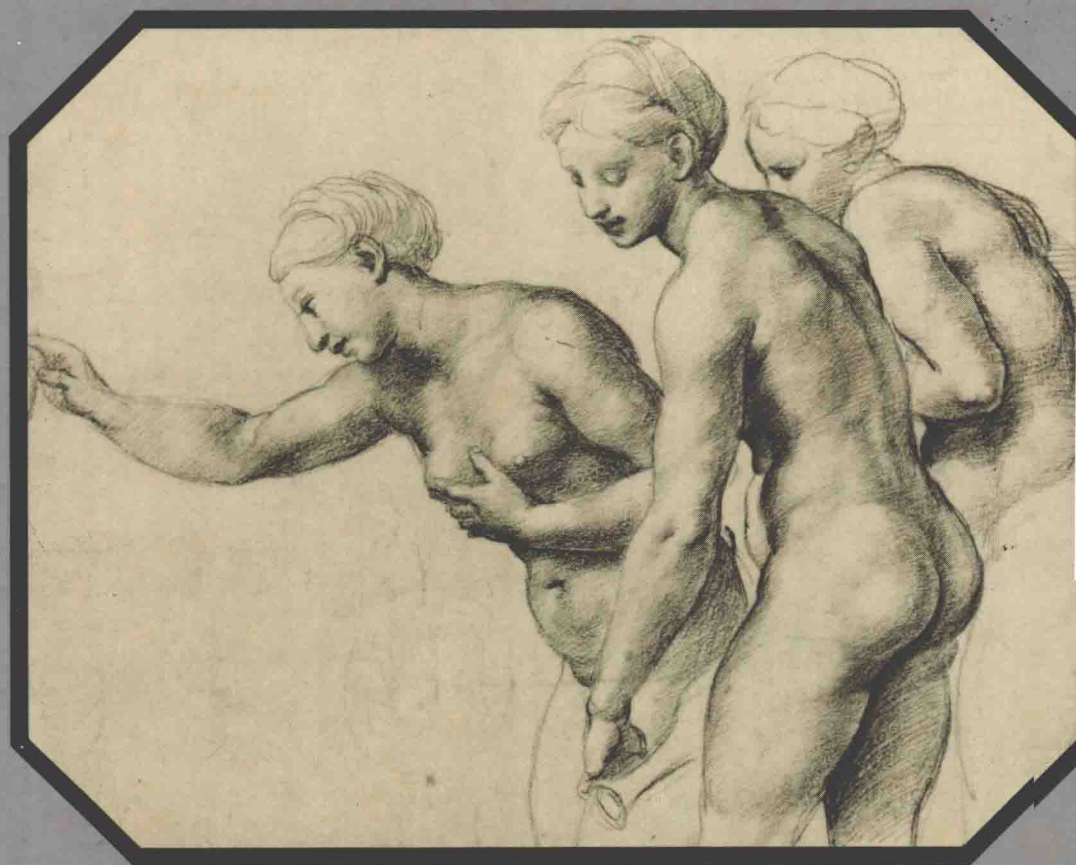

LANGUAGE AND NUMBER

The Emergence of a Cognitive System



JAMES R. HURFORD

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Basil Blackwell

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To the three graces of the magic Number 14

Language and Number

Preface

A working linguist who regards linguistics as a science shedding light on minds, languages, and language-communities as real objects, mental or social, should find this book congenial. Though I write from a linguist's background, I also hope that psychologists and philosophers (and perhaps even mathematicians) with an interest in language and number will find points in this book useful to them in the development of their own ideas, as I have drawn on theirs. But the 'hocus-pocus' linguist concerned only with constraining formalisms and the merely descriptive linguist, both of whom avoid questions of ontology and explanation, probably will not pick it up.

The book is intended as a contribution to linguistic theory in the broadest sense. It offers a view of language (illustrated in detail from one particular subsystem) which brings together considerations of individual psychology and of communication within a speech-community. These two strands, the psychological and the social, are put together to give an evolutionary perspective on language, which explains salient characteristics of its form. The psychological considerations relate both to the invention and to the ordinary acquisition of language; the social considerations relate to the ways in which individuals negotiate common standardized expressions for their meanings. Languages grow through the interaction of individual minds on the forms invented and socially negotiated by their predecessors. This growth of languages leaves traces from which the linguist, working like an archaeologist, a geologist, or indeed a nineteenth-century comparative linguist, can reconstruct the likely pattern of development. Turning the perspective around, he can use the pattern of development to explain why languages are the way they are now.

Somewhat to my surprise, the book also claims to make a contribution to the philosophy of number. The three central chapters, 3, 4, and 5, are at least as much about the nature of numbers as they are about language, and an argument is developed that our knowledge of number is in fact a product of our possession of language, plus a faculty for constructing collections from aggregates. An account is given of the rise of the number sequence and of constructions expressing the basic arithmetical operations of addition and multiplication, the latter by turning the techniques of denotational semantics onto numerals. While it may be convenient to talk about numbers as abstract Platonic objects, the account here shows a way of explaining the possibility of inventing and knowing such objects through linguistic devices. This in its turn could be fed back into arguments that languages, like numbers, are abstract objects, such as Katz has put forward. Once numbers, the Platonist's paradigm example of abstract objects, have been shown to develop *through* language, the argument that a language is a Platonic object becomes much harder to sustain.

Nevertheless, I do claim that languages are in some sense abstract objects, the results of the historical interaction of both psychological and social factors. But, unlike Chomsky, who also believes that that is what languages are, I believe that it is possible to say something interesting about the interplay of factors that gives rise to them, and thereby to begin to explain their form. A computational model of the social negotiation of standardized expressions is developed in the final chapter.

