TWO PARADIGMS OF LINGUISTICS: THE SEMIOTIC VERSUS NON-SEMIOTIC PARADIGM

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1 Introductory

Language is essentially a system of relationships between sound and meaning. This anodyne bromide, more a cliché than a theoretical statement, is espoused by every modern linguist. Chomsky says that "each language can be regarded as a particular relationship between sound and meaning" (Chomsky 1972:17). I do not think anybody would argue with Chomsky.

There is a rich research tradition of the study of the system of relationships between sound and meaning. This research tradition I call the *semiotic paradigm*. The father of the semiotic paradigm to the study of language is Ferdinand de Saussure. His theory was presented in *Cours de linguistique générale*, originally compiled and prepared by de Saussure's students and published in 1916. Saussure's work had a great influence mostly among Russian and European linguists, whose work originally centered around small intellectual circles in Europe, particularly in Vienna, and in the Prague and Copenhagen schools. Among prominent linguists who followed de Saussure, we may mention Roman Jakobson, Nikolai Trubetskoi, Sergej Karcevski, Aleksandr Peshkovskij, Louis Hjelmslev, Jerzy Kurylowicz, Karl Bihler, André Martinet, Lucien Tesniére.

For all the lip service Chomsky has paid to the view that language is relationships between sound and meaning, he has paid scant attention to the ramifications of such an approach for understanding the nature of language. Chomsky has not pursued the profound ideas of de Saussure and other linguists working within the semiotic paradigm. Defining the goals of linguistics, Chomsky wrote:

> The fundamental aim in the linguistic analysis of a language L is to separate *grammatical* sequences which are the sentences of L from the *ungrammatical* sequences which are not sentences of L and to study the structure of grammatical sentences. (Chomsky, 1957:12).

Furthermore, Chomsky defined language as follows:

> The grammar of L will thus be a device that generates all the grammatical sequences of L and none of the ungrammatical ones. (Chomsky 1957:12).

What strikes one in this definition of language and grammar is a complete disregard of the fact that language is a system of relationships between sound and meaning. True, the sentence is the basic unit of language; true, the linguist must study the laws of the generation of sentences - but it is also true that the linguist must formulate the laws of the generation of sentences in accordance with the laws of relationships between sound and meaning: these laws are logically prior to the laws of the generation of sentences.If you do not understand these laws, you do not understand the laws of the generation of sentences.

Chomsky's works have established a new a paradigm in linguistics which is diametrically opposed to the semiotic paradigm. The new paradigm I call the non-semiotic paradigm. The new generation of linguists working within the non-semiotic paradigm consider Saussure's ideas irrelevant to linguistic theorizing; they dismiss them.

A characteristic feature of the current linguistic scene is a controversy between two trends in contemporary theoretical linguistics, formalism and functionalism. The issues dividing both parties are important. But both parties belong in the same non-semiotic paradigm of theoretical linguistics. Regardless of the importance of the issues dividing both parties, this is an internal controversy, a controversy within the same paradigm.

From the point of view of their origin and spread, the semiotic paradigm may be called the European paradigm and the non-semiotic paradigm, the American paradigm, although of course there are followers of de Saussure in the U.S.A. and Canada and adherents of the semiotic paradigm in Europe.

This paper aims to compare the semiotic paradigm with the non-semiotic one. My theory,Applicative Universal Grammar (AUG), is a modern representation of the semiotic paradigm. (A complete description of AUG is presented in my book *A Semiotic Theory of Language*, Indiana: University of Indiana Press, 1987). On the other hand, the generative grammar of Noam Chomsky is the most characteristic and important representation of the non-semiotic paradigm. Therefore my comparison of both paradigms will be done in terms of AUG and generative grammar. But my critique of generative grammar is at the same time critique of theories that belong in the non-semiotic paradigm. Henceforth, I will use the words "current linguistic theories" in a narrow sense, meaning only those current theories that belong in the sentence-based paradigm.

AUG views language as a system of interactions between sound and meaning. The goal of AUG is discovery of the laws of the interactions between sound and meaning. AUG makes assumptions which on the one hand are crucial for understanding the essence of language, but on the other hand are incompatible with assumptions of generative grammar and other current theories. The fundamental assumption of AUG is the Duality Principle: *Sound and Meaning each constitute a unity of two mutually exclusive, but complementary facets.* For example, a sequence of signs is both linear and non-linear, two sounds are both identical and non-identical, two meanings are both identical and non-identical, a sequence of sounds is both continuous and discontinuous.

To give a graphic picture of dualities, I have introduced the metaphorical term "centaurs" because the structure of entities having dual character is reminiscent of those fabulous creatures of Greek mythology,half men and half horses (Shaumyan 1987:42).

Language is part of consciousness. My Duality Principle has received an independent support from the latest results in the research of consciousness. Working on his epistemological theory, called *Natural Epistemology* (Mamardashvili 1996), Merab Mamardashvili formulated the Duality Principle for consciousness. Due to his results, we recognize a striking parallelism between the duality of language and duality of consciousness (Mamardashvili 1996: 229-50).

Dualities pose problems called *paradoxes*, or *antinomies*. *A* paradox is a statement that seems impossible because it contains two opposing ideas that both are true. Paradoxes are problems crucial for science because science cannot live with unexplained contradictions. Dualities are crucial for modern linguistics no less than they are crucial for modern physics, where, at the subatomic level, particles are both destructible and indestructible, matter is both continuous and discontinuous, and matter and force are but different aspects of the same phenomenon.

The phenomenon of duality was recognized originally in physics but later it became clear that phenomena of duality can be discovered in any field of human knowledge and that they are crucial for any science. Niels Bohr proposed the Complementarity Principle as a general epistemological statement about the phenomenon of duality having a heuristic value for any science. The Complementarity Principle prescribes that in any field of science you must search for phenomena of duality, recognize problems they pose and explain them.

Dualities are phenomena that constitute the essence of language. A linguistic theory that aims to understand the essence of language must understand dualities, understand problems they pose and be able to solve them.

The most acute problem posed by dualities is that of abstraction. What is the right abstraction in theoretical linguistics? AUG says that the right abstraction in theoretical linguistics is this: 1) a complete abstraction from all irrelevant contexts (irrelevant contexts are those excluded by the central laws of theoretical linguistics, explained in this paper, the Law of the Sound-Meaning Bond and the Superposition Law); 2) a complete abstraction of grammatical structure from its linear presentation due to the linearity of the linguistics sign; 3) a complete abstraction of grammar from the lexicon.

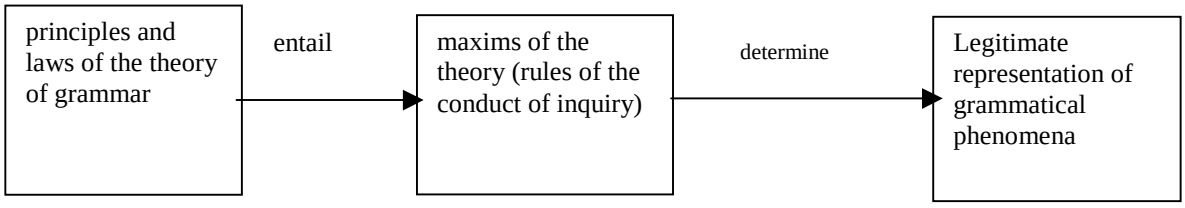
AUG is diametrically opposed to current linguistic theories in the following respects: 1) AUG recognizes the problems posed by dualities as central to linguistics, whereas current linguistic theories are simply unaware of dualities and problems they pose; 2) To solve problems posed by dualities, AUG pursues maximum abstraction: it abstracts grammatical structure from all irrelevant contexts, from its

linear presentation, and from the lexicon, whereas generative grammar as well as other current linguistic theories are unaware of the distinction between relevant and irrelevant contexts, and they balk at abstracting grammatical structure from its linear presentation and from the lexicon, they confuse grammatical structure with its linear representation and with the lexicon.

The comparison of AUG with generative grammar will lay bare the most acute questions which theoreticians must answer. If one takes theoretical linguistics seriously, one cannot dismiss the questions:1) Must theoretical linguistics recognize the phenomenon of dualities and paradoxes posed by this phenomenon? 2) If dualities and their paradoxes are recognized, what are ways to solve them? Must theoretical linguistics adopt the radical approach to abstraction, defined above, or stick to its old ways of confusing relevant contexts with irrelevant, confusing grammatical structure with its linear representation and with the lexicon?

The answers of AUG to these questions are not anodyne statements, but fundamental proposals on which a radically different type of theoretical research hinges.

If one accepts the principles and laws of a theory one must accept the techniques of the representation of empirical phenomena implied by them. A theory entails a set of rules of the conduct of inquiry. These rules, which I call *maxims*, define which techniques of the representation of empirical phenomena are legitimate and which ones are incompatible with the principles and laws of the theory. Maxims are a set of do's and don'ts entailed by a theory. The use of the theory of grammar for explaining empirical phenomena may be represented by the following diagram:



I will address concrete examples of disastrous consequences of the violation of the maxims entailed by the Principle of the Sound-Meaning Bond in later sections.

The principles and laws of AUG, introduced later, entail maxims defining legitimate techniques of representation which must enter into the explanation of linguistic phenomena.

Let me start with points of my agreement with Chomsky. Chomsky's interprets the term "generative grammar" as an explicit description of grammar: When we speak of linguist's grammar as a "generative grammar" we mean only that it is sufficiently explicit to determine how sentences of the language are in fact characterized by the grammar" (Chomsky 1980:220).This definition of generative grammar is so general that we may treat the term "generative grammar" as synonymous with the term "theory of grammar": one expects that any theory of grammar be sufficiently explicit. Like generative grammar, AUG is sufficiently explicit.

As to its subject matter, generative grammar is viewed by Chomsky as a universal grammar. Characterizing generative grammar as to its subject matter, Chomsky says:

> It is concerned with those aspects of form and meaning that are determined by the "language faculty" which is understood to be a particular component of the human mind. The nature of this faculty is the subject matter of a general theory of linguistic structure that aims to discover the framework of principles and elements common to attainable human languages; this theory is now often called 'universal grammar" (UG), adapting the traditional term to the new context of inquiry. (Chomsky 1986:3).

Like generative grammar, AUG is a universal grammar. Like generative grammar, AUG considers universal grammar to be related to the human mind, but AUG differs from generative grammar as to the sense in which universal grammar is related to the human mind. This point will be explained below.

In the following sections, I present an outline of AUG compared with generative grammar. An author of a theory using new methods owes the reader an explicit presentation of his epistemological position. I have done it in my book and here I present some new ideas on this topic. I consider only the synchronic aspect of the semiotic framework for universal grammar. AUG makes important contributions to

diachronic linguistics, to linguistic typology, to the study of universals of the philogeny of human language, to the study of language acquisition, and to the development of applicative programming languages, a new generation of programming languages for computers. These are topics in their own right, and I do not discuss them here.

2 Language as a Semiotic Phenomenon versus I-language

What is the subject matter of universal grammar? AUG and generative grammar give different answers to this question. Chomsky defines the subject matter of universal grammar in the form of three questions (for example, in Chomsky 1986:3):

1) What constitutes knowledge of language?

2) How is knowledge of language acquired?

3) How is knowledge of language put to use?

These are important questions. But a linguistic theory must first ask "What is language?" and only then "What constitutes knowledge of language?". These are distinct questions. The first question concerns language itself and the second concerns the mental state of the speaker experiencing language. The question "What constitutes knowledge of language? presupposes that we know the answer to the question "What is language?", a question central to any linguistic theory.

What is language? Chomsky proposes two distinct technical concepts of language: E-language (externalized language) and I-language (internalized language). E-language is externalized in the sense that it is understood independently of the mind/brain. I-language is internalized in the sense that it is "a system represented in the mind/brain of a particular individual" (Chomsky 1988:36). Chomsky says that I-language is the aim of generative grammar: "Taking language to be I-language, the grammar would then be a theory of I-language, which is the object under investigation." (Chomsky, 1986:22).Chomsky is dismissive of E-language: "E-language, if it exists at all, is derivative, remote from mechanisms and of no particular significance, perhaps none at all" (Chomsky 1991:10).

In his Minimalist Program, Chomsky charcterizes language in a more detailed way:

> When we say that Jones has the language L, we now mean that Jones's language faculty is in the state L, which we identify with a generative procedure embeded in performance systems. To distinguish this concept of language from others, let us refer to it as *I-language*, where is to suggest "internal","individua"l and "intensional". The concept of language is internal, in that it deals with an inner state of Jones's mind/brain, independent of other elements of the world. It is individual in that it deals with Jones, and with language communities only derivatively, as groups of people with similar I-languages. It is intensional in the technical sense that the I-language is a function specified in intension, not extension: its extension is the set of SD's (what we might call the *structure* of the I-language). (Chomsky 1995:15).

What can we say about Chomsky's distinction of E-language and I-language? One can agree with Chomsky that what he calls the E-language must be rejected as a theoretical concept. Should we accept the I-language as a theoretical concept? The notion of I-language reflects an aspect of reality in that the mind/brain is the place where human language belongs. However, this notion runs into a serious difficulty. The I-language means an individual phenomenon; Chomsky recognizes that language communities are groups of people with similar I-languages, but he does not draw important consequnces from this. Why people speak similar I-languages? Because they need to understand each other; a common I-language is imposed on the members of a language community, they depend on each other as to the language they use. Language is both an individual and interindividual phenomenon. It is an individual phenomenon because it belongs in an individual mind/brain; but it is also an interindividual phenomenon because it consists of signs, which have a social character: linguistic signs exist due to a tacit convention which the speaker cannot infringe without running the risk of being incomprehensible or ridiculous. The term "interindividual phenomenon" means a phenomenon involving interdependence between individuals. We face a paradox: language is both an individual and interindividual phenomenon.

To solve the paradox, we must introduce a notion of language as a *semiotic system*.The notion of the semiotic system covers phenomena independent of an individual. If we accept this notion, then the phenomena covered by it are logically prior to the phenomena covered by I-language because they constitute the essence of language. As an interindividual phenomenon, language is a *semiotic* phenomenon because signs involve interdependence between individuals.

The proper object of the study in linguistics is language as a semiotic system. The I-language is a psychological entity, derivative from the semiotic system. The theory of I-language covers knowledge of language, acquisition of language and other psychological phenomena related to language. This important psychological theory presupposes the theory of language as a semiotic system. Henceforth I will use the term "language" in the sense of language as a semiotic system.

3 Language and Consciousness as a Semiotic Problem

One of the most important notions of theoretical linguistics is identity. The duality of sound and the duality of meaning imply two kinds of identity: structural identity and material identity. I use the word "structural identity" as a technical term denoting the identity determined by the oppositional structures of sound and meaning; the oppositional structure is the semiotic structure. I use the word "material identity" as a technical term denoting the identity outside the oppositional structure, that is, the identity determined by physical properties of sound or referential properties of meaning. As explained below, we face the following situations: 1) two sounds X and Y are identical structurally and non-identical materially, conversely, they may be identical materially and non-identical structurally; 2) two meanings X and Y are identical structurally and non-identical materially, conversely, they may be identical materially and non-identical structurally. Material and structural identities are independent from each other: the structural identity cannot be inferred directly from the material properties of sound or meaning, nor material identity can be inferred directly from structural identity The independence of material and structural identities poses a problem:

What are the conditions of this independence? Given the fact that in empirical observation we have only material identities and differences and the fact that structural identities and differences cannot be inferred directly from empirical data, how can they be inferred from the empirical data at all?

