The Openness of Natural Languages

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Preface

It might seem plausible to the non-specialist who thinks about *natural language* (NL) that a given NL, NL_x, permits one to report linguistic performances, both performances of NL_x elements and those of NLs distinct from NL_x. By 'reporting linguistic performances' I refer to nothing more arcane than forming statements like 'Amanda just shouted 'where's my baby?'' It might also seem to a non-specialist that NL_x permits one to do descriptive linguistics, not only the descriptive linguistics of NL_x, but that of other distinct NLs. By 'doing descriptive linguistics' I mean nothing more exotic than forming sentences like 'The German word for 'air force' is 'Luftwaffe''. But while these non-specialist assumptions might seem not only plausible but self-evidently true, modern linguistics in its dominant instantiation called *generative grammar*, in fact denies both these claims. Of course, it does this only implicitly and most advocates of generative grammar may be unaware that its doctrines taken literally preclude what any non-specialist would assume possible. Readers not easily accepting this conclusion will find their skepticism addressed in what follows, for a major goal of this study is to justify in detail the claim that generative grammar has the evidently intolerable implications just mentioned.

Section 1 Background

Near the beginning of the *generative grammar* movement in linguistics the following claims were made (all emphases mine: PMP):

(1)a. Chomsky (1959: 137) "A language is a collection of sentences of *finite length* all constructed from a *finite alphabet* (or, where our concern is limited to syntax, a *finite vocabulary*) of symbols."

b. Chomsky (1959: 137) "Since any language L in which we are likely to be interested is an infinite set, we can investigate the structure of L only through the study of the finite devices (grammars) *which are capable of generating its sentences*."

c. Chomsky (1959: 138) "The weakest condition that can significantly be placed on grammars is that F be included in the class of general, unrestricted Turing machines."

Characterization (1a) was clearly meant not to introduce some arbitrary notion 'language' but rather assumed that NLs fell under the conditions given:

(2) Chomsky (1957: 13)

"...I will consider a language to be a set (finite or infinite) of sentences, each finite in length and constructed out of a finite set of elements. All natural languages in their spoken or written form are languages in this sense, since each natural language has a finite number of phonemes (or letters in its alphabet) and each sentence is representable as a finite sequence of these phonemes (or letters)..."

That is, it was in effect claimed in (1a) inter alia that:

(3)a. Every NL sentence is finite in size (therefore, e.g. in length).
b. Every NL sentence is exclusively formed from a fixed, finite vocabulary of symbols.
c. Every NL is an infinite collection.
d. Every NL can be generated (recursively enumerated).

Given (3a, b), it is plausible, although not necessary, that the sentence collections defining NLs form (recursively) enumerable sets, [1] and hence (3d) and (1c) might well be true. But they might also be false and (3a, b), interpreted as factual claims about NLs might also be false. If so, (3d) would be false and hence (1c) would also be false.

However, as observed in Langendoen and Postal (1984: 15), Chomsky then gave no arguments or evidence for (3a, b, d) in the 1950s. Nor has he since. This meant that in the mid to late 1950s, claim (1c) was *question begging*. Chomsky's never interrupted and current maintenance of it (see below) is arguably *worse*. For Langendoen and Postal (1984, 1985) rejected all of these claims, focusing in particular on (3a, d), and offered a purported proof (whose conclusion was named *the NL Vastness Theorem*) that any NL with productive coordination, that is, apparently every NL, including English, was not only not an enumerable set but not a set at all. Rather full collections of NL sentences were concluded to be what logicians call *proper classes*; see e.g. Stoll (1979: 319). And it was argued that this was true because, inter alia, NLs not only have individual sentences which are not finite but contain, contrary to (3a), infinite-sized sentences of every (nonfinite) cardinality.

Purported proofs can, obviously, contain flaws. But these results were reviewed in major journals and, while hardly welcomed, no reviewer claimed to have found any error in the argument. [2] Rather, even the unenthusiastic reviews by and large somewhat grudgingly admitted that the argument seemed sound. Moreover, while eighteen years have passed since the publication of the arguments in question, to my knowledge no one has since even claimed to have shown that they were erroneous. Like any proof, that in Langendoen and Postal (1984, 1985) involved fixed premises and a logic. To reject the conclusion, a rational critic would have to reject at least one of these. But the logic of the proof was almost entirely that of a fundamental result in set theory, *Cantor's Theorem*. [3] It stretches plausibility, to say the least, to imagine that *this* aspect of the argument can be undermined. That leaves a rational critic with only two choices: either accept the conclusion, or find grounds for rejecting the premise. No one has done the latter and yet the conclusion seems not to be accepted.

In particular, although the formulation in Langendoen and Postal (1984) was specifically and explicitly aimed at Chomsky's various formulations, he has never to my knowledge, addressed the result. [4] Instead, despite frequently speaking of his own work as 'rational inquiry' and sometimes disparaging other work in linguistics as lacking this virtue, [5] he has throughout the intervening period continued to assume, without justification and without dealing with the counterargument, that nothing precludes taking an NL to involve (in fact, as in (4), to *be*) a computational procedure which recursively enumerates a set of expressions. [6] This view is strongly embedded, for instance, in his so-called 'minimalist program', which entirely postdates Langendoen and Postal (1984, 1985). So, for instance:

(4) Chomsky (1995: 14-15)

"We may think of the language, then, as a finitely specified generative procedure (function) that enumerates an infinite set of SDs. Each SD, in turn, specifies the full array of phonetic, semantic, and syntactic properties of a particular linguistic expression."

But of course, unless the argument of Langendoen and Postal (1984, 1985) is refuted, claim (4) is just what a rational person *cannot* think, since:

(5) Langendoen and Postal (1984: 72) The NL Non-constructivity Theorem

No NL has any constructive (= proof-theoretic, generative or Turing machine) grammar.

Conclusion (5) is evidently a trivial consequence of the NL Vastness Theorem.

So it appears that the argument of Langendoen and Postal (1984, 1984) to the effect that NLs are (i) not recursively enumerable sets, (ii) are not sets at all and hence that (iii) NLs have no generative/computational/constructive/Turing machine grammars, although both factually and logically unchallenged, was too arcane and too much in conflict with deeply held a priori beliefs to be taken seriously within contemporary linguistic theory. The arcane aspect was localized in two points. First, the argument depends on granting the existence of *nonfinite* sentences, [7] whereas the unargued prejudice that all NL sentences are finite is very strong in linguistics. [8] Second, the argument assumed an axiom about the productivity of coordination, a claim that the class of e.g. declarative sentences is closed under coordination, which was not hitherto recognized. From this *closure axiom*, appealing to Cantor's Theorem, the existence of nonfinite sentences can be proven. Now, given these arcane aspects, and given the sociological fact that the substantively unchallenged argument has not been accepted, it would be significant if it could be shown *independently of these seeming truths* that NLs fail to be recursively enumerable sets, hence (must) fail to have constructive grammars, on other, less arcane grounds. I believe this can be done by focusing on Chomsky's claim (3b), largely passed over in Langendoen and Postal (1984). Given that he presented no argument or evidence for this in 1959 or since, it should obviously *also* be a major point of suspicion.

The goal of this study is to show that (3b) is false; hence by merely *asserting* (1a), Chomsky was then and has continued simply to beg the question in a way Langendoen and Postal (1984) mostly *ignored* of whether NLs could have generative/constructive grammars. By focusing on (3b), it will be possible to present a different type of argument for the claim in Langendoen and Postal (1984, 1985) that no NL has a generative/computational/constructive/proof-theoretic grammar. The attraction of the newer form of argument is that, unlike that of Langendoen and Postal (1984, 1985), it depends neither on recognizing non-finite sentences nor on accepting the axiom about coordinate closure appealed to there. Moreover, the new argument also does not inherently stand on the conclusion that each NL includes more than $\aleph_o$ sentences, although it provides independent grounds for the latter conclusion. So the goal of the present study is to establish the earlier conclusion on different and possibly less controversial grounds.

Section 2 Fixed, Finite Lexicons

Focus on claim (3b) built into Chomsky's (1), which requires that the sentences of NL NL_i are formed exclusively from forms listed (hence listable) in a fixed, finite lexicon of NL_i (hereafter: LX_i). This doctrine enunciated by Chomsky more than forty years ago and never been abandoned by him is maintained in e.g. (6):

(6) Chomsky (2000: 120).

"The I-language consists of a computational procedure and a lexicon. The lexicon is a collection of items, each a complex of properties (called "features"), such as the property "bilabial stop" or "artifact". The computational procedure selects items from the lexicon and forms an expression, a more complex array of such features."

Chomsky thus makes it clear that the computational procedure he posits as characterizing an NL (or, in his terms, as being an NL) operates by finding items in a lexicon, that is, in some kind of finite list.

One can state the doctrine a bit more precisely if still informally as in (7a) or (7b):

(7)a.. For every NL NL_i, every *minimal form* of every sentence of NL_i is either drawn from LX_i, or is computable from grammatical mappings of other forms drawn from LX_i.

b. Let a grammar G be some full computational specification of an NL, NL_1 and let F be any arbitrarily chosen minimal form in an arbitrary well-formed sentence of NL_1. Then G *mentions* F.

By 'minimal form' I mean roughly what are called 'morphemes'. The notion 'mentions' of (7b) can be made quite precise in terms of set membership. For instance, one could identify the G of (7b) with an arbitrary *Turing machine* defined as in (8):

(8) Partee, ter Meulen and Wall (1993: 508)

"A Turing machine M is a quadruple (K, Σ, s, δ), where K is a finite set of states, Σ is a finite set (the alphabet) containing #, s ∈ K is the initial state, and δ is a (partial) function from K × Σ to K × (Σ ∪ {L, R})"

Then to say that G mentions some minimal form F is to say that F is either a member of K or is one of the symbols in the 'situations' defined by the partial functions. More perspicaciously perhaps for linguists, one can take advantage of the equivalence of Turing machines and Type 0 grammars (Partee, ter Mulen and Wall, 1993: 514) and take 'mention' to mean that F is one of the non-designated (e.g., not the arrow) symbols of one of the rules of a Type 0 grammar (that is, an unrestricted rewriting system).

