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228

Foreword

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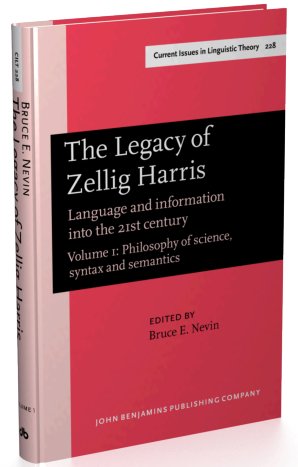

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Foreword

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The contributions to this volume reflect the influence that Zellig Harris has had in syntax, semantics, mathematical linguistics, discourse analysis, informatics, philosophy (philosophy of science in particular), phonology, and poetics, and even, as we see here, in the design of computer user interfaces — not considering in this context his influence in the understanding of social and political change through discussions and writings relating to what was called the Frame of Reference for Social Change (F.O.R.) as epitomized in Harris (1997). His career spanned almost sixty years, and contributors include colleagues from several continents and students from the 1930s through the 1980s. However, this is not a Festschrift or a Memorial Volume, something to which Harris was adamantly opposed throughout his life. The only criterion for inclusion was that some relationship to Harris's work be clearly represented, and contributions critical of Harris's views were explicitly invited. As may be expected, many of those invited declined because of prior commitments during the time available for the project, or for other reasons. One demurral that may interest some readers is that of Harris's most well-known student, Noam Chomsky, of which more will be said presently.

To make evident the cohesiveness of the themes and issues represented in these volumes and their particular importance to any science of language, we first consider their origins. Then we survey the contents of this volume. Finally, we indicate equally germane lines of research that are not represented here, and that also call for further development. A comprehensive bibliography of Harris's writings, compiled by Konrad Koerner, appears at the end of this volume.

1. Origins

Harris's long career at the University of Pennsylvania began in the Department of Oriental Studies with a strikingly insightful Master's thesis in 1932 on the

accidental origin of the alphabet from the misinterpretation of Egyptian hieroglyphics by neighboring peoples as an acrophonic system — a fortuitous mistake because "writing systems do not otherwise naturally reach single sound segments" (Harris 1991:169).[1] This is of particular interest because it hinges on the phonemic contrasts which make language possible and on problems of the phonemic representations which make linguistics possible. Two years later, he submitted a descriptive grammar of the Phoenician language as his PhD dissertation in the same department (published in 1936 by the American Oriental Society). He published a number of other works in Semitic linguistics in the 1930s and as late as the grammatical sketch of Hebrew (Harris 1941a).

But even during this early stage he was working more generally in descriptive linguistics[2] and was deeply concerned with its methodology. Although the first indication in his bibliography of these broader concerns is the work with Carl Voegelin on Hidatsa (Lowie 1939), he was already developing the substitution grammar of (Harris 1946) and presumably was doing discourse analysis (published for Hidatsa in (Harris 1952a)), because as early as 1939 he was teaching his students about transformations[3] which by his own account arose out of the work on discourse analysis. As he says in the introductory essay of this volume, the close interrelationships and general character of these three aspects of language structure — discourse structure, transformations, and relations of substitutability yielding a grammar of constructions — were evident from the outset, though obviously not in detail. With these insights came the task of working them out, not as philosophical claims supported by episodic examples, but with full responsibility to the data of language. We turn now to the nature of that responsibility, and why it is important.

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1. The 1932 thesis is summarized in (Harris 1933) and briefly recapitulated in (Harris 1991:168–171) with references to subsequent research. The *OED* defines 'acrophony' as "the use of what was originally a picture-symbol or hieroglyph of an object to represent phonetically the initial syllable or sound of the name of the object; e.g. employing the symbol of an *ox,* '*aleph*,' to represent the syllable or letter *a*."

2. The term 'structural', very much a term to conjure with in post-war social sciences, was substituted for 'descriptive' in the title of Harris (1951[1946]) by editors at the University of Chicago Press. With some amusement, Harris told me (in conversation in 1969) that he didn't remember whether they had asked him or not.

3. Lisker, in email of 1 March 2000 to Bruce Nevin.

1.1 Unavailability of a prior metalanguage

Already in the reviews of Gray's *Foundations of Language* and Trubetzkoy's *Grundzüge* (Harris 1940 and 1941b) we see the methodological principles that directed his research for the next 50 years. The most important of these is that fundamental limitation which he later articulated as the unavailability of any a priori metalanguage in which to define the objects and relations in a language. In the essay that introduces this volume, Harris says that

> since it is impossible to define the elementary entities and constraints of a language by recourse to its metalanguage (since the metalanguage is itself constructed from those entities by means of those constraints), it follows that the structure of language can be found only from the non-equiprobability of combinations of parts. This means that the description of a language is the description of contributory departures from equiprobability, and the least statement of such contributions (constraints) that is adequate to describe the sentences and discourses of the language is the most revealing.

In any other science, the structures and informational capacities of language are tacitly assumed as a given, insofar as these resources of language are freely used to describe the subject matter of the field, but for linguistics they *are* the subject matter. The consequence is that the work of linguistic analysis can be carried out only in respect to co-occurrence relations in the data of language — what had come to be called distributional analysis.

1.2 An illustration in phonology

Harris did not put this in terms of a 'metalanguage' in the 1930s and 1940s, but it is not difficult to see that his later formulation is merely a new way of stating the reason for limiting investigation "to questions of distribution, i.e. of the freedom of occurrence of portions of an utterance relatively to each other" (Harris 1951[1946]:5). One way to show this is by a brief excursus into Harris's discussion of phonology in those early years.