To answer these questions, I introduce the concept of consciousness. My view of consciousness is diametrically opposed to Chomsky's and some other authors' notion of consciousness as a psychological process (cf. Jackendoff 1997). Consciousness is a supra-psychological phenomenon. "Consciousness is not a psychological process in the classic psychological and physiological sense of the word" (Mamardashvili & Piatigorski 1997:43). Consciousness is described in objective terms "which do not presuppose references to elusive instances of introspection or to elusive human psychology"(Mamardashvili 1996:229). Psychological processes constitute the substratum of consciousness, which in itself differs from them radically.

Consciousness is a primitive concept which cannot be defined in psychological or any other terms. Conciousness is charactrized by two major operations it performs: *phenomenological abstraction* and *phenomenological reduction*. Phenomenological abstraction is the generation of structures representing the content of an empirical phenomenon. Phenomenological reduction is the reverse operation of producing an empirical phenomenon represented by an abstract structure. Consciousness is a generator of abstract structures representing and explaining empirical phenomena.

Language and consciousness interrelate and constitute a whole, language-consciousness: consciousness includes language and language includes consciousness; therefore, like consciousness, language is a suprapsychological phenomenon. Just as psychological processes constitute the substratum of consciousness, so they constitute the substratum of language; but to understand language phenomena, we must explain them in ters of consciousness rather than in psychological terms.

Conscious language processes become automatic and language is normally used in an automatic, unconscous mode. But the structures of

language generated by consciousness remain latent in the automatic mode of the use of language; to understand the nature of language we must use an objective linguistic analysis to bring its latent structures into the open. At the level of the study of the nature of language from the conscious ness perspective, there is no need to be concerned with psychological processes underlying consciousness and language.

Consciousness has a dual character: it both mirrors and generates the facts of linguistic reality, abstract structures generated by consciousness are also facts of linguistic reality. Let us begin with the perception of sound. When we observe acoustic facts of language directly or with the help of technical means, our consciousness mirrors the physical properties of sounds; sounds and acoustic properties of sounds exist independently of consciousness. But when we recognize phonemes and other semiotic properties of sounds, we recognize structures generated by consciousness. The phoneme and other semiotic properties of sounds do not exist independently of our consciousness, nay, they are products of our consciousness. Let me illustrate this by examples from my book (Shaumyan 1987:48-50), which I will present here in a more precise interpretation, using the concept of consciousness as an essential part of explanation.

Every phoneme is characterized by a set of distinctive features. Since phonemes are functional segments ordered into linear sequence, the sets of distinctive features characterizing phonemes are also ordered into linear sequences.

The assumption that phonemes are ordered into linear sequences of sets (or bundles) of distinctive features lies at the basis of modern phonology (by "modern phonology" I mean modern phonological theories continuing the research tradition of the Moscow and Prague schools, not various versions of "generative phonology", which have nothing to do with phonology) no matter how widely particular phonological theories differ from one another. This assumption has been challenged by some experimental phoneticians. Here are some of their arguments against the assumption that distinctive features are tied to linearly ordered functional segments of speech flow.

Consider duration. If duration functions as a distinctive feature, phonology includes it among other distinctive features of a functional segment. For example, in English, duration serves as a functional cue distinguishing between short and long vowel phonemes, and the opposition *short : long* must be considered a segmental property of phonemes. However, studies in experimental phonetics have shown that duration has many other linguistic functions that are not restricted to a single segment. It has been found, for example, that under certain conditions in English the phonological distinctive feature *voiced* does not correspond to the phonetic feature *voiced*. Perceptual tests with synthetic stimuli have shown that vowel duration is a sufficient cue for determining perception of voicing in a final consonant: if you synthesize a sequence such as *jus* with a voiceless *s*, and lengthen the duration of the vowel, listeners will begin to hear *juz*, even though there is no voicing present in the fricative (for a review of experiments, see Wardrip-Fruin 1982).Similarly, it has been discovered that the *tense : lax* (*fortis : lenis*) distinction of stop sounds in German is not exclusively associated with the consonants themselves that presumably carry the distinctive features of *fortis* and *lenis*, but that the distinction between words containing a fortis or lenis stop sound is characterized by a different distribution of durations of the consonant and the preceding vowel. Thus, in the analysis of German word pairs such as *baten : baden* and *Laken : lagen*, the duration of the *vowel + stop* sequence remains approximately constant at the expense of its different distribution between the vowel and consonant: in words such as *baten*, the vowel is shorter and the consonant is longer; whereas in words such as *baden*, the relationship is reversed, a shorter consonant follows a longer vowel (Kohler 1981). Modern literature in experimental phonetics abounds in examples that seem to contradict the notion of the distinctive feature as a segmental property of the speech flow.

These findings of experimental phonetics have induced some linguists, in particular phoneticians, to question the validity of the phonological notion of the distinctive feature. Ilse Lehiste, in a paper on the experimental study of duration, writes:

> One of my long-standing complaints and criticisms of most current linguistic theories is the fact that they ignore the temporal aspects of spoken language almost completely. If duration enters into phonological theory at all, it gets segmentalized: [+long] may be included among the distinctive features of a segment. And this is where linguistic theory stops implying that duration can have only a segmental function, i.e., that all duration can do is to differentiate between short and long segments.
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> Those phonologists who have some acquaintance with experimental phonetics have devoted considerable attention and effort to the study of temporal aspects of spoken language; unfortunately this seems to have had little or no impact on theoreticians, who continue to manipulate segmental distinctive features to the exclusion of anything larger than a segment. I have said it before, and I will say it again: phonologists ignore phonetics at their own peril. The peril is that they may operate in a fictitious abstract sphere that has no connection with reality. In this abstract sphere, linguistic constructs are timeless. In the real word, spoken language unfolds itself in time. (Lehiste 1984:96).

The contradiction between the two descriptions of duration by phoneticians and by phonologists is serious. We face a paradox. Is there a satisfactory way to resolve it? Maybe we should, following Lehiste and other phoneticians, reject the phonological description in favor of the phonetic description because the phonetic description is based on experimental data whereas the phonological description seems to be speculative? Before doing so, let's explore observation or perception as a cognitive process. Perception is not a passive reflection of reality but an active phenomenon. We must distinguish between the content of perception and what is perceived. The requirement to distinguish these two aspects of perception may be traced back to Descartes' theory of perception. In an analysis of vision, he distinguished between what one sees and what is really seen. Language includes consciousness. We must distinguish between the physical content of linguistic perception and the structure of linguistic perception, that is, what is really perceived. What is real? The physical content or its structure? Both are real, but in a different sense.

Lehiste, like many other phoneticians, rejects the phonological notion of the distinctive feature because she fails to see the fundamental difference between the physical and functional levels of the speech flow. Consider the above example concerning the sequence *jus*. True, if we synthesize the sequence *jus*, with a voiceless *s*, and lengthen the duration of the vowel, listeners will begin to hear *juz*, even though there is no voicing in the fricative. That is an interesting phenomenon. But does it undermine the notion of the distinctive feature as a segmental property? From a phonological point of view, the essential thing is the perception of the opposition *voiced : voiceless* rather than the acoustic properties that constitute the content of perception. The essential thing is that although in the above experiment the sound *s* does not change, it is perceived as *z* when the preceding vowel is lengthened. What matters is that at the functional level we have the opposition *s : z*. This opposition is a phonological phenomenon that is no less real than the phonetic fact that acoustically the phoneme z is represented by the voiceless sound s plus the length of the preceding vowel.

Similarly, the discovery that in German the *tense : lax* distinction is associated with the length of the vowel that precedes the consonant does not undermine the phonological notion of the distinctive features *tense : lax*. What matters from a phonological point of view is not the distribution of the vowel duration in words such as *baten : baden* but the perception of consonants as the members of the opposition *tense : lax*.

Perception of phonological phenomena is part of consciousness rather than a psychological phenomenon. Consciousness imposes structure on phonetic phenomena. Phonological phenomena are structures generated by consciousness. Phonological perception has a form and a content. The content of phonological perception is phonetic facts; the form of phonological perception is structures generated by consciousness and imposed on the phonetic facts. (Note that I use "structure" and "form" as synonyms).

Here are problems for the psychological study of language. Why as a result of the lengthening of the duration of vowels, do listeners perceive voiceless fricatives as voiced ones? Why is the *tense : lax*

distinction in German associated with the length of the vowels that precede the consonant? These are interesting psychological problems. But we should not confuse linguistic problems with psychological ones.

I have shown that to explain problems posed by the duality of sound we must introduce the concept of consciousness into linguistics and we must assume that language includes consciousness as a factor generating phonological structures in terms of which phonetic phenomena are interpreted. Duality of sound means the unity of the physical content and the phonological form of sound. The physical content of sound comes from nature, the structure, from consciousness. As we shall see below, the same happens to meaning. Duality of meaning means the unity of the "physical" content and the linguistic form of meaning. The term '"physical" I use as a metaphorical term to describe the conceptual aspect of meaning. Meaning is both a concept and a linguistic phenomenon. As a concept, meaning refers to reality; as a linguistic phenomenon, meaning is part of the relational network of linguistic oppositions it has structure. The conceptual content of meaning comes from the use of language to describe reality, the structure of meaning comes from consciousness. In what follows I will show how all this happens.

4 The Sign as the Fundamental Concept of Linguistics

Linguistic signs are morphemes, morpheme combinations, words, word combinations, sentences, sentence combinations. Every sign has a phonic shape and meaning. The phonic shape of a sign consists of phonemes, which are diacritic units. i.e. units that serve to distinguish signs; phonemes and their combinations are part of the phonemic component of language. The term "semiotic unit" covers all kinds of signs and their combinations and phonemes and their combinations. The central problem of semiotic grammar is: In what ways are semiotic units all alike and in what ways do they differ from each other? To answer this question is to define language universals: all languages have semiotic units, and the fundamental hypothesis is that the semiotic units of all languages are governed by universal laws. To solve this problem, we must introduce a set of semiotic concepts.

As a semiotic entity, language includes two kinds of relations: 1) sign relations between a finite set of distinct phonic expressions and a finite set of distinct concepts; 2) phonemic relations between, sounds, that is, minimal components of phonic expressions and phonic expressions as wholes. A phonic expression and a concept as terms of a sign relation are called sign and its meaning. A sound and a phonic expression as terms of a phonemic relation are called a phoneme and a phoneme sequence. The term semiotic relations" covers both "sign relations" and "phoneme relations"."

This characterization of language calls for an explanation. First, "sign" and "phoneme" are not primitive terms; the primitive terms are "sign relation" and "phoneme relation" which define the sign and the phoneme. The important thing to notice is that each term of the "sign relation" and "phoneme relation" has a dual character. Thus, a phonic expression and a concept in themselves are not part of language: a phonic expression is physical entity and a concept is a referential entity (i.e. an entity that represents reality directly), they become linguistic entity only as terms of the sign relation; hence, the dual terminology, phonic expression/sign, concept/meaning. Similarly, a sound in itself is a physical entity it becomes part of language as a term of a phonemic relation with respect to another term of this relation, a phonic expression, functioning as a sign; hence, a dual terminology: sound/phoneme.

The proposed characterization of language describes its most essential property: language is an intermediary between thought and sound, it binds thought to sound and sound to thought so that their bond generates necessarily a mutually complementary articulation of thought and sound into distinct units.

My characterization of language does not include functions of language such as an instrument of communication or thought expression. I have done it deliberately. In addition to the functions of communication and thought expression, language has various other functions: establishing personal relations, arousing emotions, creative activities like poetry, indicating social backgrounds, and so on. Although I do not mention any specific functions of language, my

characterization of language is functional. What is crucial is that neither sound nor concepts in themselves are part of language. They become part of language when they are assigned the functions of being terms of sign relations and phoneme relations, what I call *semiotic functions*: sounds function as signs and phonemes and concepts function as meanings of signs. In defining language, we need not mention its specific functions because the notion "semiotic functions" implies all of them.

Under the proposed characterization, language consists of two components: 1) semantic component and 2) phonemic component. Semantic component includes the meaning of all linguistic signs. I use the term "meaning" in its wide sense covering all kinds of notion, including syntax relations. Hence the term "semantic component" covers the lexicon and grammar, both morphology and syntax.

5 The Law of the Sound-Meaning Bond and Its Implications

Under the assumption that language has a semiotic function, we face the problem of abstraction. Abstraction is considering an object or group of objects from *one* viewpoint while disregarding all other properties of the object. The purpose of abstraction is to single out one feature, which, in contrast to all other features, is considered particularly important in this connection. All concept formation depends on this process of abstraction. Our problem is to consider human language under the one viewpoint of its semiotic properties, while disregarding all its other properties. We single out the semiotic properties, which in contrast to all other properties of language, we consider particularly important for the characterization of language. Singling out the semiotic properties of language I call semiotic abstraction. One fundamental condition on semiotic abstraction is the Law of the Sound-Meaning Bond.

> The Law of the Sound-Meaning Bond
>
> The only distinctions between meanings that are semiotically relevant are those that correlate with the distinctions between their phonic expressions; conversely, the only distinctions between phonic expressions

> that are semiotically relevant are those that correlate with the distinctions between their meanings. Given two meanings that do not correlate with the distinctions between phonic expressions, they belong in the same class of meanings; and, conversely, given two phonic expressions that do not correlate with the distinction between meanings, they belong in the same class of phonic expressions.

Here are examples of the application of the law. The English word *wash* has different meanings in the context of expressions *wash one's hands* and *wash linen*. But the distinction between the two meanings is irrelevant for the English language because this distinction does not correlate with the distinction between two signs: in both cases we have the same phonic expression *wash*. Therefore the differences between these two meanings must be regarded as part of the two different contexts; the proper meaning of *wash* is the same in both contexts. On the other hand, the meaning of the Russian word *myt'*, which corresponds to the meaning of the English *wash* in *wash one's hands*, and the meaning of the Russian word *stirat'*, which corresponds to the meaning of the English *wash* in *wash linen*, must be regarded as different from each other and so belonging in different classes rather than as belonging in the same class as in English, because the distinction between the meanings of Russian *myt'* and *stirat'* correlates with different phonic expressions and therefore is relevant for the Russian language.

The Law of the Sound-Meaning Bond defines linguistic relativity: the difference between meanings is relative to the difference between phonic expressions and, conversely, the difference between phonic expressions is relative to the difference between meanings.

Since the meaning of a sign changes depending on various contexts, the Law of the Sound-Meaning Bond defines the *invariant of a class of contextual changes of the meaning of a sign* It also defines the *invariant of a class of contextual changes of the sound shape of a sign.*

A corollary of the Law of the Sound-Meaning Bond is the Phonemic Law:

> THE PHONEMIC LAW. THE ONLY DISTINCTIONS BETWEEN MINIMAL PARTS OF SIGNS, CALLED PHONEMES, THAT ARE SEMIOTICALLY RELEVANT ARE THOSE THAT CORRELATE WITH THE DISTINCTIONS BETWEEN THE MEANINGS OF SIGNS. TWO PHONEMES THAT DO NOT

CORRELATE WITH THE DISTINCTIONS BETWEEN THE MEANINGS OF SIGNS ARE VARIANTS OF ONE AND THE SAME PHONEME.

A phonic segment that serves as the sign of the meaning of a linguistic unit cannot be analyzed into smaller phonic segments having meaning. The totality of the Russian word *stol* means "table", and we cannot attribute to *st* and to *ol* a different meaning. But the phonic segment itself is analyzable into a sequence of units each of which contributes to the distinguishing of *stol* from *ston* "groan", *stal* "became", *slon* "elephant", and so on. This sequence of units called *phonemes* is characterized by the Phonemic Law. The distinction between two different /p/ in the English word pipe (the aspirated and non-aspirated /p/ does not correlate with distinctions between meanings of sign. Therefore they are variants of the same phoneme.

