

The Unfinished Chomskyan Revolution

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Abstract: Chomsky's criticism of Bloomfieldian structuralism's conception of linguistic reality applies equally to his own conception of linguistic reality. There are too many sentences in a natural language for them to have either concrete acoustic reality or concrete psychological or neural reality. Sentences have to be types, which, by Peirce's generally accepted definition, means that they are abstract objects.

Given that sentences are abstract objects, Chomsky's generativism as well as his psychologism have to be given up. Langendoen and Postal's argument in *The Vastness of Natural Languages* to show that there are more than denumerably many sentences is flawed. But, with the view that sentences are abstract objects, the flaws can be corrected. Once psychologism and generativism are abandoned, the revolution against Bloomfieldian structuralism can be brought to completion and linguistics can be put on a sound philosophical basis.

1. Introduction

In earlier publications I (1981, 1984) proposed a realist (or Platonist) position on the nature of linguistics: the sentences of a natural language are abstract objects—entities like numbers or sets that cannot have a location in space or time—and grammars are theories like mathematical theories such as number theory and set theory. In those publications, the proposal was based on a number of considerations, principally, the distinction between the speaker's knowledge of a language and the language known, and the existence of linguistically necessary truths.

I argued that, although theories of the speaker's knowledge of a language are no doubt psychological theories, there is no reason to think theories of the language known are also psychological theories. Given the distinction between knowledge of a language and the language it is knowledge of,

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Chomsky's (1965) claim that theories of the latter are also psychological requires an argument over and above those he used to refute Bloomfieldian structuralism. I also argued that Chomsky's (1965, 1986) identification of languages with contingent structures in the mind/brain cannot explain necessary truths which depend on linguistic structure. In a related criticism of Chomsky's position, Langendoen and Postal (1984) argued that the sentences of a natural language are too numerous for its grammar to be a generative system.

Our arguments initiated a controversy over whether grammars are generative theories of linguistic competence. In *Knowledge of Language*, Chomsky (1986) responded to some of our arguments, and in 'Realism vs. Conceptualism in Linguistics', Postal and I (1991) replied. For example, Chomsky argued that natural languages must be taken as empirical objects, claiming that otherwise grammars would be arbitrary stipulations; we replied that, from *Syntactic Structures* to the present, intuitive evidence about the grammatical structure of sentences has, by itself, been accepted, even by Chomsky, as a principled basis for grammars. Moreover, a number of other linguists and philosophers contributed to the controversies over psychologism and generativism, e.g. Higginbotham (1991), Israel (1991) and Soames (1985, 1989, and 1991) in the case of the former controversy and Lapointe (1986) and Rauff (1989) in the case of the latter.

Despite this discussion, it will not come as a surprise to anyone to learn the issues of generativism and psychologism were not definitively settled. This is perhaps only to be expected given that the issues are relatively new and in general exclusively philosophical. There have been no cases like Chomsky's 'John is easy to please' vs. 'John is eager to please' case which raise the philosophical issue within the immediate concerns of the working linguist. However, I have of late also come to think that our arguments against Chomsky's psychologism do not do as much as could be done to make clear the linguistic relevance of these philosophical issues and that the argument against generativism does not stand on its own, but depends on a refutation of psychologism.

To make clear the linguistic relevance of those issues, it is necessary to focus on the central failure of Chomsky's psychologism, its failure to fully represent the abstractness of grammatical structure. Ironically, it was Chomsky (1975) himself who first raised the problem of the abstractness of natural language in his critique of the Bloomfieldian view that grammars are taxonomic descriptions of speech. Chomsky showed that the categories necessary to write grammatical rules cannot be obtained from speech by 'bottom up' procedures of segmentation and classification because there is nothing abstract in the concrete phonetic reality on which the procedures operate and no way to introduce abstractness into the linguistic description the procedures induce from distributional regularities. Chomsky's reconceptualization of linguistic reality in terms of a concrete biological reality allows for more abstractness, but not for sufficient abstractness to provide a satisfactory interpretation of grammars.

To be sure, Chomsky's proposal to take grammars to be generative theories of the speaker's linguistic competence at first seems to solve the problem of representing the abstractness of grammatical structure which arose in connection with Bloomfield's structuralism. Today, nearly everyone believes that Chomsky's proposal does solve it, and, as a consequence, puts linguistics on a firm scientific basis. But, although his criticism of Bloomfieldian structuralism was essentially correct, Chomsky did not establish that grammars are generative theories of linguistic competence. His criticism established only that a generative theory of linguistic competence does not fail in the same flat-footed way as a taxonomic description of speech. The two positive components of Chomsky's proposal are incorrect. Grammars are not theories of linguistic knowledge and they are (as a consequence) not generative systems.

In not focusing on the abstractness of natural languages, my earlier arguments did not make clear the striking fact that the inadequacy which Chomsky exploited to overthrow Bloomfieldian structuralism is also an inadequacy of Chomsky's own position. The same connection between the vastness of the range of sentences and the abstractness of linguistic reality is a stumbling block for both positions. Thus, the argument which needs to be made is that, since Bloomfieldian structuralism was rejected for having too concrete a notion of linguistic reality for it to provide a satisfactory interpretation of grammars, Chomsky's psychologism ought, by parity of reasoning, to be rejected, too.

The present paper attempts to make this argument. It focuses directly on the failure of Chomskyan linguistics to solve the problem of the abstractness of grammatical structure. I will argue that, although this problem cannot be solved within Chomsky's position anymore than it could be within Bloomfield's, it is solved within realism. Given that realism can solve the problem, it, rather than psychologism and generativism, can carry the revolution against Bloomfieldian structuralism through to its logical conclusion and put linguistics on a firm scientific basis.

2. The Problem of the Abstractness of Language

As a consequence of the widespread belief in the basic success of the Chomskyan revolution, the problem of grammatically representing the abstractness of linguistic structure is mistakenly thought to have been laid to rest with the overthrow of Bloomfieldian structuralism. Accordingly, the most vulnerable aspect of the conception of grammars as generative theories of linguistic knowledge has gone unnoticed, sustaining a spurious sense of well-being about the foundations of linguistics.

In light of this, it will be necessary to explain the basic nature of the problem that Bloomfield (1936, 1938) and his followers undertook to solve when they attempted to reconstruct linguistics. That problem is far more general than it appears when just seen in the context of linguistics. The problem is,

in fact, a quite general one concerning the representation of abstractness in the formal sciences. To appreciate its generality, it is necessary to appreciate that the principal problem for inscriptionalist nominalism in mathematics is a special case of this problem in linguistics. I will begin with the special case because issues concerning the fit between formal theories involving reference to infinity and interpretations of such reference in terms of the physical world have been most extensively discussed in the foundations of mathematics. Beginning in this way lets us exhibit the generality of the problem and state it with clarity and precision.

The figure in the philosophy of mathematics customarily identified with inscriptionalist nominalism is Hilbert (1925, pp. 183–201). In order to provide an empiricist epistemology for mathematical knowledge, Hilbert, motivated by Humean scruples about reference to the infinite, attempted to eliminate the mathematician's unreconstructed talk of infinity as 'meaningless'.¹ If reference to an actual infinity of numbers and other mathematical objects were meaningful, then the finiteness and discontinuity of physical matter would prevent us from thinking of the objects which render such reference meaningful as concrete. If those theories were about material objects, there wouldn't be enough objects for them to be true. Thus, the infinity of mathematics and the finiteness of matter threaten to make empiricist accounts of the acquisition of a large portion of scientific knowledge unintelligible, and, hence, drive mathematicians to say that mathematical theories are about abstract objects.