In the review of Trubetzkoy (Harris 1941b:707), he said that "phonemes are not absolute but relative [. . .] what is relevant in phonemics is only the contrast between one group of sounds and another." This was not a new conception. As de Saussure put it (quoted by Ryckman in this volume) phonemes are "wholly contrastive, relative and negative". To identify phonemes relative to one another, one begins with "differences between morphemes, which is precisely the criterion for determining phonemes" (Harris 1941a:

147). Native speakers judge whether two utterances contrast or are repetitions. A segmentation of utterances (if need be, this can be an arbitrary segmentation to start with) serves to locate the distinctions relative to one another within each utterance, and to associate them with phonetic descriptors. Then

> [. . .] for convenience, we [. . .] set up as our elements not the distinctions, but classes of segments so defined that the classes differ from each other by all the phonemic distinctions and by these only. [. . .] The classes, or phonemes, are thus a derived (but one-one) representation for the phonemic distinctions. (Harris 1951[1946]:35)

Subsequent distributional analysis refines the segments and relations among them while at each stage of re-analysis preserving that one-one or 'biunique' mapping to the fundamental data of contrast.

Continuing with the review of Trubetzkoy, and bearing in mind that phonemic segments are always in one-one correspondence to the phonemic contrasts that they represent, not to the phonetic descriptors or 'phones' with which they are associated:

> [. . .] it is pointless to mix phonetic and distributional contrasts. If phonemes which are phonetically similar are also similar in their distribution, that is a result which must be independently proved. For the crux of the matter is that phonetic and distributional contrasts are methodologically different, and that only distributional contrasts are relevant while phonetic contrasts are irrelevant.
>
> This becomes clear as soon as we consider what is the scientific operation of working out the phonemic pattern. For phonemes are in the first instance determined on the basis of distribution. Two positional variants may be considered one phoneme if they are in complementary distribution; never otherwise. In identical environment (distribution) two sounds are assigned to two phonemes if their difference distinguishes one morpheme from another; in complementary distribution this test cannot be applied. We see therefore that although the range of phonetic similarity of various occurrences of a phoneme is important, it is the criterion of distribution that determines whether a given sound is to be classified in one phoneme or another. And when, having fixed the phonemes, we come to compare them, we can do so only on the basis of the distributional criterion in terms of which they had been defined. As in any classificatory scheme, the distributional analysis is simply the unfolding of the criterion used for the original classification. If it yields a patterned arrangement of the phonemes, that is an interesting result for linguistic structure.
>
> On the other hand, the types and degrees of phonetic contrast (e.g. whether all the consonants come in voiced and unvoiced pairs) have nothing to do with the classification of the phonemes; hence they do not constitute a necessary patterning. (Harris 1941b:709–710)

What Harris rejects here is the notion advanced by Trubetzkoy and others that phonetic distinctions are relevant for determining phonemic contrasts, instead of being more or less useful for representing them in an organized way. Bloch (1953) attempted to derive phonemic contrasts from distributional analysis of phones rather than taking the contrasts as the primitive data. Like many linguists, he assumed that "the facts of pronunciation [are] the only data relevant to phonemic analysis" (Bloch 1941:283), and that each phonemic segment has a one-one or 'bi-unique' correspondence to a phonetic characteristic. Chomsky (1964) inveighed against this view.[4] These are, in different ways, attempts to define phonemes absolutely by locating them in a descriptive framework that is already defined prior to one's working on the given language. Such a framework is a set of statements as to what is possible for languages. These are, obviously, metalinguistic statements, therefore in the metalanguage for natural language.[5] But, as we have seen, such statements cannot be formulated and communicated other than in language.[6] The metalanguage makes use of the resources of language, so it cannot be presumed for purposes of determining what those resources are. Absent an external, prior metalanguage, definitions can only be relative.

This is not to say that there are no absolutes in phonology. However, these absolutes, the foundation data for linguistics, are not defined in articulatory or acoustic terms, nor functionally, but in terms of native speakers' perceptions of contrasts (distinctions) between utterances.[7] The relation of type to token

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4. Halle (1954:335), Chomsky (1957:234), and Chomsky (1975:34, 91–93) refer to the pair test as a fundamental cornerstone of linguistics, which entails that perceptions of contrast are the primitive data of phonology. However, they reject the corollary "that only distributional contrasts are relevant while phonetic contrasts are irrelevant" (Harris 1941b:709), and the consequences that this has for the enterprise of a *phonetically* defined universal alphabet of *phonemically* distinctive features. For further discussion see Nevin (1995).

5. More carefully: a statement that is universal, as these purport to be, is a fortiori a statement about any given language and therefore in the metalanguage for that language.

6. Symbolic and mathematical representations depend upon language for their definitions and function as convenient graphical abbreviations that in any science are in practice routinely read out as sentences in oral presentations. Even mathematics depends upon the 'background vernacular' of language, although, as Borel (1928:160) notes, this is usually unnoticed.

7. To be sure, the study of phonetics is systematized in a theoretical framework, and in the interaction of speech physiology and acoustics there can be preferential 'affordances' for effecting the contrasts of languages (to borrow Gibson's term without buying with it his

has its root here, in the distinctions that language users make between different utterances, ignoring differences that make no difference when one utterance is a repetition of another. Edward Sapir, who regarded Harris as his intellectual heir,[8] brought this psychological reality to the fore, and "is remembered especially as one who emphasized the need to study what speakers know and believe (perhaps unconsciously) about their language, not simply what they do when they speak" (Anderson 2001:11).

The locations of the contrasts relative to one another within utterances, and their association with phonetic features of speech, are determined by various substitution tests, the most exacting form of which is the pair test (Harris 1951[1946]:32, 38–39, 1968:21–23). Distributional criteria enable us to derive "fewer and less restricted elements" (Harris 1951[1946]:59) that preserve this one-one correspondence to the distinctions, but the distinctions remain the fundamental data, and all the rest is a matter of working out a perspicuous physical representation for them. Harris never confused the representation with the reality.[9]

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psychology), as in 'quantal' aspects of speech. But even if all languages *can* be represented phonemically by a universal alphabet of phonetically specified elements — be it said, the question of the "intrinsic content of features" raised in Chomsky & Halle (1968) remains unresolved today — the contrasts that those elements represent must be determined relative to each other for each language individually, and only then can they be specified using that alphabet. The principle gain of such an alphabet is the direct comparability of language structures, which interested Harris greatly, but for that purpose real differences of structure must not be suppressed by a demand for universality.