To illustrate the notions, consider that infinitesimally tiny but infinite subpart of English whose initial members are represented by (9):

(9)a. My father died.
b. My father's father died.
c. My father's father's father died.
d My father's father's father's father died.
e. My father's father's father's father's father died.

Evidently, the collection of which (9) specifies an initial sequence consists of all and only those sentences of the form (10), where (X)* is the so-called *Kleene star notation*, denoting any finite string composed exclusively of occurrences of the symbol string in parentheses in that order:

(10) My + (father+'s)* + father + die+ ed

A partial grammar of this collection might be given by a totally ad hoc, and unprincipled phrase structure grammar of the form (11):

(11)a. S → DP + Verb
b. DP → my +GenDP + father
c. GenDP → GenDP + GenDP
d. GenDP → DP + 's

e. DP+s -→ father + ‘s

f. Verb → die + ed

Now, assuming that the sentences in (9) consist of all and only the minimal forms my, father, -‘s, die, -ed, it is clear that every minimal form in the collection (9) is mentioned in (11), in that my and father are among the symbols of rule (11b), ‘s is one of the symbols of rule (11d), and die and ed are among the symbols of rule (11f).

Let us say then that:

(12) An NL is *closed* if and only if:

a. there is some finite grammar of NL =G_{NL} such that

b. every minimal form of every sentence of NL is mentioned in G_{NL}.

A still simpler, essentially equivalent way of saying this would be (13a):

(13)a. An NL is *closed* if and only if there exists some finite list of all the minimal forms of every sentence of NL.

b. An NL is *open* if and only if it is *not* closed.

Clearly, for any collection of sentences, hence any NL, to be enumerable, minimally it must be closed. For devices which recursively enumerate sets, that is, Turing machines or their equivalents, are self-contained. They can only compute an output member of the set to be enumerated by combining elements from a given fixed list, as in Chomsky’s claim (6). For (3d) to be true then, it is necessary that NLs be closed. [9] Evidently, the subpart of English specified in (9) is closed. But this tells us nothing about English as a whole.

The essence of the question begging involved in Chomsky’s claim (1a)/(6) necessary to justify (3d) is then that he has never argued that full NLs are closed; nor has anyone else to my knowledge. In what follows I try to show that this logical gap in any argument for (1c)/(3d) cannot be filled for the simple reason that NLs are open, moreover, richly open in several distinct ways.

Section 3 Direct Speech

In the 1951 science fiction film, *The Day the Earth Stood Still*, a recently arrived space alien (played by Michael Rennie) at one point speaks to his giant flying saucer defense robot (named Gort). One could report that linguistic event as in (14):

(14) The space alien said 'klaatu barrada nikto' to Gort.

Example (14) is one of endlessly many sentences of a perfectly well known variety. These contain a complement of a familiar type called *direct discourse* or *direct speech*. It is a standard and quite traditional notion with a traditional Latin name. So Jespersen (1924: 290) indicates: "When one wishes to report what someone else says or has said (thinks or has thought) –or what one has said or thought oneself on some previous occasion—two ways are open to one. Either one gives, or purports to give, the exact words of the speaker (or writer): *direct speech* (oratio recta)." Trask (1993: 83) defines direct speech as: "The reporting of what someone has said by quoting her/his exact words, as in 'What time is it?', she asked..." The difference between (14) and Trask's example is that the former purports to report the exact words of an instance of performance in an (presumed for argument) NL distinct from that of the report. In view of this difference, let us informally distinguish three types of direct speech:

(15)a. *a domestic direct speech segment (DDSS)*: a piece of reported speech which is purported to be in the same NL as the containing report.

b. *a foreign direct speech segment (FDSS)*: a piece of reported speech which is purported to be in an NL distinct from the containing report

c. *a non-linguistic direct speech segment* (NonLDSS): a piece of reported noise which is not purported tobe in any NL.

Category (15c) is intended to allow for reports of e.g. noises by animals, noises of inanimate origin, tornadoes, explosions, trains, squeaking doors, etc.

Consider now a purported constructive grammar $G_{English}$ of one of the multitude of NLs referred to as 'English', say, my English, in which (14) might be a sentence. Since (14) is by assumption an English

sentence, then, if (3d) is true, $G_{English}$ generates (14) and every other sentence of English, and if so, as already argued, English would have to be closed.

The problem is that any derivation involving any computational procedure/Turing machine, e.g. that postulated by Chomsky, will fail to yield (14) unless it is able to find the foreign direct speech segment klaatu barrada nikto (or all of its components if any; see below) in $LX_{English}$.

Keeping doctrine (3d) consistent with data like (14) will apparently then require at a minimum maintaining the disjunction in (16):

(16) Either:

a. (14) is *not* an English sentence, or:

b. The foreign direct speech segment 'klaatu barrada nikto' (or its components (if any)) are listed in/elements of $LX_{English}$, that is, are mentioned by $G_{English}$.

Consider first (16a). This would follow from the more general:

(17) (14) is not an NL sentence.

The problem with any attempt to maintain (16a) is this. Surely, if, contrary to (17), (14) *is* an NL sentence, it is an English sentence, and not e.g. a Turkish, or space alienese one. However, (14) seems quite well-formed in my English. There is no intuitive fact to ground any rejection of its grammaticality. One does not teach children or foreigners to avoid such constructions. One does not correct such examples. Even the most extreme purist who bemoans the deterioration of the language would never cite examples like (14) as evidence. Popular grammarians never point to such examples as part of their prescriptive enterprise. And as already seen, traditional grammatical discussion recognizes their existence and assigns them to a type (oratio recta). There is then no direct factual basis for denial that (14) and similar examples are part of English. (16a) is groundless.

One can then turn to (16b). If doctrine (3b) has any content, then a straightforward interpretation of (16b) is evidently not tenable. For all of (18a-f) and the endlessly many other cases relevantly like them have exactly the same status as (14):

(18)a. The space alien said slatu niraba miktu to Gort.

b. The space alien said tlato sniraba fiktu to Gort.

c. The space alien said drato zimboto shiktu to Gort.

d. The space alien said snato jikmoti puroboton yablotofoo korodor to Gort.

e. The space alien said grato shilt buzu ftmakvrss muktmwik rabsidobad vagomasitor to Gort.

f. The space alien said vngmssptkfookytz to Gort.

If the notion of fixed, finite lexicon is to have any substance at all, that is, if it is genuinely to be part of a computational procedure, the FDSSs of (14), (18), etc., clearly could not be elements of an included lexicon. For an interpretation of (3b) under which it is consistent with the inclusion of all of these forms is an interpretation under which the notion 'fixed lexicon' excludes nothing. A 'lexicon' needed to cover (14), (18), etc., could hardly even meet the minimal condition of being finite, given a lack of length bound on pieces of direct speech; see Langendoen and Postal (1984: Chapter 3) for a general discussion of the nonexistence of length bounds of any sort in NLs. So nothing precludes distinct, arbitrarily long FDSSs or NonLDSSs, of e.g. the form:

(19)a. The foreigner screamed neeeeeeeeeeeeeeeeeeeeeeeeeeeee.....

b. The cow went 'moo'/'mooo'/'moooo'/'mooooo'/'moooooo...'

That is, there is no viable reason to believe that while e.g. English permits reporting as in (19a) human expressions or as in (19b) cow noises of various lengths, at some point there is a human or cow noise too long to be reported. What rule of English fixes a maximum length on reportable noises? Since it is impossible to specify an actual bound, the answer must be none. In short, and for several reasons, it is then impossible for every piece of direct speech, every DDSS, FDSS and NonLDSS to be mentioned in the grammar of any NL.

The points just made were in essence, as I am grateful to G. K. Pullum for reminding me, noted by Zellig Harris in remarks which subsequent linguistics seems to have ignored, and thus never refuted: [10]

(20) Harris (1979: 10-12)

"Hence the set of sentences, as sequences of elements in a finite discrete set, is denumerably infinite, even though it will be seen below that the matter is complicated by the fact that the set of sentences is not well-defined and is not even a proper part of the set of word sequences."

Harris inserts here a footnote, his 11:

"The latter is due to the fact that there are sentences which contain sound sequences that are not words: Any sound can be the subject of a sentence of the form X *is a sound,* X *is his name,* X_1 *and* X_2 *are different sounds even though we cannot hear the difference* (5.4), etc. The set of objects that occupies the positions of X here, and so the set of sentences of the above forms, is not discretely differentiated (aside front the limits of discrimination of hearing and perception) and not necessarily denumerable."

Harris makes it clear here that (i) direct speech expressions can in principle be parts of grammatical sentences; that is, grammaticality will fail only when the non-direct speech portions are improperly formed and (ii) that for that reason alone, the collection of sentences is not well-defined and does not form a recursively enumerable set. He also raised the possibility that the NLs were thereby not denumerable sets, but hedged with 'not necessarily'. Implicit in Harris's remarks is, of course, the claim that NLs are not closed.

While Harris's insightful claims are certainly correct as far as they go, they are too terse to really do justice to the major implications they have. He did not address various indirect moves which a defender of the closed status of NLs might attempt to appeal to.

For despite what has been implied so far, there might seem to be a way of keeping the grammaticality of even infinitely many pieces of embedded direct speech consistent with a finite lexicon. This might appeal to some idea like the vague, undeveloped, repeated claim by Chomsky that an NL grammar assigns a structure to 'every possible relevant physical event':

(21)a. Chomsky (1986a: 26): "the I-language assigns a status to every relevant physical event, say every sound wave."

b. Chomsky (2000: 79) "it could turn out that it assigns an interpretation to every possible signal"

The application to the present issue would be something like this. While it could be granted that there are infinitely many pieces of direct speech, and that these occur as parts of well-formed NL sentences, it could be claimed that (i) these pieces of direct speech are themselves recursively enumerable because (ii) every piece of direct speech merely involves some finite combination drawn from a *fixed finite phonetic alphabet*. An idea like this has already been proposed in passing by Green (1985: 123-124). [11]

These assumptions would permit taking the direct speech piece in e.g. (14) to consist neither of an arbitrary single unit nor of a sequence of say three such units. Rather, every direct speech sequence would consist of a fixed string of phonetic elements and every such string could be generated by a trivial infinite grammar finitely schematizable via the Kleene star notation as in (22): The notion 'schematizable' here can be given a precise interpretation in terms of *metagrammars*, computational devices which generate infinite collections interpreted as grammars. For this conception of finite grammars generating non-finite grammars, see Langendoen (1976).