Hilbert's solution was to allow only reconstructed talk of the infinite. On his reconstruction, mathematics is about mathematical expressions. Two kinds of mathematical statements are meaningful, those that can be observed to be true or false of combinatorial facts about expressions and those about infinite collections that can be verified or falsified on the basis of finitistically justified principles. If talk of the infinite in mathematics is restricted to such reconstructed talk, it is only a harmless *façon de parler*. The central claim of Hilbert's nominalism is that taking mathematics to be about expressions enables mathematical nominalists to do justice to the practice of mathematics, including reference to infinite collections, without committing themselves to epistemologically troublesome abstract objects.

The difficulty with this seemingly clear claim is that there is literally no way to make sense of it. The reason is that neither of the senses of the English term 'expression'— 'expression type' or 'expression token'— can be taken as the sense of the term in the Hilbertian nominalist's claim. We can immediately rule out the sense 'expression type' because, as C.S. Peirce drew the

¹ One prominent place where we find this interpretation of Hilbert is the discussion of Hilbert's formalism in the introduction to the standard reader on the philosophy of mathematics, Benacerraf and Putnam, 1983, pp. 6–8. I am aware that Hilbert does not have to be interpreted as an inscriptionalist, but the exegetical issue can be ignored here, since I am only using this interpretation to explain a related issue in the foundations of linguistics.

type/token distinction, and as everyone since understands it, types are abstract objects. Peirce (1958, p. 423) says:

There will ordinarily be about twenty 'the's on a page, and of course they count as twenty words. In another sense of the word 'word', however, there is but one 'the' in the English language; ... it is impossible that this word should lie visibly on a page or be heard in any voice.

Quine (1987, pp. 216–7) reiterates Peirce's explanation of types as abstract objects and adds a further clarification:

ES IST DER GEIST DER SICH DEN KÖRPER BAUT: such is the nine word inscription on a Harvard museum. The count is nine because we count *der* both times; we are counting concrete physical objects, nine in a row. When on the other hand statistics are compiled regarding students' vocabularies, a firm line is drawn at repetitions; no cheating. Such are two contrasting senses in which we use the word *word*. A word in the second sense is not a physical object, not a dribble of ink or an incision in granite, but an abstract object. In the second sense of the word *word* it is not two words *der* that turn up in the inscription, but one word *der* that gets inscribed twice. Words in the first sense have come to be called *tokens*; words in the second sense are called *types*.

If the whole point of taking mathematics to be about expressions is to escape a commitment to abstract objects, it is self-defeating to construe the occurrence of 'expression' in Hilbert's claim to mean 'expression type'.

But, if the occurrence of 'expression' cannot mean 'expression type', it must, by default, mean 'expression token'. But that meaning isn't possible either. What are the expression tokens which mathematics is alleged to be about? They can't be actual ones because there are far too few actual expression tokens for all the numbers (not to mention sets, spaces, and everything else mathematicians prove theorems about). The most philosophically sophisticated nominalists have always recognized this numerical discrepancy, but none have found any way out.² It is an indication of the hopelessness of the situation in which this discrepancy puts the nominalist that Goodman and Quine (1972, p. 175) once resorted to the desperate and

² It is perhaps because contemporary nominalists have abandoned all hope of finding a solution that some, e.g. Field, 1980, 1989, have taken the entirely different direction of a fictionalist view of mathematical objects. Field, 1989, pp. 2–3, says, 'The sense in which $2 + 2 = 4$ is true is pretty much the same as the sense in which 'Oliver Twist lived in London' is true.' See Katz, 1995, p. 5, fn. 2 for a criticism of the claim that reference to numbers can be construed as reference to fictional entities and mathematical truth truth in a fiction.

doomed contrivance of counting unmarked parts of the surfaces of things as expression tokens. The contrivance is desperate because 'parts' that are indistinguishable from the rest of the surface are parts only in the most Pickwickian sense. It is doomed because, even with this sizeable increase in the number of actual expression tokens, there must still be far too few in our finite universe for all the infinities of mathematical objects.

Less canny nominalists than Quine and Goodman have said that the term 'expression' means 'possible expression token'. There are, of course, now enough expression tokens for all the mathematical objects, but only because of the non-actual ones among them. The non-actual ones make the numerical difference. But, from a nominalist standpoint, a non-actual possible token is an unacceptable entity if anything is. Expressions destined to occur at some time and place in the future, even in the distant future, can be legitimately regarded as tokens, as it were, *sub specie aeternitatis*. But expression tokens fated never to occur—because there simply isn't enough matter in the universe—cannot be legitimately regarded as tokens in any sense. Since the customary notion of a token is that of a concrete thing which instances a type, a never-to-be-actual token is, strictly speaking, a contradiction in terms. (Note that Quine (1987, pp. 217–8) makes short work of the attempt to treat types as classes of their tokens.)

Rejecting the customary notion of a token in favour of something like the notion of instantiation possibilities might seem a promising way to escape this contradiction, but the latter notion raises the spectre of the 'expression type' construal. Non-actual instantiation possibilities aren't dribbles of ink, incisions in granite, or disturbances of the air. They do not 'lie visibly on a page', and are not 'heard in any voice'. Having no location in space-time, non-actual instantiation possibilities qualify definitionally as abstract objects just like types themselves. Hence, mathematical nominalists can no more allow such non-actual possible tokens into their ontology than other abstract objects. They have to choose between enough ontologically unacceptable entities and too few ontologically acceptable ones.

This problem about mathematical sentences is a special case of the general problem about language as a whole that Bloomfield undertook to solve when he set out to reconstruct linguistics. Convinced that the mentalism of the linguistics of the day prevented it from being a proper science, Bloomfield undertook to reconstruct linguistics. His model for the reconstruction was the conception of science then current in writings of Schlick, Carnap, and the other logical positivists. In accord with that model, Bloomfield (1936 and 1938, p. 231) construed linguistic reality nominalistically, as concrete acoustic phenomena. Grammars were to describe the distributional structure of natural languages. Such a description had to cover more than the distributional structure of expression tokens in the linguist's corpus, and more even than the actual expressions that fall outside that corpus, to encompass the full distributional structure of the language. Accordingly, Bloomfield and his followers formulated a methodology for nominalistically constructing grammars as category structures which taxonomize all expressions of a natural

language. The methodology consisted in segmentation and classification procedures which, working up from actual expression tokens in a nominalistically acceptable way, construct a categorical structure describing all expression tokens of the language, including the possible but not actual ones.

Bloomfield's attempt to construct such a methodology was a novel development in the history of nominalist thought. Never before had the problem of the abstractness of language been put in a fully general form and never before had an attempt to solve it brought to bear the full resources of the science of language. On Bloomfield's methodology, the troublesome notion of a possible but not actual expression token is to be explained in terms of grammatical principles generalized from distributional relations of actual tokens in a sample. The acceptability of the principles consists in their having been constructed by procedures which work up stepwise from a nominalistically acceptable corpus of actual expression tokens without an appeal to anything not already certified as nominalistically acceptable. Thus, as with Hilbert's nominalism, reconstructed talk about 'abstract' features of natural languages is supposed to turn out to be only a harmless *façon de parler*, reducible via the categorical structure to talk about the distributional relations among short stretches of speech.