8. P.c. Victor Golla, May 1992, reporting conversation with Helen Sapir Larsen, who dated Harris in New Haven, reconfirmed in email of 18 Dec. 2001; also p.c., Regna Darnell, 31 Oct. 1997, reporting her own conversations with Sapir's children.

9. After the writings of the 1940s cited above, Harris said little more about phonology, probably because for linguistics beyond phonology it matters little how morphemes are represented so long as they are reliably distinct. Indeed, even a representation so notoriously imprecise and inconsistent as standard English orthography is routinely used for study of syntax and semantics, and suffices even for the stochastic procedure giving a preliminary segmentation of utterances into morphemes (Harris 1955). Of course, syntactic and semantic phenomena influence details of phonology pertaining to stress, intonation, and the like, and a few encapsulated relations such as rhyme and sound symbolism go the other way, but these are probably elaborations of pre-language modes of communication that are not unique to language, and in any case do not bear on the informational capacity of language, which was Harris's primary interest.

1.3 The role of linguistic intuitions

Another early statement of Harris's methodological stance is in the review of Gray's 1939 book (Harris 1940), where he says that intuitive apprehensions of *langue* cannot be used a priori in linguistics as means for identifying and accounting for regularities that may be observed in *parole*:

> With an apparatus of linguistic definitions, the work of linguistics is reducible, in the last analysis, to establishing correlations. [. . .] And *correlations between the occurrence of one form and that of other forms yield the whole of linguistic structure.* The fact that these correlations may be grouped into certain patterned regularities is of great interest for psychology; but to the pattern itself need not be attributed a metaphysical reality *in linguistics.* Gray speaks of three aspects of language [. . .], basing himself on the langue-parole dichotomy of de Saussure and many Continental linguists. This division, however, is misleading, in setting up two parallel levels of linguistics. 'Parole' is merely the physical events which we count as language, while 'langue' is the scientist's analysis and arrangements of them. The relation between the two is the same as between the world of physical events and the science of physics. The danger of using such undefined and intuitive criteria as pattern, symbol, and logical a prioris, is that *linguistics is precisely the one empirical field which may enable us to derive definitions of these intuitive fundamental relationships out of correlations of observable phenomena.* (Harris 1940: 704; emphasis added)

The patterning and structure found by the scientist in language may (and surely does) have a 'metaphysical reality' and significance outside of linguistics, but not within linguistics, on pain of question-begging.

The same considerations may be seen not just in phonology but also in Harris's treatment of all aspects of language, including of course syntax and semantics. Informant perceptions of contrast vs. repetition may be considered to be one kind of 'mental' data.[10] The second kind of 'mental' data in

10. The term is used here advisedly, given commonplace attributions of 'anti-mentalism' to Harris. "In practice, linguists take unnumbered short cuts and intuitive or heuristic guesses [but it is necessary then] to make sure that all the information [. . .] has been validly obtained" (Harris 1951[1946]: 1–2). These mentalist intuitions and guesses, which are notoriously unstable and difficult to control, must be validated. The requirement is "not so much to arrive at [plausible] conclusions, as to arrive at them from first principles, from a single method which is [. . .] essential because of the lack of an external metalanguage" (Harris 1991: 28–29 n.6). Note that this is not the truism that data must be validly obtained, but rather a concern that conclusions bear a valid relationship to those data. Some claims associated with the Universal Grammar hypothesis blur the distinction between data and conclusions, making this point difficult to recognize.

Harrisian methodology are informant judgements as to whether a given utterance is in the language or not — or more subtly to what degree or in what contexts it is acceptable as an utterance in the language. These two touchstones of 'psychological reality' identify the fundamental elements of language on the one hand and the universe of language data[11] on the other. All else is distributional analysis, whose aim is to identify constraints on the combinability of elements, the 'departures from equiprobability' of their combinations. Any seeming constraint that can be eliminated by a more perspicuous analysis is a property of inadequate analysis, not a property of language. Hence the endeavor, from the beginning, to wrestle the data into a representation whose elements are as unconstrained and freely combinable as possible. All that then remains are those essential constraints that together construct language, a 'least grammar'.

1.4 Complete coverage

Another cardinal point of Harris's methodology is that "data can be usefully analyzed only in respect to a specified whole structure of a language, and not as selected examples in support of episodic grammatical rules or processes" (Harris 1991:15). Harris did use isolated examples to clarify methodological issues in earlier writings, notably in Harris (1951[1946]), but claims about the structure of language were always grounded in broad coverage.[12]

2. Work represented in this volume

From the simplicity, directness, and mathematical elegance of the resulting theory of language arises the great fecundity of Harris's work in so many fields. Some of its many ramifications are reflected in the contributions to these volumes.

11. Generatively, in the use of graded acceptability as a criterion for transformation.

12. Assuming that student discussion focused around this ms. in the late 1940s, one could speculate that this is one reason that argument about examples and counterexamples may have appeared to the young Chomsky to be how one does linguistics.

2.1 Harris's survey article

A paper by Zellig Harris surveying the development of his own work introduces this volume.[13] In this survey article, Harris makes it clear that he began work on linguistic transformations quite early. In fact, he was talking about transformations in his seminars as early as the end of 1939 and certainly by the term ending June 1941.[14] Also very clear is the centrality of mathematics from the beginning, and the importance of simplicity (what he later termed a 'least grammar') for getting the machinery of analysis and presentation out of the way of our seeing transparently the correlation of form with information in language.

2.2 Philosophy of science

In the section on philosophy of science, T.A. Ryckman's "Method and Theory in Harris's Grammar of Information" discusses Harris's methodology and especially the role of the metalanguage. To be sure, he touches on misrepresentations found in many accounts of the recent history of linguistics, but the more important discussion concerns just how this methodology results in a grammar of information, in which is laid bare the intuitively obvious but hitherto elusive correlation of linguistic form with meaning. Information theory, it will be recalled, concerns only a statistical measure of the amount of information in a 'message' or through a 'channel'. It says nothing about information content.

