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CHAPTER 11

Biolinguistics today and Platonism yesterday

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This contribution expounds on ideas put forth by a group of New York City generative grammarians that language possesses certain essential features that are uncaused and adhere to an abstract ideal form. An analogy of the situation with language is made with certain natural properties of numbers. It is also noted that this situation contrasts with that of the functional structure of human color vision. This idea is viewed alongside recent work in biolinguistics and is compared to the neoplatonist view of language, namely that language is discovered by the child learner and not triggered. The main consequences of this idea are discussed both within the historical context and with respect to current theories on language acquisition.

During the 1980s, an extreme idea about the ontology of language emerged amongst a group of New York City generative grammarians. Jerry Katz wrote several articles and then a book, "Language and other abstract objects" (1981). In this work, he outlined his arguments for the notion that certain aspects of the essential features of language have a natural form, and hence are uncaused in the usual sense of causation. He likened this view to Plato's notions of ideal form, and suggested that certain aspects of language exhibit such an ideal form.

The obvious analogy is to properties of number. There is no physical cause that explains why/how functional relations between numbers have particular properties: why/how 2+2 = 4, why/how the square root of 4 is 2, why/how the difference between 0 and 2 is the same as between 2 and 4, etc. Most important, the number of numbers is not countable but transfinite: a fact like that clearly suggests (and for many, proves) that, wherever numbers come from, it is not from human cognition — we can imagine counting to the highest immediate infinity, given enough time: but human notions of time in which to count are transcended by the number of numbers.

This situation contrasts with the cause of the functional structure of human color vision: red is the opposite of green and blue the opposite of yellow (in each case they merge to grey) for neurochemical reasons, which may in turn have an interesting evolutionary basis (see Shepard 1997). The point is that the functional structure of certain biological or physical phenomena can be codified and understood, even used practically, long before the physical basis is determined or at least given a mechanistic theory (notorious cases include the gene theory and the periodic table of elements). But the fact that these theories have an articulated and predictive func-

tional structure does not mean that they are inevitably abstract or uncaused — the 'true' cause is eventually unearthed. But in the case of numbers, the 'true' cause appears intractably abstract. Our intuition insists that 2+2 = 4, or that the right triangle's hypotenuse is the root of the sum of the squares of the other two sides, long before humans discovered such facts, and will persist without possible counter demonstration, after humans have disappeared. In the case of the essence of language, Katz applied roughly the corresponding form of argument for Platonism used in mathematics: Natural language has formal properties independent of us, it is abstract, and we come to know it via intuition.

Langendoen and Postal (1984) were interested in the idea, and developed a form of proof that language has properties independent of us. Their achievement was to show that the number of sentences is not countable, but is transfinite, just as in the case of numbers themselves. Chomsky had often used the idea that the number of sentences is countably infinite to show that what people know when they know a language has to be governed by learned generative rules, not a finite list of sentences. Langendoen and Postal's took their formal demonstration to argue that the situation is even more extreme: the number of sentences is not merely countably infinite, it transcends any human counting mechanism, just like numbers. Thus, language has its own properties, properties that existed before humans discovered and applied some of those properties for their own purposes, and properties that will persist after humans have disappeared.

I lived in the same milieu as Katz, Langendoen and Postal (albeit further uptown than the first two) and added my own contribution to the 'Platonic' idea by exploring some psychological implications of the notion of language structure as uncaused. The idea was particularly intriguing because it cast a distinct light on the problem of language acquisition relevant for the zeitgeist: the current view was that the child re-creates language based on critical cues from the speech that it hears, which trigger options on a number of innately predefined dimensions. This model (basically an early version of parameter setting) was (and is) extremely elaborate, since the kind of linguistic model to be accounted for — government and binding - was a complex set of distinct 'theories' (e.g., case theory, government, theta role theory…) and levels of representation, (DS, SS, Logical form…). and complex movement rules organizing the relation between levels. Meaning was in part read off of the logical form, in part off the surface form. Parameter setting is a model that attempts to show how learning such a complex architecture is possible in the absence of clear cues to that structure in what the child hears. Parameter setting today remains to be developed even as a logically possible model, although recent investigations have made substantial progress in outlining the nature of the data that the child must experience and note for such a program to work. (Fodor 1998, 2001; Fodor and Sakas 2004).

The neoplatonist view proposed by Katz, Langendoen and Postal seemed to cut through this complexity. On the neoplatonist view, language is *discovered* by the child, not *triggered*: Just as the child (allegedly) discovers the concept of number or naïve physics or the moon because those entities exist outside the child, the child discovers the true essence of language because it is real and external to the child. This framed the language acquisition problem quite differently from the idea that the child has it already innately prefigured and is only waiting for specific cues to clarify which of the innate parametric options are relevant for its particular language. At the time, I noted that this has several consequences (Bever 1982):

(a) The 'poverty of the stimulus' presented to the child remains the central problem of language acquisition. If language is to be discovered and learned (not automatically triggered), the child must have learning mechanisms more constructive than associative connectionism. It may also have innate mechanisms that point it to the correct kind of grammatical structures, while not causing those structures.
(b) Conversely, the language learning child may be capable of making false *kinds* of hypotheses about the language it is learning. That is, if possible languages are not pre-configured within the child's cognition, it may create impossible hypotheses on its way to mastering its language correctly.
(c) There must be structurally possible languages that are not attested because they cannot be learned via normal language learning mechanisms.