3. *The Official Story*

In the late 1950s and early 1960s, Chomsky launched a successful revolution against Bloomfieldian structuralism which abandoned the nominalist view of linguistic reality and the taxonomic conception of grammars, replacing them with a conceptualist view of linguistic reality and a generative conception of grammars. Chomsky (1975) showed that the construction of a structure of grammatical categories for the expressions of a natural language could not be carried out nominalistically. He showed that, since nominalist constraints prevent abstract notions from coming in at any step, there is no way to construct the necessary abstract categories 'bottom up' from distributional relations among actual tokens. In order to permit such categories, Chomsky (1959, 1965, 1975) proposed a 'top down' approach on which the linguist is free to hypothesize systems of formal rules containing category symbols, subject only to appropriate empirical confirmation. The systems must generate an infinite class of sentences. Since sentences have derivations in generative grammars in the same way that theorems have proofs in logical and mathematical systems, the derivations make predictions about grammatical properties and relations relative to definitions of such properties and relations stated in terms of formal features of derivations (e.g. generability or multiple generability). The adequacy of a grammar as a theory of natural language is a matter of how comprehensively and simply the grammar predicts the evidence obtained from judgments native speakers make about its sentences.

The formalism of generative grammars requires an interpretation that

specifies the linguistic reality of which they are theories. Once we have an interpretation that tells us what objects the statements of a grammar are true or false of, those statements can be confirmed or disconfirmed on the basis of the speaker's judgments, understood as statements about the linguistic reality specified in the interpretation. Chomsky (1965, 1986) interpreted grammars as psychological theories of the 'linguistic competence' that speakers acquire in learning their native language. The nominalist interpretation of grammars as descriptions of acoustic phenomena was thus replaced with a conceptualist interpretation of grammars as theories of the linguistic aspect of human psychology, or, as he (1986) now expresses it, a 'language organ' in the human brain. The nominalist 'discovery procedure' conception of linguistic theory was replaced with a conception on which linguistic theory is a theory of the universals of language, conceived as the initial competence of the first language learner. This competence is the innate state from which the language organ of a mature speaker develops under the influence of satisfactory linguistic input from the community.

Today there is a broad consensus among linguists, cognitive scientists, and philosophers that generativism and psychologism are the two pillars on which scientific linguistics rests. As they see it, the general acceptance of grammars as psychologically interpreted generative systems put the foundations of linguistics on a formally and ontologically unproblematic footing. Not that linguists will be spared the empirical difficulties that other scientists encounter in trying to uncover nature's secrets, but that the problems which plagued linguistics under the taxonomic-nominalistic paradigm are put to rest under the new generative-psychological paradigm. With the new paradigm, the turbulent revolutionary period is over and linguistics can settle down to the routine of normal science.

That's the official story of the Chomskyan revolution. But, as with so many official stories, this one is largely untrue. The question of how to make sense of the notion of non-actual possible expression tokens that plagued Bloomfieldian nominalism also plagues Chomskyan conceptualism.³ This is because the source of the problem is not Bloomfield's acoustic conception of linguistic reality *per se*. The source of the problem is taking linguistic reality to be concrete. Taking expressions to be acoustic objects is just one way of taking linguistic reality to be concrete. Another way is taking expressions to be mental/neural objects. Nothing essential changes when the concreteness of stretches of physical sound is replaced with the concreteness of mental/neural states. All that changes is the particular kind of concreteness put forth as linguistic reality. The fundamental problem of the

³ It is not necessary to agree with linguistic realism to see that there is at least one issue in the foundations of linguistics about the interpretation of grammars that linguists have not put behind them. Since Chomsky's arguments exploit the concreteness of an acoustic interpretation, and since they are thus inapplicable to an interpretation of grammars as theories of abstract objects, there is the issue of whether interpreting grammars as theories of the mind/brain is preferable to interpreting them as theories of abstract objects.

revolutionary period, the problem of the abstractness of language, was not solved in the Chomskyan revolution, but swept under the rug.⁴

Chomsky's (1986, pp. 22–7) terminology of 'I-language' and 'E-language' underscores his conception of the concreteness of language. I-languages are the knowledge a speaker has of a language—'some element of the mind of the person who knows the language', while E-languages are outside the mind. He (1986, p. 23) says that for speakers to know a language

... is for [them] to have a certain I-language. The statements of a grammar are statements of the theory of mind about the I-language, hence statements about structures of the brain at a certain level of abstraction from mechanisms. These structures are specific things in the world.

Since Chomsky is taking a generative grammar of English to be about something mental/neural, and since an English grammar is about the denumerable infinity of English sentences (those referred to in the denumerable infinity of structural descriptions that it generates), it follows that those sentences must also be something mental/neural. Hence, there has to be a denumerable infinity of mental/neural objects. But given the finiteness and discontinuity of matter, and of brain matter in particular, there can't be an infinity of mental/neural objects. There cannot be enough mental/neural sentences for all the generated structural descriptions, and, hence, there will be infinitely many uninstanciatable structural descriptions.

Since conceptualism is no less opposed to abstract objects than nominalism, the infinitely many uninstanciatable structural descriptions cannot be taken as describing sentence types. As before, the only thing that can be done is to invoke the notion of a possible but not actual sentence token, and say that structural descriptions are about merely possible sentences. The category symbols in a grammar, like 'S' or 'CP', which express unrestricted reference to the expressions of a natural language, must be taken to range over possible as well as actual mental/neural expressions. Hence, the linguistic conceptualist can no more get along without linguistic possibilities than can the linguistic nominalist. Both require the notion of possible but not actual expressions and sentences to make sense of category symbols that express general reference to sentences and expressions of a language.

Furthermore, just as the nominalist account of infinitely many untokened and untokenable sentences had to be nominalistically acceptable, so the conceptualist's account of the infinitely many uninstanciated and uninstanciatable sentences has to be conceptualistically acceptable. In spite of the fact

⁴ Note that the problem of abstraction is not solved with the introduction of the notion of linguistic competence as the ideal speaker-hearer's knowledge of the language. The explanation of idealization as 'abstracting away' from performance has sometimes misled linguists into thinking that something genuinely abstract is to be found in the subject-matter of Chomskyan theories of natural languages. See Katz, 1984, pp. 45–6, fn. 18.

that Bloomfield's nominalist account is given 'bottom up' and Chomsky's 'top down', their acceptability requirements are fundamentally the same. The account of 'merely possible sentence' has to be framed in terms of concrete things in the natural world—sound waves in the one case and brain matter in the other—without appealing to types or any other abstract objects. Hence, the linguistic conceptualist's problem of how to understand possible but non-actual mental/neural tokens is fundamentally the same as the linguistic nominalist's problem of how to understand possible but non-actual acoustic tokens.

Chomsky recognized the hopelessness of trying to solve the problem of the abstractness of language on the basis of a concrete acoustic interpretation of grammars, but, failing to see that the fundamental difficulty is concreteness, not the form that concreteness takes, he failed to see that linguistic conceptualism is on a par with linguistic nominalism. Neither position can solve the problem because infinity in linguistics cannot be squared with concretism in the foundations of linguistics. Linguistics requires that there be infinitely many real objects to serve as the referents for the linguist's statements about the infinitely many sentences of a natural language, while a concrete linguistic reality guarantees that there is none for the infinitely many possible but never-to-be-actual sentences. In the case of linguistic nominalism, the failure of the attempt to represent the sentences of a natural language without the use of types or other abstract objects, appears as a bootstrap operation. In the case of linguistic conceptualism, the failure takes the form of a grammatical formalism which is not comprehensively interpretable in terms of linguistic reality.

The only way abstractness can be incorporated into a theoretical construction in linguistics which begins with a domain of concrete objects is to bring it in at some point in the construction. If abstractness cannot be brought in, the construction cannot be comprehensively carried out, and the limited theories that can be constructed cannot be understood as theories of the full domain of the sentences of a natural language. Chomsky's programme to show that theories of natural languages are psychological theories of physical features of the human brain is another futile reductionism, entirely on a par with the linguistic nominalism and behaviourism he (1959) so effectively opposed.