(22) Direct Speech-→ (Phonetic Segment)*

This assumes the existence of some grammatical category Direct Speech and a recursively enumerable set of phonetic segments. The latter assumption might be claimed to have a certain plausibility if one limits its application to direct speech involving purely linguistic performances. However, it is by no means obviously true, even for this class. The limited view itself is challenged in Pullum (1983). If there is such a thing though, then the claim could be that the computational grammar would specify all and only the positions where the category Direct Speech could appear, e.g. after verbs like <u>say</u>, <u>whisper</u>, <u>yell</u>, etc., after nouns like <u>sound</u>, <u>utterance</u>, <u>form</u>, <u>expression</u>, etc. It would then be necessary to expand the notion of lexicon to include not only the *listed* minimal forms but the entire computational output of (22) plus the principles spelling out the fixed set of phonetic segments.

This would no doubt induce complications in particular versions of the doctrine under attack here. Viewing e.g. <u>klaatu barrada nikto</u> as made up *syntactically* of each of its phonetic segments seems entirely artificial. Is one, for instance, to maintain claims such as that all branching is binary by claiming that this has a huge number of alternative binary bracketings? [12] Further, how are these putative syntactic constituents to be analyzed so as to be consistent with other putative universal constraints on tree structures, e.g. X bar theories? Additionally, normal syntactic constituents have meanings, but analyzing direct speech

into syntactic constituents the size of phonetic segments precludes any assignment of meanings to these constituents. Finally, it is arguable that entire direct speech segments have meanings, as discussed in Section 9, and if this is so but their syntactic components do *not*, then claims about compositionality also run afoul of these cases. The obvious argument for the claim that direct speech segments have meanings is that e.g. (23a, b), (23c, d) and even (23e, f) (see (23g)) embody distinct propositions, a key point to which I will return.

(23)a. Elmer grunted 'you'll never take me alive'.

b. Elmer grunted 'you'll never make me a hive'.

c. Ellen snarled 'snedo'.

d. Ellen snarled 'fneto'.

e. The cow went 'moooo'.

f. The cow went 'mooooooooo'.

g. Don't be silly! The cow went 'moooo' not 'mooooooooo'.

But despite these problems, it might still be concluded that any notion that direct speech clashes fundamentally with the claim that NL grammars can be computational has been successfully gotten around.

But even were this approach capable of rendering direct speech compatible with the idea that NL grammars can be proof-theoretic in the case of DDSSs and FDSSs, it still seems hopeless for NLDSSs, since the view that there is a universal computational alphabet capable of representing every non-linguistic noise which can be reported with direct speech seems impossible to take seriously. I will not belabor this point here since it is taken up in a more general context in Section 5 and, as considered in the following sections, the idea of a purely computational account of performance reports faces distinct and, if anything, worse problems.

Section 4 Gestural Performance

Even if one ignores the direct speech reporting of non-linguistic noises and accepts the possibility of a recursive enumeration of phonetic segments for spoken NLs along the lines of (22), this would *not* suffice to solve the problem of direct speech for a view that NLs are closed. The reasons involve *first* non-spoken NLs, e.g. the *multitude* of sign languages of the deaf. Even Chomsky, who in the past had written as if NLs and phonetically performed NLs were coextensive, as in (21a), has recently said:

(24) Chomsky (2000: 121)

a. "Though highly specialized, the language faculty is not tied to specific sensory modalities."
b. "Thus the sign language of the deaf is structurally much like spoken language" [13]

Given though the fact that some NLs systematically use non-phonetic gestures to create tokens of their sentences, to maintain a claim that NLs as such are closed even in the face of direct speech, it cannot suffice for there to be a recursive enumeration of *phonetic* segments relevant only for the subgroup of NLs which are in standard circumstances performed via sound. Rather, under the assumption that there are analogs of direct speech constituents in non-spoken NLs, [14] there would have to be as well a recursive enumeration of a gestural equivalent of discrete phonetic segments for every physical gesture which could underlie the performance of any non-spoken NL. Far from being plausible, this seems chimerical. That it is might well be implicit in the claim pertaining to signing cited in Perlmutter (1986: 523):

(25) Whitney (1875)

"Among their manifold capacities, they are able to make *gestures, of infinite variety*, all of which are reported by the vibrations of the luminous ether to a certain apprehending organ, the eye, both of the maker and of others." (emphasis mine: PMP)

In any event, anyone claiming that there is a recursive enumeration of the gestures capable of serving as parts of performances of *all* signed NLs bears the enormous (and to my knowledge never assumed) burden of supporting such an idea.

Second, it can be argued that the demarcation between phonetically expressed NLs and others like the gesturally signed NLs of the deaf is incomplete. This means that the logic which shows how gesturally expressed NLs attack the notion that NLs are closed can be applied *internal to standard phonetically expressed NLs*. That is, I claim that even basically phonetically expressed NLs like English allow restricted gestural and other non-vocal forms of expression, specifically in certain direct speech and related contexts. So there is every reason to take e.g. (26a, b) to be *schemas* for endlessly many *English* sentences whose next to final constituent is gesturally signed:

(26)a. The deaf person went ___ yesterday.

b. The deaf person made the gesture ___ in the living room.

To perform a relevant instance of (26a) one articulates the first four words and then makes at that point (corresponding to the dashes) a gesture appropriately identical to that which is being reported, then pronounces yesterday. Other examples of the same type having nothing to do with NLs associated with the deaf include (27b), a truth functional equivalent of (27a):

(27)a. When the cop told her to leave, Sheila gave him the finger (twice).

b. When the cop told her to leave, Sheila went ___ (speaker makes the appropriate gesture) (twice).

So, barring a factually unmotivated claim that instantiations of schemas (26a, b), (27b), etc., are not NL sentences (e.g. sentences of English in this case), to maintain Chomsky's claim (3b) requires again the posit of a recursive enumeration of gestures.

Section 5 Beyond Gestures

I have so far considered the implications for claim (3b) of types of NL sentences involving direct speech and non-phonetic gestural performance. But the situation for a defender of NL closure is more threatening than that entailed by these phenomena. First, as already touched on, there are NL sentences which bear certain similarities to direct speech structures but which involve not reference to linguistic performance, that is, in the standard case, to utterances taken to perform sentences, but to other sorts of noises, either vocally produced or not. For instance, (28a) might be a schema of descriptions of the noise made by a person afflicted with serious snoring, while (28b) might schematize the description of the noise associated with a tornado:

(28)a. He goes ___.

b. It gives off a roar like ___.

The relevance of such cases is that even though the material schematized by the blanks in (28) involves proper performance via the creation of sound waves, there is, evidently, no reason at all to imagine that the full range of such performances is coded by anything like a universal phonetic alphabet. That is, there is no

reason to believe that e.g. the class of examples illustrated in (29) purporting to indicate bump-induced car noises is a priori specifiable in a linguistic way.

(29) Pullum and Scholz (2001: 17)

My car goes 'ehhrgh' when I go over a bump.

This position is consistent with the observation of Kathol and Levine (1993: 210; n 7) that: "Thus inarticulate cries, imitations of animal or industrial noises, indeed anything producible by the human vocal tract can appear within the fronted quotation."

The point is strengthened if, as, I would claim, it is correct to see such schemas as (28) and the quoted part of cases like (29) covering NL sentences where the blanks or quoted material are performed even without human vocal apparatus, e.g. by clapping, or utilizing an arbitrary mechanical means of producing sounds, orchestras, guitars, machine guns, or what not. That is, I suggest that, while it is certainly proper to perform (29) by making a vocal noise after the word goes, it is just as proper to perform it by playing a recording of actual car noises in that position and just before one pronounces when I go over a bump. If so, any possibility of reducing such cases to consistency with (3b) via analogs of (22) is out of the question.

Support for the view that NL sentences can involve nonvocal apparatus noise is provided by the remarks in (30) about metalinguistic negation:

(30) Horn (1985: 136)

"As Barbara Abbott has pointed out to me, *u* need not even be a specifically linguistic utterance, as seen by the function of metalinguistic negation in the following musical scenario:
Piano student plays passage in manner μ.
Teacher: 'It's not [plays passage in manner μ]. __ It's [plays same passage in manner μ'] "

Here Horn's μ, μ' denote some physical characteristics of piano playing performances. While Horn does not assert that the teacher has performed NL sentences, using only the term 'scenario', his discussion only makes sense on that assumption. For he is taking the examples to support his view about the nature of

metalinguistic negation. This would be illogical unless the performances in question were instances of performance of NL sentences. If the entities involved were *not* NL sentences, that is, not part of the NL being discussed, how could they positively support a claim about the way metalinguistic negation is to be analyzed in that NL? That is, if no NL sentences are involved in the scenarios, they could no more support a claim about metalinguistic negation than e.g. (31a, b) can support a claim that English has verb final transitive clauses:

(31)a. *Melissa will her room mate cheat.

b. *The government should the elderly support.

Second, I see, moreover, nothing in the structure of NL itself which limits cases like (28) to *sounds*. For instance, the written medium can be seen to bring out the fact that, again in a regimented set of contexts, even regularly phonetically signed NLs allow graphic or geometric realizations of certain constituents. Thus I claim that (32a, b) *schematize* endlessly many *English* sentences, where the blank denotes some *shape*; one of these can be represented on paper as in (32c):

(32)a. The professor drew ___ on the blackboard.

b. The professor drew a figure of the form ___ on the blackboard.

c. The professor drew a figure of the form Ⓟ on the blackboard.

Each distinct instance of (32a) can be performed by articulating the first three words, then providing some representation of the geometric form and then pronouncing the final three words. For (32b), one pronounces the first eight words, then somehow instantiates the figure and then pronounces the final three words. Hence one instance of (32a) will be truth functionally equivalent to (33):

(33). The professor drew a circle with the letter P in it on the blackboard.