Harris's theory of linguistic information is grounded in the same considerations of relative probability that underwrite mathematical information theory

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13. This paper was first published as (Harris 1990) in French translation by Anne Daladier, who kindly provided the English text for this first publication in English, including several paragraphs toward the end that she received too late for translation and publication, which are published here for the first time. In one of these paragraphs, the opening sentence seems incomplete: "traditional and structural linguistics found regularities of co-occurrence word classes, between one or another word of another set." The author would surely have corrected this. The intention clearly is to say that traditional and structural linguistics dealt with selection restrictions only as far as word classes — more precisely, that they went only as far as saying that any word of one class could co-occur in a construction with any "one or another" of the words of a specified other class. The next sentences go on to say that it required first transformations and then operator grammar to "deal with the co-occurrence properties of individual words."

14. Lisker, in email of 1 March 2000 to Bruce Nevin.

as ordinarily understood. Given the social context of the origin, learning, and use of language, the commonplace hypothesis of a 'mentalese' for which language is a 'code', in the familiar conduit metaphor of communication, is superfluous. As a philosopher of science (concerned with questions posed by realist and instrumentalist interpretations of physical theories) and as a co-author of *The Form of Information in Science* (Harris et al. 1989), Ryckman is especially well suited to give this account of Harris's theory of information content.

Paul Mattick, another co-author of Harris et al. (1989), in his essay on "Some Implications of Zellig Harris's Work for the Philosophy of Science", shows the relevance of Harris's work to fundamental issues that are evoked in the philosophy of science by the question of a 'syntax of science'. Logical empiricism assumed that scientific thought could be adequately represented by a logical system. This had the advantage that meaning relationships and patterns of reasoning could be analyzed with some precision, but had little to do with the actual practice of science. More recent studies of science seek to specify boundaries of domains and the relations between methods, concepts, and data within them, but must depend for this on the much debatable semantic intuitions of the researcher. Harris's study of science sublanguages suggests an approach to the 'syntax of science' based not on philosophical presuppositions but the actual syntax of the specialized sublanguages used in doing science. It offers a middle way that combines analytical rigor with empirical sensitivity.

Maurice Gross turns directly to pivotal methodological (and empirical) issue that we have considered above, in his "Consequences of the metalanguage being included in the language". He clarifies the empirical basis of Harris's claim that the metalanguage of linguistics is included in each language that linguistics describes, and develops some theoretical implications which are perhaps surprisingly profound. These implications include the rejection of most categories currently in use in linguistics, such as subject, predicate, and semantic categories. When one takes the trouble to look, the generalizations expressed by these categories turn out to have as many exceptions as they have compliant examples. This gives striking support not only for their rejection, but also for a reconsideration of the notion 'grammatical exception'. Work on this paper was interrupted by the author's final illness, but although it might have been extended farther, it is complete in itself.[15]

15. The concluding sentence was added by the Editor (Bruce Nevin).

Noam Chomsky introduced the term 'discovery procedure' in 1957 in order to contrast it with the notion of 'evaluation procedure'. In "On Discovery Procedures", Francis Lin accepts the attribution of the idea of 'discovery procedures' to Harris, but under a reinterpretation in terms of language acquisition. Lin distinguishes two senses: mechanical procedures which the linguist follows to discover the grammar of a language, and innate procedures which enable the child to acquire the grammar of a language. Lin argues that Harris's formal procedures were not manual discovery procedures for the linguist[16] but can be regarded as innate procedures for grammar acquisition. He analyzes Chomsky's criticisms of Harris's 'discovery procedures' in both senses, and argues that the criticisms are unwarranted. He proposes that Harrisian constructions and transformations be used to explain knowledge of grammar and that Harrisian formal procedures be employed to account for grammar acquisition.

2.3 Discourse analysis and sublanguage grammar

The section on discourse analysis and sublanguage grammar begins with "Grammatical specification of scientific sublanguages" by Michael Gottfried, the first-named coauthor of Harris et al. (1989). The notion of sublanguage has an important place in Harris's perspective on language and its development. In Harris et al. (1989), this concept was extended to characterize the discourses concerned with a specific research question in immunology — that is, the sublanguage of that particular scientific domain. Harris et al. (1989) describes the grammatical organization of these discourses and the ways in which the information in them could be formally represented. Distinguished parts of these discourses were described in terms of (1) metascience operators such as *We hypothesize*, (2) science language sentences, and (3) various conjunctional and relational operators. Gottfried addresses some further questions involved in grammatical specification of a scientific sublanguage, in particular, the relation that the metascience operators bear to science language sentences. A sublanguage is defined by closure under operations of the grammar. New results presented here indicate that a science sublanguage is closed under resolution of referential forms.

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16. For additional discussion of the observation that Harris did not intend his methods as practical discovery procedures, see e.g. Hymes & Fought (1981:176), Ryckman (1986: 45–54), Nevin (1993:375–376).

James Munz, in "Classifiers and Reference," identifies complications to the resolution of reference that may arise when the corpus for sublanguage analysis is less constrained than that of Harris et al. (1989). He reports how in a study of about 50 articles on the function of cardiac glycosides (the digitalis family) it was found that classifier vocabulary played a prominent role in discourse coherence. However, the cross-classification relationships turned out to be rather complex and in some measure ad hoc, and especially subject to change through time. These lexical relationships could be included in the grammar at the cost of complicating it. Munz discusses the tradeoffs in sublanguage grammar between a simplification of grammar at the cost of more complex treatment of pragmatics (the interpretation), or inclusion of such classifier relations at the cost of complicating the grammar and lexicon. He demonstrates these issues for a sublanguage of pharmacology.

Many linguists and rhetoricians have applied the term 'discourse analysis' to what might be called the macro-syntax of text, involving overt markers for such things as point of view, shift of topic, and conversational turn-taking, rather than with the information content of texts. In "Some Implications of Zellig Harris's Discourse Analysis", Robert Longacre explores the relationship of these approaches to that of Harris, using for demonstration purposes the "Proper Gander" text whose analysis Harris published early in the work on discourse analysis.