Quine (1960, p. 34), who began his philosophical career as a 'constructive nominalist' but ended it as a Platonist, put the point this way:

Certainly it is hopeless nonsense to talk thus of unrealized particulars and try to assemble them into classes. Unrealized entities have to be construed as universals.

The moral is simple. Infinity and abstractness go hand in hand. No concrete interpretation of grammars can satisfactorily represent the infinity of sentences of a natural language. Sentences are types, and types cannot be reduced to concrete particulars. Consequently, the only way to obtain the

unactualized possibilities required to do justice to what the field of linguistics knows about the sentences of a natural language is to non-reductively take that scientific knowledge to be about types. But, since types are abstract objects, taking theories in linguistics to be about types is linguistic realism.⁵

4. *The Brouwerian Option*

The only way left to preserve linguistic conceptualism is to follow the lead of Brouwer's (1914, 1949) mathematical intuitionism and say that natural languages contain no more than the small finite number of sentences that have mental or neural existence. There is, in fact, a strong similarity between Chomsky's position and Brouwer's. Brouwer sees arithmetic as a human creation. He (1913, p. 80) says:

... the falling apart of moments of life into qualitatively different parts, to be reunited only while remaining separated by time ... creates not only the numbers one and two, but also all finite ordinal numbers.

Chomsky sees language as a human creation. Both positions are Kantian. Both oppose a realist view on which knowledge in their discipline is a discovery about a mind-independent domain of abstract entities. Hence, just as Brouwer attempts to avoid the problem of the abstractness of mathematics by denying that there is an actual infinity of numbers and asserting that the class of numbers is not fixed in advance, so linguistic conceptualists might attempt to escape the problem of the abstractness of language by denying that there is an actual linguistic infinity and that the class of sentences of a natural language is fixed in advance. The hope is that, being committed to only a finite stock of sentences and a finite system of sentence-generating operations which characterizes a potential infinity of sentences, linguistic conceptualism will be consistent with the finiteness and discontinuity of matter.

The hope is illusory. To say that a system of sentence-generating operations characterizes a potential infinity of sentences says that that system *can* generate the infinity of sentences. The claim that a particular system characterizes the potential infinity of English sentences is true if it generates them and false if not. The problem is that the modal 'can' commits the same sin as the term 'possible' in talk about possible but never-to-be-actual tokens. 'Can' means 'would under appropriate circumstances', but here the earlier dilemma resurfaces. The notion of 'appropriate circumstances' cannot be

⁵ Bromberger's (1989, p. 58) claim that we can know about types on the basis of sense experience shows that he does not recognize that real types, being abstract objects, cannot causally interact with us or with anything that can causally interact with us. See the discussion of Bromberger's claim in Katz, 1990, pp. 276–80.

explained in logical terms, since that would involve an actual infinity of cases to which the operations apply, and it cannot be explained in naturalistic terms either, since there is not natural world enough and time for all the cases. The former horn embraces abstract objects; the latter is question begging.

Of course, we do understand the Brouwerian use of 'can', but that is only because, from our outside perspective, we perfectly well see that the sentence-operations, assuming them to be ones of the usual recursive sort, do generate an infinity of sentences. This perception of generative success creates an illusion that there is something to the notion of a potential infinity. The Brouwerian option trades on this illusion. But when linguistic conceptualists try to explain what it means for them to say that such operations 'can' generate an infinite class of sentences, the explanation either has to use 'sentence' in the type sense or has to use the notion of non-actual possibilities in connection with the infinitely many derivations. Since one must already understand the notion of a non-actual possible to understand the notion of a potential infinity and since that notion is supposed not to be meaningful, recasting linguistic conceptualism along Brouwerian lines does not, to say the least, solve the problem of non-actual possibility.⁶

Stripped of its notion of potential infinity, a Brouwerian linguistic conceptualism forfeits the full generality on which the linguist relies in grammar construction. It deprives the linguist of the notion of 'any sentence' because it depends on iterating grammatical operations an arbitrarily finite number of times. This is particularly damaging in the case of Chomsky's position, since the denial of such iteration involves an internal conflict with generativism in his overall position. The denumerable infinity of sentences which is the output of a generative grammar contains infinitely many sentences that exceed the finite limits of the humanly constructible and the biologically realizable. Even if the conceptualist would be willing to forfeit generativism, abandoning general reference to the standardly accepted objects (and imposing a verificationist notion of truth) would not square any better with linguistic practice than it has with mathematical practice.⁷

⁶ In connection with Dummett's (1977) attempt to explicate the conceptualist's use of the modal 'can', see Katz, 1990, pp. 270–2.

⁷ Further, the Brouwerian option requires linguists to take length as an aspect of syntactic structure which determines the sentences of a language. When certain taxonomic linguists claimed that there is an upper limit on the length of sentences, Chomsky (1965, pp. 10–18) criticized them for confusing acceptability with grammaticality. He was quite right to do so because taking length as a determinant of grammaticality runs contrary to the deeply structuralist character of syntax. As I (1966, pp. 120–2) argued at the time, syntax is structuralist in abstracting away from the morphemic content of sentences and is invariant with respect to replication of productive grammatical operations. Thus, for any alleged finite size limit on the sentences of a language, we can find sentences that exceed it but whose structure differs in no relevant way from well-formed sentences that do not exceed it. Hence, one cannot separate strings that do not differ in syntactic structure into those short enough to be grammatical and those too long to be grammatical without violating the principle that syntactic distinctions are a matter of syntactic structure.

5. *On the Nature of Linguistics*

I think the step from saying that the sentences of natural languages which are the subject-matter of theories in linguistics are types, and, hence, abstract objects, to saying that linguistics is not a natural science like psychology or biology is unavoidable. This is because I think that the nature of the objects which constitute the subject-matter of a science determines the nature of the science. Physics, biology, and psychology are natural sciences because they study natural objects. The issue of whether mathematics is part of natural science, as a naturalist like Mill claims, or a formal science entirely apart from natural science, as a Platonist like Gödel claims, turns on whether numbers, sets, etc. are natural, concrete objects or non-natural, abstract objects. (There are, of course, corresponding epistemological differences, but there is no space to discuss them here (see Katz, forthcoming, chapter 1).

George (1989) disagrees with this way of determining the nature of a discipline, or, at least, disagrees with it in the case of linguistics. He thinks that linguistics is concerned with grammar in the abstract sense, but he holds that it is nevertheless a psychological/biological science. He thinks conceptualists are right about the psycho-biological nature of linguistics, but wrong about the concrete nature of the objects its theories are about. He thinks that realists are right about the abstract nature of the objects those theories are about, but wrong about the Platonist nature of linguistics.

George (1989, pp. 106–7) claims that linguistic realists are 'confused' because they

slide from the view that linguistics is not about [internal mental states] to the view that linguistics is not psychological. [Katz] seems to assume that the nature of the objects one is investigating determines the nature of one's investigation.

George (1989, p. 98) denies that the ontological nature of the objects a science is about determines the ontological nature of the science on the grounds that 'Entities can be referred to in many different ways'. He argues that:

Just as an inquiry into the identity of Z's favorite planet is not plausibly considered part of planetary astronomy, so an inquiry into the identity of Z's favorite grammar is not plausibly considered part of mathematics. . . . identification of that grammar, an abstract object, is a fully empirical inquiry.

Since the case of 'Z's favorite number' is completely parallel to the case of 'Z's favorite grammar', it follows, by parity of argument, that arithmetic is 'a fully empirical inquiry'. Since it is hardly credible that so striking a result in the philosophy of mathematics could be gotten by so paltry a linguistic means, there would appear to be some fallacy.