Actual instances of such sentences are found, even in the linguistic literature. Here is one from a recent monograph:

(34) Culicover (1999: 28)

“Conversely, the fact that hotdog means

[PICTURE OF HOT DOG]

is not predictable from 'hot', 'dog' or the combination."

I see no reason beyond a priori dogma for denying that Culicover has as much instantiated an English sentence with (34) as he did with his following remark, which incorporated no image.

To avoid an arbitrary claim that (32a, b) do not represent actual NL sentences, and that (32c) and (34) are not written representations of actual sentences, maintenance of (3b) would then require not only a recursive enumeration of gestures, but an enumeration of all the geometric forms which could be covered by (32a, b). Given the uncountable character of even the collection of all planar (two dimensional) forms, whose number is of the order of the real numbers, this is impossible. [15]

Moreover, any restriction to just *two* dimensions seems artificial, since (35a) could be a truth functional equivalent of one instance of (35b):

(35)a. The sculptor carved something of the form of a cube out of sandstone.

b. The sculptor carved something of the form ___ out of sandstone.

c. The device produced a three dimensional image just like ___.

To perform a relevant instance of (35b), one pronounces the first seven words, then displays a cube, then pronounces the last three words. The way to perform an instance of (35c) is to pronounce the first nine words and then to in some way introduce the relevant image, e.g. by turning on multiple slide projectors, by displaying a holograph, by holding mirrors in a certain way, etc. But, since the number of three dimensional objects is, via the logic of note 15, of the order of real numbers, it follows that the class of constituents schematized in (35b, c) is also of that order.

Section 6 Metalinguistic Structures

A type of linguistic information-representing sentence distinct from all the various 'direct speech' varieties is relevant to questions of openness, a type represented by e.g. (36):

(36)a. The French word for milk is 'lait'.

b. To express ignorance of some topic, one can say in French 'va savoir'.

c. German 'Kopf' is equivalent to French 'tête'.

Such examples, like standard direct speech representation cases, contain parts seeming to involve NL elements. The difference is that a direct speech sentence purports to describe a particular *performance*...the direct speech report references an object with space/time coordinates. The foreign parts of examples like (36), however, are not putative descriptions of any performance of the NLs referenced. They purport instead to denote elements of those NLs themselves. Let us refer to the relevant parts of such examples as *metalinguistic constituents*.

Clearly, examples like (36) containing metalinguistic constituents are common, and, intuitively entirely grammatical. To deny their well-formedness would be an act of desperation. Notably, those whose theoretical position might demand such a rejection, e.g. Chomsky, utilize metalinguistic examples like (36) en masse, without the slightest indication that they are in any way abnormal. (37) displays some examples from Chomsky (1988), which contains by a rough count more than *two hundred and forty* others:

(37)a. "The verb *examinar* requires an object,..." (page 95)

b. "One of the traces must be bound by *nos* and the other by *al que*." (page 96) [16]

c. "Thus (2) must be understood in the manner of (8a), not (8b) (where *lo* stands for *el hombre*)." (page 98)

d. "Let us first take the case in which the clitic attaches to *afeitar*, forming *afeitarse*." (page 86)

To deny that (37a-d) are English sentences would have such implications as that touched on in the preface, namely, that it would not be possible to express the linguistics of NL_1 in any NL distinct from NL_1.

Given that metalinguistic expressions occur in grammatical sentences, the question arises of how they can be kept consistent with claim (3b). The same pattern of argument involved in the discussion of direct speech segments becomes relevant. While the infinite number of metalinguistic forms obviously cannot be listed in any LX_i, it might be claimed that metalinguistic forms nonetheless fall within the domain of recursive enumerability via appeal to an analog of (22) something like (38).

(38) Metalinguistic Constituent -→ (Phonemic Segment)*

The choice of phonemic rather than phonetic segments here seems natural (see (2)) but is not crucial. The same artificiality issues would arise with respect to taking the syntactic structures of metalinguistic stretches to be phoneme-sized. More importantly, the same issues of gestural forms, geometric forms, etc., attack any claim that a universal theory of phonemic segments could cover all metalinguistic constituents. For instance, this is hardly conceivable for instances of schemas like (39):

(39)a. In the NL of the deaf of Gwambamamba, the gesture ___ means 'why not'.

b. In America, the gesture ___ means 'screw you'.

Overall then, metalinguistic sentences just strengthen the arguments against (3b) from direct speech structures, gestural structures, etc.

Section 7 The Controversial Constituents as Real Constituents

No doubt there will exist considerable resistance to accepting as real NL sentences the sort of wholly or partially non-phonetically performed objects I have claimed are NL sentences, including those schematized in (26), (27b), (28), (29), (30), (32a, b, c), (34), (35b, c) and (39). Part of such resistance might just be the traditional association of sentence with its pronunciation, reinforced by frequent repetition of remarks like

(40)a. Chomsky and Halle (1968: 3)

"The grammar of the language is the system of rules that specifies this sound-meaning correspondence."

b. Chomsky (1972: 26)

"The person who has acquired knowledge of a language has internalized a system of rules that relate sound and meaning in a particular way."

Besides what can now be seen to be an exaggeration of the link between NL sentences and *sound* performance in particular, such statements are misleading in another respect. Actual sound can only be produced by a physical object capable of producing a physical disturbance in a medium like air, in this case,

the speech apparatus. An NL itself cannot directly link structure and sound, since actual noise can only be produced by performance, by setting some physical objects in motion. What an NL can and for the most part does, [17] as made clearer in Chomsky (1975: 18), is link various abstract structures including a superficial one which can be interpreted (according to some sort of conventions) as instructions to a certain physical apparatus. From this point of view, the interpretation conventions which associate particular parts of sentences with physical instantiations of particular kinds might be regarded as external to the NL proper. In any event, the interpretation via articulation, non-vocal gestures or whatever, is not determined by the abstract structure. Given that, there is no reason to assume an inherent relation between NL sentences and sound in particular.

On the positive side, one reason to view the sort of constituents at issue here as real NL objects is that they seem to have key properties of uncontroversial constituents. [18] For instance, all the examples cited so far had the form of independent (in fact, declarative clauses) or simple embeddings. But this is not at all necessary. Such structures can yield questions, commands, and suggestions, can appear as restrictive relative clauses, as complement clauses, as parts of predicate clauses, etc., as illustrated in (41)-(43):

(41)a Did the alien shout 'klaatu barrada nikto'?

b. Don't go around whispering 'klaatu barrada nikto'.

c. I suggest that you never grunt 'klaatu barrada nikto' at that robot.

d. Every alien who shouted 'klaatu barrada nikto' was executed.

e. They reported that the alien shouted 'smato marada snikto'.

f. The right thing to do was to scream 'klaatu barrada nikto'.

(42)a. Every deaf person who went ___ was arrested.

b. When did Marsha make the gesture ___ with her right hand?

c. The facial expression ___ often indicates anger.

d. They reported that she made the facial expression ___.

(43)a. No professor who drew ___ on the blackboard was rehired.

b. The sculptor who carved something of the form ___ was criticized.

c. A star shaped like ___ is associated with the Jewish religion.

d. They denied that she drew ___on the blackboard.

Moreover, constituents of the relevant kind can be coordinated and negated:

(44)a. The alien shouted 'klaatu barrada nikto' and not 'slatu niraba miktu'.

b. What did the alien shout? Not 'slatu niraba miktu'.

c. Carla went ___ or ___.

d. The alien shouted neither 'slatu niraba miktu' nor 'smatu birada smakto'.

e. The ASL/English bilingual went 'please have some pie' or ___ twice.

f. The sculptor carved things of both the forms ___ and ___.

g. He drew not the shape ___ but rather the shape ___.

h. The teacher played not __ on the piano but ___ on the tuba.

Further, constituents with gestural or other non-sound performances can be antecedents for ellipsis:

(45)a. The space alien went ___ with his right tentacle but I didn't ___ with mine.

b. Male space aliens can go ___ with their tentacles faster than female space aliens can ___ with theirs.

c. Although Mercedes drew the shape ___, I didn't.

d. While Noriko can't carve a three dimensional image of the form ___ on Friday. she can on Saturday.

In such cases, it is clear that the ellipsis-containing constituent involves a claim about the same non-verbally performed constituent as the antecedent. [19]

And such non-verbally performed constituents can also be the antecedents for non-null anaphoric elements, highlighted in (49):

(46)a. The space alien produced an image just like yours, but I did not produce an image anything like *that*.

b. The space alien produced an image just like ___, but I did not produce an image anything like *that*.

c. Sheila gave the cop the finger, *which* is a vulgar gesture.

d. Sheila went ___, *which* is a vulgar gesture.

e. Sheila gave the cop the finger but I did not make *that gesture*.

f. Sheila went ___ but I did not make *that gesture*.

g. Sheila went both___ and ___ but Glen did not make *the latter gesture*.

h. *I did not make *that gesture* but Sheila gave the cop the finger.

i. *I did not make *that gesture* but Sheila went ___.

Given that performances of such cases yield no sense of grammaticality, seem to have the standard properties of uncontroversial sentence performances (note the parallel ungrammaticality of (49h, i) for violating a constraint which evidently does not allow the anaphoric device to both be in a coconjunct of the conjunct containing the antecedent and to precede that coconjunct) and provide no general obstacle to formulating a coherent account (see Section 9), it seems that their inclusion in NL is deniable only on purely doctrinal grounds.

Section 8 The Irrelevance of the Historical Dynamics of Lexicons

A certain range of well-known and undisputed NL phenomena have *not* been cited here as objections to (3b) and should not be. I refer to the omnipresent existence of *lexical accretion and loss*, which over time add new forms to, and more slowly remove old ones from, the lexicons of NLs continuously. So fifty years ago there was no English form laptop referring to a type of computer, no verb suck meaning 'to be of minimal value/quality', etc. Just so, previous to constructing the present work, the forms open, openness, etc. were not used in the way they are here. But, according to Partridge (1970: 153) before 1915 there was a word chuck-up meaning a military salute, a form I had never heard of and which evidently is not part of current English. Looking at the full range of such phenomena, it might seem that one is also dealing with facts which render the notion of a fixed lexicon incompatible with linguistic reality.