Let's turn to implications of the Sound-Meaning Law.

5.1 The Model of Language as a Code

Language may be viewed as a complex multidimensional and multilevel code where every class of concepts corresponds to one coding expression. If we take the sign *Corr* to denote a correspondence between the coding expression *E* and any concept it admits, then we may represent the correspondence and its terms by the formula:

coding expression *E* *Corr* ...

This determines encoded classes of concepts. As a next step, we establish classes of identical signs. If we take the sign *Corr'* to denote correspondence between any coding expression and a class of concepts *C*, then we may represent the correspondence and its terms by the formula:

... *Corr'* class of concepts *C*

About classes of concepts and classes of coding expressions defined by these cormulas, we say that each class of concepts is in opposition to other classes of concepts and each class of coding expressions is in opposition to other classes of coding expressions. Concepts that belong in different classes of concepts must be encoded by different expressions.

It is important that the operations of establishing classes of concepts and classes of coding expressions is performed in the order mentioned. The operation of establishing classes of coding

expressions presupposes the operation of establishing classes of concepts, but the latter operation does not presuppose any other operation.

5.2 The Principle of the Duality of Sound and Meaning

This principle is a corollary of the Law of the Sound-Meaning Bond.

> The Principle of the Duality of Sound and Meaning
>
> Sound and meaning each have two complementary facets - value and worth. These facets are completely independent from each other, so that two different sounds may have an identical value, and, conversely, two different values may be represented by one and the same sound; two different meanings may have an identical value, and, conversely, two different values may be represented by one and the same meaning.

I use the term "value" in the same way as Saussure did, that is, in the sense of the property of sounds and meanings as terms of relations within the system of linguistic signs. And I use the term "worth" to denote the empirical properties of sounds and meanings, physical characteristics of sounds and so to speak "physical" characteristics of meanings, that is, their characteristics not as terms of relations but as concepts which directly refer to reality.

I have borrowed the technical term "worth" from old treatises on political economy where this term is used in the sense of Marx's term "use-value", as opposed to "exchange-value" of commodities. This correspondence between the terms is mentioned by Marx.

Taking the above examples illustrating the Law of the Sound-Meaning Bond, we can now interpret them in terms of the Principle of the Duality of Sound and Meaning.The English word *wash* has different meanings in the context of expressions *wash one's hands* and *wash linen*. But the distinction between the two meanings is irrelevant for the English language because this distinction does not correlate with the distinction between two signs: in both cases we have the same phonic expression *wash*. Therefore the differences between these two meanings must be regarded as part of the two different contexts; the proper value of the meaning of *wash* is the same in both contexts. On the other

hand, the meaning of the Russian word *myt'* which corresponds to the meaning of the English *wash* in *wash one's hands*, and the meaning of the Russian word *stirat'*, which corresponds to the meaning of the English *wash* in *wash linen*, must be regarded as having different values, rather than having the same value, because the distinction between the meanings of Russian *myt'* and *stirat'* correlates with different phonic expressions and therefore is relevant for the Russian language.

Speaking of the linguistic notion of duality in terms of epistemology, we may say that this is an instance of a non-classical approach to abstraction. The classical approach to abstraction postulates that any phenomenon must be taken as a phenomenon complete in itself, as a completed phenomenon. The classical approach worked well in classical physics, but breaks down in modern physics, where you cannot describe the behavior of an electron as a particle or as a wave taken separately as a phenomenon complete in itself. The same in linguistics.We cannot view the physical facet of sound as a phenomenon complete in itself. It is an incomplete phenomenon. To make it complete, we introduce additional assumptions characterizing a sound as a phoneme. Similarly, we cannot view the content of meaning as a phenomenon complete in itself. To make this phenomenon complete, we must introduce additional assumptions characterizing meaning as a structural entity, as a value.

5.3 The Significance of the Law of the Sound-Meaning Bond

One can never overstate the significance of the Law of the Sound-Meaning Bond. If one wants to present de Saussure's doctrine in a single theoretical statement, the Law of the Sound-Meaning Bond is it. This law defines the essence of linguistic reality It is a keystone of the semiotic study of language. If we question the Law of the Sound-Meaning Bond, the whole subject is at stake. This law is not open to falsification in any straightforward way. This is not to say that this law is not empirical. If we accumulate sufficient empirical evidence against it, we may give it up entirely, but then we must be ready to write off the semiotic study of language as a whole.

A unique feature of AUG which sets it apart from current theories of grammar is that, in accordance with the Law of the Sound-Meaning Bond, AUG establishes classes of meanings and classes of signs by researching how distinctions between meanings and distinctions between signs correlate with each other.

If we accept the notion of linguistic reality as characterized by the Law of the Sound-Meaning Bond, then we must consider any conduct of linguistic inquiry incompatible with this law an activity producing a distorted representation of linguistic reality. Here are some examples of the distorted representation of linguistic reality.

Generative Phonology considers only the sound patterns of morphemes, completely disregarding their meanings. As a result, Generative Phonology makes wrong identification of morphemes by positing fictitious relationships between them. For example, in their book on the sound pattern of English, Chomsky and Halle (1968: 234) suggest that alternations such as *resign : resignation* can be accounted for by providing a unique base for each morpheme. Thus, they posit *re=sign* as a phonemic representation of *resign.* The sign = represents a special morpheme boundary which is necessary for the following rule:

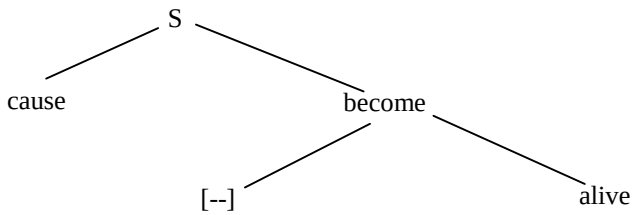
s ---" *z* in the context: *Vowel=___Vowel*

Chomsky and Halle posit *s* in the underlying form because they claim that the same morpheme occurs in words such as *consign* where the same boundary = is recognized.

Is *sign* in *resign* identical with *sign* in *consign*? Are they allomorphs of the same morpheme? No, they are not. From the synchronic point of view, *resign* cannot be divided into morphs *re* and *sign,* nor can *consign* can be divided into two morphs *con* and *sign.* From the synchronic point of view, *resign* and *consign* have nothing in common with each other except for partial similarity of their physical shapes: neither the word *resign* nor the word *consign* is related to the word *sign.*The fundamental error of Generative Phonology is that it generates away alleged cognate forms based entirely on the physical shape of phonic segments without regard to the meanings of phonic shapes. Disregard of the meanings of the phonic shapes of morphemes leads to the confusion of synchrony with diachrony. No one doubts that the above relationships between morphemes are valid

in terms of the diachronic reconstruction of the forms of these morphemes. What is illegitimate is to assume that the above morphemes are semantically related in the synchronic sense.

The opposite error is encountered in Generative Semantics, which works itself into fictions by ignoring the need to show that the proposed distinctions between meanings are supported by concomitant distinctions between phonic expressions. Consider, for instance, the famous McCawley's analysis of *kill* as a causative verb in English (McCawley 1968) or a similar modern variety of this analysis proposed by Apresian (1995:21). The Generative Semantics tree representing the semantic components looks like this:



The diagram reads: "cause became minus alive", which is meant to be a semantic componential analysis of the verb *kill*. This analysis is false because it is based on a naive idea that given a possible causative paraphrase of the verb *kill*, the verb *kill* must thereby *ipso facto* considered a causative verb. In accordance with the Law of the Sound-Meaning Bond, any difference between linguistic meanings must be correlated with the difference between phonic expressions. In other words, differences in meanings must be encoded by corresponding differences in meanings, language is a coding device. Real causative verbs are characterized by appropriate phonic markers as in the forms *sit* : *set* (*I sit by the table, I set the table*), *fall* : *fell* (*the tree falls, the lumberjack fells the tree*}. The verb *kill* has neither the alternation *kill* : **kell* nor other phonological markers of the causative meaning.

Generative semantics is concerned with meanings but does not care about their signs. It wants to analyze meanings independently of signs representing them. However, the true grammatical problem is to research how grammatical meanings or functions are organized in relation to their signs. This problem requires understanding that the means of

expression and what is expressed by them complement each other. No grammatical meaning or function exists independently of the means of its expression. Generative Semantics fails to understand that the grammatical problem is a semiotic problem. We must not confuse the linguistic meaning with various kinds of inferential meaning that are parasitic on linguistic meaning.

Paraphrasing is widely used by logicians as a useful method of a comparison of expressions in artificial languages of logic with expressions in natural languages. Paraphrasing as part of the logical analysis of natural languages and paraphrasing as part of the linguistic analysis of natural languages are very different things. The logician is interested in discovering how certain logical concepts are expressed in natural languages no matter whether or not logical concepts are represented by specific symbolic devices, whereas it is specific symbolic devices for representing any concepts that are central to a linguistic semantic analysis. Linguistics is an autonomous science independent of logic.

The linguistic meaning of a sentence or a word is vital for communication and is an essential aspect of every use of language; but the linguistic meaning does not constitute *the total meaning* of a sentence or a word. Consider the sentence "Garry Kasparov and I.B.M.'s computer Deep Blue came to a draw in the fourth game yesterday". The linguistic meaning of the sentence is determined by the dictionary and the rules of the grammar of English. But the sentence means more than that. A man who knows chess can infer from the context of the word "game" that it was the game of chess. He may also infer that Kasparov and Deep Blue had played three games before the game yesterday. He may infer further that Deep Blue is a superstrong chess program because Kasparov is the world champion of chess. A man who does not know chess cannot infer from the meaning of the word "game" that it was a chess game. Nor can he infer what can be inferred from this sentence by a man who knows chess. From the sentence "John killed a bear" we infer that "John caused a bear not to be alive", but causation is an inferential meaning that is parasitic on the linguistic meaning of *kill*. We must not confuse the linguistic meaning of *kill* with its total meaning.

The total meaning is a compound containing the linguistic meaning combined with other kinds of meaning just as a chemical compound contains a certain substance combined with other substances. To isolate a certain substance from other substances, one uses chemical reagents. The analysis of meaning is mental chemistry. The chemical reagent of the linguist is the Law of Sound-Meaning Bond. Using it, the linguist isolates the linguistic meaning in its pure form.

One cannot overstate the importance of the Law of the Sound-Meaning Bond. Linguistic meanings are linguistic forms of thought. Linguistic meanings are thought-groves. As Sapir has put it, "Language and our thought-groves are inextricably interrelated, are in a sense one and the same" (Sapir 1921:217-218). It is wrong to say that thought itself is intrinsically formless; for thought does not exist before and independently of language, nor does language exist before and independently of thought.

6 Combinations and Classes of Semiotic Units

Semiotic units divide into classes of semiotic units and combinations of semiotic units. We start with a distinction of two kinds of relations between semiotic units: 1) relations between the parts of a combination of semiotic units, say, between a noun and a verb in the combination " noun + verb" or between a consonant and a vowel in the combination "consonant + vowel"; 2) relations between semiotic units of a one and the same class, say, between different verbs or between different vowels. Relations of the first kind are called "paradigmatic relations" or "horizontal relations" and of the second type "syntagmatic relations" or "vertical relations".

We distinguish the privileged classes and combinations of semiotic units. The semantic component of language has classes of content words (nouns, verbs, adjectives, adverbs) as its privileged classes and sentences as its privileged combinations. The phonemic component of language has classes of phonemes as its privileged classes and phonemic syllables as its privileged combinations.

How do classes and combinations of semiotic units relate to each other? Classes with respect to their essential properties are subordinate to combinations, i.e., the essential properties of classes are defined by their contexts. We introduce the Defining Principle for Classes:

The Defining Principle for Classes

Any class must be defined in terms of its functions in combinations.

Under this principle, our task is a rigorous and explicit analysis of combinations of semiotic units and defining classes of semiotic units by a rigorous and explicit definitions of their functions as part of combinations.

7 The Invariance of Grammatical Structure

This and the next section contains theoretical statements that are most important for understanding language universals and their explanatory function.

The Transfer Principle

The grammatical structure of a sign combination can be transferred from one symbolic device into another without changing its meaning or function.

For example, subject-object relations can be represented by case markers like in Russian or Latin or by word order like in English. In a Russian sentence consisting of three words, subject, predicate, and direct object, the words can be permuted in six different ways without a change of the grammatical meaning of the sentence.

The Principle of the Invariance of Laws of Grammatical Structure

Laws of grammatical structure are invariant of the symbolic representations of grammatical structure.

This principle is a corollary of the Transfer Principle. It constrains laws of grammatical structure by separating them from statements about symbolic representations of grammatical structure.

The Transfer Principle implies linear sequences of signs as a symbolic means of representing grammatical structure. A linear sequence of signs is a symbolic means of the representation of grammatical structure insofar as word order serves as a sign or signs of grammatical meanings in languages such as English or Chinese. But linearity is an intrinsic property of the sign. The sign is always linear no matter whether or not word order serves as a means of symbolic expression. As Saussure stated emphatically, the principles of arbitrariness and linearity are two most important characteristics of the linguistic sign. It is enough to say that the linearity of the linguistic sign constitutes the basis of the distinction of syntagmatic and paradigmatic relations.

8 The Autonomy of Grammar from the Lexicon

8.1 Grammatical and Lexical Meanings

To define and explain the Principle of the Autonomy of Grammar from the Lexicon, let's start with distinction between grammatical and lexical meanings.

> **Definition of Grammatical-Lexical Opposition**. In every language meanings divide into two fundamental contrasting classes: lexical meanings, which are the meanings the speaker chooses freely, depending on the content of the intended expression, and grammatical meanings, which must be expressed in conjunction with the chosen lexical meanings. Grammatical meanings are a limited closed set, whereas lexical meanings are a large open set.

Let me illustrate this principle. When the speaker says "The hunter killed the bear", he means that in the past a definite single hunter killed a definite single bear. The speaker cannot express this information in such a way that the hearer were to remain in doubt as to whether a definite or indefinite person or bear, one or more persons or bears, the present or past were meant. The speaker *must* choose between

the definite and indefinite, singular and plural, present and past. Grammatical meanings are obligatory meanings of a sign.

The strict distinction between the two classes of meanings, grammatical and lexical, is absolute, that is, this distinction is necessary in any language. On the other hand, the content of these classes is relative to every language; grammatical meanings of one language may be expressed by lexical meanings of another language, and, conversely, what is expressed by lexical meanings in one language may be expressed by grammatical meanings in another language. For example, definite and indefinite are not grammatical meanings in Russian or Latin; they are expressed by lexical means. Indonesian does not have any distinction of grammatical tenses; it distinguishes tenses by combining tenseless verbs with appropriate adverbs.

There are two classes of grammatical meanings: *inflectional* and *derivational*. Derivational meanings concern word structure. For example, the meaning of suffix *-er* in *worker* or of suffix *-ess* in *lioness* are derivational meanings. The inflectional class divides into *functional* and *specifying* meanings. Functional meanings characterize connections between words having different syntactic functions in the sentence, whereas specifying meanings characterize different kinds of words having an identical function. For example, characterization of words as predicates, arguments of predicates, attributes, and the like is a characterization of words by the functional meanings of their morphemes, whereas a characterization of verbs by their tense or aspect or a characterization of nouns as being determinate or indeterminate is a characterization of words by specifying the meanings of their morphemes.

