead, his position is that language, when present, can feed and transform thought in various ways. The key claim here is, it seems, that language makes thoughts available for attention and that this in turn opens up new possibilities of reflection and detailed analysis (see especially MS pp. 14-18).

Underlying this vision (more on which below) is Jackendoff's controversial view that the deep cognitive processes which constitute thought are never conscious, and that what consciousness presents is some kind of echo (in linguistic images, or visual and other images) of these deep processes. The consciousness of a monkey, on this picture, is limited to whatever contents/up shots of these deeper processes can be captured by images in various sensory modalities (visual, somatosensory, etc.). Language-users by contrast, are able to be conscious of whatever contents/upshots can be linguistically expressed -- a much wider and more abstract realm of possibilities. Unlike the monkey, we (Jackendoff says) can even be conscious of the steps of abstract reasoning, courtesy of the linguistic modality.

Jackendoff claims that we can only attend to what is consciously present, and that as a result, availability to consciousness has real implications for problem-solving activity (it=s not just an epiphenomenal choir repeating our thoughts). This is the first point at which I want to enter a question mark. For Jackendoff merely asserts that one can attend only to what is consciously presented. But what kind of claim is this? It is certainly not obvious why this should be the case. I do concede

that the claim is phenomenologically well grounded. But this leaves its force undetermined. Could there be creatures for whom conscious presentation is not a pre-condition of attending? Consider the kind of cognitive benefit that attention, on the Jackendoff model, supports. Attention is said to enhance resolution at the attended location (in conceptual as well as perceptual space). It is said to be useful for anchoring ideas, for stabilizing abstract concepts in working memory, and for individuating the elements of complex thoughts as distinct objects for further scrutiny. These are worthwhile benefits, indeed. But it is not at all obvious why they demand the presence of a public linguistic code. Couldn't a device bereft of public language command a private inner code capable of expressing abstract ideas and making steps of reasoning available as objects of further processing? Attentional effects, in short, look to be logically and technologically independent of the presence of a public linguistic code. Equally, they look to be logically and technologically independent of the presence of conscious awareness however it is supported. Could not some computational device, lacking all conscious awareness, nonetheless engage in precisely the kinds of resource re-allocations (leading to enhanced resolution, etc.) which Jackendoff describes? How, then, should we understand claims such as the following:

Language is the only modality that can present to consciousness abstract parts of thought like kinship relations, reasons, hypothetical situations and the notion of inference. Only through language can such concepts form parts of experience rather than just being the source of intuitive urges.@

(Jackendoff, MS, p. 17)

(My emphasis)

In what sense is it only through language that such ideas can become objects of conscious awareness and hence of attentional processing? One weak, but plausible reading depicts public language as the contingent, but sole, filler of a specific functional role. On this reading it just so happens that public language, in human cognition, provides a code which supports substantial abstraction and is consciously experienced. Language is, as it happens, the modality which does this job in us. But there is nothing intrinsic to the idea of a public language which implies that *only* a public code could support the kinds of computational benefit Jackendoff so usefully isolates. Suppose, for example, that vision was the only sense modality by which we gained information about distant objects. In such a case, vision would be the contingent but sole filler of a specific kind of functional role. But it is a role which, we know, might also be filled (in different ways, but preserving the broad role of gleaning distal information) by hearing, radar and sonar.

My guess is that Jackendoff intends something stronger -- some claim to the effect that public language is the only thing which could in principle fill the functional role he isolates. But I do not see anything in the text (or elsewhere) which would work as an argument for this stronger conclusion. My own view is thus that the relation between public language and the functional role Jackendoff describes falls well short of either logical or technological necessity, but may nonetheless be dictated by evolutionary and developmental constraints. This idea is pursued in the next section.

