Linguistics as a Cognitive Science: Noam Chomsky's Naturalistic Approach to Language

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I. Two different approaches to the study of language

Α.

- "The only useful generalizations about language are inductive (1)generalizations." Bloomfield (1933, p.20)
- "Children want explanations, and there is a child in each of us; (2) descriptivism makes a virtue of not pampering that child." Joos (1958, p.96)
- "The over-all purpose of work in descriptive linguistics is to (3) obtain a compact one-one representation of the stock of utterances in the corpus." Harris (1951, p.366)

В.

- (4)"We are...interested in developing a theory that will shed some light on such facts as the following:
 - 1. A speaker of a language has observed a certain limited set of utterances in his language. On the basis of this finite linguistic experience he can produce an indefinite number of new utterances which are immediately acceptable to other members of his speech community. He can also distinguish a certain set of "grammatical" utterances, among utterances that he has never heard and might never produce. He thus projects his past linguistic experience to include certain new strings while excluding others.
 - 2. Furthermore, the speaker has developed a large store of knowledge about his language and a mass of feelings and understandings that we might call "intuitions about linguistic form." Chomsky (1955/1975, pp.61-62)
- (5)a What do we 'know' when we are a able to speak and understand a language?
 - b How is this knowledge acquired?
- "A naturalistic approach will assume that like other complex systems, he human brain can be profitably viewed as an array of interacting subcomponents, which can be studied at various levels: atoms, cells, cell assemblies, neural networks, computational systems of the kind pioneered, at a primitive stage, by the Cartesians, and so on." Chomsky (1993, p.42)
- (7) "A naturalistic approach to linguistic and mental aspects of the world seeks to construct intelligible explanatory theories, taking as "real" what we are led to posit in this quest, and

hoping for eventual unification with the "core" natural sciences..." Chomsky (1995a, p.1)

II. A Case Study: Interrogative Inversion

Will John solve the problem? [cf. John will solve the problem]

(9)DECLARATIVE INTERROGATIVE

a. Susan must leave. Must Susan leave? b. Harry can swim. Can Harry swim?

c. Mary has read the book. Has Mary read the book?

d. Bill is sleeping. Is Bill sleeping?

(10) Interrogative inversion process - structure independent (1st attempt)

Beginning with a declarative, invert the first and second words to construct an interrogative.

(11)DECLARATIVE INTERROGATIVE

a. The woman must leave. *Woman the must leave?
b. A sailor can swim. *Sailor a can swim?

c. No boy has read the book.d. My friend is sleeping.*Boy no has read the book?*Friend my is sleeping?

Compare these with the correct pairings:

INTERROGATIVE (12)DECLARATIVE

a. The woman must leave. Must the woman leave?
b. A sailor can swim. Can a sailor swim?

c. No boy has read the book.d. My friend is sleeping.Has no boy read the book?Is my friend sleeping?

(13) Interrogative inversion process - structure independent (2nd attempt)

Beginning with a declarative, move the auxiliary verb to the front to construct an interrogative.

(14)DECLARATIVE INTERROGATIVE

Could Bill be sleeping? a. Bill could be sleeping.

*Be Bill could sleeping?

b. Mary has been reading. Has Mary been reading?

*Been Mary has reading?

Should Susan have left? c. Susan should have left.

*Have Susan should left?

(15) Interrogative inversion process - structure independent (3rd attempt)

Beginning with a declarative, move the first auxiliary verb to the front to construct an interrogative.

(16)DECLARATIVE INTERROGATIVE

- a. The man who is here can swim. *Is the man who here can swim?
- b. The boy who will play has left. *Will the boy who play has left?
- (17) For these examples, fronting the **second** auxiliary verb gives the correct form:

(18) DECLARATIVE INTERROGATIVE

- a. The man who is here can swim. Can the man who is here swim?
- b. The boy who will play has left. Has the boy who will play left?
- (19) Does the child acquiring English learn these properties?
- (20) We are not dealing with a peculiarity of English. No known human language has a transformational process that would produce pairings like those in (16). Further, the incorrect forms in (16) (like the incorrect forms in (11) and (14), are not attested in any of the voluminous literature documenting the errors young children make in learning their language.
- (21) In fact, experiments specifically designed to determine whether such incorrect forms are possible for children (even 3-year old children) have invariably shown that they are not. Crain and Nakayama (1987)
- (22) The seemingly simple structure independent computational operations in (10), (13), and (15) are evidently not available to the human language faculty.
- (23) The right generalization is a priori much more complicated, relying on structured hierarchical organization:
- (24) Interrogative inversion process structure dependent
 Beginning with a declarative, move the first auxiliary verb
 following the subject to the front to construct an interrogative.
- (25) Does the child have evidence that would determine the correct process and exclude the incorrect ones?
- (26) Example dialogues like those in (18) surely are not uniformly available to the child learning language.
- (27) Even more significantly, even if the child is exposed to (18), that alone does not rule out the other possibilities as options.
- (28) This line of reasoning is a model of the classic 'poverty of the stimulus' argument for innateness of some aspects of language ability.
- (29) Further complications?
- (30) The man left.
- (31) Mary sleeps.
- (32) Sentences with no auxiliary at all do have interrogative counterparts, but ones that initially seem to fall under entirely different mechanisms.
- (33) a. Mary sleeps. b. Does Mary sleep?
- (34) ???
- (35) a. Mary will sleep. b. Will Mary sleep?
- (36) Comparing (35)a and b, we see just the familiar inversion alternation.
- (37) But comparing (33)a and b, instead we see a change in the form of

the main verb (from <u>sleeps</u> to <u>sleep</u>), and the addition of a form of the auxiliary verb <u>do</u> in pre-subject position. Yet native speakers have a strong intuition that the same process is involved. (33)) a is to (33)b as (35)a is to (35)b.