8.2 Antinomy between Grammar and the Lexicon and Its Implications

There is not necessarily a proper correspondence between the grammatical and lexical meanings of a word. A proper correspondence of these meanings is observed in the word *cat,* where both structural and lexical meaning refer to an object. But often the structural and

lexical meanings of a word act in different or even diametrically opposite directions. For example, the grammatical meaning of *rotation* refers to an object, while its lexical meaning refers to a process. Conversely, the grammatical meaning of *to cage* refers to a process, while its lexical meaning refers to an object.

This conflict between grammatical and lexical meanings I call the *Antinomy between Grammar and the Lexicon.* The Russian linguist Aleksandr Peshkovskij, who was far ahead of his time, warned against the confusion of grammatical ("formal") with lexical ("material") meanings due to *antigrammatical hypnotism* that comes from the "material" parts of words:

> We must warn the reader against the antigrammatical hypnotism that comes from the material parts of words. For us, material and grammatical meanings are like forces applied to one and the same point (a word) but acting sometimes in the same direction, sometimes in intersecting directions, and sometimes in exactly opposite directions. And here we must be prepared to see that the force of the material meaning, just like the stream of a river carrying away an object, will be obvious, while the force of the formal meaning, just like the wind blowing against the stream and holding back the same object, will require special methods of analysis (Peshkovskij 1934: 71).

The distinction between grammatical and lexical meanings is of a paramount importance for the theory of grammar. The subject matter of the theory of grammar is grammatical meanings as opposed to lexical meanings. We must not confuse grammar with the lexicon. In stating the laws of grammar we must abstract from the lexical constraints on the rules of grammar of individual languages. The laws of grammar cannot be stated in terms of lexical constraints on the rules of grammar of individual languages.

Here I present another principle which is crucial both for defining subject matter of semiotic grammar and understanding language universals.

> The Principle of the Autonomy of Grammar from the Lexicon
>
> Laws of grammatical structure concern grammatical meanings and are independent from lexical meanings.

I warn the reader against confusing the autonomy of grammar from lexicon with Chomsky's autonomous syntax. The latter means the autonomy of syntax from meaning, whereas the autonomy of grammar means only the autonomy of grammar from lexical meanings, not from grammatical meanings. The Principle of the Autonomy of Grammar from the Lexicon is an idealization. In the real world grammatical structure is constrained by lexical meanings. Grammar independent from the lexicon is an ideal object, a theoretical construct. Why do we need it? As an instrument of explanation. Consider the processes of passivization. To understand this grammatical process, we need to perform two kinds of complete abstraction: 1) an abstraction of grammatical structure from the lexicon and 2) an abstraction of grammatical structure from its linear representation. In different languages the process of passivization is constrained by the lexicon and rules of word order in very different ways, but the essence of passivization is the same in all languages where it occurs. The law of passivization must be stated in terms of grammatical relations independent of the constraints of the lexicon and rules of word order which are different in different languages.

8.3 Pitfalls of the Confusion of Grammatical and Lexical Meanings

The confusion of the grammatical and lexical meanings of a sign leads to grave errors in grammatical analysis. As a result of these errors, innumerable quasi-grammatical meanings are ascribed to verbal tenses and aspects, noun cases, etc. Here are some examples of these errors. Marantz (1984:129) assigns different roles to the object of the preposition *by* in the following sentences:

(1a)a. Hortense was passed by Elmer. (agent)

(1b)b. Elmer was seen by everyone who entered. (experiencer)

(1c)c. The intersection was approached by five cars at once. (theme)

(1d)d. The porcupine crate was received by Elmer's firm. (recipient)

While AUG treats all objects of *by* as grammatical agents, Marantz assigns roles to these terms because he lumps together grammatical and lexical

meanings. One must strictly distinguish between grammatical and lexical meanings and not confuse them. Grammatical meanings are obligatory meanings that are imposed by the structure of a language, while lexical meanings are variables depending on the context. The grammatical meaning "agent", assigned to a term, is a formal meaning that treats an object denoted by the term as an agent regardless of whether it is a real agent. Thus, the objects denoted by the terms in (3b-3d) are not real agents in the context of the lexical meaning of predicates (added to the lexical meaning of the noun stems), but linguistically they are treated as if they were real agents. Since lexical meanings are closer to reality, a conflict often arises between lexical and grammatical meanings of a term. We can observe this conflict in (3b-3d), whereas in (3a) the lexical meaning of the term agrees with its grammatical meaning.

Every word has a number of meanings: some of them are lexical meanings and others are grammatical meanings. Although from the structural point of view grammatical meanings are the most important, they are the least conspicuous. To dispel any illusions, we must understand that the grammatical meanings of a word are not directly accessible; they are blended with the lexical meanings. The blend of lexical and grammatical meanings constitutes a heterogeneous object. While lexical meanings are obvious, an insight into grammatical meanings requires special methods of analysis.

The grammatical meaning "agent" can be separated from a lexical meaning by means of a thought experiment. If we replace the lexical morphemes of a word with dummy morphemes, we obtain the grammatical structure of a word in a pure form. Here is an example of such an experiment (Fries 1952:71):

(2a)Waggles urged giggles.

(2b)Eggs waggled digs.

(2c)Wags giggled ogles.

(2d)A waggle ugged a diggle.

(2e)An ugg woggles diggs.

(2f)A diggled woggle ugged a woggled diggle.

All of these sentences are clearly transitive constructions, owing to the specific word order and nominal and verbal morphemes. It is clear that the first terms in these constructions mean "agent", whereas the second terms mean "patient". Now we can relate passive constructions to all of these sentences:

(3a)Diggles were ugged by woggles.

(3b)Diggs were wogged by uggs

(3c)Й

It is clear that the preposition *by* introduces a term meaning "agent" in these sentences. Now let us substitute a lexical morpheme for a dummy root in a verb. If we substitute the morpheme *hate* for a dummy verbal root, we will get sentences such as:

(4)Woggles hated diggles.

We can relate a passive construction to (3):

(5)Diggles were hated by woggles.

From the viewpoint of the lexical meaning of *hate*, the first term in *Woggles hated diggles* and the oblique term in *Diggles were hated by woggles* mean "experiencer". But this meaning has nothing to do with the grammatical meaning of these terms ("agent"), which remains invariant under various substitutions of lexical verbal roots whose meaning may often conflict with the grammatical meaning of terms.

Lexical meanings are the meanings of morphemes that constitute word stems, while grammatical meanings are the meanings of inflectional morphemes, prepositions, conjunctions, and other devices such as word order. Most current works on the theory of grammar disregard the fundamental opposition *grammatical meaning : lexical meaning* and confuse these notions. Recently, Foley and Van Valin (1984:29) have proposed the notions of *actor* and *undergoer*, which they define as "generalized semantic relations between predicate and its arguments". "Actor" and "undergoer" are abstract notions that roughly correspond to the notions "grammatical agent" and "grammatical patient" in the sense of AUG. However, Foley and Van Valin present these abstract notions as purely empirical generalizations without defining the basis for their generalization. Their work lacks a distinction between grammatical and

lexical meanings, which is the necessary basis for the above and other abstractions in the theory of grammar. We arrive at grammatical notions by separating, by abstracting, grammatical meanings from lexical meanings.

Another example of an error in the analysis has to do with ergative constructions. Apart from the controversy about what syntactic constructions must be recognized as ergative, the prevailing view has it that even in syntactic constructions commonly agreed as being ergative the notion "agent" is an informal concept. Thus, Comrie writes:

> I explicitly reject the identification of ergativity and agentivity, [ ] despite some similarities between ergativity and agentivity, evidence from the wide range of ergative languages points against this identification. (Comrie, 1978: 356)

To support his view, Comrie quotes examples from Basque (Comrie 1978:357):

(6a)Herra-k z-erabiltza.
hatred-Erg. you-move
"Hatred inspires you."

(6b)Ur-handia-k d-erabilka eihara
the-river-Erg. it-move mill-Abs.
"The river works the mill"

Such examples show that agentivity is denied formal status in ergative languages because of the confusion of the lexical and grammatical meanings of nouns in the ergative case. From the grammatical point of view, any noun in ergative case means "agent", no matter what its lexical meaning is and no matter in what context it occurs. In Comrie•s examples, the lexical meaning of *herra-k* in (8a) and of *ur-handia-k* in (8b) conflict with the meaning of the ergative case, which is a grammatical meaning. The ergative case has nothing to do with the objects of reality that the lexical meanings of nouns refer to. It has nothing to do with real agents. Rather it is a form of presentation of anything as an agent, no matter whether or not it is a real agent.

8.4 A Note on the Terms "Meaning" and "Semantics"

In considering the distinction between grammatical and lexical meaning one must be careful not to be misled by an ambiguous terminology. In semiotic and linguistic literature, the term "meaning" has been used in a wide and in a narrow sense. In a wide sense, the term "meaning" covers any kind of lexical and grammatical information, including syntactic information such as various syntactic functions, syntactic dependences, etc. In a narrow sense, the term "meaning" does not cover syntactic information, which is considered merely functions, relations, or dependencies rather than meaning. The term "meaning" has been used in its wide sense by all semiotically oriented linguists such as Sapir, Boas, Fries, Jakobson among many other American, European, and Russian linguists. In accordance with the wide and the narrow senses of the term "meaning", the term "semantics" also has a wide and a narrow sense. The term "semantics" in a wide sense covers the study of both grammar and the lexicon as opposed to phonology. The term "semantics" in a narrow sense only covers the study of the lexicon. In current linguistic literature, the terms "meaning" and "semantics" are used mostly in their narrow sense, that is, in the sense of "lexical meaning" and "the study of the lexical meaning". Hence the opposition *syntactic relation : meaning* or *grammatical relation : meaning*, widely accepted in current linguistic literature, translates into the opposition *grammatical meaning : lexical meaning* in our terminology. The term "semantics" in its currently accepted use translates into the term "lexical semantics" in our terminology.

Perlmutter and Postal claim that Relational Grammar is concerned with the distinct, nonthematic level, opposed to the semantic level. In my terminology, this claim translates into the statement: "Relational Grammar is concerned with pure grammar as opposed to the lexicon, including the thematic notions, which are part of the lexicon". This is why I consider Relational Grammar a homogeneous theory of grammar as opposed to Lexical Functional Grammar or Government and Binding Theory, which are heterogeneous theories because they combine grammatical notions with thematic and other notions drawn from the lexicon.

9 Laws of grammatical structure

The laws of grammatical structure are formulated independently of their linear representation. The laws of grammatical structure presented below are true linguistic universals. These linguistic universals cannot and need not be formulated in terms of the linear representation of linguistic structure. When I say "cannot" I do not mean an absolute impossibility. If one tries hard, and introduces empty entities, movement transformations, and other tricks leading to complications hard to understand, then maybe... Maybe, but why we should do this?

9.1 The Sign Combination Law

Let us now turn to the fundamental problem of syntax: How do signs combine to form a new sign? I introduce the fundamental constraint on the combination of signs, the Sign Combination Law:

> The Sign Combination Law
>
> A sign, called an operator, combines with one or more signs, called its operands, to form a new sign, called its resultant, on condition that its meaning is incomplete and needs to be supplemented by meanings of other signs.

Examples. Verbs and adjectives are operators with respect to nouns because meanings of verbs and adjectives are incomplete and are in need of supplementation by meanings of nouns. Consider "boy" or "paper". The meanings of these nouns are complete. Take now "walks" and "yellow". We ask: Who walks? What is yellow? The meanings of the words are incomplete because they denote properties of things: "walks" is a verb, and verbs denote properties assigned to things within an explicit or implicit time frame; "yellow" is an adjective, and adjectives denote properties assigned to things outside of an explicit or implicit time frame. They need to be supplemented by meanings of nouns such as "boy" or "paper": in "the boy writes" the verb "walks" is an operator and

"the boy" is its operand; in "white paper" the adjective "white" is an operator and "paper" is its operand". Similarly, the meaning of prepositions is incomplete without supplementation by meaning of nouns, therefore prepositions are operators with respect to nouns; in "on the table", "on" is an operator and "the table", its operand. The meaning of a conjunction is incomplete, it needs to be supplemented by the meaning of words belonging to basic word categories, nouns, adjectives, verbs, adverbs, or sentences; therefore a conjunction is an operator with respect to expressions of all these categories: in "black and white", "in" is an operator with respect to "black" and "white". We observe chains of meaning supplementations. Thus, in "John wrote his letter quickly" we observe the following meaning supplementations:

1) wrote <- quickly,
2) his -> letter,
3) (wrote <- quickly) -> (his -> letter),
4) John<-(wrote <- quickly) -> (his -> letter)

The arrows between words denote the process of combining of operators with their operands: X -> Y means "operator X combines with its operand Y"; X <- Y means "operator Y combines with its operand X". Under 4), we observe a complete chain of meaning supplementations and, respectively, a chain of operators and their operands for the sentence "John wrote his letter quickly". Thus, "quickly" is an operator and "wrote", its operand; "his" is an operator and "letter", its operand; "wrote quickly" is a two-place operator whose operands are "his letter" and "John".

9.2 The Applicative Sign Combination Law

The Sign Combination Law, as I have formulated it, assumes that operands of an n-place operator are symmetrical.This assumption is questionable. We can observe various facts showing that a many-place operator has an asymmetrical relation to its operands, i.e., it is closer connected with one operand than with another. In particular, we observe an asymmetry in the relation of the transitive predicate to its

subject: the transitive predicate is connected with object closer than with subject. How to describe this asymmetry?

We must use a formal device proposed by the Russian mathematician Schoenfinkel which constitutes an essential feature of combinatory logic. I mean the reduction of an *n*-place operator to a one-place operator of a special type. The reduction is defined by the Applicative Principle:

The Applicative Principle

Given an operator F of operands $x_1, x_2, \ldots x_n$, it can be replaced by an operator F' of x_1, which yields another operator F'' of x_2, that yields another operator, and so on.

F' is said to be a *curried* version of F'(called so after Haskell B. Curry, the creator of combinatory logic). The binary operation of combining F' with x_1, yielding F'', combining F'' with x_2, and so on, is called the *application operation*, or, simply, *application*. Application is the only syntactic operation needed to describe the complex syntactic system of semiotic grammar. Hence my version of semiotic grammar is called Applicative Universal Grammar.

Using application, we can represent the syntactic asymmetry as follows: the first application represents the closest connection between the operator and its operand, the second application, a less closer connection, and so on. Thus the sentence "John loves music" can be represented as follows: (LOVES MUSIC) JOHN. This notation shows that the connection of LOVES with its object is closer than with its subject.

Now we are ready to redefine the Sign Combination Law, so that it reflects the syntactic asymmetry:

The Applicative Sign Combination Law

A sign, called an operator, combines with one or more signs, called its operands, to form a new sign, called its resultant, on condition that 1) its meaning is incomplete and needs to be supplemented by meanings of other signs, 2) if it has more than one operand, then it combines with them in accordance with the Applicative Principle.

The Applicative Sign Combination Law generates *applicative structure*. A detailed description of applicative structure is given in my book *A Semiotic Theory of Language*. Applicative structure is a concept which integrates phrase structure and dependency structure into a uniform hierarchy with rich properties.