In "Accounting for Subjectivity (Point of View)", Carlota Smith develops what she calls an information-based approach to certain aspects of meaning in which a recipient constructs a point of view on a text by ascribing perspective, consciousness, an attitude, belief, or way of thinking to the author or to a person presented in the text on the basis of a composite of grammatical and lexical forms rather than any single feature. Smith has identified a number of principles of composition. There may be a single, sustained point of view; or more than one, conveyed by forms with a deictic component, including pronouns and anaphors, tense, adverbials, aspectual viewpoint, and modality. A clear point of view often emerges when terms from more than one deictic sub-system are in accord, and there may be rather subtle interactions between forms. For instance, whether or not tense is deictic depends to some extent on modality. In a sense this project relates directly to Harris's important work on co-occurrence, though Smith's interest is in the co-occurrence of what she terms linguistic features rather than of words or word-classes, and with the interpretations which recipients make of them.

2.4 Syntax and semantics

In much of the literature of linguistics, syntax and semantics are distinct rubrics. For Harris, they are two faces of the same socially maintained phenomenon, linguistic information, and this is borne out in the section on syntax and semantics. Harris was always interested in comparing different languages, e.g., "if such description is made of two or more languages it becomes relatively easy to compare their structures and see wherein and how far they differ" (Harris 1941a: 143).[17] Harris (1954) described how to create a transfer grammar expressing the relationship between the structures of two languages. Morris Salkoff is probably the first actually to write a detailed transfer grammar. In "Some New Results on Transfer Grammar", Salkoff sketches the syntactic portion of a French-English transfer grammar (Salkoff 1999), and describes the method by which it was developed. In the contrastive French-English grammar, the comparisons between French structures and their English equivalents are formulated as rules which associate a French schema (of a particular grammatical structure) with its translation into an equivalent English schema. For each of the principal grammatical structures of French — the verb phrase, the noun phrase and the adjuncts (modifiers) — the grammar presents all the rules that generate the corresponding English structure under translation. In addition to its intrinsic linguistic interest, this comparative grammar has two important applications. The translation equivalences that it contains can provide a firm foundation for the teaching of the techniques of translation. Furthermore, such a comparative grammar is a necessary preliminary to any program of machine translation, which needs a set of formal rules, like those given here for the French-to-English case, for translating into a target language the syntactic structures encountered in the source language. Of particular interest are ambiguities and word classifications that arise cross-linguistically but not in either language by itself.

In "Pseudoarguments and pseudocomplements", Pieter Seuren investigates a phenomenon that has been neglected in much of the linguistic litera-

17. Also: "in many [. . .] published grammars, the reader who wishes to have a picture of the language structure has to reanalyze the whole material for himself, taking merely the elements and their distributions as reported by the author of the grammar and hardly utilizing the author's analysis. This situation arises from the fact that linguists do not yet have a complete common language" (Harris 1944a: 190), i.e. a common metalanguage for the science of linguistics. This was one motivation for clarifying methodology.

ture.[18] Embedded infinitival, participial, adjectival, and prepositional clauses often occur as quasi-object-complements to main verbs whose meaning does not appear to call for a sentential object-complement. Such 'pseudocomplements' normally have a resultative, purposive, or comitative meaning. The English verb *go*, for example, is normally intransitive and its meaning does not call for a resultative, purposive or comitative complement proposition. Yet English has sentences like *John went fishing*, where *fishing* has the same syntactic features as it has in *John went on fishing*, where *fishing* is a real, semantically motivated object-complement. This phenomenon is extremely general, perhaps even universal. In almost all such cases, the original lexical meaning of the embedding predicate is 'bleached' and the verb in question assumes auxiliary status. Seuren hypothesizes that pseudocomplementation with *be* is the origin of the English progressive form.[19] In many languages, the distribution of infinitival and participial pseudocomplements (PCs) is restricted by the lexical specification of the embedding main verb. In SVC languages (with serial verb constructions), the distribution with regard to the embedding main verb appears to be free, but the selection of the embedded main verb is lexically restricted. Adjectival and prepositional PCs in sentences like *He painted the door green* or *He put the ladder up*, also extremely widespread in the languages of the world, appear to be adequately described as cases of pseudocomplementation. For this analysis to hold, it must be assumed, with Harris and McCawley, that all lexical content words, including adjectives and prepositions (those not used as argument indicators), are semantic predicates and thus take arguments.

In "Verbs of a feather flock together", Lila Gleitman reports on experimental work showing how structural (syntactic) information supports the learning of the semantics of verbs. Harris saw that a fine analysis of verbs'

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18. It is related to the notion of *support verb* elaborated by Maurice Gross in his (1975) and in later developments of lexicon-grammar. Gross attributes its origin to Harris (1951[1946]).
19. Harris (1982:158) derives the progressive from a zeroed preposition: *John is fishing* ← *John is on his fishing*. Compare obsolete and dialectal *John is a-fishing*, where "in Old and Middle English *a-* (a reduced form of *on*) plus the verbal noun ['gerund' with *-unge*, *-ing*], was used for a second argument of *be*, *go*: *He was a-fighting, I go a-fishing*" (Harris 1982:295). It is often the case in operator grammar that zeroing of a higher operator (here, the preposition *on*) results in apparent multiple classification of the operator under it (of which the distinction between intransitive *go* and this 'pseudocomplement'-taking *go* is an example).

relative distribution with regard to their complement structures (their subcategorization privileges) effects a coarse semantic partitioning of verbs in the lexicon. Experimental work has shown, in various languages, how syntactic overlap predicts semantic overlap. For example, languages largely agree in reserving tensed sentence complements for verbs with mental content. Such correlations can be used to project the syntactic privileges of known verbs beyond their observed structural environments, and to project the meanings of verbs based on their observed structural environments. Studies of infants and toddlers by Gleitman and colleagues demonstrate that they use these regularities as guides to the interpretation of verbs. Such a structure-sensitive learning procedure is required in the vocabulary learning process because raw observation of the extralinguistic environments for verb use provides almost no constraints that can be used to derive their meanings. The use of structural evidence by children begins to explain the robustness of their vocabulary learning irrespective of vast differences in the extralinguistic evidence made available to them, as for example (dramatically) in the congenitally blind child's understanding of such 'visual' terms as *look* and *green*.