- (38) Hidden causes:
- (39) Reconsidering (33), it is as if the inflectional ending (carrying present tense and 3rd person singular agreement information) that appears on the main verb <u>sleeps</u> in (33)a has moved to the front of the sentence, much as the auxiliary verb in the other examples (<u>will</u> in (35)) does. And in that fronted position, it is realized as an inflectional ending on a sort of 'dummy' verb <u>do</u>, that is, on a verb that makes no semantic contribution of its own to the sentence, but rather, is present for some purely structural reason.
- (40) Chomsky's breakthrough was the insight that the tense/agreement morpheme in English is syntactically an autonomous entity even though it is invariably realized as a bound morpheme. It is available to transformational manipulation just as much as, say, a modal auxiliary is.
- (41) Implementation of the insight requires a notion of abstract underlying structure.
- (42) Three more phenomena displaying the same abstract pattern:
- (43)

 NEGATION

 John left

 John didn't leave

 John should leave

 John has left

 John is leaving

 Negation

 John didn't leave

 John shouldn't leave

 John hasn't left

 John is leaving
- (44) EMPHASIS

John left John **did** leave John should leave John has left John is leaving John **is** leaving

- (45) VERB PHRASE ELLIPSIS

 John left Mary did too

 John should leave Mary should too

 John has left Mary has too

 John is leaving Mary is too
- (46) An even more hidden cause:
- (47) a She worked b She works
- (48)a They worked b They work
- (49) In the present tense, except for the third person singular form, there is no apparent morpheme on the verb at all. The verb in (48)b is indistinguishable from the uninflected citation form.

- (50) "An alternative we did not consider was to eliminate the zero morpheme and to state simply that *no* affix occurs if the subject is not third person singular." Chomsky (1957, p.64)
- (51) They work
 (52) Do they work
 (52) They don't work
 (53) They do work
 (54) We work They do too
- (55) The reason for rejecting that alternative out of hand was that it would have substantially complicated the system with no concomitant benefit.

III. Minimalism

- (56) Over the decades, simpler and simpler syntactic theories have been put forward, with more general rules and principles.
- (57) Surprisingly, these simplifying developments in the theory have generally led to greater breadth and depth of understanding of both how human languages work and how they are acquired by children. This success has led Chomsky to put forward a 'minimalist program' as a working hypothesis:
- (58) Languages are based on extremely simple principles that interact to form intricate structures. (Here, Minimalism is the culmination of a decades old research direction.)
- (59) The language faculty is 'nonredundant'. For example, an ill-formed sentence is ruled out by just one principle or constraint.
- (60) Principles of 'economy' play a central role in determining computations and the structural descriptions they generate. No superfluous steps in derivations, no superfluous symbols in representations.
- (61) Language has two interface levels: Logical Form, which interfaces with the conceptual-intentional performance system; and Phonetic Form, which interfaces with the articulatory-perceptual performance system. There are no other levels.
- (62) Conditions on the levels represent necessary properties of the interfaces.
- (63) A linguistic expression is a formal object that satisfies the interface conditions in the optimal way.
- (64) "At the methodological level, the [minimalist] program has a certain therapeutic value. It encourages us to distinguish between genuine explanations and 'engineering solutions'..." Chomsky (2000, p.93)
- (65) "The minimalist program [hopes to show] that elimination of descriptive technology yields empirical results that are as good, or perhaps better, than before." Chomsky (2000, p.93)

(66) "How 'perfect' is language [as a system relating sound and meaning]?" Chomsky (1995b, p.9)

Bibliography

- Bloomfield, L. 1933. Language. New York: Holt, Rinehart and Winston.
- Chomsky, N. 1955/1975. The logical structure of linguistic theory. Ms. Harvard University, Cambridge, Mass. and MIT, Cambridge, Mass. [Revised 1956 version published in part by Plenum, New York, 1975; University of Chicago press, Chicago, 1985].
- Chomsky, N. 1957. Syntactic Structures. The Hague: Mouton.
- Chomsky, N. 1993. Language and Thought. Wakefield, Rhode Island: Moyer Bell.
- Chomsky, N. 1995a. Language and nature. Mind 104: 1-61.
- Chomsky, N. 1995b. The Minimalist Program. Cambridge, Mass.: MIT Press.
- Chomsky, N. 2000. Minimalist inquiries: the framework. In Step by step: Essays on minimalist syntax in honor of Howard Lasnik, ed. Roger Martin, David Michaels, and Juan Uriagereka, 89-155. Cambridge, Mass.: MIT Press. Minimalist inquiries: The framework. MIT ms.
- Chomsky, N. 2000. New Horizons in the Study of Language and Mind. Cambridge: Cambridge University Press.
- Crain, S. and M. Nakayama. 1987. Structure dependence in grammar formation. *Language* 63: 522-543.
- Crain, S. and P. Pietroski. 2002. Nature, nurture and Universal Grammar. Linguistics and Philosophy 24: 139-186.
- Harris, Z. 1951. Methods in Structural Linguistics. Chicago: University of Chicago Press.
- Hauser, M. D., N. Chomsky, & W. T. Fitch. 2002. The faculty of language: What is it, who has it, and how did it evolve? *Science* 298: 1569-1579.
- Joos, M. 1958. Readings in Linguistics. Washington: American Council of Learned Societies.
- Lasnik, H. 2002. The minimalist program in syntax. *Trends in Cognitive Sciences* 6: 432-437.
- Newmeyer, F. 1980. Linguistic Theory in America: The First Quarter-Century of Transformational Generative Grammar. New York: Academic Press.
- Pinker, S. 1994. The Language Instinct. New York: William Morrow.