9.3 The Superposition Law

What is the significance of the Applicative Sign Combination Law? This law reveals the inherent potentials of sign classes to combine with each other, and it shows that these potentials are heavily constrained by characteristic properties of sign classes. The Applicative Sign Combination Law characterizes the core syntactic relations of language which limit its expressiveness. Is there a way to transcend these limitations? An answer to this question is provided by the Superposition Law:

> The Superposition Law
>
> Any sign or phoneme A has one characteristic function or meaning on which in relevant contexts the characteristic meaning or function of another sign or phoneme B, C, ... can be superposed, so that new, syncretic signs or phonemes A *qua* B, A *qua* C, ... are formed. The characteristic meanings or functions of signs or phonemes B, C, ... superposed on A, are called the complementary meanings functuins of A.

The set of all relevant contexts that define all complementary functions or meanings of a sign or phoneme I call the *field of the sign* or *field of the phoneme*. The characteristic meaning or function of a sign or phoneme is an invariant of their superpositions with the characteristic meanings or functions of other signs or phonemes. It is independent of contexts. Using the term introduced by de Saussure, we can call the characteristic function or meaning of a sign its *value*. We can see an analogy between the value of the linguistic sign, so defined, and the

value of a unit of money. Depending on circumstances, the purchasing power of a 5-dollar bill may vary; but its value will always be one-half of a 10-dollar bill and five times the value of a 1-dollar bill. I use the word "field" as a technical term whose meaning is quite distinct from and should not be confused with the meanings of the term "field" in other theories.

To explain the Superposition Law, I will concentrate on words as privileged signs of language. In any language we must distinguish classes of signs, but not all classes of signs are equal: the privileged, central classes of signs are words. Words combine to form combinations of words. The privileged combinations of words are sentences.

Let us take the words *lion* and *green*. The characteristic meaning of *lion* is the name of an animal. But in combination with some words it takes on the complementary meaning "a famous and important person", as in *a literary lion*. The characteristic meaning of *green* is "the color of grass or leaves", but the word may take on the complementary meaning "inexperienced", as in *green recruits*. These examples are instances of metaphor. Metaphor is a complementary lexical function of a word whose characteristic meaning is non-metaphorical. The lexical superposition involves the influence of the context on the meaning of the word. As metaphors, "lion" is synonymous with "a famous and important person" and "black" is synonymous with "very bad". The important thing to note is that synonymy involves syncretism: as metaphors, "lion" and "black" do not lose their characteristic meanings; what happens is that complementary meanings are superposed on the characteristic meanings of these words, so that metaphors are syncretic signs, i.e. signs with a blend of characteristic and complementary meanings.

Turning to grammatical synonymy, we discover similar facts. Compare *the stone is black* and *the stone wall.* In the first phrase, the noun *stone* functions as a subject; this is its characteristic function. But in the second phrase the word *stone* functions as an attribute of a noun, i.e. as a grammatical synonym of an adjective; this is its characteristic function, superposed with the characteristic function of an adjective. We discover a syncretism of grammatical meanings: the grammatical

meaning of attribute is superposed on the grammatical meaning of subject.

There is the following correspondence between the four main classes of words and their characteristic syntactic functions: *noun : subject, adjective: attribute of a noun, verb: predicate, adverb: attribute of predicate.* The superposition of the characteristic function of a word of one class with the characteristic functions of words of other classes will produce a set of complementary functions of the word.

We discover a similar phenomenon in phonology. In Russian or Polish the voiced consonant is replaced at the end of a word by a corresponding voiceless consonant, for example, *b, d, g* by *p, t, k.* This is a case when voiced consonants function as voiceless consonants, when voiced consonants are "synonymous" with voiceless consonants, so due to this phenomenon, the Russian *rot* is ambiguous it means both "mouth" and "genus".

Under the Superposition Law, language may be viewed as a sign/field hierarchy.

9.4 The Law of Correlation between the Superposed Sign and Its Form

Now I introduce the Law of Correlation between the Superposed Sign and its Form:

> Given a syncretic sign <A qua B>, its sign form must be derived from the sign form of the unit A.

Examples. The Russian finite verb form *begaet* "runs" and the participle *begushchij* "running" differ from each other as regards their meaning in that *begushchij* is the result of the superposition of the function of the attribute of an argument on the characteristic function of a predict of the verb *begaet*. This difference correlates with the difference between the sign forms of both words: the sign form of *begushchij* is derived from the base sign form of *begaet.* The word "stone" in "the stone is white" and the word "stone" in "the stone wall" differ as regards their meanings: "stone" in the "stone wall" is the result of

the superposition of the function of the attribute of an argument on the characteristic function of subject in "the stone is white". This difference correlates with the sign forms of both words: the position of "wall" after "stone" in "stone wall" is a formal context which plays the role of a derivational affix.

9.5 A Note on the Notions of Primary and Secondary Functions in the Works of Kurylowicz

It is important to distinguish between the notions of charactreric and complementary functions and the parallel notions of primary and secondary functions in the works of Jerzy Kurylowicz. In spite of their parallelism, these are quite different sets of notions.

9.6 The Problem of the Reality of Parts of Speech and the Superposition Law

By principal parts of speech I mean four classes of words: nouns, verbs, adjectives, and adverbs. Is there an objective basis for the distinction of these classes? Linguists who view language as a mere set of sentences often do not recognize this question; they are not concerned with parts of speech. On the other hand, some linguists who are concerned with words and recognize the question reject the distinction between word classes; they refer to the well-known fact that besides its proper syntactic function a word of a given class may have a syntactic function of a word of any other class. For example, in addition to its proper syntactic function, a noun can have the syntactic functions of a verb, an adjective, and an adverb. Referring to such facts, some linguists question the reality of word classes.I may mention F. Brunot in his *La Pensée et la langue* (Paris 1936) and Sapir, (Sapir 1921: 117-118).

The fact that any principal part of speech can have the syntactic function of any other part of speech is a serious problem. Leaving aside languages which do not have morphological markers of parts of speech and taking into account only languages with clear morphological markers, we face a paradox: on the one hand, every principal part of speech has clear morphological markers which distinguish it from other part of speech, but on the other hand, each part of speech can have a syntactic function of any other speech; so, it seems that, from a syntactic point of view, there is no distinction between parts of speech. Let's consider an example of an overlapping of syntactic functions of parts of speech.

Consider noun *gold* in the following phrases:

(7a)Gold is yellow. - $gold_{arg:}$
(7b)gold watch - $gold_{att:}$

In (7a) the noun *gold* performs the role of an argument of predicate *(*$gold_{arg).}$ In (7b) *gold* performs the role of an attribute of a noun *(goldatt).* So different syntactic types are assigned in each case. We may classify nouns as polymorphic. But consider the adjective *brave* in the context of the following phrases:

(8a)The brave man came., $brave_{att:}$
(8b)The brave entered the burning building., $brave_{arg:}$ t

In (8a), the adjective *brave* functions as an attribute of a noun *(*$brave_{att).}$ In (8b) the adjective *brave* functions as an argument of a predicate *(*$brave_{arg}$*).* So in the different syntactic contexts different types are assigned to *brave.*

Nouns and adjectives seem to behave in a similar way: in some contexts they fulfil the role of the argument of a predicate, in other contexts, the role of an attribute of a noun. If we classify nouns and adjectives as polymorphic, then we must admit that their polymorphism is identical and that nouns and adjectives are identical at the level of their phrasal projection. An analysis of the syntactic behavior of the four classes of the content words shows that their syntactic behavior seems to be identical. If we classify content words as polymorphic, then nouns, adjectives, verbs, and adverbs belong in the same class with respect to their syntactic behavior. This explanation

of the type ambiguity of lexical classes would conflict with the generally accepted notion of lexical classes as morphologically and syntactically distinct entities. In search of a plausible explanation, we come up with a hypothesis of the hierarchy of syntactic types assigned to each lexical class. This hierarchy is explained by the Superposition Law.

Under the Superposition Law, the revised type assignment in the above examples is:

(9a)$gold_{arg:}$

(10a)$gold_{\text{arg qua att :}}$

(11a)$\text{brave}_{\text{att:}}$

(12a)$\text{brave}_{\text{att qua arg}}$

(12b)

This analysis reveals the opposition between the noun and the adjective: *the characteristic type of the noun is the complementary type of the adjective, and, conversely, the characteristic type of the adjective is the complementary type of the noun.* A sign with a complementary type superposed on its characteristic type displays *duality*: it takes on the properties of the complementary type superposed on its characteristic type but retains at least part of properties of its characteristic type.

We see that differences between categories are characterized by different hierarchies of the characteristic and complementary functions of categories. In our case, what is the difference between the category of noun and category of adjective? They may have the same syntactic functions, but what is crucial for determining the difference between noun and adjective is the hierarchy of the characteristic and complementary functions of the noun and adjective: the characteristic function of the noun is the complementary function of the adjective, and, conversely, the characteristic function of the adjective is the complementary function of the noun.

The characteristic function of a sign is *invariant* of a class of superpositions that determine its complementary functions.

I use the term "field" to name the hierarchy of the characteristic and complementary syntactic functions of a category and of their

intersections defined in terms of the concept of superposition. Every category is characterized by its field. Category is a paradigmatic concept, whereas field is a syntactic concept. The important thing to note is that the notion of field makes paradigmatics subordinate to syntax because categories do not have inherent characteristics independent of their syntactic functions. Syntactic functions precede all other characteristics of categories.

The concept of field obviates the widely held view that word classes have certain intrinsic properties as opposed to their grammatical functions. Under the field view, word classes are defined by their characteristic functions and complementary grammatical functions. A word class is identified as a bundle of its characteristic and complementary grammatical functions. The linguistic field has two planes, semantic and phonological.

Mutatis mutandis, we may draw an analogy between the electromagnetic and linguistic fields. Just as in physics there is no principled difference between matter and energy, so in linguistics we have to recognize that there is no principled difference between category and function. In physics, we have the dualistic concept "matter-energy". In linguistics we have to recognize the dualistic concept "category-function". As matter is identical with a high concentration of the field energy, so are linguistic categories identical with intersections of linguistic functions.

Let us now turn to phenomena that can be classified as truly polymorphic. Polymorphism is really a situation when a word is assigned several syntactic types having the same syntactic weight. For example, an English adverb can be assigned at least three types, having an equal syntactic weight, depending on whether it modifies an intransitive, transitive, or ditransitive verb. Here we have an equality between the types *with respect to their function as predicate attributes.* To describe polymorphism in an efficient way, AUG uses *type variables*. Another case of polymorphism, is the conjunction *and*. It combines two sentences, two nouns, or any two signs of an identical type. To distinguish different cases of polymorphism, AUG uses different type variables.

9.7 The Superposition Law and the Law of Inverse Relation Between The Range and Load of The Sign

The characteristic function of a sign is its inherent property. The superposition of complementary functions on the characteristic function of the sign creates a hierarchy of qua-signs. There is an objective test of the hierarchy of the characteristic and complementary functions of a linguistic sign. The test is based on the following structural constraint:

> **LAW OF INVERSE RELATION BETWEEN THE RANGE AND THE LOAD OF THE SIGN**. THE WIDER THE RANGE OF THE SIGN, THE SMALLER ITS LOAD; AND, INVERSELY, THE LARGER THE LOAD OF THE SIGN, THE NARROWER ITS RANGE.

The range of the sign is the sum of its functional positions in the sentence. The load of the sign is the degree of the complexity of its function or meaning.

Superposition of types generates loaded signs, that is, signs that have one or more types superposed on their characteristic types. For example, any noun in its characteristic syntactic function of an argument of predicate can occur in three syntactic positions: as subject, direct object, and indirect object. But in its complementary function of an attribute it occurs only in one position, in the position of the attribute. It is true that an adjective can modify the three kinds of arguments of a predicate. But these three positions count as one position because the attributive function of the adjective is identical in all these positions.

We must distinguish syntactic contexts and lexical contexts. Syntactic contexts superpose one grammatical function on another. Lexical contexts do not superpose grammatical functions; they superpose lexical meanings creating a hierarchy of lexical qua-signs. This kind of superposition we may call lexical superposition. For example, the characteristic meaning of *lion* is the name of an animal. But in combination with some words it takes on the meaning "a famous and important person", as in *a literary lion*. The characteristic meaning of *green* is "of the color of grass or leaves", but the word may take on the meaning "inexperienced", as in *green recruitsr*. These examples of lexical superposition are instances of metaphor. Metaphor is a complementary

lexical function of a word whose characteristic meaning is non-metaphorical. The lexical superposition involves the influence of the context on the meaning of the word.

9.8 The Superposition Law and Passive Constructions

One cannot overstate the significance of the Principle of Superposition for explaining various linguistic phenomena. The following example illustrates syntactic superposition.

One of the most knotty problems of universal syntax arises with respect to passive constrictions. Together with my colleagues Jean-Pierre Desclés and Zlatka Guentchéva, we have tackled this problem within the framework of AUG. Here I give a further development of our research recast in terms of the concept of superposition.

What is the status of the agent in the long passive? The usual answer is that the agent in the long passive is a modifier of the passive intransitive verb. This modifier is represented by an oblique case, such as the instrumental in Russian or the ablative in Latin, or by a prepositional phrase, such as *by* + *noun* in English.

This view is inadequate because although the agent in the long passive has the form of an oblique term, it also has the properties of syntactic subject. This can be illustrated by the facts of the Russian syntax. In Russian, as Perlmutter has observed, a syntactic law can be formulated under which reflexive pronouns in passive sentences can refer only to terms that are either subjects or counterparts of subjects in active sentences (Perlmutter and Rosen 1984: 10-12). Compare the following sentences:

(13a)Boris kupil étu knigu dlja sebja.
NOM bought this book for REFL
"Boris bought this book for himself."

(13b)eta kniga byla kuplena **Borisom** dlja **sebja**.
this book-NOM was bought INSTR for REFL
"This book was bought by Boris for himself."

In (13a) the reflexive *sebja* refers to the real subject *Boris*. But in (13b), which is a long passive, the reflexive *sebja* refers to the agentive term in the instrumental *Borisom*, which modifies the passive intransitive

verb *byla kuplena*, but simultaneously retains the properties of the subject, from which it was derived.

In view of similar observations, Perlmutter and Postal (1977) came up with the conclusion that the agentive term in the long passive is not an intransitive predicate modifier or an oblique term, as is commonly believed in contemporary linguistics, but a distinct entity. And since the agentive term in the long passive is neither superficial subject nor direct object, they have invented a new concept to refer to it. Perlmutter and Postal call the agentive term in the long passive *ch™meur (*Perlmutter 1983:3-29). As I have argued elsewhere, the claim that the agentive term is distinct from a modifier of an intransitive predicate is correct. But this is only half the story. The other half is that the agentive term in the long passive also has something in common with predicate modifiers like *by hand*. The relational grammar of Perlmutter and Postal fails to recognize the importance of the identity of the form of the agentive term in the long passive with the form of the predicate modifier. The crucial fact is that the agentive term in the long passive is really a predicate modifier. But simultaneously it is the counterpart of a syntactic subject.

The agent in the long passive has a dual structure: it is <*subject qua predicate modifier*>, that is, predicate modifier superposed on a subject. This superposition is the result of the symmetrical configuration of active and passive constructions. The subject in a passive construction is the counterpart of the direct object in the active construction; and the oblique of the passive construction is a counterpart of the subject of the active construction. The symmetrical configuration of the active and passive constructions also entails the superposition of the two-place predicate property on the passive one-place predicate. As a result, the passive one-place predicate functions as two-place predicate, and the agent of the long passive construction functions as its second term. And the long passive construction functions as the converse of the active construction.

Superficially, one might conclude that we have come up with a traditional view of the long passive construction as the converse of the active construction. This view, favored in the past,

has been mostly abandoned by contemporary linguists. But this conclusion would be false. What is advocated here is that the long passive construction has dual character: it is a unity of two contradictory but simultaneously complementary intransitive and a transitive structures. It is a syncretic structure, a dualistic concept.