2.5 Phonology

Two papers here revert to the issues of phonetics and phonology which we used earlier to illustrate Harris's methodological principles. In "The Voiceless Unaspirated Stops of English", Leigh Lisker applies substitution tests not for identifying contrast vs. repetition, but for discriminating phonetically precisely where an identified contrast is located in the phonetic data of speech. The distinction between English /p/ and /b/ has generally been assumed to be effected by differences in voice onset time (VOT) during or after stop closure. Lisker demonstrates that this is not always the case, with evidence that may challenge some familiar and supposedly universal categories such as 'voiceless unaspirated'. For Harris, of course, this would not matter: the contrasts between the original utterances are already determined by the judgements of native speakers, and the substitution experiments serve only to locate the contrasts relative to one another and to associate them with phonetic data. Whatever the phonetic facts turn out to be, those they are. An a priori phonological framework that posits a universal feature expressing VOT such as [+delayed release] is problematic. This is not a case of neutralization, since in context the distinction is perceived, but whereas in some contexts the /p/ vs. /b/ distinction is effected by VOT, in these cases it

is effected by other means still to be determined among phonetic features preceding stop closure.

Sometimes what seems most obvious is in fact not well defined. Such is the familiar distinction between consonants and vowels, which is vexed by intersecting but non-identical phonetic and phonological usage of these terms and the persistent but still unachieved objective in Generative phonology of giving phonetic definitions for a universal set of distinctive, that is, phonemic, features. Harary & Paper (1957) described phoneme co-occurrence in abstract relational and graph-theoretical terms and suggested a numerical method, related to that of Harris (1955), for describing the distribution of the phonemes in a language. In "On the Bipartite Distribution of Phonemes", Frank Harary and Stephen Helmreich extend this work, developing the notion of a bipartite graph and applying it to the distribution of phonemes. Recognizing the intimate relation of the C–V distinction to the no less elusive notion of syllabicity, they propose a method for distinguishing *+syllabic* segments from *−syllabic* segments. First, they look at this distinction from the standpoint of graph theoretic concepts, and, building on the work of Harary & Paper (1957), they relate it to the graph-theoretic notion of a bipartite graph. In a bipartite graph *G* every node can be colored with one of two colors so that each edge of *G* joins two nodes of different colors. In this case, the 'colors' are vowel and consonant. They study the graph in which the nodes are phonemes and the edges are determined by succession in the corpus. They introduce a method of quantifying the degree of bipartiteness of the phonemic graph of a particular corpus, apply this method to Hawaiian, and show that the C–V division produces a highly bipartite graph. Second, they generalize this result by developing a computer program which examines divisions of elements of a set (in this case, phonemes) into two groups, including such phonetic divisions as front/back, high/low, etc. This program determines the bipartiteness of each division with respect to the graph of a corpus in that language. They show for a number of typologically diverse languages that the most bipartite graph has an obvious interpretation as the C–V distinction for that language, so that this approach provides a distributional method of identifying this important distinction.[20]

20. It will be interesting to see this method applied to languages in which segments that are consonants by any phonetic reckoning are syllabic, such as Imdlawn Tashlhiyt Berber (Prince & Smolensky 1993 and works of Dell and Elmedlaoui cited there).

2.6 Applications

Daythal Kendall presents an application of Harrisian linguistics to poetics in "Operator Grammar and the Poetic Form of Takelma Texts". Within the framework of Harris's operator grammar, Takelma texts turn out to be highly structured. The overall form of a fable, as revealed by syntactic analysis and other factors such as deviations from the dominant subject-object-verb (SOV) word order, repetitions, and overt lexical markers, indicates a deliberate manipulation of the language to create an artistic form. First, a partial syntactic analysis of the fable "Coyote's Rock Grandson" illustrates the technique, and then the entire fable is given in free-verse form, as recovered through syntactic analysis, in both Takelma and English. Finally, Kendall discusses symbols used in the story, social norms addressed, and details of the poetic form. In addition to providing entertainment, many Takelma fables illustrate the consequences of violating selected social conventions. "Coyote's Rock Grandson" addresses the issues of obtaining a wife, establishing and maintaining the proper social and economic relationships between a man and his wife's parents, and behaving appropriately toward one's neighbors. Explication of the text shows how the social fabric is rent and restored, and the consequences of violating conventions. In addition, Kendall discusses the use of symbols, the manipulation of syntax, overt surface markers, repetition, and the poetic form of the fable.

It is not often remembered today how closely the development of departments of linguistics in the United States was related to the development of new methods of teaching languages during and after World War II. From at least 1939, Zellig Harris taught a course called Linguistic Analysis in the Department of Oriental Studies and later in Anthropology. In 1946, a Department of Linguistic Analysis was established at the University of Pennsylvania, which was renamed the Department of Linguistics in 1948. Many of the early papers, such as those on Swahili, Moroccan Arabic, and Fanti, came out of this work. In a fascinating reprise of these concerns, still of vital importance today, Fred Lukoff gives us "A Practical Application of String Analysis" to language pedagogy, using the teaching of Korean as an example. Students' perception of the structure of long Korean sentences can be hindered by the length and complexity of adjunct material (modifiers). Lukoff shows that long sentences in written Korean are well suited for analysis by the methods of Harris (1962), because the relatively fixed word order of Korean sentences allows comparatively straightforward progressive excising of adjunct material, leaving the minimal structure, or elementary sentence, which lies at the syntactic and

semantic core of the given sentence. These methods lead to an uncovering of the basic constituent structure and hence to an understanding of the intended meaning of long sentences in Korean. Lukoff draws numerous examples from texts of various kinds, and gives step-by-step string analysis procedures for uncovering the structure of these sentences. Classroom experience with string analysis has proven to be an effective and efficient means by which students learn to perceive the structure of long, complex Korean sentences. He gives examples of the difficulties that students typically experience when they lack these tools. Applying the methods of string analysis also brings certain questions into focus, some new and some old, concerning the constituent structure of Korean sentences, among them the problem of analysis of ambiguous coordinate constructions. There are obvious and interesting relations between this paper and that of Salkoff on transfer grammar. I am happy to report that Professor Lukoff was able to complete this work just before his death, and that he was pleased with the result.