The fallacy results from the ambiguity of phrases like 'inquiries about Z's

favorite planet'. As Yuji Nishiyama (personal communication) points out, such phrases have both a referential sense on which the inquirer can be an astronomer investigating a certain planet, which just happens to be Z's favorite planet, and also a non-referential sense on which the inquirer can be a psychologist investigating Z's taste in planets. The sentence 'Linguistics is an inquiry into the grammar that a speaker knows' is ambiguous in the same way. On its referential sense, it expresses the claim that linguistics is an inquiry into an abstract object—which is referred to under a scientifically quaint description. On its non-referential sense, it expresses the claim that linguistics is a psychological inquiry into the speaker's epistemic states, namely, an inquiry to discover which grammar they know. Conflating these two senses, George (1989, p. 89) infers that 'identifying a speaker's grammar ... is already part of the psychological enterprise'. Once these senses are separated, it is clear that the argument for this conclusion is fallacious. On the referential sense, where there is no identification which is a matter of psychology, no conclusion about linguistics follows, while, on the non-referential sense, where there is such an identification, George's conclusion is a bit of a *petitio principii*. Finally, if we could show that linguistics is part of psychology on the basis of such an argument, we could also show that all the sciences collapse into psychology, leaving no room for the study of their objects *per se*.

My guess is that the motivation for claiming that linguistics is part of psychology is epistemological. If linguistics were part of psychology, it would be possible to have a naturalistic account of linguistic knowledge and thereby avoid the question that Benacerraf (1973) raised about how we know abstract objects when we can have no causal contact with them. For example, McGinn (1993) argues that linguistic abstract objects can be known on the basis of naturalistic investigations of the mind/brain because competence mirrors the abstract objects it is knowledge of. This mirroring claim begs Benacerraf's question. Since it is not an a priori truth that linguistic competence mirrors the structure of the language it is knowledge of, determining whether the claim is true requires that we verify whether our linguistic competence does in fact mirror abstract linguistic reality. Such verification, however, presupposes that we have knowledge of linguistic reality independent of naturalistic investigations of the mind/brain. Since the claim that there is a mirroring relation begs Benacerraf's question, the hope of having a naturalistic account of knowledge of abstract objects has to be given up. Once it is given up, the motivation for thinking linguistics is part of psychology, as far as I can see, disappears. (See Katz (forthcoming, introduction and chapter 1) for further discussion of McGinn and also Katz (1995) for a non-naturalistic answer to Benacerraf's question).

If theories in linguistics are about expressions which are irreducible types and if the nature of a science is determined by the nature of the objects its theories are about, then linguistic conceptualism has to be rejected on the very same grounds as linguistic nominalism. We have to interpret formal grammars of natural languages and the theory of language in general as

theories of sentence types, and hence as theories of abstract objects. If we are finally to solve the problem of representing the abstractness of natural languages, we have to adopt linguistic realism.

6. *Langendoen and Postal's Argument against Generativism*

Linguistic realism seems to be compatible with the view that a grammar of a natural language is a generative system. It seems entirely open to us to understand generative grammars as descriptions of sentence types, and, hence, as descriptions of abstract objects. But while it is true that linguistic realism is by itself consistent with generativism, linguistic realism is the first step in a line of argument, based on Langendoen and Postal's (1984) argument, leading to the rejection of generativism.

In the decade since the appearance of their argument, there has been a growing tendency within Chomsky's Principles and Parameters approach to think of grammars as systems of constraints which act as a filter on the set of strings in the vocabulary of a language. The set of strings which pass the filter are the sentences of the language and the set of strings which do not are the non-sentences. The new format is a departure from the production-format of traditional generativism, but not necessarily a departure from generativism. A grammar of a language can still be generative if its derivations first employ a production-format to obtain the set of all the strings in the vocabulary of the language and then a filter to obtain the set of sentences. Since that set is recursively enumerable, an argument against generativism remains relevant to syntactic theories based on the new format.

However, the new format also lends itself to a non-generative formulation on which the grammar of a language is only a system of principles and parameters. Since grammars on this formulation no longer enumerate the sentences of a language, it is not clear what we are to think about the fact that we can no longer determine when a grammar is a descriptively adequate theory of a language (in Chomsky's (1965) sense). Moreover, Chomsky (1987, p. 33) claims that an I-language is in no sense a theory of syntactic well-formedness. Here it is not even clear that there is any notion of a grammar for natural languages left.⁸ Be this as it may. The fact that some linguists at present adopt a non-generative conception of grammars does not make an argument against generativism unnecessary. For, if a non-generative conception of grammars were adopted in linguistics, it would be adopted on the basis of a body of evidence suggesting that such a conception is the best hypothesis. This being so, it is perfectly possible for further evidence to show that a generative conception is better. It sometimes happens that a science

⁸ This feature of I-languages is perhaps the best argument for taking theories of natural languages to be E-languages. See the discussion of Chomsky's claim in Katz and Postal, 1991, pp. 538–41.

returns to an abandoned theory under the pressure of new evidence. In contrast to the evidential argument that might usher in a non-generative conception of grammars, an argument based on Langendoen and Postal's work would be a proof. Hence, if such an argument goes through, it shows that writing generative grammars for natural languages is impossible. It rules out a return to generativism no matter what new evidence might come up.

Langendoen and Postal construct their argument on analogy to Cantor's proof that there are more than denumerably many real numbers. They argue that there are more than denumerably many sentences, that some sentences are infinite in length, and that the totality of sentences of a natural language is too vast to form a set. If natural languages have non-denumerably many sentences, then generative grammars cannot generate their sentences. Generative grammars construct the strings they generate on the basis of finite derivations, but a non-denumerable set of strings contains infinite strings for which there is no finite derivation. Hence, if English consists of non-denumerably many sentences, as Langendoen and Postal argue, generative grammars falsely describe the cardinality of its sentences, and, furthermore, the set of all derivations in such grammars fails to describe the structure of very many English sentences.⁹ Hence, if Langendoen and Postal are right, generative grammars must be discarded along with taxonomic grammars and finite state grammars.

Since generativism asserts the antecedent of (C) and denies the consequent of (C), we can reconstruct Langendoen and Postal's argument as an attempt to prove (C):

- (C) If grammatical structure is a basis for replacing the claim that the collection of sentences of a natural language is finite with the claim that it is denumerably infinite, then grammatical structure is also a basis for replacing the claim that the collection of sentences of a natural language is denumerably infinite with the claim that it is non-denumerably infinite.

Langendoen and Postal begin with the premiss, to which the generativist can make no objection, that each of the infinitely many strings in (E) is a grammatical sentence of English:

⁹ It might be tempting for the generativist to try to get around this criticism by saying that a generative grammar indirectly describes the grammatical structures in the sentences that cannot be generated in the process of describing the proper subset of the sentences of a natural language which can be generated. We may grant for the sake of argument that any structure in the former sentences is also found in the latter sentences. If the notion of description is weakened to such indirect description, then those who think that grammars have a finite output can say that finite grammars are adequate theories of natural languages. The reply saws off the limb on which the generativist sits.

- (E) I know that I like cheese. I know that I know that I like cheese.
I know that I know that I know that I like cheese . . .

They argue that the infinite string (S) is also a grammatical sentence of English:

- (S) I know that I like cheese and I know that I know that I like
cheese and I know that I know that I know that I like cheese . . .

Their reasoning is that the set of strings which results from forming all possible conjunctions from the sentences in (E), the set (E'), has the cardinality of the power set of (E) and that every string in (E') is an English sentence because well-formedness is preserved under coordinate compounding. Since (S) is in (E'), (S) is a sentence of English, but since there can be no derivation of (S) in a generative grammar, (S) is a counter-example to generativism.