However, the dynamic socio-historical processes which alter historical lexicons in this way have nothing to do with the point being argued for in this study, that is, have nothing to do with the issue of whether NLs are open or closed. The reason is that such historical phenomena can be viewed as mappings from one finitely specifiable lexicon LX_1 to another LX_2 such that if each is combined with the remaining elements of an NL, the result consists of two (relatively trivially) distinct NLs. [20] This is entirely consistent with the view that NL variants differing in lexical elements, like those in (47), also represent trivially different NLs.

(47)a. British: The bonnet of the Jaguar was scratched/wants washing.

b. American: The hood of the Jaguar was scratched/needs washing.

Such variation also is irrelevant to the issue of whether NLs are closed.

But lexical change is in no way parallel to the phenomena illustrated by (3), (5), (8), (9) and (10). While the former can be viewed as a historical phenomenon which really amounts to the instantiation of (relatively) trivially distinct NLs, it is absurd to imagine that there is a pre 1950s English excluding the expression klaatu barrada nikto and a post 1950s one containing it. The absurdity of the assumption is fully revealed by e.g. the infinite open endedness of the example collection illustrated in (5). That is, direct speech and related phenomena discussed above do not involve historical processes of NL change but rather for every NL at every point the possibility of representing infinitely many unconstrained physical performances. Just so, a 'dynamic' approach equally lacks any application to cases like (8)–(10), since it makes no sense to imagine that every sentence involving a descriptive remark about a hitherto unmentioned foreign form in NL_5 represents a historical modification of NL_5.

Section 9 Unregimented Constituents and the Nature of NL Sentences

Standard views of NL sentences, fairly represented, I believe, by (1a) and (6), are arguably correct over a certain range of sentences. But such views fail, as argued in earlier sections, when faced with the variety of NL direct speech sentences, metalinguistic sentences, gesturally represented sentences, sentences incorporating pictorial, geometrical or multidimensional objects, etc. The standard view has thereby deeply underestimated the richness and expressive potential of NLs. In this section, I wish to show how this richness of expressive power can be given a coherent interpretation internal to what I believe is independently the only viable ontological view of NL sentences, namely, that they are abstract objects, and, more specifically, that each NL sentence is a set.[21] I want to suggest that the line between sentences which can be viewed as based on a fixed, finite lexicon, as in (1a), and those which cannot, corresponds to several types of division of constituents. The first distinction is that between constituents of NL_x which are, as (1a) requires, wholly based on forms mentioned in the grammar of NL_x. I will call these *lexically pure constituents*. So, in (48), the subject constituent is lexically pure, but the object constituent, the verbal phrase constituent containing it, the whole clause, etc., are not. Call them *alexical constituents*.

(48) The newly arrived alien shouted 'vlaatu worrada smeikto' at the mailbox.

A second distinction involves the relation between the abstract objects, in fact, sets, which are constituents, and any physical events objects, etc. which serve as genuine tokens of constituents. The basic idea is this. One class of constituents, those *normally* considered in linguistics, contain specific elements, in the standard case, a phonetic representation, which can be regarded as a recursively enumerated object capable of being interpreted as instructions to a fixed physical apparatus. I will refer to such constituents as *regimented*. There is little need to say more about them here.

But part of the force of earlier sections can be summed up simply by saying that NLs incorporate certain constituents which are *unregimented*; these include direct speech constituents whose performances seem to include arbitrary noises, image constituents whose performances seem to include arbitrary two dimensional representations, etc. And the current task is to see how one can make sense of unregimented constituents, specifically, in context with the view that sentences are abstract objects of the type set.

Arguably, of the four types of constituents logically constructable from the two distinctions just made, only three are characteristic of NLs. The normally considered constituents are both lexically pure and regimented. While all of the theoretically unusual constituents that have been considered in earlier sections are alexical, many are naturally taken as regimented. Others though, like those schematized in (32b), (35b), etc. are clearly not. What I see no way to instantiate though is a constituent which is both lexically pure and unregimented; and I assume that there are no such objects.

I therefore concentrate on the question of how to give a theoretical account of the notion of a constituent which is both alexical and unregimented. It has been claimed that sentences are sets, and it is natural and I think correct to assume that sentences have a complex set-theoretical structure, involving sets with other sets as members as well as some sets whose members are whatever the appropriate primitives for characterizing lexically pure and regimented constituents turn out to be. The question then is how can alexical, unregimented constituents fit into such a set-theoretical framework. The only answer I see is that an alexical, unregimented constituent C must represent a set whose elements include *the physical tokens making up individual performances of* C. Let us clarify this through maximally simple examples:

(49)a. Felicia yelled 'smekto'.

b. Felicia yelled 'smektof'

The crucial property such examples have from the point of view of maintenance of the conception of sentences as sets is that distinct elements seem to be defined by distinct performances, or, more precisely by sets of performances. So (49a, b) represent distinct propositions and hence, if one assumes that meanings are parts of sentences, distinct sentences. This entails that the sets comprising NL sentences must be able to contain as members or submembers something which can instantiate the endlessly distinct physical properties involved in direct speech. The only way I see that this can be the case is if direct speech segments involve sets containing the physical properties themselves, and not, as in the case of more standard (regimented) linguistic elements , symbols representing instructions (to a fixed physical apparatus) to produce physical things.

What I am claiming is that the object constituent of the unique English sentence represented by (49a) is a set one of whose subsets contain as elements the actual physical sound waves produced by performances of (49). Note that a priori there is nothing strange in talking about sets, abstract objects, at least some of whose elements are physical objects, that is, non-abstract objects. This is common in introductory discussions of set theory. So Halmos (1960: 1) states: "A pack of wolves, a bunch of grapes, or a flock of pigeons are all examples of sets of things." And Allwood, Andersson and Dahl (1997: 3) indicate: "We might for instance choose to consider the set which consists of the Premier of Sweden, the smallest moon of Mars and the square root of 7." So if there are three marbles on a table, one can speak of the set consisting of exactly those three marbles, and I can speak of the set of all electrons in the universe and ask questions about it, e.g., about its cardinality. [22] The fact that the latter might be currently unspecifiable in no way attacks the existence of the set in question. Just so in the case of the unregimented object constituent in (49a), the fact that there is no way to specify the size of the set of sound waves making up all its tokens in no way argues against the existence of such a set. [23]

Taking an unregimented constituent to involve a set of its tokens is evidently superior to taking it to involve some single, specific token. The latter is incompatible with the fact that no less than regimented constituents, unregimented constituents have unlimitedly many potential tokens. So e.g. (49b) can be said repeatedly and no particular sound wave associated as a token of its object has any primacy with respect to the specification of the nature of the object constituent.

The idea that an unregimented constituent involves a set of its tokens receives some support, I believe, when one considers the semantics of cases such as (49) involving them. I claimed earlier that direct speech

constituents had meanings. It would perhaps be better to say 'have denotations'. For, under the account of unregimented constituents just sketched, these denotations are, in general, informal terms, not hard to specify. The idea is as follows. An ordinary referential constituent, e.g. the one associated with that dog, has a denotation which is independent of any token of that constituent. But not so for unregimented constituents. For these, the denotation is one of the set of associated tokens.

(50) The denotation of an unregimented constituent X one of whose subsets is a set of physical tokens T is some member of T. [24]

So if one specifies that the object constituent of (49a) is defined by a set of physical tokens T_1, an utterance of (49a) by someone at 10 PM on October 31, 2002 amounts to the instantiation of a true proposition only if at some earlier point in time Felicia produced a yell which was a sound sequence S, where S is a member of T_1.

While what I have just sketched seems to me to be correct, it does have, I grant, one aspect which might seem like sleight of hand. It is all very well set-theoretically to speak about unregimented constituents being subsets of physical tokens. But since in general these tokens can neither be listed nor recursively enumerated, how are these sets specified? One way to understand this question is to ask what grounds a claim that e.g.; (51a, b) are distinct direct speech sentences, accounting e.g. for the sensible character of (51c):

(51)a. Helen whimpered 'snedo'.
b. Helen whimpered 'sneto'.
c. Helen whimpered 'snedo' not 'sneto'.

It appears inevitable that unregimented constituents must be assumed to involve some kind of *equivalence conditions*, not necessarily (and surely not) the same for different types of unregimented constituents. Hence when one produces a token of an unregimented constituent C, one will specify the set defining that constituent by virtue of the equivalence condition somehow associated with C. It would be nice if these associations were derivable from the linguistic structures in which unregimented constituents occur.

For example, the fact that a constituent C is the object of the specific verb whimper, as in (51), might determine the relevant equivalence conditions. Since whimper describes a form of verbal performance, it is natural that these conditions would then involve some kind of identity of sound features but exclude as irrelevant such properties of verbal noises as those defining individual voices, involving loudness, etc., since these are in general properties irrelevant to claims about whether so and so *whimpered* such and such.

Just so, the fact that an unregimented constituent is object of a verb involving the creation of two dimensional figures like that in (52) would naturally impose certain equivalence requirements and exclude others:

(52) The professor drew ___ on the blackboard.

Here the equivalences would exclude sound but include properties of two dimensional objects, geometric characteristics, color, etc.

So the overall idea is roughly that the set of physical tokens taken here to characterize an unregimented alexical constituent C is specified as follows. Any fixed physical performance P interacts with the equivalence conditions EQ imposed by the context of C to define the token set characterizing C. The logic is simply that the relevant set is the set of all elements X such that EQ holds between X and P.

I cannot attempt here to say more about the required equivalence conditions. But nothing seems to emerge which interferes with the account suggested, in which an unregimented constituent involves a subset of its tokens, where the membership requirement involves crucially equivalence conditions imposed by the meanings present in linguistic context of the unregimented constituent.