3. Further issues and themes

Developments based on Harris's work in mathematical linguistics, formal systems, informatics, and computer science are presented in Volume 2 of this work. Many other researchers who were invited were unfortunately unable to prepare a contribution within the time available for this project, or declined for other reasons. There are also themes and problems for research, many of which Harris identified, that are not reported in this publication.

3.1 Relation to Generativist theory

Noam Chomsky was invited to contribute to these volumes on any topic, at any length, with particular interest being expressed in his perception of the relation of his work to that of Harris. He declined on grounds of having too slight acquaintance with Harris's work after the mid 1950s.[21] It is unfortunate

21. More specifically, that he did not fully understand what Harris was doing and why after the mid 1950s because, in his view, Harris's work then took a new course, which he had not followed closely. Compare Harris's account, in the present volume, of continuous development of principles evident from the beginning. As to Chomsky's understanding of those principles and of Harris's earlier work, a comparison of their respective accounts is

that his remarks in various places generically about 'structural' or 'taxonomic' linguistics have frequently been understood as applying to Harris; they do not.[22]

Chomsky's most substantive contributions — and they are very important and lasting — are in the characterization of formal systems, such as the Chomsky hierarchy of context-free languages. For Harris, rather

> The interest [. . .] is not in investigating a mathematically definable system which has some relation to language, as being a generalization or a subset of it, but in formulating as a mathematical system all the properties and relations necessary and sufficient for the whole of natural language. (Harris 1968:1)

Symbolic approaches such as phrase-structure-grammar (PSG) build abstract structures, typically represented as labeled trees. Relations between words are mediated by abstract preterminal nodes that are devoid of semantic content. Lexical content is inserted into an abstract structure, and special mechanisms are adduced to account for meanings and selection restrictions on the one hand and for phonological phenomena on the other. Each such mechanism has a distinct syntax and semantics over its own vocabulary of (typically) features and feature values. In any Harrisian grammar, from the 1940s to 1991, sentences are constructed out of words directly, and selection restrictions and phonological changes apply at a stage of construction when the relevant lexical items are contiguous.

> There is an advance in generality as one proceeds through the successive stages of analysis [from structural linguistics, to transformational analysis, to operator grammar]. This does not mean increasingly abstract constructs; *generality is not the same thing as abstraction.* Rather, it means that the relation of a sentence to its parts is stated, for all sentences, in terms of fewer classes of parts and necessarily at the same time fewer ways ('rules') of combining the parts, i.e. fewer constraints on free combinability (roughly, on randomness). But at all stages the analysis of a sentence is in terms of its relation to its parts – words and word sequences – without intervening constructs. (Harris 1981: v; emphasis added)

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easy for anyone to make, though it is frequently unclear which if any characteristics attributed to structural or 'taxonomic' linguistics are intended to apply to Harris's work. Chomsky (1977b:122), in a paragraph that was inserted into the translation of Chomsky (1977a), mentions Harris (1965), but probably only referring to Harris's objection (in fn. 5) to the pitting of one tool of analysis against another.

22. See Ryckman in this volume. Also Nevin (1995), a severely cut version of a ms. distributed at ICHoLS VI and revised slightly in 1999 in response to correspondence with Noam Chomsky in 1995 and 1997–1998.

It may be that the central difference between Generativist theory and Harris's theory of language and information is that the former asserts the existence of a biologically innate metalanguage.[23] The fact that grammars and a theory of language and information have been achieved without this hypothesis presents a considerable challenge to it, a kind of existence proof. Against this press the intellectual and professional commitments of a great many people constituting the field of linguistics as it stands today. In consequence, the question continues widely unaddressed.

Harris recognized no standpoint outside of language from which one may describe language. Without an understanding of this fundamental fact, the methodological strictures that Harris imposed on his work are incomprehensible. Those who (without understanding this) have attempted to account for the incomprehensible have described Harris as anti-mentalist, positivist, even behaviorist — preposterous falsehoods, trivially refuted by simple examination of his writings.[24] He did not even *like* the word 'behavior'.[25]

Some have asked why Harris did not defend himself against attack and refute at least the most ludicrously false attributions. He was certainly capable of intellectual criticism of great power and incisiveness where he felt that was necessary and appropriate, as in politics. For science, however, where unfettered inquiry and open communication are essential, scientific results must stand or fall on their merits, and need not, indeed should not be defended. He was dedicated to science and in particular to the methods that became clear in the late 1930s and early 1940s as ineluctable for any science of language. In any field — this is strikingly illustrated by his posthumous book on politics (Harris 1997) — he always looked for constructive solutions in a positive way. An

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23. To be sure, Chomsky does not accept that UG constitutes or incorporates a prior metalanguage, but it can scarcely be disputed that it is given a priori, nor that it is metalinguistic (else how could it constrain grammars and languages).

24. These allegations are frequently made about 'structural linguists' generically. Chomsky (1964) provides an early example and Anderson (2001) a recent one. Whether or not these allegations are meant to apply to Harris is often either equivocal or not obvious. For example, we are to infer that Chomsky did not intend the 'Linearity Condition' to apply to Harris from his mention in a footnote (Chomsky 1964:82n.16) that there are several examples in *Methods* (vaguely identified as in "chapters 7, 9") that pose difficulties for such a principle. See Nevin (1995) for discussion.

25. P.c., 1969 or 1970. Harris was talking with someone who had evidently called his attention to some statement or suggestion that he was a behaviorist. This was spoken aside to me, with something between amusement and bemusement at the preposterousness of it.

attack on the work of others benefits no one, and the perspicuity of an analysis is established not by argument but by demonstration in respect to the data of the field. Furthermore, he did not cling to his ideas and insights, however major, to defend them as his own, but instead with great creativity moved on to more advanced discoveries.