On the one hand, generativists have to say that (S) is grammatical. Since each of the denumerably many sentences in (E) is grammatical, grammaticality is preserved under coordinate compounding, and (S) belongs to (E') which results from coordinate compounding applied to (E), it follows that (S) is grammatical. On the other hand, generativists also have to say that (S) is not grammatical. Since (S) is more than denumerably infinite, it does not meet the generativist's condition for grammaticality, namely, generation in an optimal grammar of English. Since generativism is committed to saying that (S) is grammatical and also to saying (S) is not grammatical, generativism is false.

Generativists in the Chomskyan tradition should balk at accepting Langendoen's and Postal's argument, since it does not compel them to concede that the set (E') exists. They can agree with Langendoen and Postal that grammaticality is preserved under coordinate compounding. 'To be sure', they will say, 'if there were infinite strings like (S) that result from coordinating members of (E), then, since those strings would violate no grammatical restriction in English, it would be arbitrary for us not to count them as grammatical sentences of English'.¹⁰ But, such critics will go on to observe that

¹⁰ The intuition of arbitrariness is compelling. If there is such a string as (S), it could not be ungrammatical unless the constituents of one of its conjuncts are related in a grammatically improper manner. Since (S) decomposes into the infinitely many finite conjuncts which are the sentences in (E), each of the finite conjuncts of (S) is grammatical. Thus, we can see that the constituents in each of the conjuncts in the infinite conjunction (S) are properly related, since seeing that is seeing that the constituents in each of the sentences in (E) are properly related. We can see from looking at the conjuncts consisting of two sentences that their constituents are properly related. We can also see that, if the conjuncts consisting of n sentences have properly related constituents, then the conjuncts consisting of $n+1$ sentences have properly related constituents, and hence the constituents in every one of the conjuncts of (S) is properly related. With every possible source for ungrammaticality of (S) eliminated, (S) must be grammatical in English.

these considerations put them under no pressure to grant the existence of infinite strings like (S). As conceptualists as well as generativists, they deny, and indeed are committed to denying, that infinitely long strings like (S) exist, since such strings could have no concrete psycho-biological reality.

Therefore, far from it being arbitrary to deny that there are infinite strings like (S) which are English sentences, their non-existence is a direct consequence of the psycho-biological reality that conceptualism requires for existence in the domain of linguistics. Given the finiteness of the human mind/brain, the non-existence of such sentences is a truth of language. As Chomsky (1986, p. 33) writes:

In the case of arithmetic, there is at least a certain initial plausibility to a Platonistic view insofar as the truths of arithmetic are what they are, independent of any facts of individual psychology, and we seem to discover these truths in the way we discover facts about the physical world. . . . Knowing everything about the mind/brain, a Platonist would argue, we still have no basis for determining the truths of arithmetic, but there is not the slightest reason to suppose that there are truths of language that would still escape our grasp.¹¹

Chomsky would claim that Langendoen and Postal's analogy with Cantor's argument breaks down: while there may be infinite numbers, the nature of linguistic reality precludes there being a set (E') with infinite strings like (S). Since the existence of such a set depends on iterating grammatical operations like coordination an infinite number of times, its existence is ruled out by the finitism inherent in linguistic conceptualism. On a position which combines conceptualism and generativism, assuming the existence of a set (E') with infinite strings like (S) begs the question. Thus, conceptualism provides generativism a way out of Langendoen's and Postal's argument.

But the situation changes once we have the argument against linguistic conceptualism in the first part of the present paper. That argument shows that linguistic conceptualism is unable to capture the most basic facts about sentencehood in natural language. Given the new situation in which linguistic conceptualism is seen as untenable, Langendoen and Postal's argument does not have to defeat the combined forces of conceptualism and generativ-

¹¹ Chomsky seems reluctant to embrace a mathematical conceptualism parallel to his linguistic conceptualism. But in taking the view that truths of arithmetic are discovered 'in the way we discover facts about the physical world', he makes what on the face of it is the Millian claim that the truths of arithmetic, presumably mathematical truths generally, are empirical discoveries about the physical world. Chomsky seems to be saying that mathematical discoveries like Cantor's discovery of the facts about transfinite numbers are discoveries just like the physicist's discoveries about atomic structure.

ism. The situation is reversed: generativism now has to face the combined forces of linguistic realism and the Langendoen–Postal argument.¹²

There is, however, a second, more subtle, problem with Langendoen and Postal's argument. Coordinate compounding says only that if there is a string which is the grammatically proper coordination of some number of well-formed expressions, then that string would be grammatical. But neither this operation nor anything else in Langendoen and Postal's argument guarantees the existence of (S). It cannot be argued against them that the size of (S) precludes its existence, but, on the other hand, nothing in their argument prevents the generativist from saying that it does not exist. Their argument not only does not guarantee the existence of such strings, it doesn't even mention any condition for the existence of strings. Thus, the second problem with the Langendoen and Postal argument is that it lacks a basis on which to establish the existence of strings like (S), and, as a consequence, the argument does not establish the existence of a counter-example to generativism.

Linguistic realism plugs this gap. It supplies the condition for the existence of string types which enables us to establish the existence of strings like (S). On linguistic realism, the existence condition for a string type is the consistency of its specification. If a string type is consistently specifiable, it's a possibility, and if it's a possibility, it exists as a string type. In the case of abstract objects, there is no extensional difference between the possible and the actual. Since the specification of (S) and similar string types in terms of the coordinate compounding of their component sentences in (E) is a consistent specification, those string types exist. Given that such string types exist, Langendoen and Postal's argument shows that they are grammatical in English, and, hence, that there is a counter-example to generativism. Thus, once realism is in place as a premiss of their argument, we have the appropriate existence condition for string types, and with it, Langendoen and Postal's

¹² Another reason why generativism cannot make use of conceptualism was mentioned in connection with the suggestion that Chomskyan conceptualism be recast along the lines of Brouwerian intuitionism. The size limit of the set of sentences of a natural language to which such a recast linguistic conceptualism is committed entails not only that there is no meaningful notion of iterating an operation an arbitrary *infinite* number of times, but that there is no meaningful notion of iterating an operation an arbitrary *finite* number of times. Hence, conceptualism is inconsistent with generativism. Conceptualism posits a concrete reality, while generativism posits the existence of infinitely many sentences that exceed whatever number expresses the finite size of the mind/brain.

Yourgrau (1989, p. 398, fn. 12) points out that Langendoen's and Postal's thinking about sentences is reminiscent of Gödel's thinking about numbers. Yourgrau (1989, p. 397) reports that Gödel thought the decisive step in the determination of the size of mathematical domains is the first step from finiteness to denumerable infinity. Once we take the step to the first transfinite number, there is no turning back. There is no non-arbitrary way to stop with the first transfinite number—or anywhere else up the hierarchy of transfinite numbers—if we are to do justice to mathematics.

argument goes through without a hitch.¹³ This settles the remaining issue about the Chomskyan revolution: a grammar of a natural language cannot be a generative systematization of its sentences.

7. The Unofficial Story

The above discussion of the form and interpretation of grammars has been a piece of revisionist history. Let us summarize the results. Both the principal

¹³ This is a natural point at which to comment on Soames's (1991) criticism of the necessity argument in Katz and Postal (1991). Postal and I were sloppy about our formulation of the necessity argument. We intended the argument to concern analytic senses, but undermined this intention by talking about analytic senses in terms of the sentences which express them. Our (1991, p. 542) footnote 13 was meant to say that talk about sentences is just a *façon de parler*, but that footnote obviously didn't do its job. As a consequence, we opened ourselves to Soames's (1991, p. 576) objection that we failed to secure the assumption that it is more than a contingent fact that sentences have the sense they do. But, even granting Soames's construal of our argument, his objection to it is now fully met. The first part of the present paper secures the premiss that sentences have their grammatical properties essentially.