Linguistic dualistic concepts are akin to such dualistic concepts as wave-particle in physics. The electron, characterized as a wave-particle, is relativized as to different experimental conditions: under one set of experimental conditions the electron behaves like a particle, and under another set of experimental conditions it behaves like a wave. I call dualistic concepts *centaurs*, thinking of the fabulous creatures of the Greek mythology.

9.9 The Superposition Law and Phonology

Let us now consider superposition in phonology.

Vowels and consonants as phonological concepts are different from vowels and consonants as phonetic concepts.There is a widely explicitly or implicitly held view that the phonological distinction between vowels and consonants must be based on their function inside the syllable. Vowels constitute the center, the nucleus, the peak of the syllable, while consonants are in marginal positions, being the flanking units, the adjuncts of this peak; consonants are satellites of vowels.

This view is not shared by everybody in current linguistic literature. Some linguists accept this view with serious reservations: they say that the distinction between vowels and consonants in phonology may be expedient for some languages, but does not make sense for others. For example, Martinet believes that phonemes can be classified as vowels and consonants according to their function in the syllable, but he makes the following reservation:

> This does not mean that certain sounds cannot, according to the context, function as the syllable peak, which is normal for a vowel, or as the flanking unit of this peak, which is normal for a consonant. [i] in many languages is a syllabic peak before a consonant and the adjunct of such a peak before a vowel: e.g. French *vite* and *viens*. [i] is a syllabic

> peak, i. e. vowel, in the English *battle* or Czech *vlk* "wolf", but a consonant in English *lake* or Czech *léto* "year". In these circumstances there is no point in distinguishing two phonemes, one vocalic and the other consonantal (Martinet 1960:72-73, emphasis added).

The fact that sometimes consonants can be used as syllabic nuclei and vowels as satellites of syllabic nuclei seems to contradict the assumption that the distinction between vowels and consonants based on their function in a syllable is universally valid. And yet, if correctly interpreted, this fact does not undermine the universal validity of this distinction. True, one and the same phoneme may function sometimes as a syllable nucleus and sometimes as a nonsyllabic phoneme in the same language. But we must distinguish between the characteristic function of a phoneme and the complementary one. The difficulty is resolved by the concept of superposition. Thus, the characteristic function of a vowel is as a syllable nucleus, but the complementary of a satellite of a syllable nucleus can be superposed on a vowel so that it functions as a consonant; conversely, the characteristic function of a consonant is that of a satellite of a syllable nucleus, but the complementary function of the syllable nucleus can be superposed on it so that it functions as a vowel.

The distinction between the characteristic and complementary functions of vowels and consonants is based on the range of the phonemes under the Law of Inverse Relation between the Range and the Load of the Sign stated above. By the range of a phoneme I mean its distribution within the syllable. If the range of a phoneme is greater when it is used as a syllable nucleus than when it is used as a satellite of a syllable nucleus, then the characteristic function of this phoneme is that of a syllable nucleus and its complementary function is that of a satellite of the nucleus; and, conversely, if the range of a phoneme is greater when it is used as a satellite than when it is used as a syllable nucleus, then the characteristic function of that phoneme is that of a satellite and its complementary function is that of a syllable nucleus.

Note that the range of a phoneme has nothing in common with the statistical notion of frequency. The range of a phoneme is defined

solely by its distributional properties. For example, the Czech *r* and *l* occur as satellites in syllable-initial and syllable-final positions, while as syllable nuclei they occur only between consonants. Therefore, their characteristic function is that of satellites, while their complementary function is that of syllable nuclei. The French *i* as a syllable nucleus occurs between syllable-initial and syllable-final consonants, between zero onset and syllable-final consonants, between syllable-initial consonants and zero syllable-final consonants; while as a satellite it occurs only before vowels. Therefore, the characteristic function of the French *i* is as a syllable nucleus and its complementary function is that of a satellite. (For more on superposition, see Shaumyan 1987: 201-206, Shaumyan & Segond 1993, Sypniewski 1996.)

9.10 An Explanation of Superposition: Antinomy between the Needs of Flexibility and Stability

As a semiotic mechanism serving as means of communication, language is subject to the action of two opposing needs: social and individual. On the one hand, language is a common possession of the members of a community. The signs of the language must have the same meaning for all members of the community. On the other hand, every individual wants to apply signs to concrete situations where signs have to acquire new meanings that cannot be reduced the meanings of signs that are common to all members of the community. If meanings of signs were fixed and unchangeable, then language would become a simple nomenclature: a list of terms corresponding to a list of things. It is also impossible to conceive of a language whose signs were flexible so much that they would mean nothing outside of concrete situations. Hence, meanings of signs must be both flexible and stable.The meaning of a sign must vary depending on the situation; but it must have some stable, unchangeable part underlying all its variations. Language must meet conflicting needs: social needs require the stability of language, or else members of a community will be unable to communicate; individual needs require a flexibility of language, or else members of a community will be unable to apply signs to concrete situations.

The need to make language flexible causes the sign to express different meanings depending on different situations.That is, this need causes polysemy of the sign. On the other hand, the need to maintain the stability of language restricts polysemy by the requirement that every variation of a sign must be synonymous with some other sign.For example, the word *snake* is polysemous because it is synonymous with another expression. This word denotes an animal, but in the sentence *He is a snake* it is synonymous with "deceitful person'. Similarly, with grammatical polysemy. A noun can have the grammatical meaning of an adjective and an adjective can have the grammatical meaning of a noun but only because in the first case a noun functions as a synonym of an adjective and in the second case an adjective functions as a synonym of a noun. For example, in *time bomb* the noun *time* functions as a grammatical synonym of an adjective, and in *Times are hard for rich and poor alike* the adjectives *rich* and *poor* function as grammatical synonyms of nouns.

The complementarity of polysemy and synonymy involves superposition: every sign has its characteristic meaning but it gets a complementary meaning on top of its primary meaning by superposing with another sign.

The concept of superposition requires that we redefine the traditional concept of polysemy. Consider *Mary bakes a potato* and *Mary bakes a cake.* From a traditional point of view, one may say that the verb *bakes* has different meanings in both sentences. In the first sentence, *bakes* denotes an action directed to an object, and in the second there is no object it is created by the action denoted by *bake.* Actually, this is a spurious ambiguity: the meaning of *bake* is the same in both sentences. What is different is the lexical meaning of the contexts *potato* in the first sentence and of *cake* in the second sentence. These different contexts do not change the meaning of *bake,* but add their own meanings to it.

We come up with a distinction of two kinds of context: 1) *modifying context*, a context that causes a real polysemy of a sign by superposing the sign with another sign; 2) *adding context*, a context that does not change the meaning of a sign but adds its own meaning to the meaning of the sign. We must not confuse real polysemy with spurious polysemy.

Spurious polysemy is parasitic on meanings added to the meaning of a sign by an adding context.

9.11 The Superposition Law and the Problem of Invariance

The proper business of the theory of grammar is the search for invariants as hierarchies of the characteristic and complementary functions of linguistic units. Grammar as stored in consciousness is a system of invariants that are not observable directly; the theory of grammar has to discover them, and thereby it faces the problem of invariance.

What is invariance?

E. T. Bell, an American mathematician, characterizes invariance as follows:

> A comprehensive formal definition of invariance might be difficult to fabricate and unilluminating once it was constructed. The following definition gives the gist of the matter more intelligibly. "Invariance is changelessness in the midst of change, permanence in a world of flux, the persistence of configurations that remain the same despite the swirl and stress of countless hosts of curious transformations." (Bell 1945).

The concept of invariance is important both in mathematics and in science. An immediate example is the conservation of energy as conceived in nineteenth-century physics.

According to Bell and other historians of mathematics, the concept of invariance gained a far-reaching influence on mathematics after Klein published his famous program of 1972 for a unification of the principle geometries. The full import of invariance was recognized only after the formulation of the principle of relativity, that is, after 1916, when Einstein published his book on the general theory of relativity. We may say the same about linguistics, where simultaneously in 1916 the posthumous book on general linguistics by Ferdinand de Saussure appeared. De Saussure defined the basic entities of

linguistics as relative and oppositive and presented the problem of relativity as fundamental for linguistics.

The concept of invariance as a hierarchy of the characteristic and complementary functions of a unit is this: the characteristic function of a unit is invariant of changes of complementary functions of the unit. As was shown in the preceding section, every part of speech is characterized by its characteristic function, i.e., by its invariant property. Search for the characteristic function or meaning of a linguistic category, which I define as a class of linguistic units sharing a common characteristic function or meaning expressed by a common sign form, means search for the invariant property of the linguistic category. Here is another example. Y. D. Apresian contends that the main property of the various meanings of a grammeme ("concrete grammatical category", in my terminology) is lack of a semantic invariant. He says:

> Contrary to a widespread, if not a common view, the main property of the various meanings of a grammeme is, lack of a semantic variant. For example, it is wrong to count "coinciding with the moment of speaking", "preceding the moment of speaking", "following the moment of speaking" as the invariants of the grammemes PRES, PAST, FUT. (Apresian 1995:33).

To make his point, Apresian argues that each of these grammemes can be used in the sense of another grammeme (Apresian 1995:33). True, each of these grammemes can be used so, but this fact confirms rather than refutes the view that the above meanings are invariants of these grammemes.Under the Superposition Law, any grammeme must have a characteristic meaning, invariant under various superpositions of the grammeme with other grammemes. In our case, each of the above grammemes can superpose with another grammeme of this set. A correct analysis of the meanings of these grammemes looks as follows: 1) PRES, PRAES qua PAST, PRAES qua FUT; 2) PAST, PAST qua PRES, PAST qua FUT; 3) FUT, FUT qua PRES, FUT qua PAST.

Obviously, Apresian confuses the notion of the invariant with the questionable notion of general meaning, introduced by Roman Jakobson, who distinguished three kinds of the meaning of a grammatical category:

1) general meaning, 2) principle meaning, and 3) particular meaning. The problem with the notion of general meaning is that it presupposes an inductive generalization from the particular meanings of a grammeme. But inductive generalization works well in natural history, concerned with classifying plants and animals, but breaks down in sciences concerned with relational entities, in sciences such as linguisitcs. General meaning really does not exist. Roman Jakobson and his followers have confused the notion of the invariant with the notion of general meaning, and Apresian is misled by this confusion.

The notion of the characteristic meaning in AUG corresponds to the notion of principal meaning in the works of Roman Jakobson, but he considered principle meaning less important than general meaning and did not identify this notion with that of the invariant. There are other kinds of invariance in AUG such as the invariance of grammatical grammatical structure under changes in its linear or symbolic representation, but all kinds of invariance in AUG are relational constructs rather than generic notions inferred by inductive generalization. The notion of invariance in AUG radically differs from that in the works of Roman Jakobson and his followers.

9.12 The Nucleus Law

Let me now introduce the Nucleus Law:

The Nucleus Law

> Given a binary combination AB of operator A with its operand B, if the grammatical category of combination AB is different from the grammatical category of operand B, then operator A is the nucleus and operand B, the margin of the combination AB. If, on the other hand, the grammatical category of the combination AB is the same as the grammatical category of operand B, then operand B is the nucleus and operator A, the margin of the combination AB. The nucleus can occur outside AB, without a co-occurrence of the margin, whereas the margin occurs only if the nucleus co-occurs. If the nucleus occurs outside the combination AB, then, the nucleus takes on the function of AB on top of its proper function of the nucleus of AB.

Dependency Defined

> Given a binary combination AB of operator A with its operand B, if A is a nucleus of AB, then B depends on A; conversely, if B is the nucleus of AB, then A depends on B.

The Nucleus Law is one of the most significant laws of the semiotic framework. What is the significance of the Nucleus Law?

Sentences and word groups are fundamental syntactic structures. Many linguists recognize correctly that a sentence has a binary structure: it consists of subject and predicate or subject group and predicate group. This binary structure of the sentence is called the *predicative articulation* of the sentence. The binary structure of the sentence contrasts with the binary structure of word groups like noun + adjective ("round table"), noun + prepositional attribute ("the leg of the table"), verb + adverb ("runs quickly"), and so on. The binary structure of word groups is called their *attributive articulation*.

The distinction between predicative and attributive articulation seems to be clear and this distinction does not seem to pose any problems. One cannot see any problem here if one does not distinguish between logical and linguistic concepts.

The terms"subject" and "predicate" are used both in linguistics and logic. Are linguistic concepts of subject and predicate identical with the logical concepts of subject and predicate? No, they are not. The logical concepts of subject and predicate are tied to logical truth conditions which are alien to the true goals of linguistics. The linguistic concepts of subject and predicate must be defined in terms of proper linguistic notions. The confusion of linguistic concepts of subject and predicate with logical concepts of subject and predicate is no less scandalous than the confusion of the linguistic concept of syntax with the logical concept of syntax.

The Nucleus Law offers an illuminating characterization of the concepts of subject and predicate and other syntactic concepts in terms of purely linguistic notions. Tee Nucleus Law captures the essential properties of attributive and predicative structures in terms of precise linguistic concepts.

What is the linguistic characterization of attributive and predicative structures? Let us consider the attributive structure as in

"the blue sky" and the predicative structure as in "the sky is blue" with respect to dependency relations between the components of these structures. The phrases "blue" and "is blue" are comparable as to their semantic dependency. Under the Sign Combination Principle, both "blue" and "is blue" are operators of "the sky" because their meanings are supplemented by the meaning of "the sky". However, under the Nucleus Law, "the sky" is the nucleus of "the blue sky" and the margin of "the sky is blue". In terms of the above definition of dependency, we recognize that the dependency between the binary components of the sentence and the dependency between the binary components of the word group are mutually converse relation: in the sentence, operand (subject) depends on operator (predicate), whereas in the word group, conversely, it is operator (attribute) which depends on operand (any support of attribute, like noun with respect to adjective or verb with respect to adverb).

The above description provides a distinct linguistic characterization of the notions of subject, predicate, and syntactic relations as opposed to logical characterization of these notions.

9.13 The Generalized Nucleus Law

The Nucleus Law can be generalized to define an isomorphism between the structures of the sentence, word, syllable, and phoneme. In order to formulate the Generalized Nucleus Law, I introduce a new concept, the *complex.*

We must distinguish between two replaceable units that belong in one and the same class (for example, two nouns or two phonemes) and two units in a combination (for example, *noun* + *verb*, forming a sentence or *consonant* + *vowel*, forming a syllable), i.e., between two paradigmatic units and two syntagmatic units.

I focus on the derivation relation between replaceable classes which traditionally is called the privative or markedness opposition between two members: *neutral-negative*: *positive*, for example, *lion*: *lioness* or *book*: *booklet*. This opposition can neutralize, so that the first member can replace the second one, but the reverse is impossible. So "I see a

lioness" implies "I see a lion", but "I see a lion" does not imply "I see a lioness". A well-known example of the markedness opposition in phonology is the opposition *voiceless*: *voiced* in many languages, for instance in Russian or Polish: *p* : *b*, *t* : *d*, etc. In comparison with *p*, *t*, etc., the phonemes *b*, *d*, etc. have the mark of being voiced which is absent from *p*, *t*, etc. The voicelessness of the latter is not perceived as a positive mark, but as an absence of voicedness: on the one hand, *p* is defined as a labial stop; on the other, *b* is defined as a voiced labial stop. The content, i.e., the sum of the distinctive features of *b* is richer than the content of *p*. And this difference is reflected in the range of their occurrence: in Russian or Polish, the opposition *p* : *b*, *t* : *d*, etc. suspends at the end of the word in favor of the voiceless members, but at the beginning of the syllable this opposition is always possible. Thus, there are positions common both to voiced and voiceless stops, and positions where only voiceless stops can occur.We see that the range of occurrence of voiceless stops is larger than the range of occurrence of voiced stops. This is an instance of the Law of the Inverse Relation between the Range and Content: *The larger the range of occurrence of a unit, the poorer its content; and, conversely, the smaller the range of occurrence of a unit, the richer its content.* This law is valid both in the phonemic and semantic component of language, as characterized above.