### **3. Why Publicity Matters.**



What might it be about public language which fits it for the functional role Jackendoff describes? One attractive answer, it seems to me, is that the expressive power of natural language has been molded by its role as a medium of public, interpersonal exchange. In particular, we use public language for a variety of broadly normative ends involving practices of questioning and interrogation. For example we ask someone to explain why they are pursuing a given course of action, we may question specific assumptions which someone looks to be making, we may ask why someone thinks X follows from Y, and so on. This profile of interpersonal criticism is, it seems, an integral part of the cooperative use of language to promote so-called collaborative learning (see e.g. Tomasello et al. (1993)). If public language evolved so as to aid interpersonal communication and cooperation, then these uses are, to coin a phrase, teleologically constitutive: they are of the essence of language qua evolved tool for collaborative endeavor.

If we now place this teleological scenario beside some familiar, broadly Vygotskian, ideas, an interesting picture emerges. For one powerful aspect of a Vygotskian treatment (see e.g. Vygotsky (1962), Berk (1994), Berk and Garvin (1984), essays in Diaz and Berk (Eds.) (1992)) is the notion that we come to internalize various public, interpersonal uses of language. In particular, we learn to use inner linguistic rehearsal as a means of >thinking through= a problem, questioning our own strategies, staying on guard against common errors, etc. Recent studies of the self-directed speech of 5-10 year olds for example, found that such speech is largely keyed to the direction and control of the child=s own actions and increases when the child is alone and trying to perform some difficult task (Berk and Garvin (1984)).

Perhaps, then, it is no accident that it is public language which fills the functional role Jackendoff espouses. For the original interpersonal role of language is what shapes it as a code suitable for interrogation, criticism, and the pursuit of reasons. And it is these very properties which subsequently feature in the supra-communicative uses in which it functions so as to make complex and abstract trains of thought available for attention, self-inspection and self-criticism. If this were so, then public language would be the only evolutionarily plausible filler of Jackendoff's functional role: only a code developed so as to facilitate interpersonal criticism and cooperation would be likely to exhibit the powers of expression, reification and abstraction which subsequently enable the kinds of more sophisticated supra-communicative use with which we have been concerned. It has recently been suggested (Changeux and Connes (trans) (1995)) that higher intelligence is most clearly characterized by the presence of self-evaluation and self-criticism as waystations to increased efficiency and success. It is satisfyingly unsurprising (given a broadly Vygotskian scenario) that it is beings graced with public language who most powerfully exhibit these very traits.

#### **4. Language as a Complementary External Artifact.**

The last issue I'd like to raise concerns the question: what kind of inner, computational mechanisms underlie the sorts of language-involving episodes which figure in this account? Is the image one in which there exist some quite novel kinds of internal processing device supporting the phenomena of inner rehearsal and expression? Or should Jackendoff's avowed commitment to evolutionary continuity (MS, p. 1) incline him to depict the inner mechanisms as

>more of the same= except this time targeted on the unusual domain of linguistic expressions and forms.

It is exactly this issue which, for example, seems to divide Paul Churchland and Daniel Dennett. Dennett, as we saw in Section 1, imagines inner linguistic rehearsal as the province of a special type of device (a kind of virtual classical machine) installed in the brain courtesy of the extensive and rather profound re-programming instigated by the acquisition and use of public language. Churchland, by contrast, insists (contra Dennett) that our manipulations of language require no more than the operation of so-called recurrent neural networks (see e.g. Elman (1993)) and that no radical re-organization of the inner realm is therefore necessary. Unfortunately, Churchland does not go on to recognize the powerful supra-communicative roles of language, but instead rests content with a rather standard picture in which language is (just) an instrument of communication and collective endeavor. But on the question of the kind of inner computational device needed to support our linguistic manipulations, my sympathies lie squarely with Churchland. Notice, incidentally, that this is neither to deny nor affirm the independent proposition that language acquisition may require substantial innate biases in the learning device. Rather, it is a question of what kind of computational device is needed to support the mature capacities of linguistic imagination which Jackendoff highlights.