To answer (a), I suggested an hypothesis-testing model of acquisition which accesses abstract concepts to resolve conflicts in representation. The flagship model was the acquisition of the concept of number. Since the 1930s, it was known that children go through several phases of mastery of numbers. At one point, they are confused about the relationship between the number of objects in an array and the apparent size of the array — they accept the view that if an array is changed to look larger (to adult eyes), it is assessed as having 'more' than before: at the same time if you take one of the objects away, now the child volunteers that it has 'less' than before. This is a representational conflict: stretching an array makes it have more, taking one object away makes it have less. The ultimate resolution is to access the concept of the invariance of number under physical transformation of shape. At the time, I argued that since the properties of numbers are not caused, the child is discovering an abstract and 'real' set of properties. Since then, cognitive neurologists such as S. Dehaene (1997) have elucidated many demonstrations that the number *concept* itself has innate neurological foundations in humans which he claims both enable and circumscribe its possible forms. Dehaene suggests that the biologically based simple number concept — available in similar inchoate form to some animals — evolved as a functional capacity adapted to a world that our perceptual sys-

tem resolves into discrete objects. In fact, he argues directly that the basic number concept *is* exactly like color vision — humans are innately wired to segment the world into objects and to differentiate amongst small numbers of those objects.

This casts a new light on the claim that children discover an abstract platonic form for numbers — it is now arguable that children *apply* a neurologically predisposition to categorize the world not only in terms of objects in it, but in terms of number of similar objects. But it leaves open what the critical experiences are that stimulate the child to access that capacity. It remains the case that children go through a phase of mathematical inconsistency before arriving at a stable number concept: hence, we can still infer that the concept is accessed as a resolution of conflicting representations.

What are the implications of all this for language acquisition? Dehaene's discoveries of specific brain areas devoted to the early development of number concepts may be elegant and surprising science, but we already knew well that there are specific brain areas devoted to language. What we do *not* know is whether these areas are predisposed to cause language, or are special mechanisms available to discover it. The basic learning issue remains — is there a special learning device for language, or is it the outcome of the combination of a general hypothesis testing model, in combination with a large symbolic capacity and special tuning to access particular linguistic architectures that provide consistent cognitive representations of languages?

The other two implications of language as an abstract object for learning also remain. Children may come to false kinds of hypotheses about their language — for example that every phrase is a sentence, or that there are only nouns and verbs. And it remains the case that there are many languages allowed by today's syntax, which are not learnable or usable, for various reasons.

What is the situation today? The notion of 'biolinguistics' has crystallized the idea that language has an essential structure, and that attested languages result from the interaction of that structure with interfaces, such as mechanisms for thought, acquisition, perception, production and associative memory (Hauser et al. 2002). The 'essential structure' of language has shrunk from the elaborate — almost Byzantine — GB architecture, to a single recursive tree-building process — recursive merge — almost everything else about attested languages is being explored as the result of interfaces, abstract categories and the lexicon. If this proposal is correct, it opens up a different way of thinking about acquisition from triggering settings on innate parameters. In fact, it makes more plausible the idea that the child's attested language is discovered via hypothesis testing, using variations on combinations of merge to reject and verify hypotheses created at the language interfaces.

Indeed, the greater reliance on interface constraints confirms the importance of the largely unstudied range of mental and neurological filters that can

substantially narrow the search space for possible languages. It is interesting that Terry and I spent some time four decades ago exploring the role of statistically valid perceptual strategies in constraining attested languages — a radical notion at the time. We suggested that the counterpoint between systems of behavior such as perception, and systems of grammatical knowledge can explain certain dynamics of historical language change. Our major case study was the the emergence of the restriction on deleting the subject relative pronoun (who) in subject relative clauses. In old English the equivalent could be deleted when the inflection and agreement on the verb blocked a garden path in which the subject relative could be taken as the main independent clause. When the inflectional system of English was basically leveled, initial subject relative clauses became compelling garden paths, blocked only by requiring the subject relative pronoun to be explicit (but not the object relative pronoun, since deleting that did not create a substantial perceptual garden path) (Bever and Langendoen 1971, 1972). As part of our exploration of the role of behavioral systems, we also suggested that certain apparently grammatical constructions are actually ungrammatical, but allowed in the attested language because they are transparently interpretable speech errors created by normal processes of speech production (Langendoen and Bever 1973). Finally, together with Jerry Katz, we collected a set of reprinted and new articles outlining different ways in which behavioral and learning mechanisms constrain attested languages: presciently, we called the book "An integrated theory of Linguistic Ability", just because each article discussed the impact of one or another system of language use — what today are called 'interfaces', on apparent language structures. (Bever et al. 1976).

More recently, I have suggested that an important general role of many interface structures is to compile statistical regularities as the child experiences them: the statistical regularities create an internalized bank of potential sentences with paired meaning and form, against which the child can test his/her syntactic hypotheses about their derivational structure. This alternation between hypothesis formation at the interface and filtering via a derivational model is spelled out a bit more in several current papers (Bever in press a, b). It has the possible implication of greatly reducing the impact of the poverty of the stimulus arguments in favor of passive parameter setting. (Bever in press a, b).

Thus, from the psychological viewpoint, the notion of language as an abstract object does not change the idea of how it might be learned, from the current formal architecture. In either case, hypothesis formation and verification is a possible model. In either case, interface constraints may account for a great deal of the appearance of attested languages. This leaves the prior arguments for platonic linguistics from Katz, Langendoen and Postal as they were: for better or for worse.

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