Soames's criticisms do not come to grips with our necessity argument run exclusively at the semantic level. Soames (1991, p. 578) is not actually referring to that argument when he talks about a version of our argument focusing on analytic senses and says that it 'does achieve a measure of success' but is of 'somewhat restricted' significance. Soames makes this criticism because the argument he has in mind is again one that is about sentences. As he (1991, p. 578) says, 'It is consistent with the argument that *every claim attributing semantic properties to sentences of a natural language* is contingent, or even psychological. Soames (1991, p. 578) also misconstrues the aim of our necessity argument when he criticizes it for failing to 'rule out the possibility that semantics as a whole is an empirical psychological theory whose subject matter is to account for the contingent semantic properties of sentences'. The aim of the necessity argument (though not of our overall argument in the paper) was the more modest one of showing that Chomsky's commitment to analytic senses is incompatible with his view of the grammar of a natural language as an entirely contingent facet of the human mind/brain. Postal and I were quite clear on this point (see our (1991, p. 541) premiss (10)(a)). Soames's criticisms take one of our arguments out of context and make it appear to be our entire case against Chomsky's conceptualist position on linguistic semantics. If, as Soames (1991, p. 578) concedes, 'the reformulated Necessity Argument tells us that parts of semantics are non-empirical', then that argument fully succeeds in achieving its modest aim of showing, against Chomsky, that not all of linguistic semantics is empirical.

Soames (1991, p. 578) is also wrong to say that Postal and I intended our argument 'to apply to all semantic theories that recognize analyticity . . . [because it] is intended to be largely independent of controversies about the form that a semantic theory should take'. No. We were exploiting Chomsky's agreement that there are analytic connections in the sense of Katz (1972)—see the quotes from Chomsky cited in our (1991, p. 542) paper immediately preceding the necessity argument—to show that the conception of lexical semantics that has played a role in Chomskyan theories of language over the years, not only in Katz's version but also, for example, in Jackendoff's (1983), is incompatible with Chomskyan conceptualism. Thus, it is of no matter that our necessity argument does not apply to a semantic theory that defines analyticity model theoretically. Moreover, Soames again mistakenly assumes that our argument is intended to 'deprive a [semantic] theory of its overall empirical status' as a theory about the contingent properties of sentences.

claims in the official story are incorrect. First, the Chomskyan revolution did not establish that the reality of natural languages is psychological/biological. Chomsky's criticism of linguistic nominalism revealed a deep problem about the grammatical representation of abstract linguistic structure which arises when linguistic reality is taken to be concrete, but his conceptualist solution did not solve the problem. It substituted one concrete reality for another. To solve the problem, grammars must be interpreted as theories of sentence types, and, hence, as theories of abstract objects. Second, the Chomskyan revolution did not establish that grammars of natural languages are generative systems. Linguistic realism together with Langendoen's and Postal's argument show that that part of the official story is incorrect, too.

This last revision of the official story might seem tantamount to rejecting theory construction in linguistics. But it is no such thing. The examples of number theory and set theory show that theory construction in the formal sciences does not presuppose a denumerably infinite domain. It is easy to imagine what grammatical investigation would be like without generativism. Grammatical investigation post-Langendoen and Postal would be like number theoretic and set theoretic investigations post-Cantor.

Abandoning generativism means grammatical properties and relations can no longer be defined in terms of formal features of derivations in generative grammars. Grammaticality can no longer be defined as derivability in an optimal generative grammar, ambiguity can no longer be defined as multiple derivability in an optimal generative grammar, and so on. But that is all to the good. Such definitions are an unnecessary and roundabout way of saying what should be said straightforwardly. Saying that grammaticality is derivability in an optimal grammar would be just as odd as saying that numberhood is derivability in an optimal arithmetic. Just as an attempt to construct an optimal arithmetic is an attempt to understand numberhood, so an attempt to construct an optimal grammar is an attempt to understand sentencehood. Linguistics should say that the grammatical sentences of a language are those strings in its vocabulary which conform to its syntactic constraints, that the ambiguous sentences are those with two or more senses, and so on.

Thus, such straightforward statements are preferable to the generativist's circuitous definitions. The reference to the notion of an optimal generative grammar in such definitions has to be unpacked on the basis of the very same straightforward statements. The generative linguist has to say that a grammar is optimal just in case it is the simplest system whose derivations represent strings that conform to the syntactic constraints of the language, whose multiple (non-equivalent) derivations correspond to sentences of the language with two or more senses, and so on. Hence, the generative definitions are a roundabout way of expressing the conditions for grammatical properties and relations that the straightforward statements express directly.

The intuitions of speakers, which are the source of the evidence for grammars, are not about formal features of the derivations in the linguist's theories. They are about the structure of sentences. Our intuition that 'The cat

is on the mat' is grammatical in English is about the structure of that English sentence. Our intuition that 'Visiting relatives can be annoying' is ambiguous is about the structure of that English sentence. Hence, the evidence on which it is claimed that a formal theory is an optimal grammar of the language is evidence about the structure of its sentences. Insofar as evidence about the well-formedness, ambiguity, etc. is what determines that a grammar is optimal, the generativist's approach to defining grammatical properties and relations is unnecessary as well as roundabout.¹⁴

Furthermore, the psychological study of competence and performance, at both the levels of language use and language acquisition, can proceed essentially as before. The only difference is that psychologists cannot make direct inferences from theories in linguistics to theories in psycholinguistics, nor, alternatively, can linguists make direct inferences the other way around. Those inferences have to take account of the ways in which linguistic knowledge may fail to mirror the language it is knowledge of. Just as it is an open question what the knowledge-of relation is between theories in mathematics and logic and theories in psychology about our mathematical and logical knowledge, so it is an open question what the knowledge-of relation is between theories in linguistics and theories in psychology about our linguistic knowledge.

Moreover, psychology has something to gain if linguistics leaves this question open. Psychologists studying the speaker's knowledge of English, its use, or its acquisition are free to consider formal systems other than those that the linguist thinks (perhaps rightly, perhaps wrongly) are the true grammar of English or theory of universal grammar. Of course, the formal systems that psychologists consider as hypotheses ought to be plausible candidates for theories of competence, but such plausibility requires no more than that the competence they posit count as knowledge of the language as

¹⁴ Since logical systems originally served as the model for generative grammars, it is curious that the attempt to define grammatical properties and relations in terms of features of derivations is based on a misunderstanding of the relation between the meta-theoretic concepts for grammatical systems and the meta-theoretic concepts for the logical systems. Grammatical concepts of soundness and completeness are model-theoretic concepts like logical concepts of soundness and completeness. The soundness of a grammatical system (each of its theorems represents a sentence of the language) corresponds to the soundness of a logical system (each of its theorems represents a truth about the domain). The completeness of a grammatical system (each of the sentences of the language is represented by a theorem of the system) corresponds to the completeness of a logical system (each of the truths about the domain is represented by a theorem of the system). Since grammaticality in linguistics corresponds to truth in logic, it is a confusion to define the notion 'S is grammatical in L' in terms of the proof-theoretic property of generability in a specified formal system. Such a property is a formal feature of derivations in the system, so that the definition is empty until the system's soundness and completeness with respect to L have been established. This gives the show away. The generativist's definition of grammaticality in terms of the proof-theoretic property of generability itself rests on the notion of grammaticality as an inherent, absolute property of the objects in the domain where the system is modelled.

judged by the best available theories of the language and the best available account of the knowledge-of relation.

The official story contains three true claims. First, grammars should be imposed 'top down', not built 'bottom up'. Second, grammars should be seen as scientific theories, not as data-cataloguing devices. Third, grammars should be evaluated on the basis of evidence from the judgments of native speakers about the grammatical properties and relations of sentences, not on the basis of evidence about distributional relations among acoustic stretches.