According to how we depict the inner cognitive machinery, we get a subtly different take on the way in which language turbo-charges thought. If we suppose (with Dennett) that the relevant inner machine is of some radically different computational type, then it is as if language has parasitized and re-organized chunks of the brain. If we suppose (with Churchland) that we are deploying

essentially similar computational resources for both linguistic and perceptual-motor tasks, then the way is open to treat public language as essentially an external artifact whose intrinsic dynamics complement (without fundamentally altering) those of the brain. This, as it happens, is my own view of the matter (see Clark (to appear)), and I will end by offering the very briefest sketch of how it goes.

Consider a common artifact, such as a pair of scissors. The artifact is itself the result of a quasi-evolutionary process (design) in which the form of the artifact is adapted so as to be easily used and manipulated by the target users (typically, right-handed adult humans!). The artifact does not deeply alter the user (although some muscles may develop to aid frequent use). But the combination of the artifact's special properties and the user's own nature creates an extended system (us-plus-scissors) capable of solving a new and interesting class of problems (e.g. straight-edge paper cutting).

My own view is that language is, in this same sense, an artifact, one which has itself evolved so as to be easily acquired by young humans (perhaps exploiting processing biases inherent in the young -- see e.g. Newport (1990), Elman (1993) (see also Clark (1994), Christiansen (1994)). And one whose on-line use exploits the very same kinds of basic computational resources we share with other animals and use for ordinary perceptuo-motor tasks. To forestall immediate worries, two further comments are necessary.

First, it is of course true that there is something special about human hardware that gets the process of language acquisition off the ground. But that something need not amount to the presence of any special class of computational device (for a thorough treatment of the issues here, see Christiansen (1995)). Instead, it may simply consist in the freeing up of some resources, or in the

provision of some additional feedback loops for re-entrant processing (see Edelman (1992), Damasio (1994)), or some other small tweak which allows the fully fledged use of language to get off the ground.

Second, we need to factor in the crucial use of language in interior monologue. Here, the parallel with purely external artifacts (like scissors) breaks down. But the point to stress is that the internalized uses of language may still be running on the kinds of simple recurrent neural network envisioned by Churchland, and that they may literally amount to an inner recapitulation of the expressive and manipulative resources we first encounter in public, interpersonal use. Indeed, this is precisely the image suggested by the original treatment of these issues in Rumelhart, Smolensky, McClelland, and Hinton (1986). These authors describe some ways to manipulate and exploit external symbol structures and are led to comment that:

We can be instructed to behave in a particular way. Responding to instructions in this way can be viewed simply as responding to some environmental event. We can also remember such an instruction and tell ourselves what to do. We have, in this way, internalized the instruction. We believe that the process of following instructions is essentially the same whether we have told ourselves or have been told what to do. Thus even here we have a kind of internalization of an external representational format.

Rumelhart, Smolensky, McClelland, and

Hinton (1986) p.47.

The larger passage (p. 44-48) from which the above is extracted is, in fact, remarkably rich and prescient. The authors note that the external formalisms

themselves are especially hard to invent and slow to develop, and are themselves the kinds of product which (in an innocently bootstrapping kind of way) can evolve only thanks to processes of cultural storage and gradual refinement over many lifetimes. They also note that by using real external representations we put ourselves in a position to use our basic perceptual/motor skills to separate problems into parts and to attend to a series of sub-problems, storing intermediate results along the way -- a kind of operation which bears a striking resemblance to Jackendoff's image of language making the steps of reasoning available for attention and scrutiny.

In sum, I would like to depict language as an external artifact which complements, but does not profoundly transform, our basic computational profile. Such complementarity seems to provide plenty of space for the kinds of indirect effect of language on thought which Jackendoff so ably displays. An especially nice property of this kind of story, it seems to me, is that it may help us to build some bridges between the recent explosion of interest in the way biological intelligence couples with and exploits features of the local environment (see e.g. Hutchins (1995), papers in *Artificial Life* (1)1 (1994)), and more traditional interests in reasoning, logic, and high-level planning. For language, if I am right, is the principal resource which allows human brains to reconfigure complex, abstract problem spaces into forms which will succumb to the basic, pattern-transforming skills of biological intelligence. We are just ordinary animals with some small internal tweak and a very, very fancy tool: swimmers in the sea of words, thinkers in the shadows of the text.

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