Now, I redefine the markedness opposition as a paradigmatic binary counterpart of a syntagmatic binary unit. I introduce the complex which covers the markedness opposition, the paradigmatic complex and combination, the syntagmatic complex. I interpret the unmarked member of the markedness opposition as the nucleus of the paradigmatic complex and the marked member as the margin of the paradigmatic complex. And I extend the concept of the operator as a device for forming complexes. I interpret the mark of the markedness opposition as an operator forming a paradigmatic complex. We are ready to state the Generalized Nucleus Law:

The Generalized Nucleus Law

Given a complex AB of operator A with its operand B, if the grammatical category of complex AB is different from the grammatical category of

operand B, then operator A is the nucleus and operand B, the margin of the complex AB. If, on the other hand, the grammatical category of the complex AB is the same as the grammatical category of operand B, then operand B is the nucleus and operator A, the margin of the complex AB. The nucleus can occur outside AB, without a co-occurrence of the margin, whereas the margin occurs only if the nucleus co-occurs. If the nucleus occurs outside the complex AB, then, the nucleus takes on the function of AB on top of its proper function of the nucleus of AB.

In a paradigmatic complex, the operator, i.e., the mark, never changes the category of the unmarked member, so, in accordance with the Generalized Nucleus Law, the unmarked member of the markedness opposition is always the nucleus of the paradigmatic complex.

The Nucleus Law is an isomorphic law. It states universal isomorphic constraints on the well-formedness conditions of four types of linguistic units: the sentence, word, syllable, and phoneme. I use the term "unit" as a general term, covering these four types of linguistic units.

The empirical content of the Generalized Nucleus Law may be represented by the *whole-part* and *part-part proportions:*

(14)**WHOLE-PART PROPORTION**

UNIT	SENTENCE	SYLLABLE	DERIVED WORD	MARKED PHONEME
------- =	---------- =	-------=	---------=	----------
NUCLEUS	PREDICATE	CORE	BASE WORD	UNMARKED PHONEME

(15)**PART-PART PROPORTION**

MARGIN	SUBJECT	ONSET	AFFIX	MARK
----- =	------ =	------ =	----- =	----------
NUCLEUS	PREDICATE	CORE	BASE WORD	UNMARKED PHONEME

The Generalized Nucleus Law provides a straightforward explanation of the Unaccusative Hypothesis, the constraints on the syllable

structure, and other phenomena. The phenomenon of neutralization is a special instance of the Generalized Nucleus Law.

Let us consider some examples of the action of the Generalized Nucleus Law.Under the Generalized Nucleus Law, predicate is the nucleus of the sentence and subject is its margin, because predicate belongs in the category "verb" and subject belongs in the category "noun", and the latter is different from the former. The predicate may occur outside a complete sentence. In this case, the predicate superposes with te sentence, so that the predicate represents a sentence. This is a case of impersonal sentences such as Latin *Pluit* "It is raining" or Russian *Morozit* "It is freezing".

There seem to be facts that contradict the Generalized Nucleus Law. There are one-word sentences that cannot be viewed as resulting from the superposition of a predicate with a sentence, for example, *Fire!* or *Shame!* In fact, this type of sentences are beyond the scope of the Generalized Nucleus Law. This law defines precisely the behavior of the nuclei of syntactic constructions. But if a word functions as a sentence, it does not mean that it is the nucleus of the sentence. *Fire!* or *Shame!* belong in "*noun qua sentence*". This means that although they function as sentences, they are not nuclei of sentences. Only a word whose characteristic function is to be a predicate, that is a verb, can serve as a sentence nucleus. As for sentences, the Generalized Nucleus Law applies to the opposition *predicate : subject* and to the neutralization of this opposition, when a verb is used in impersonal and other constructions that do not differentiate between predicate and subject.

As was said before, the Generalized Nucleus Law is an isomorphic law operating on all linguistic structures. So, let us now look at the operation of the Generalized Nucleus Law in phonology by drawing a comparison between the structure of the sentence and the structure of the syllable. A complete syllable consists of three parts: 1) the *nucleus*, represented by a vowel, 2) the *onset*, represented by one or more consonants, preceding the nucleus vowel, and 3) the *coda*, represented by one or more consonants following the nucleus vowel; the combination of the nucleus and coda is called the *core*. For example, in the syllable *start*, *a* represents its nucleus, *st* its onset, *rt* its coda, and *art* its core. A

syllable without a coda is called an *open syllable*, and a syllable with a coda is called a *closed syllable*.

Let us now stipulate correspondences between parts of the sentence and parts of the syllable:

(16)

sentence	**syllable**
predicate	syllable
	nucleus
subject group	onset
predicate group	core

How are these correspondences motivated? Sentences and syllables share a common property of being basic structures: sentences are basic structures of semantics and syllables are basic structures of phonology. Predicates and vowels have in common that they both are constitutive elements of their structures. By "constitutive" I mean those elements that can represent their structures, that is to say, can be the sole components of their structures: a predicate can be the sole component of a sentence, and the vowel can be the sole component of a syllable. The correspondence between the subject group and the onset, on the one hand, and between the predicate group and the core, on the other, is motivated by the fact that the dichotomy *subject group : predicate group* parallels the dichotomy *onset : core*.

To extend the analogy, the syllable and its components can be assigned types corresponding to the syntactic categories. Thus the syllable is assigned the category "sentence". The onset, that is, the consonant or the consonant group immediately preceding the vowel, are assigned the category "noun". Vowels in an open syllable are assigned the category "verb" and those in a closed syllable, the category "transitive verb". The second consonant to the left preceding the vowel is assigned the category "adjective". Depending on the structure of the onset, the third consonant preceding the vowel may be assigned the category "operator changing a noun into an adjective" or "adjective". Depending on its structure, the coda and its components may be assigned categories "noun" or "adverb".

The formal description of superposition also has its counterpart in phonology. Thus, a consonant that functions as a vowel, like *l* in

Czech *vlk,* is assigned the category *"noun qua verb".* A vowel that functions as a consonant, like *i* in French *viens,* is assigned type *" verb qua noun".*

There is a structural parallelism between sentence and syllable. The opposition *core : onset* is isomorphic to opposition *predicate : subject.* The core can occur without the onset, but the onset cannot occur without the core, just as predicate can occur without subject, but subject cannot occur without predicate. Hence we assign the core to the category "verb" and the onset to the category type *"noun".*

Let us now consider what Prince and Smolensky (1993; Bybee 1996) call "the Jakobsonian typology" of the universal preference for CV (consonant-vowel) syllables: all languages allow syllables with onsets, but some languages disallow V-initial syllables. This phenomenon is explained by the Generalized Nucleus Law. Under this law, the complete structure of the sentence is *Predicate + Subject* and the complete structure of the syllable is *Core + Onset.* A syllable without an onset, that is a V-initial syllable, is a reduced syllable just as a sentence without a subject is a reduced sentence. Since the standard structure of the sentence is *Predicate + Subject,* this structure occurs more often than the reduced structure of the sentence. Likewise, the complete structure, that is the CV-structure, of the syllable occurs more often than the reduced, that is V-initial, structure of the syllable without an onset.

Turning now to the structure of the word, we discover that the root of a derived word is its nucleus and the affix of the derived word is its margin: the affix presupposes the root whereas the root does not presuppose the affix. The root may occur without the affix and may superpose with the derived word. For example, in the word *lion-ess*, the root, that is the nucleus, is *lion* and the margin is *-ess* because *-ess* presupposes *lion;* whereas *lion* does not presuppose *-ess:* it may occur independently and, depending on the context, mean a male or a female lion. In the latter case *lion* superposes with *lioness.*

The relation between unmarked and marked phonemes parallels the relation between simple and derived words, in the first place. To see this, consider the *voiceless : voiced* alternation in Russian. Let us denote any unvoiced consonant by *P* and its voiced counterpart by *B.* We discover that *B* can be analyzed into a nonlinear hierarchy *P + Voice.* We discover

that *P* is the nucleus and *Voice* is the margin of *P* + *Voice* because *Voice* presupposes *P* whereas *P* does not presuppose *Voice*, *P* may be used independently. In the word-final position or before unvoiced consonants *P* may either function as *P* proper or superpose with *P* + *Voice*. It is clear, of course, that not only the relation between the nucleus and the margin of a marked phoneme parallels the relation between the nucleus and the margin of a derived word, but that both these relations parallel the relation between the nucleus and the margin of the syllable and the nucleus and margin of the sentence.

10 A Methodological Note on What Must Count as Discovery in Theoretical Linguistics

Doing theoretical linguistics, the vital thing to know is what sorts of questions need to be asked about language. If we are to know what questions to ask about language, we must be clear what kind of things count as discoveries in theoretical linguistics.

It is a common view that progress in theoretical linguistics, that new discoveries in theoretical linguistics depend on the accumulation of data from a large number of language, especially from exotic languages, on building huge linguistic corpora. Is this view valid? Can we expect that the accumulation of linguistic facts and building large linguistic corpora will lead to new discoveries, to a serious progress in theoretical linguistics?

Let's ask the question: What must count as a discovery in theoretical linguistics? If, in theoretical linguistics, someone claims that he has discovered something, what sort of demonstration will justify us in agreeing that whereas it was not previously known, it can be now regarded as known? Is it like that which is required when an explorer discovers a new river, or a botanist discovers a new variety of flower, or an engineer discovers how to build more powerful computers?

10.1 The Proper Business of Theoretical Linguistics is not Accumulation of Data but Conceptual Analysis, Looking for New Ways of Regarding Well-Known Phenomena

Let's repeat: What must count as a discovery in theoretical linguistics? This question will best be answered with the help of an example from AUG. Consider the sign.To many linguists the sign is an obvious, trivial, uninteresting thing. A sign is a sign, is a sign• Who will argue against the obvious that language relates sound and meaning? However, to recognize and state the obvious is one thing, and to discover unexpected implications of the obvious is another. To recognize that language relates sound and meaning is one thing, and to discover the crucial aspects of this relationship is another. The Law of the Sound-Meaning Bond is the discovery of this crucial relationship. Let's recall it:

> .The only distinctions between meanings that are semiotically relevant are those that correlate with the distinctions between their phonic expressions, conversely, the only distinctions between phonic expressions that are semiotically relevant are those that correlate with the distinctions between their meanings. Given two meanings that do not correlate with the distinctions between phonic expressions, they belong in the same class of meanings; and, conversely, given two phonic expressions that do not correlate with the distinction between meanings, they belong in the same class of phonic expressions.

The Law of the Sound-Meaning Bond presents a new way of regarding the old, recognized by every linguist phenomenon that language relates sound and meaning.

10.2 New Viewpoints Bring New Inferential Techniques

What does the Law of the Sound-Meaning mean? What is the significance of this law? To answer this question, we must examine how the Law of the Sound-Meaning Bond enters into a linguist's explanations. As was shown above, the Law of the Sound-Meaning Bond in connection with the Superposition Law brings a distinction between *semantic* and *subsemantic* contexts. Semantic contexts are signs that change

the meanings of linguistic units by superposition. Subsemantic contexts add to or subtract from the meanings of linguistic units they act on, but they do not change them. The distinction of semantic and subsemantic contexts in the analysis of the meaning of linguistic units has a counterpart in phonology. In phonology, we must distinguish *phonemic* and *subphonemic* contexts.

The distinction of the semantic and subsemantic contexts leads to a new technique of linguistic analysis. Using the new technique, we establish classes of meanings and classes of signs by researching how distinctions between meanings and distinctions between signs correlate with each other.

If we accept the notion of linguistic reality as characterized by the Law of the Sound-Meaning Bond, then we must consider any conduct of linguistic inquiry incompatible with this law an activity producing a distorted representation of linguistic reality. It was shown above that generative phonology and generative semantics use wrong techniques of analysis based on wrong principles.

We see that the Law of the Sound-Meaning Bond comes with a novel method of drawing linguistic inferences. The new way of regarding of the well-known common phenomenon that language relates sound and meaning brings with it a fresh way of drawing inferences about linguistic phenomena.

Inferring techniques are the core of discoveries. The important thing to notice is that the Law of Sound-Meaning Bond is not a result of generalization from a wide variety of linguistic facts drawn from a wide variety of languages. Rather it is a result of a conceptual analysis of a simple, well-known and commonly recognized fact. Theoretical inquiry is not concerned with generalizations from a wide variety of data from a wide variety of languages. Neither is it concerned with hunting for exotic data from exotic languages. The proper business of theoretical linguistics is conceptual analysis of common, well established facts. Mysteries are inside of what seems simple. Language universals are inside of common, well established facts.The art of theoretical inquiry is to see complexity in simplicity, and, conversely, to see simplicity in complexity, often,

things that seem complex are really simple and things which seem simple are really complex.

The approach taken here is not meant to imply that theoretical linguistics is "nothing but" new ways of regarding well-known phenomena. What I have said is not to deny the value of cross-linguistic research, to deny the importance of problems raised by the discovery of new empirical data. Furthermore, any new hypothesis calls for a search for new facts providing counterexamples to the hypothesis. However, the focus of theoretical inquiry, the focus of the study of language universals are common, well established facts.

11 A Methodological Note on the Theory of Grammar

Many linguiststs assert that a linguistic theory must deal with all aspects of language. For example, those linguists who accept the functional view of language as a system of signs and an instrument of communication insist that a theory of language must include the study of all processes in which human activities are integrated by means of signs. On this view, a linguistic theory must include all aspects of signification, all aspects of contextualization, all aspects of the content of communication, all psychological, logical, social, anthropological aspects of communication, and other large topics.

Such a linguistic theory is not a productive notion because combining heterogeneous aspects of language into a coherent system of intersting and testable hypotheses is hardly possible, at least at present or in a forseeable future. What is realistic is to focus on a limited but on an essential field of reasearch - grammar. Grammar constitutes the essence of language. The theory of grammar is a special field of linguistics-*the study of the universals of grammar.* The theory of grammar is neither the theory of language in the traditional sense of a theory of covering all aspects of language nor a theory of communication. The theory of grammar is a field of linguistics in the same sense as, say, quantum mechanics is a field of physics. I repeat: the theory of

grammar is neither a theory of language nor a theory of communication; the theory of grammar is just that - *the study of the universals of grammar*. One may consider the theory of grammar boring or interesting, dull or exciting; one may choose or may not choose to study universals of grammar. But, studying universals of grammar, one should not expect things which this field of linguistics does not offer.

The traditional wide notion of grammar covers both grammar proper and phonology. The term "grammar" is used with a systematic ambiguity: it refers, on the one hand, to a special kind of mechanism stored in the speakers' minds, on the other, to the explicit theory constructed by the linguist and proposed as a description of this mechanism.

Any language has an outstanding, but commonly overlooked, feature, which Sapir called *formal completeness* by analogy with mathematical systems such as a number or a geometrical system. To pass from one language to another is psychologically parallel to passing from one geometrical system of reference to another.

The important thing to notice is that the formal completeness of language has nothing to do with its lexicon. As the formal part of language, grammar sharply differs from the lexicon.