To conclude the discussion of the reality of NL constituents which are alexical and unregimented, it is worth mentioning a proposal of Partee (1973). Partee (1973: 416) suggested very briefly that a possible way of describing direct quotes and sentences seeming to contain gestures would involve recognition of invisible demonstratives plus a claim that the direct quote or gesture was actually not part of the sentence but only part of a larger discourse. The idea would then be that e.g. (53a) would be an elliptical form of (53b):

(53)a. Morry went ___ (where the blank represents a vocal noise X)

b. Morry went like this: ___ (where the blank represents a vocal noise X)

The connection between the demonstrative and the putative nonsentence part would then be mediated by some sort of contextual algorithm picking out certain objects in, or properties of, the whole context as a referent of the demonstrative. Partee's model for this type of description was, specifically, cases like (53a), in which the quoted material referred to by the demonstative follows everything else in the sentence. This makes the sentence external view of such at least conceivable. But of course, that property is not at all general and there are endless cases not subject to such a treatment:

(54)a. Everyone who claimed they went ___ may have really gone ___ or at least thought they did.

b. Since the claim that she went __ has not been refuted, I can assume that someone who went __ was seen.

Moreover, on other grounds, Partee's sort of account would have no obvious application to cases of the sort dealt with by Jackendoff (1984), discussed below, where no analog with a demonstrative is grammatical:

(55)a. The sound ___ is grating

b. *The sound that is grating: ___

c. He discussed the gesture ___ on Friday.

d. *He discussed the gesture that on Friday: ___.

Section 10 Conclusions

The principle result of the preceding sections has been an array of arguments supporting the untenable character of the claims in (1), repeated here:

(1)a. Chomsky (1959: 137) "A language is a collection of sentences of *finite length* all constructed from a *finite alphabet* (or, where our concern is limited to syntax, a *finite vocabulary*) of symbols."

b. Chomsky (1959: 137) "Since any language L in which we are likely to be interested is an infinite set, we can investigate the structure of L only through the study of the finite devices (grammars) *which are capable of generating its sentences*."

c. Chomsky (1959: 138) "The weakest condition that can significantly be placed on grammars is that F be included in the class of general, unrestricted Turing machines."

The key element of (1a) for present concerns is the view that each NL sentence is constructed from a finite (hence listable) alphabet of symbols or a finite vocabulary of syntactically minimal forms, a fixed lexicon. Accepting (1a) amounts to accepting that NLs have the property I have called *closed*. It has been argued to the contrary that (1a) must be seen as false and NLs regarded as *open* because of diverse facts involving direct speech, non-phonetic gestures, non-linguistic noise, geometrical forms, metalinguistic constituents, etc. All these phenomena reveal that NLs incorporate certain constituents whose minimal elements are not mentioned in any grammars; these are the alexical constituents of Section 9.

Several aspects of doctrine (1a) are worth highlighting. First, the logical conjunction of (1a, b, c) define the technical aspect of the *generative grammar* view of NLs. The untenability of (1a) thus undermines that general view. Second, (1a) was introduced in the 1950s with no supporting argument Third, it has been maintained by its originator and a multitude of those he has influenced ever since also with no supporting argument. Works like Chomsky (1995) advancing the minimalist program of the 1990s and later which incorporate (1a) neglect to argue for it just as did those of the 1950s. That the doctrine flourishes in the face of this lack suggests that many may have assumed that (1a) is a sort of self-evident truth. But it has been argued here that not only is (1a) not self-evident, unchallenged factual properties of NLs incompatible with it (e.g. the existence of various forms of direct speech, metalinguistic constituents) were known long before (1a) was enunciated. This principle seems in short to be nothing more than a (strangely) popular dogma, which is evidently an extraordinary state of affairs. If one were to have asked a priori whether a doctrine incompatible with well-known and traditionally discussed (e.g. by Jespersen, 1924) features of the domain of study could be introduced in the mid twentieth century in a growing field and successfully take root and maintain itself over a period now approaching a half century, one would have tended to answer in the negative. But the facts are otherwise.

No doubt one reason that (1a) was so easily maintained in spite of its grave incompatibility with common fact is that the issue it raises was rarely discussed. A notable exception is provided by Hockett (1966: 182-183). Hockett ended up assuming (1a), specifying (1966: 183) as in (56):

(56) "Any sentence in the language is a string of characters, each of which is one or another of the characters of the fixed finite alphabet."

However, this claim by Hockett was not question-begging, since prior to that he had considered the factual adequacy of the claim, characterized it as open and only specified (56) as a working assumption. Hockett's discussion was phrased in terms of a striking and insightful implication of (1a) for the logical connection between NL and *typewriters*. He noted (1966: 182):

(57) "A point of departure for the formalization of language description is afforded by the fact that one can design a typewriter for any human language." "The keyboard and type bars give us a small, clearly defined stock of symbols among which we must make our choice for any key-striking. The carriage motion is such that our choices appear in a linear sequence on the paper. The operator can override these arrangements - I have seen pictures drawn with a typewriter - but let us set aside such aberrations. If the stock of symbols is the correct one for a given language, then we can write practically anything we wish in that language.

Any linguist who uses a typewriter has had the experience of lacking some symbol he needs and having to improvise or to arrange for his keyboard to be modified. There are two possible interpretations of this. One is that a typewriter's limitations are only a matter of economics. Symbols but rarely needed can more cheaply be written in by hand as the occasion arises, but in principle there is no reason why we should not incorporate everything we will ever need for a given language on a single keyboard. Of course, not everything we put on paper is language. If the supply of useful type faces is indefinitely large only because of charts, graphs, pictures, and other nonlanguage items, the first interpretation can stand. The second interpretation is that the limitation is not merely practical but essential. No matter how large we were to make the keyboard for a particular language, according to this interpretation, we might still encounter a need for symbols not provided on it."

"It is not at all obvious which of these interpretations is empirically correct. It is clear, however, that for purposes of analysis and description the first interpretation is customarily assumed. If the assumption is in fact true, all is well." "Our assumption is, then, that if one has the right keyboard one can type, not just almost anything one wishes in a given language, but any sentence of that language. The keyboard supplies a finite alphabet of characters. Any sentence in the language is a string of characters, each of which is one or another of the characters of the fixed finite alphabet. On the other hand, not every string of characters drawn from the alphabet is a sentence of the language. The string of symbols that begins with the last capital letter before this and ends with the next period is a sentence of written English. The string that follows the next colon and runs to the following period is drawn from the proper alphabet, but is not, I believe, a

sentence of written English: fkwwy qpat emff agvktom. Every sentence is a string of characters from the appropriate alphabet, but not vice versa."

Hockett thus saw with full clarity that there was a factual claim involved in (1a). And his typewriter account permits one to see in a most graphic way the nature of the issue and why the evidence of earlier sections involving e.g. arbitrary noises, arbitrary gestures, arbitrary pictures, etc., that is, unregimented constituents, shows that (1a) cannot be true.

Moreover, Hockett's description of the regimentation issue in terms of typewriters permits a novel and very vivid alternative way of specifying the nature of openness, as follows:

(58)a. T is an *abstract typewriter/printer* if and only if T consists of finite set of elements called *keys*, $\{k_1 \ldots k_n\}$, each associated with some single symbol $S(k_i)$.

b. A word string W is *typeable/printable(T)* ('printable by T') if and only W consists of a finite string of symbols [Z] and every member of [Z] (except perhaps 'space') is a member of $\{S(k_1), \ldots, S(k_n)\}$.

c. An NL, NL_x, is *closed* if and only if there is some abstract typewriter/printer T such that the word string of every sentence of NL is typeable/printable(T).

d. An NL which is not closed is *open*.

What Hockett did not see then is that evidence showing the correctness of his 'second interpretation' of the relation between NLs and abstract typewriters was easily at hand. No abstract typewriter provides the means to type/print every sentence of an NL allowing direct speech, gestural or pictorial constituents, etc. Any such NL will have indefinitely many sentences at least one part of which is unprintable.

Moreover, in effect, a perception of the falsehood of (1a) was also reached by Jackendoff (1984). He was concerned with an English construction that I have not so far mentioned, one that he characterized (1984: 25) as consisting "of a definite article and a noun followed without pause by an expression *E* which can be of quite varied character; I will refer to it as the *the N — E* construction. Here is a range of examples, grouped approximately into semantic categories." Jackendoff's large list of examples included those of (59):

(59)a. the phrase *the phrase*

b. the word/verb *run*

c. the prefix *un*

d. the construction *N of NP*

e. the sentence *Will you marry me*

f. the sequence *up a*

g. the sound p^h

h. the syllable *pa*

i. the letter A

j. the number 14

k. the note E^b

l. the noise ***** [raspberry, imitation of' a goat, etc.]

m. the pattern *da-dum da-dum da-dum*

n. the symbol $

Crucial from the present perspective, of course, are cases like (59i, k, l, m, n), where in present terms the expression E is alexical and in some cases (clearly, l, n) unregimented.

About such cases, Jackendoff (1984: 26) concluded:

(60) "On the other hand, there are no inherent *syntactic* constraints on E: it need not be a syntactic constituent - as in (1); nor even an expression of English - as in (3). In fact, if the construction is uttered, E need not be expressible in standard orthography (as I have tried to suggest in (8a)); while if the construction is written, E need not have a pronunciation, as in (9). Hence, like the complements of verbs such as say and go (in the sense 'make a noise'), E is a constituent whose interior is unconstrained by normal rules of syntax and phonology."

Clearly then, Jackendoff had recognized that the constituents he called 'E' were overall unregimented and alexical and thus implicitly that no NL containing an E-like constituent could satisfy (1a).

Jackendoff thus had in hand seventeen years ago a tool for showing further the entailed falsity of (1b, c). But, like Hockett eighteen years earlier, he did not take this step. Rather, he concluded for some reason that alexical, unregimented constituents could be subsumed internal to the generative apparatus of the time, stating further:

(61) Jackendoff (1984: 26)

"We will assume, therefore, that the phrase structure rule responsible for introducing E violates the normal theory of syntactic categories by permitting a totally free expression."

But this assumption is impossible. For there can be no phrase structure rule or indeed any generative rule which permits a 'totally free expression'. Because 'totally free' is incompatible with the fact that E subsumes objects whose minimal elements are drawn from no list. But any generative rule ultimately specifies a class which is closed. Jackendoff's remark might naturally be construed as a confusion which wrongly attributed to a putative generative rule properties which could only hold of a non-generative, model-theoretic one (see below). Suppose, for example, one offers (62) as a putative phrase structure rule reconstructing Jackendoff's idea:

(62) E $\rightarrow$ ' anything at all '

The intention would be to have a rule which permits a 'totally free expression'. But, contrary to the intention, the characterization of phrase structure rule would allow only one real interpretation of (62) (ignoring that where each character is a separate symbol). Namely, its right hand side consists of the five morpheme string ['', anything, at, all, ''']. Far from allowing free expression, the rule allows only a single output. To get what Jackendoff wanted, one needs the equivalent of a logical variable over the class which E represents. But phrase structure rules and generative rules in general do not contain such equivalents.