It has been alleged (following Chomsky) that Harris denied the reality of language and saw no value in asking how it is that language is uniquely learned by human children. Rather, he denied that philosophical speculation about these matters had any place as guiding principles for doing linguistics.[26] They can only fruitfully be asked in light of what linguistics has to tell us, since "linguistics is precisely the one empirical field which may enable us to derive definitions of these intuitive fundamental relationships out of correlations of observable phenomena" (Harris 1940:704). It was out of profound respect precisely for the *reality* of language that he would not interpose between linguists and the object of their investigation any a priori speculations about the 'patterned regularities' that may be observed in language. Harris employed the only kind of methods that can be available given the absence of any presupposed metalanguage.[27] As these methods disclosed more clearly the structure of language as a whole, and especially as operator grammar began to emerge in the late 1960s, he included in each report some statement of the interpretation of the formal results. The clearest and most complete statement is in his last book, *A Theory of Language and Information* (1991). Here, he dis-

26. No "metaphysical reality in linguistics" (Harris 1940:704, quoted earlier). For example:

> At various points, the conclusions which are reached here turn out to be similar to well-known views of language. [. . .] The intent of this work, however, was not so much to arrive at such conclusions, as to arrive at them from first principles, from a single method which is proposed here as being essential because of the lack of an external metalanguage. The issue was not so much what was so, as whether and how the essential properties of language made it so. (Harris 1991:28–29 n.6)

> That the picture of language presented here is similar in some respects or others to various views of language [. . .] does not obviate the need for reaching the present theory independently by detailed analyses of language. This is so partly because a more precise and detailed theory is then obtained, but chiefly because we then have a responsible theory in direct correspondence with the data of language rather than a model which is speculative no matter how plausible. (Harris 1991:6n.1)

27. Contrast e.g. "on suppose donnée à l'avance la structure générale d'un système de savoir" (Chomsky 1977a:126) or in the expanded English revision "one assumes the general form of the resulting system of knowledge to be given in advance" (Chomsky 1977b:117).

cusses how words carry meaning; what linguistic information is and how it is created in the form of predication in sentences; how language 'carries' information; the relation of form and content; the relation of language to the perceived world; the structure of information; the origin of language in prehistory; the nature of language as a self-organizing system in a context of social use; its relation to thought; and what capacities are required to learn and sustain language. It was never the case that Harris thought these questions were improper, only that asking them prematurely was, and that any answers to them that one might propose (necessarily a posteriori) have no a priori relevance among the data or 'facts' of linguistics. His methodological strictures can be seen as an injunction against question-begging. You have to know what you're talking about before you can talk about it. You can't get to language by way of talk about language, only by way of a nonverbal analysis of the objects and relations observed in language.

One may ask whether all of Harris's methodological strictures are still necessary for the description of languages. Perhaps some may now be set aside if they were required only for the achievement of a theory of language determined by "how the essential properties of language made it so" (Harris 1991:29). With that goal attained, perhaps we can now presume henceforth the minimalist characterization of language and information, the 'least grammar', that his methods at last reached.[28] We might take his theory of language and information to constitute at least the lineaments of a 'prior metalanguage', given now a priori in the science of linguistics, by which we may anticipate the structure of a given language that we aim to describe — a formulation, in short, of Universal Grammar.

But perhaps such an assumption carries no more weight than the "short cuts and intuitive or heuristic guesses" that linguists have always made. It is true that in addition to these 'intuitions of linguistic form' we now have an informed theory of language, but if the linguist fails to verify that conclusions about a particular language are validly related to the data of that language, it is at risk of having

28. Something like this is seen in Harris et al. (1989, Chap. 7) where the information formulae of a science sublanguage, established for English, are subsequently used to recognize the corresponding sublanguage categories and dependencies in French texts in the same domain. However, sublanguage analysis can avail itself of an external, a priori metalanguage without prejudice to the question we are considering here.

> the undesirable effect of forcing all languages to fit a single Procrustean bed, and of hiding their differences by imposing on all of them alike a single set of logical categories. If such categories were applied [. . .] it would be easy to extract parallel results from no matter how divergent forms of speech. (1951[1946]:2)

To this earlier caution, Harris might now reply that on the other hand anything that did not have the essential properties found for language — phonemic contrasts, constraints on combinability, especially dependence on dependence, and so on — would be something other than language. A pertinent question, then, is how much of this is in fact innate and how much is merely indispensable, given the informational uses of language.

3.2 Continuing themes

A number of themes cut across the topical sections into which the contributions have been organized in this volume, and bridge even across the two volumes. For example, though Harris did not propose an account of the development of language until late in his career (Harris 1988, 1991), his procedures for the linguist have always seemed to invite reinterpretation as processes for the child (e.g. Chomsky 1977a:124–128, English version revised and expanded in 1977b:114–119). This theme is explicit in the papers by Gleitman and by Lin, and in the paper by Pereira in Volume 2. Another recurrent theme is the role of classifier relations in vocabulary. Although these relations are notoriously inconsistent and unstable (see Munz in this volume), and for that reason Harris did not find them useful in grammar or in a theory of language, they may align with the lexical classes in sublanguage grammar where they are defined in an explicit external metalanguage, and they may further be useful in resolution of referentials. Papers here by Mattick, Munz, Gottfried, and Gleitman touch on these issues, as does that by van den Eynde et al. in Volume 2. The attentive reader will discern other shared themes. Broached in a number of places but not yet frankly advanced here is the very important question of argument and consequence in science,[29] one of a dozen or so topics called out by Harris (1991:28) as suggestive examples of "areas of investigation which are related to language structure as presented here, but remain to be undertaken." Others may be added, such as for example the

29. John Corcoran has been developing some interesting work on these lines, which he had intended to publish here. See Corcoran (1971a–c) for antecedents.

retention of reduced traces of sentence-intonation and lexical stress in a paratactic conjunct (interruption) and in the further reductions that result in various modifiers; the relation of sublanguages to one another and to less well-specifiable kinds of language use in a 'whole language'; problems of language variation and change, areal phenomena, and language typology, seen from this perspective; the structure of discourse prior to the linearization of word-dependencies in sentences, the integration of such structures in language-borne aspects of knowledge and learning, and their relation to the nonverbal universe of perception. Broader questions arise: What is language, really, that it is so central to human nature? By what interplication of biological and social inheritance is it acquired, and how may it be sharpened and extended in the ongoing evolution of society, if not of species, in which we may perhaps take an increasingly active role?

Other researchers and new students take up these questions. What we see here is only a beginning.

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