As Sapir has put it:

> Formal completeness has nothing to do with he richness or the poverty of the vocabulary. It is sometimes convenient, or, for practical reasons, necessary for the speakers of a language to borrow words from foreign sources as the range of experience widens. They may extend the meanings of words which they already possess, create new words out of native resources on the analogy of existing terms, or take over from another people terms to apply to new conceptions which they are introducing. None of these processes affects the form of the language, any more than enriching of a certain portion of space by the introduction of new objects affects the geometrical form of that region as defined by an accepted mode of reference. It would be absurd to say that Kant's "Critique of Pure Reason" could be rendered forthwith into the unfamiliar accents of Eskimo or Hottentot, and yet it would be absurd in but a second degree. What is really meant is that the culture of this primitive folk has not advanced to the point where it is of interest to them to form abstract conceptions of a philosophical order. But it is

> not absurd to say that there is nothing in the formal peculiarities of Hottentot or Eskimo which would obscure the clarity or hide the depth of Kant's thought, indeed, it may be suspected that the highly synthetic and periodic structure of Eskimo would more easily bear the weight of Kant's terminology than his native German. Further, to move to a more positive vantage point, it is not absurd to say that both Hottentot and Eskimo possess all the formal apparatus that is required to serve as matrix for the expression of Kant's thought. If these languages do not have the requisite Kantian vocabulary, it is not the languages that are to be blamed but the Eskimo and the Hottentots themselves. The languages as such are quite hospitable to the addition of a philosophic load to their lexical stock-in-trade. (Sapir 1949: 153-154.)

The theory of grammar is central to linguistics as the study of the formal completeness of language. We must distinguish sharply facts of grammar and facts of the lexicon. The necessity to sharply distinguish between grammar and the lexicon was emphasized by Sapir. He acknowledged the parallelism of language and culture as it concerns the lexicon. But he denied that this parallelism is of interest to the linguist as a theoretician. Thus, he stated:

> In the sense that the vocabulary of a language more or less faithfully reflects the culture whose purposes it serves it is perfectly true that the history of language and the history of culture move along parallel lines. But this superficial and extraneous parallelism is of no real interest to the linguist except in so far as the growth or borrowing of new words incidentally throws light on the formal trends of the language. The linguist student should never make a mistake of identifying a language with its dictionary. (Sapir 1949:219).

12 Genotype Calculus as a Mathematical Model of Universal Grammar

AUG uses a variable-free formal language, called *Genotype Calculus*, as its formal framework. Genotype Calculus is an applicative semiotic system used as a formal metalanguage for describing natural languages.

Although AUG can be presented precisely entirely in terms of ordinary English, ordinary Russian, or any other ordinary non-formal language, enriched by technical terms, Genotype Calculus makes the presentation of AUG more compact and transparent. Therefore, I use Genotype Calculus whenever it is convenient.

Genotype Calculus includes: 1) a calculus of types, or categories: 2) a calculus of combinators. Both calculi are based on the corresponding calculi of combinatory logic. Here I will present only the calculus of types.

Like the Lambek Calculus, the AUG Calculus can be traced back to so called categorial grammar in the works of Lesniewski and Ajdukiewicz. The term "categorial grammar" is incorrect. Categorial grammar is not grammar at all. Rather it is a mathematical machinery which can be applied to very different, even incompatible theories. The best illustration of this is a comparison of the use of the calculus of types in Montague Grammar and various theories based on the Lambek Calculus. As shown in Shaumyan 1987:253-57, Montague Grammar has nothing to do with linguistics. As to what I think of the use of Lambek Calculus, will be said below.

In AUG, *sign* is taken as a primitive notion. There are three fundamental types, or categories, of signs: *terms, sentences,* and *operators*. The first two types we call *closed signs* in contradistinction to operators. AUG recognizes two kinds of signs: 1) atomic signs, and 2) composite signs constructed from atomic signs. By convention, we identify atomic signs with *words*: every atomic sign is a word. Hence, sign and atomic sign (or word) are primitives of AUG. By convention, we identify a *combination of atomic signs* (a *composite sign*) with a *word combination.*

For classification of signs into *types,* or *categories,* we need four sorts of primitive notions:

a. laws of isomorphism between sentence, word, syllable, and phoneme, I will interpret *s* as "complex" and *t* as "margin". The motivation for this interpretation will be explained later.

b. Rules for constructing composite types from primitive ones.

c. Axioms assigning certain types to atomic signs (which are words, by convention).

d. Rules for inferring the type of a composite sign (a word combination, by convention) when the types of its components are known. These include: 1) the application operation, 2) combinators, 3) natural deduction.

As an applicative system, Genotype Calculus is based on the Applicative Principle:

APPLICATIVE PRINCIPLE. AN N-PLACE OPERATOR CAN ALWAYS BE PRESENTED AS A ONE-PLACE OPERATOR THAT YIELDS AN (N-1)-PLACE OPERATOR AS ITS RESULTANT.

Inasmuch as we postulate an applicative system, all we need is a means of inferring that *AB* belongs to a certain type determined by types of *A* and *B*. Intuitively, this will be the case if *A* is an operator. If *x* and *y* are types, the operator that changes *x* into *y* also forms a type. If we designate this type as:

Oxy,

where *O* is a new primitive operator (called type constructor), then the rule of classifying obs may be formulated thus: "If *A* is in *Oxy* and *B* is in *x*, then *AB* is in *y*". Now we define the formal concept of *sign type* as follows:

a. The *t* and *s* are sign types.

b. If *x* and *y* are sign types, then **O***xy* is a sign type.

Taking *t* and *s* as primitives, we may generate an inductive class of types as follows: *t, s, Ott, Oss, Ots, Ost, OtOts, OOtsOts*, and so on.

In representing types we use the parenthesis-free Polish notation, which is more convenient than Curry's notation with internal parentheses.

The axioms assigning signs to types are defined by type-assignment axiom scheme:

x A

where *x* is a sign type and A is a sign. This axiom scheme is interpreted as: "sign A belongs to type *x*".

We assume the following constraints on type assignment:

1. **Inclusion**: Every atomic sign is assigned a characteristic type.
2. **Exclusion**: No sign belongs to more than one characteristic type.

3. **Superposition**: Every sign can be assigned complementary types superposed on its characteristic type.

The basic deductive process is specified by the Combination Rule:

COMBINATION RULE. IF SIGN A BELONGS TO TYPE OXY AND SIGN B BELONGS TO TYPE X, THEN THEY COMBINE TO YIELD (AB) OF TYPE Y:

OXY A X B

Y AB

To make the AUG notation compact, the concept of the recursively defined *adjoined symbol* is used (Shaumyan 1987:199):

A type symbol is called **ADJOINED** IF IT IS INTRODUCED INTO THE TYPE SYSTEM BY A DEFINITION OF THE FORM:

Z=**O**XY,

WHERE Z DENOTES AN ADJOINED TYPE AND **O**XY DENOTES A TYPE WHERE X AND Y ARE EITHER OTHER ADJOINED TYPE SYMBOLS, OR T, OR S.

We introduce adjoined type symbols recursively by a process called *definitional reduction.* By this process all adjoined type symbols are defined in terms of the ultimate definientia *t* and *s.* We can introduce as many adjoined type symbols as we need. Here are some examples of definitional reduction for adjoined type symbols that will be useful later:

(17) $p_{1 = Ots}$

p_2 = Otp1 = OtOts

p_3 = Otp2 = OtOtOts

d_1 = Op1p1 = OOtsOts

d_2 = Op2 p2 = OOtp1Ot p1 = OOtOtsOtOts

The canonical word order requires that an operator precedes its adjacent operand. For example, the canonical form of *My brother, who is a nice guy, likes chocolate* is: *(((likes chocolate) (my (who is (a nice guy)) brother)))*.

An important property of natural language is that there is a unique construction process in terms of the application operation. Curry calls this property *monotectonic* as opposed to a *polytectonic* one. In terms of algebra, "monotectonic" means *non-associative* and "polytectonic" means *associative.* To express this property, I formulate the Principle of Monotectonicity;

PRINCIPLE OF MONOTECTONICITY. IN THE APPLICATIVE SYSTEM OF NATURAL LANGUAGE, EVERY SIGN IS CONSTRUCTED BY THE APPLICATION OPERATION IN A UNIQUE WAY SO THAT DIFFERENT CONSTRUCTIONS DEFINE DIFFERENT SIGNS.

The Principle of Monotectonicity is one of the fundamental principles of AUG. It is unique to AUG and marks a watershed between conceptual and formal fundamentals of AUG and all current associative versions of categorial grammar based on the Lambek Calculus (Lambek 1958).

Superposition Law

SUPERPOSITION LAW. IF IN A GIVEN CONTEXT C A UNIT A TAKES ON THE FUNCTION OF THE UNIT B AS ITS COMPLEMENTARY FUNCTION, A SYNCRETIC UNIT <A QUA B> IS FORMED. WE SAY THAT A AND B ARE **SUPERPOSED** IN THE SYNCRETIC UNIT <A QUA B>, AND WE CALL THE OPERATION OF FORMING <A QUA B> THE **SUPERPOSITION** OF A WITH B. GIVEN "A QUA B", A IS CALLED THE **BASIS**, AND B THE **OVERLAY**.

Qua-units are governed by the following principles:

1. **Existence**. The qua-unit "x qua y" exists in a given context C if the unit *x* is superposed with the unit *y*.
2. **Identity**. A qua-unit is distinct from its basis. Two qua-units are the same only if their bases and **Inheritance**. In any context *C* in which a qua-unit exists, it has those normal properties possessed by its basis.

DEFINITION OF SUPERPOSER. AN OPERATOR R OF TYPE "X'X QUA Y" SHALL BE CALLED A SUPERPOSER.

RULE OF SUPERPOSITION.

"x'x qua y" A x B

"x qua y" AB

Symbol *A* is a variable standing for an operator, and *B* is a variable standing for an operand. The expression enclosed in angle brackets indicates type *x* on which type y is superposed. This rule may be interpreted as follows: Let *A* be an expression of type "*x'x qua y",* which means that *A* is a superposer. Then, if *A* is applied to *B* of type *x*, we obtain a combination *AB* of type "*x qua y".*

12.1 Pitfalls of the Lambek Calculus

Here's an example of the use of the Lambek Calculus. Generalized Categorial Grammar is based on the Lambek calculus (Moortgat 1988). The Lambek Calculus is associative. The associativity of categorial calculus means that a sentence can be bracketed in every possible way. Moortgat motivates the use of the associative Lambek Calculus as follows:

> The application analysis for John loves Mary is strongly equivalent to the conventional phrase-structure representation for a sequence subject-transitive verb-direct object, with the transitive verb and the direct object grouped into a VP constituent. Suppose now that we not so much interested in constituent structure, as commonly understood, but rather in the notion of derivability, that is, in the question: Given a sequence of input types (viewed as sets of expressions), what type(s) can be derived from the concatenation of the input sentences? It will be clear that the result type S would also be derivable if the transitive verb had been assigned the type NP\(S/NP) instead of (NP\S)/NP (Moortgat 1991: 148).

As a mathematical model, the associative Lambek Calculus is impeccable. But what does this sophisticated formalism offer to a linguist? It teaches us nothing about the constituent or dependency structure of a sentence. It is not clear how a linguist can use this calculus unless he or she enjoys tinkering with mathematical symbols.

The motivation for postulating associativity as an essential property of the Lambek Calculus has nothing to do with the theoretical

goals of linguistics. The postulating of associativity is motivated solely by the consideration of convenience: an associative calculus is much more convenient for parsing a string of words in a purely mechanical fashion. The trouble is that the sentences of a natural language have a non-associative structure. And if we want to understand their structure, we have no choice but to construct a non-associative calculus. This may be a much more difficult task, but we must have the courage not to compromise the truth.

The crucial question about a mathematical model of language does not concern the intrinsic formal virtues of the model itself, but its usefulness in illuminating the understanding of language. In connection with the Lambek calculus an old story about a drunk comes to mind. According to the story, a drunk was searching under a street lamp for his house keys which he had dropped some distance away. When some one asked him why he was not looking where he had dropped them, he replied: "There's more light here".

Conclusion

The fundamental characteristic of language that emerges from the comparison of the semiotic and non-semiotic paradigms is the duality of sound and meaning, which is the consequence of the Law of the Sound-Meaning Bond and the Superposition Law. We must distinguish between the value and the worth of sound and between the value and the worth of meaning. In accordance with the distinction between the value and the worth of sound and between the value and worth of meaning, we distinguish between two kinds of context: 1) *modifying context*, a syntactic or semantic context that generates multiple syntactic functions or a real polysemy of a sign by superposing the sign with another sign; 2) *adding context*, a context that does not change the meaning of a sign but adds its own meaning to the meaning of the sign. We must not confuse real polysemy with spurious polysemy. Spurious polysemy is parasitic on meanings added to the meaning of a sign by an adding context.

The duality of sound and meaning has far-reaching consequences. We must distinguish between two levels of the study of sound-*structural phonetics* (phonology) and *natural phonetics*-and two levels of the study of semantics-*structural semantics* and *natural semantics.* Structural phonetics and structural semantics is concerned with the action of the Law of the Sound-Meaning Bond and the Superposition Law and all laws formulated within the structural space defined by these two laws. Both structural phonetics and structural semantics are concerned with structural phonemic variants and structural semantic variants generated by supplementary functions added to characteristic functions of sign and phonemes. By contrast, natural phonetics and natural semantics are concerned with adding phonetic and semantic contexts. The focus of their study is rich phonetic variants of sounds and variants of signs generated by adding contexts. Both disciplines formulate rules of addition due to adding contexts, for example, rules of the assimilation of sounds or a semantic counterpart of these rules.

The source of the structures of sound and meaning is consciousness. Consciousness is not a passive reflection of reality. Rather consciousness is an active factor that imposes structures both on language and on our total perception of the world. The theory of grammar is concerned with the structure of meaning and the structure of sound. As to the structure of meaning, the theory of grammar focuses solely on grammatical meaning as the single essential property of language, with a complete exclusion of lexical meaning.

The theory of grammar is concerned with grammatical structure rather than with its the linear representation or its representation by various symbolic means (including order of words when it functions as a symbolic means).

The theory of grammar uses a multidimensional abstraction: 1) it abstracts the structures of meaning and sound from their contents; 2) It abstracts grammar from the lexicon; 3) it abstracts grammatical structure from its symbolic and linear representation; 4) it abstracts relevant contexts from irrelevant ones.

The theory of grammar is concerned with the discovery of the laws defining the isomorphic properties of the sentence, the syllable, the word, and the phoneme.

The Superposition Law is central to the theory of grammar. It defines the invariance of the characteristic function of a grammatical unit with respect to the changes of its complementary functions. The Superposition Law defines the isomorphic properties of the sentence, the syllable, the word, and the phoneme.

Other laws of the theory of grammar define the invariance of the other dimensions of grammatical structure. For example, the Law of the Sound-Meaning-Bond defines invariance of the structures of sound and meaning with respect to changes of their contents; the Transfer Law defines the invariance of grammatical structure with respect to the changes of its symbolic representation; the Nucleus Law defines the invariance of the nucleus of the binary complex with respect to the changes of its margin-also the Nucleus Law defines the invariance of the isomorphic features of the sentence, the syllable, the word, and the phoneme with respect to the changes of their non-isomorphic features; and so on.

The theory of grammar studies how language and consciousness interrelate and thus contributes to the epistemology of consciousness and language. Language and consciousness as a semiotic problem is an important topic for research in which both linguists and philosophers should be interested.

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