So, while Jackendoff (1984) insightfully uncovered and discussed a relevant class of evidence showing that (1a, b, c) were all untenable, unfortunately he did not then grasp the implications of what he had found. [25]

The relation between the false (1a) and (1b) is logically more complex than might appear. Certainly, the falsehood of (1a) shows that (1b) cannot be true. Given that NLs are open and hence not recursively enumerable collections, the idea that one can only study them through finite grammars which generate (recursively enumerate) their member sentences is untenable. It cannot sensibly be required that one adopt descriptive mechanisms which must logically fail. Notably, no argument has ever been given by Chomsky

(or anyone else as far as I know) for (1b) either. This is fundamental because in fact, once one goes beyond the uncontroversial issue of grammars being finite, even the *truth* of (1a) would not justify (1b).

The reasons are that there is nothing inherent in the linguistic goal of specifying the nature of infinite collections of highly structured objects like the sentences of NLs which imposes the methodology of formulating generative/constructive/computational/proof-theoretic grammars. This is an obviously impossible conclusion given the existence of non-recursively enumerable infinite collections, e.g. the real numbers. Formal fields other than linguistics, mathematics, logic, etc., have thus developed ways to study such collections in various ways via appeal to axiomatic systems, model theoretic satisfaction, etc.

The point with specific reference to linguistics has recently been nicely put by Pullum and Scholz (2001: 1):

(63) "The second half of the 20th century saw the emergence of two quite different types of frameworks for theorizing about the syntax of natural languages. One sprang from the syntactic side of mathematical logic, the other from the semantic side."

By the 'syntactic side of mathematical logic' Pullum and Scholz refer to proof-theoretic ('derivational') approaches whose linguistic instantiations are the various versions of generative grammar. By the 'semantic side of mathematical logic', Pullum and Scholz refer to model-theoretic/satisfaction approaches. About this they say (2001: 3):

(64) "It applies model theory rather than proof theory to natural language syntax."

Given the logical existence of these two very different approaches, even if, counterfactually, (1a) were true and NLs were recursively enumerable collections, to justify generative grammar one would still need a never supplied argument that their proper grammars are generative/proof-theoretic systems, rather than non-constructive, axiomatic/model-theoretic ones. Chomsky's claim (1b) thus further begs the question of the superiority of proof-theoretic over model-theoretic approaches to NL grammars, which would still need to be argued *even if (1a) were true*. Since it is false, the missing argument can never be supplied.

Since (1b) is false because (1a) is and (1b) would not follow even if (1a) were true, (1c) cannot, of course, be a tenable condition to impose on grammars. It simply embodies the question-begging about the choice

between proof-theoretic and model-theoretic approaches to NL grammars. The weakest condition that can reasonably be placed on NL grammars is not the quite arbitrary (1c) but rather that they be systems capable of characterizing the full collections which form NLs. Given the openness of NLs and the arguments that the class of direct speech, geometric, etc., NL sentences are of the order of the real numbers, model-theoretic approaches seem to be the only basis for constructing correct NL grammars.

The just reached conclusion in effect reiterates one already reached in Langendoen and Postal (1984: 77-78), who stated:

(65) "Since the ideas of generative grammar became dominant in the late 1950s, linguistics has in general assumed that the task of grammatical theory involves answering the question: What is the right form of *generative* grammar for NLs? The many disputes which have divided linguists over the past quarter century are then reducible by and large to disputes over claims about 'right form'. Some linguists have believed that NL grammars contain transformational rules; others have denied this. Some linguists have believed that transformational rules are parochially orders; others have denied this. Some linguists have believed that there are interpretive semantic rules; others have denied this. And so on. Underlying all such disputes has been the assumption that it is possible through appeal to some combination of proof-theoretical devices to construct *some* generative grammar for each NL."

Langendoen and Postal (1984) rejected this possibility but only reached the conclusion of the untenability of proof-theoretic grammars on the basis of the proof, mentioned at the outset, that NLs were not (sets). Given the radical and controversial nature of that line of argument, the present work has sought to construct a path to the same conclusion in a different and hopefully less controversial way. This path appeals of course to the conclusion that NLs are not closed. Accepting the latter as a fact means that NLs cannot be regarded as recursively enumerable sets and directly yields the result that NL grammars cannot be generative grammars. The proof-theoretic approach to NL grammars which generative grammar insists on is thus seen as irreparably flawed independently of the bases of the argument in Langendoen and Postal (1984, 1985).

The available and seemingly only available alternative then is to develop model-theoretic approaches, as primitively attempted in Johnson and Postal (1980), Langendoen and Postal (1984: Chapter 5.2). See

Pullum and Scholz (2001) for many references to more recent sophisticated and formalized approaches to model-theoretic grammars.

Finally, it is worth indicating exactly why a model-theoretical approach to NL grammars is *not* undermined by NL openness in the way that proof-theoretical approaches are. Consider the direct speech case (66):

(66) Maureen grunted 'fnstribkl'.

A generative grammar cannot characterize such sentences because it cannot find ('look up') the alexical object constituent or its components in its lexicon. Thus no proof-theoretic grammar can, as required for factual adequacy, yield a proof (derivation) of arbitrary grammatical direct speech sentences simply because the unregimented direct speech constituents are unlistable, hence unlisted. But model-theoretic approaches, as stressed in Pullum and Scholz (2001), embody necessary (and I would stress, sufficient) conditions for sentencehood. They state what conditions an object must satisfy to be a sentence of the NL described. Therefore, such a grammar can characterize (66) without having to mention fnstribkl or any other direct speech segment. For this to work, it merely must characterize the realizations of the object of direct speech verbs like grunt in such a way that no conditions are imposed which fnstribkl, etc., will fail to satisfy. A non-constructive grammar can allow alexical constituents, regimented or not, in various contexts simply by failing to state overly specific constraints. For the object context of (66), it will suffice if the grammar requires only that an acceptable object constituent specify a set of actual noises. Thus a collection of endlessly many direct speech objects like that of (66) is characterized without mentioning any of them, engendering no conflict between a finite grammar and a non-recursively enumerable set of constituents, that is, a class of constituents which have no gödel numbering; see note 9. Put differently, a model-theoretic approach permits accomplishing what Jackendoff's putative but nonexistent phrase structure rule could not. So, while the openness of NLs is strongly incompatible with proof-theoretic approaches to NL grammars, hence with the defining ideas of generative grammar, it is trivially compatible with model-theoretical approaches.

Notes

**Any discernable virtues in this study only exist thanks to the remarkable work on the foundations of linguistics over the last two decades by Jerry Katz; see Katz (1981, 1984, 1996, 1998). It is with great appreciation that I dedicate this work to him.

*I am greatly indebted to Ray Jackendoff, David Johnson, Christopher Potts, Haj Ross, Pieter Seuren, and Geoffrey K. Pullum for comments on earlier versions of these remarks which have substantively improved the result. None of them, however, can be assumed to accept any specific claim made here And the author alone is responsible for any deficiencies.

1 A (recursively) enumerable set is one falling under the following characterization (Boolos and Jeffrey, 1974: 4): "To say that a set A is enumerable is to say that there is a function all of whose arguments are positive integers and all of whose values are members of A, and that each member of A is a value of this function: for each member *a* of A there is at least one positive integer *n* to which the functions assigns *a* as its value."

2 The reviews in question were Abbott (1986), Lapointe (1986), McCawley (1987), Rauff (1989), Sgall (1987) and Thompson (1986). Wilks (1984) is also a review of sorts; although it does not mention the actual argument of Langendoen and Postal (1984) and badly misconstrues a number of points, it also fails to contain even any claimed refutation of the argument.

3 Cantor's Theorem states that for any set V the power set of V, that is, the set of all subsets of V, is of a higher cardinality than V; see Stoll (1979: 86).

4 This despite Lapointe's (1986: 238) remarkably inaccurate quasi-prediction that "if Chomsky takes L&P's comments at all seriously, we can anticipate a lengthy response from him in the near future."

5 See Chomsky (1975, 229, n8, 244-245, n1, 246, n9, 251, n38; 1977, 188; 1978, 311-312; 1980, 267, n28; 1982, 33; 1984, 47; 2000, 49-50).

6 Clearly then, the argument of Langendoen and Postal (1984, 1985), though publicly unchallenged, has had no effect on Chomsky's assertions. It would be instructive to have a specification and defense of some principles of proper scholarly conduct or 'rational inquiry' which could justify somone's continuing to assert

the contrary of a published claim A without offering any refutation or criticism of the argument for A, indeed without even mentioning A.

7 The existence of non-finite sentences was not a premiss of the basic argument but a consequence of its underlying assumption. So if one could show that every NL sentence is a finite object, one would have falsified the argument by proving the negation of one of its entailments. Such a demonstration remains unknown however.

8 This prejudice is strong in philosophy as well as in linguistics; see Langendoen and Postal (1984: 95-96). And more recently Sorensen (1998) claims without argument: "This context sensitive approach is designed to work within a single, learnable language ~ such as English. However, such a language has only denumerably many sentences. Supplementing the language with indices might ensure that there will be a sentence for any thought in the super-denumerable queue. But the language will not have a sentence for each and every thought in the queue. For there are uncountably many thoughts and only countably many sentences." Sorensen's unsupported claim is directly inconsistent with the arguments of Langendoen and Postal (1984, 1985).

9 The argument that only closed collections of sentences can be enumerated and hence that Chomsky's claim (3d) can only hold if NLs are closed can evidently be stated in terms of gödel numbering, described by Boolos and Jeffrey (1974: 170) as follows: "A gödel numbering is an assignment of natural numbers (called 'gödel numbers') to expressions (in some set) that meets these conditions: (i) different gödel numbers are assigned to different expressions: (2) it is effectively calculable what the gödel number of any expression is; (3) it is effectively decidable whether a number is the gödel number of some expression in the set, and, if so, effectively calculable which expression it is the gödel number of."