But even these truths are not acceptable in the form in which the official story presents them. On Chomsky's approach, the order of linguistic things is only partially 'top down', going from competence to performance. Given the distinction between knowledge of a language and the language know, the order becomes fully 'top down', going from the abstract language to competence and from competence to performance.

Next, grammars are scientific theories, but they are theories in formal science, not natural science. Grammatical questions are factual questions, but they are no more empirical questions than mathematical or logical questions. Given that grammatical questions are about types, that is, about abstract objects, they cannot be answered on the basis of causal interactions with natural objects. In contrast to questions in the natural sciences, they have to be answered on the basis of intuitions of structure and conceptual reasoning (see Katz, 1995, forthcoming, chapter 1).

Finally, the facts on the basis of which grammars are chosen come from intuitive judgments of speakers of the language. Chomskyan conceptualism incorrectly treats them as introspective judgments. Linguistic intuitions are entirely different from introspections. The former acquaint us with objective facts about sentences, while the latter acquaint us with subjective facts about minds. Different speakers who intuit the fact that a sentence is well-formed or ambiguous are epistemically related to one and the same grammatical object. That object is no more one speaker's than another's. The sentence is independent of all the speakers. In contrast, different people who introspect the colour of an after-image, the intensity of a pain, or the displacement of a figure in double vision are epistemically related to different things. An object of introspection belongs to the introspector and to no one else; it is completely dependent on him or her. These are, of course, familiar Fregean (1953) distinctions, but they apply to linguistic intuition as much as to mathematical and logical intuition.

The bottom line is this. Grammars are not generative theories of the neural structure of an organ in the brain that stores information about sentences. They are non-generative theories of the grammatical structure of sentences and languages themselves. Linguistics is not psychology or biology or anything else to which someone might wish to reduce it. Linguistics is linguistics.

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References

- Benacerraf, P. 1965: What Numbers Could Not Be. *The Philosophical Review*, 74, 47–73.
- Benacerraf, P. and Putnam, H. (eds.) 1983: *Philosophy of Mathematics: Selected Readings*. Cambridge University Press (Second Edition).
- Bloomfield, L. 1936: Language or Ideas? *Language*, 12, 89–95.
- Bloomfield, L. 1983: Linguistic Aspects of Science. In O. Neurath, R. Carnap, and C. Morris (eds.), *International Encyclopedia of Unified Science*, Vol. I. Chicago: The University of Chicago Press.
- Bromberger, S. 1989: Types and Tokens in Linguistics. In A. George (ed.), *Reflections on Chomsky*. Oxford: Basil Blackwell.
- Brouwer, L.E.J. 1913: Intuitionism and Formalism. *Bulletin of the American Mathematical Society*, 20, 81–96. In Benacerraf and Putnam 1983.
- Brouwer, L.E.J. 1949: Consciousness, Philosophy, and Mathematics. *Proceedings of the 10th International Congress of Philosophy*. Amsterdam: North-Holland Publishing Company, pp. 1243–9. In Benacerraf and Putnam 1983.
- Chomsky, N. 1959: Review of *Verbal Behavior*. *Language*, 35, 1, 26–59.
- Chomsky, N. 1965: *Aspects of the Theory of Syntax*. Cambridge, MA.: MIT Press.
- Chomsky, N. 1975: *The Logic Structure of Linguistic Theory*. Chicago: The University of Chicago Press.
- Chomsky, N. 1986: *Knowledge of Language*. New York: Praeger.
- Chomsky, N. 1987: Language in a Psychological Setting. *Working Papers in Linguistics*, No. 22. Sophia University, Tokyo.
- Dummett, M. 1977: *Elements of Intuitionism*. Oxford University Press.
- Field, H. 1980: *Science without Numbers*. Princeton: Princeton University Press.
- Field, H. 1989: *Realism, Mathematics, and Modality*. Oxford: Basil Blackwell.
- Frege, G. 1953: Sense and Reference. In M. Black and P. Geach (eds.), *Translations from the Philosophical Writings of Gottlob Frege*. Oxford: Basil Blackwell.
- George, A. 1989: How Not to Become Confused about Linguistics. In A. George, *Reflections on Chomsky*. Oxford: Basil Blackwell.
- Goodman, N. and Quine, W.V. 1972: Steps Toward a Constructive Nominalism. In *Problems and Projects*. Indianapolis: Bobbs-Merrill.
- Higginbotham, J. 1991: Remarks on the Metaphysics of Linguistics. *Linguistics and Philosophy*, 14, 5, 555–66.
- Hilbert, D. 1925: On the Infinite. In Benacerraf and Putnam 1983.
- Israel, D. 1991: Katz and Postal on Realism. *Linguistics and Philosophy*, 14, 5, 567–74.
- Jackendoff, R. 1983: *Semantics and Cognition*. Cambridge, MA.: MIT Press.
- Katz, J.J. 1966: *The Philosophy of Language*. New York: Harper and Row.
- Katz, J.J. 1972: *Semantic Theory*. New York: Harper and Row.
- Katz, J.J. 1981: *Language and Other Abstract Objects*. Totowa: Roman and Littlefield.
- Katz, J.J. 1984: An Outline of Platonist Grammar. In T.G. Bever, J.M. Carroll, L.A. Miller (eds.). Cambridge, MA.: MIT Press. Reprinted in J.J. Katz (ed.), *The Philosophy of Linguistics*.
- Katz, J.J. (ed.) 1985: *The Philosophy of Linguistics*. Oxford University Press.
- Katz, J.J. 1990: *The Metaphysics of Meaning*. Cambridge, MA.: MIT Press.
- Katz, J.J. 1995: What Mathematical Truth Could Be. *Mind*, 104, 1–32.
- Katz, J.J. (forthcoming): *Realistic Rationalism*.

- Katz, J.J. and Postal, P. 1991: Realism vs Conceptualism in Linguistics. *Linguistics and Philosophy*, 14, 5, 515–54.
- Langendoen, D.T. and Postal, P. 1984: *The Vastness of Natural Languages*. Oxford: Basil Blackwell.
- Lapointe, S.G. 1989: Review of *The Vastness of Natural Languages*. *Linguistics and Philosophy*, 15, 1, 55–7.
- McGinn, C. 1993: Logic, Mind, and Mathematics. In *Naturalism and Normativity*, E. Villanueva (ed.). Atascadero: Ridgeview Publishing Co.
- Peirce, C.S. 1958: *Collected Papers of Charles Sanders Peirce*, Vol. 4. C. Hartshorne and P. Weiss (eds.). Cambridge, MA.: Harvard University Press.
- Quine, W.V. 1960: *Word and Object*. Cambridge, MA.: MIT Press.
- Quine, W.V. 1953: Two Dogmas of Empiricism. In *From a Logical Point of View*. Cambridge, MA.: Harvard University Press.
- Quine, W.V. 1987: *Quiddities*. Cambridge, MA.: Harvard University Press.
- Rauff, J.V. 1989: Review of *The Vastness of Natural Languages*. *Computational Linguistics*, 15, 1, 55–7.
- Soames, S. 1985: Semantics and Psychology. In J.J. Katz (ed.), *The Philosophy of Linguistics*.
- Soames, S. 1989: Semantics and Semantic Competence. *Philosophical Perspectives*, 3, 575–96.
- Soames, S. 1991: The Necessity Argument. *Linguistics and Philosophy*, 14, 5, 575–80.
- Yourgrau, P. 1989: Review Essay: Reflections on Kurt Gödel. *Philosophy and Phenomenological Research*, 1, 391–408.