Such a numbering provides a way of mapping any denumerable set of elements into a distinct set of gödel numbers. Put differently, a gödel numbering provides a way of coding any denumerable set into an isomorphic set of natural numbers. If, contrary to (3d), at least some NL sentences contain minimal elements *m* not drawn from a finite list, there is no way to calculate any assignment of gödel numbers to *m*

and hence a set of sentences some of whose members contain elements of *m* cannot have a complete gödel numbering, and is thereby not denumerable.

10 Notably, Chomsky's major linguistic works subsequent to Harris's volume fail to reference it. So none of e.g. Chomsky (1981, 1986a, 1986b, 1988, 1995, 2000) cite Harris (1979).

11 Earlier, Partee (1973: 411-412) contemplated the idea that the correct representation of a direct speech component was simply a phonological representation. But her remarks were terse and she did not address the problems of extending this idea to foreign segments, nonlinguistic noises, etc.

12 As the number of segments increases, the size of the set of alternative bracketings becomes staggeringly large; see Pullum (1982: 211) for a relevant formula for calculating the cardinality of such sets.

13 The careless implication built into Chomsky's singular/definite phrase the sign language of the deaf that there is *only one* such NL is a falsehood clashing with modern research on non-phonetically expressed NLs; see e.g. Perlmutter (1983). Neidle, Kegl, Maclaughlin, Bahan and Lee (2000: 6-7) indicate rather: "Contrary to popular misconception, there is no single, universal signed language. As with spoken languages, distinct signed languages are found in different parts of the world. Moreover, individual signed languages exhibit dialectal variation. For example, there are regional variations in the use of ASL."

14 That there are such in particular in ASL, the language of the deaf in America, is argued in Lee, Neidle and Maclaughlin (1997); many thanks to Carol Neidle for making me aware of this work and providing a copy.

15 The claim that the class of planar figures is of the order of the real numbers can be justified as follows. A planar figure is a set of *lines*, each line being a set of *points*. But the number of points on a line is itself of the order of the real numbers. As Davis and Hersh (1981: 224) put it: "The first, the infinity of the natural numbers (and of any equivalent sets) is called aleph nought ($\aleph_0$). Sets with cardinality $\aleph_0$ are called countable. The second kind of infinity is the one represented by a line segment. Its cardinality is designated by a lower-case German $\mathfrak{c}$ ($\mathfrak{c}$) for 'continuum'. *Any* line segment of arbitrary length has cardinality $\mathfrak{c}$. So does any rectangle in the plane, any cube in space, or for that matter all of unbounded *n*-

dimensional space, whether n is 1, 2, 3 or 1,000." So the number of lines in the plain is of the order of real numbers. Since each planar form consists of at least one line, the result is immediate.

16 As with direct speech segments, the issue arises of which contexts permit metalinguistic constituents like by nos, and by al que in the example Chomsky might suggest that this is possible simply after the passive agent marker by. However, a more plausible alternative is that such examples involve invisible forms of a noun denoting 'expression' or the like. For such forms are part of paradigms with visible nouns with similar denotations:

(i) One of the traces must be bound by the element/expression/form/morpheme/word nos.....

Recognition of an invisible element of this paradigm in examples like Chomsky's (37a) would permit a much more limited and context-restricted specification of the environments allowing foreign metalinguistic expressions.

17 The reasons for the hedge in this claim are explicated in Section 9.

18 Actually, Kathol and Levine (1993: 210) seem to be casting doubt even on the constituency of direct speech segments, as follows:

"Thus, consider examples such as (based on Peters 1984:108):

(11) a. "I intend", said Melicent rather grandly, because ..., "to take the veil,
and would like to be among the Benedictine sisters of Polesworth."
b. "I intend to take the veil", said Melicent rather grandly, "and would like to be ..."
c. "I intend to take the veil, and would like", said Melicent rather grandly, "to be .."

It is difficult to see how in anything remotely like an X-bar based syntax the quoted material which appears to be fronted to the left of the inverted verb could be taken to be a projection of some lexical category – especially given the fact that this material need not be grammatical, or even correspond to human speech. Given that the quotation cannot be characterized as even a grammatical category, we find it extremely

implausible that it could arise in its fronted position via a syntactic relation which is only well-defined between syntactic categories, such as that which relates a filler to the empty category it is linked to."

Questions of X-bar theoretic assumptions being irrelevant to issues of constituency per se, it is not made explicit in this quote, nor is it very clear, what the argument against the constituency of the quoted material is supposed to be. I take it though that the key element in the argument is the discontinuous character of the quotes. That is, presumably there would be no argument if the only example were:

(i) "I intend to take the veil, and would like to be ..", said Melicent rather grandly.

But a general principle to the effect that segments of a surface sentence whose discontinuity is due to separation by a parenthetical element cannot correspond to an abstract constituent would seem to have consequences that few if any would accept. Consider for instance:

(i) Herb, (I guess/suppose) Bob, and (I assume/am nearly certain) Ted will vote for Sheila.

Clearly, without the parentheticals, it is uncontroversial that there is a complex conjoined constituent [Herb, Bob and Ted], a DP which is the subject of the clause. It seems then that the only argument derivable from the data Kathol and Levine (1993) cite in apparent opposition to the constituency of direct speech segments would equally yield an argument denying that there is a subject DP constituent in the long versions of (i) which is a conjunction of three other DPs. An alternative in both cases is to allow certain appearances of parentheticals inside certain constituents. If I have understood them, this is the view of discontinuous direct speech cases taken by Collins and Branigan (1997: 10-11) for cases like their:

(ii) "When on earth", asked Harry, "will the fishing begin again?"

To suggest such a 'parenthetical insertion' view is not of course to give a precise account or even a rough conceptualization of it. This is no trivial matter and it is obscure to me what even the basic conditions allowing the kind of positional alternations illustrated by Kathol and Levine are. For me though, it seems that such insertions are very narrowly limited and, bizarrely, I find that they depend on the fact that the quoted material is English. Thus I see sharp contrasts between e.g. (iii) and (iv):

(iii)a. “I don’t give a damn about Bananastan”, shouted Felicia in English.

b. “I don’t give a damn”, shouted Felicia in English, “about Bananastan”.

c. “I don’t give”, shouted Felicia in English, “a damn about Bananastan”.

(iv)a. “Je m’en fous de Bananastan”, shouted Felicia in French.

b. *“Je m’en fous”, shouted Felicia in French, “de Bananastan”.

c. *”Je m’en”, shouted Felicia in French, “fous de Bananastan”.

That is, the possibility of a discontinuous direct speech constituent may depend in part on the possibility of analyzing the latter according to the rules of the NL in which it is quoted.

19 That is, the elided parts of ellipsis constructions and their antecedents involving direct speech constituents seem to obey the same type of identity conditions as those discussed for standard elided constituents in e.g. Fiengo and May (1994).

20 Evidently, this view requires recognition of a vast number of distinct NLs, even internal to mutually intelligible speech communities. This consequence is not only harmless but entirely in line with parallel conclusions based on distinct observations about NLs. So Kayne (2000: 7-8) observes: “My own experience in observing the syntax of English speakers…makes me think that it is entirely likely that no two speakers of English have exactly the same syntactic judgements.” Based on such an assumption, Kayne then is led to an estimate, with whose bases I agree, that: “Extrapolating to the world at large, one would reach the conclusion that the number of syntactically distinct languages/dialects is at least as great as the number of individuals presently alive (i.e. more than 5 billion).” From this point of view, the cardinality of specifiable NLs due to partially distinct lexicons seems unremarkable.

21 See Katz (1981, 1984, 1996, 1998), Katz and Postal (1991), Langendoen and Postal (1984: Chapter 6) for extended arguments for the abstract object character of NLs. The specification that NL sentences are sets is elaborated in Langendoen and Postal (1984: 165-166).

22 The set of marbles is not to be confused with the marbles. For instance, the latter are physical objects, located on the table, but the former is an abstract object and has no space/time location at all.

23 An analogy with the set of presidents of the United States is apt. While one can specify the cardinality of the subset of presidents up to a fixed date, the cardinality of the set itself is at present indeterminate to mere mortals.

24 Specification (50) does not specify that the token *denoted* by a use U of an unregimented constituent is distinct from the actual token which is U. Such a specification would make a false claim in a case like the performance of (i):

(i) I just said 'smekto'.

That is, on one interpretation (i) could be truly uttered by a person whose total lifetime pronunciations of smekto were unitary. It could also be truly uttered by a person at 10:15 who had uttered smekto at 10:10. On the former reading, a distinctness specification would yield a false claim, since the utterance is in an obvious sense self-referential.

The normal communication that a direct speech constituent use U, as in (ii), denotes some token distinct from U itself must be an implicature from various pieces of contextual information.

(ii) Bob said 'smekto' yesterday.

More specifically, in enunciating (ii), a speaker is referencing a past action; therefore, the token that instantiates a present time use of the unregimented constituent in (ii) must be distinct from the token denoted, given that tokens have time coordinates and that the same token cannot have distinct time coordinates.

25 Quite positively though, Jackendoff (1984: 36) did avoid being bluffed by a reader's attempt to dismiss his observations:
(i) "One reader has remarked that these constructions "lie at the edge of linguistic structure - in my judgment, just at the point where linguistic structure slides off into chaos," and that "one would presumably not want to use them to throw light on the core of linguistic theory." My conclusion, however, is quite the opposite. The only 'chaos' in these constructions ties in the appearance of the free expression E, and the

judgments seem to me no more delicate or unreliable than those in contemporary discussions of 'core' matters such as control."

Jackendoff's rejection of the reader's attempt to justify ignoring the constructions at issue here was entirely correct. The reader provided no argument at all that the facts Jackendoff was discussing were not internal to NL. The illegitimacy of the reader's approach to the matters is then clear from the fact that the exact words used by the reader could otherwise be used to dismiss any set of facts which any theorist found embarrassing. Consider for example "the difficulty of determining the facts of e.g. weak crossover, where linguistic structure slides off into chaos so that one would presumably not want to use them to throw light on the core of linguistic theory, etc."

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