After I finished writing *The Linguistic Theory of Numerals* about twelve years ago, I thought I would not write another book on the same topic. And in a sense I haven't, even though this book is about linguistic theory with specific relation to numerals. I feel I have climbed the same mountain twice by completely different routes, seeing completely different landscapes on the way. The basic data for the two books are the same (the numeral systems of natural languages), but the books' objectives are completely different.

The Linguistic Theory of Numerals was an attempt, like many studies by people of my generation around that time, 'to extend and modify the detailed theory of generative grammar'. It shared 'the principal methodological assumptions about "doing linguistics" professed in such works as Chomsky (1965) and Chomsky and Halle (1968)'. There was a widely shared vision

in the 1960s of generative grammar as a monolithic cumulative corpus of propositions about universal grammar. But by 1975 work within generative grammar was splintering into many distinct subschools, all with different theoretical emphases and preoccupations, none of which happened to find the data from numeral systems particularly interesting. The data are still there and they are interesting to anyone who will take a close look at them.

The dissolution of this shared vision led many, including myself, to study the philosophical and methodological foundations of generative grammar, and there was a growth of interesting and provocative work in this philosophical and methodological vein. There were conferences and collections of papers on explanations in linguistics, evaluating linguistic hypotheses, the relation of data to theory in linguistics, and so on. Scholars as diverse as Itkonen, Katz, Fodor, and Chomsky himself produced a number of challenging monographs on the ontology and epistemology of linguistics. I published three small efforts in this vein (Hurford, 1977, 1979b and 1980). All of this work, though it made interesting and worthwhile contributions to thought, clearly offered no hope (if that is the right word) of reuniting generative grammar. And meanwhile, the practitioners in the splintered subschools were getting on with 'doing linguistics' in their own ways. I heard the opinion that all this discussion of the foundations of linguistics was of no use: the thing to do was to get on with the job of describing and explaining language(s).

Linguistics has grown too large and diverse for anyone to be able to articulate any uncontroversial set of foundational premises for it. As there are many metaphysical starting points, there will probably always be a wide range of schools of linguistic thought and research programmes in the subject. Still, there remains some consensus on what counts as illuminating and interesting in linguistics. Chomsky's most important influence, I believe, lies in his emphasis on how linguistic work should try to illuminate the subject matter, rather than merely describe it in tidy ways. We all differ widely in our views of what counts as an adequate explanation, but there is agreement that some kind of explanation is the goal of work in linguistics. In this book I offer a specimen of 'doing linguistics', that is a detailed discussion of data in a particular area, which is at the same time centrally concerned with explaining the data and considering the general form of explanations in linguistics. Thus this book attempts to promote

a particular view of explanation in linguistics by working thoroughly with an example.

The previous book severely restricted the data it accounted for. I was aware of many impinging considerations which I resolutely kept at arm's length. In this book I open up these considerations, barely mentioned previously, but relevant to the wider task of explaining the structure of numeral systems. These topics include: the activity of counting, ordinal numerals, languages with no numeral systems, the integration of numerals into noun phrases and sentences, numeral classifier constructions, the denotational semantics of numerals, word-order universals, non-standardized numerals, the acquisition of numerals, psycholinguistic experiments on the perception of number, the evolution of numeral systems, and communicative interaction between speakers using numerals in a speech-community. I idealized away from consideration of these factors, as a way of searching where the light is brightest. Although I still value idealization and the present book contains many idealizations, I believe that taking these topics into consideration has produced a more satisfactorily explanatory account of why this particular subsystem of language has the characteristics that it does. Idealization is a useful research strategy, but progress is also made by trying to reach out into the dimness beyond our idealizations.

A preference for integration and synthesis is noticeable in this book. I try to bring things together: linguistics, psychology, and philosophy; language use and language system; synchrony and diachrony; what is valuable in Chomsky's ideas and in those of his critics. The result is not fusion (or, I hope, confusion), but statements of links and relationships between areas and approaches that are all too often isolated from each other.

A 'jilted lover syndrome' can be seen over the last decade in a number of books by former generative linguists. In these works, the adverse criticism of Chomsky's work is unconstructively shrill, and the condemnatory rhetoric often obscures the real issues. I have taken issue with Chomsky at several points in this book, but I have tried to avoid an irrational tone. I believe that a generative approach to language provides us with the most refined strategy yet devised for discovering linguistic structure, and I would not renounce this approach any more willingly than an experimental scientist would give up his laboratory. But simply working with sophisticated laboratory equipment does not make an experimental scientist, and simply describing linguistic

structure using the rigorous frameworks and argumentative structures associated with the generative enterprise does not in itself explain the nature of that structure. I do not believe that Chomsky's ideas on the innateness of certain linguistic principles are wrong, merely that they are not the whole story about language, and that an interesting additional story can in fact be told.

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1

The Object of Study

1.1 Interest in Numerals

Some subjects hold an intrinsic fascination for their students because of the intricacy and beauty of their structures. For some people who successfully grasp an intricate system, the satisfaction of doing so is in itself sufficient. But whatever the intrinsic fascination of a subject, it gains in interest if it can also be shown to provide evidence and arguments relevant to debates in other subjects; and it gains even greater interest if it can be shown to bear on enduring philosophical issues. The set of subjects which are potentially interesting by virtue of their intrinsic structure and the light they shed on wider issues is far larger than the set of subjects which people have, to date, found interesting for these reasons. Within the set of potentially interesting subjects, what actually attracts attention is affected by such factors as accessibility of the relevant data and the possibly haphazard courses of intellectual and external history.

Natural language numeral systems have not figured largely in any of the (major or minor) intellectual debates of the twentieth century, but this seems to be an accidental omission. In fact, the numeral systems of natural languages, taken as a whole, show enough intricacy of morphosyntactic/semantic structure to be of purely intrinsic interest (although admittedly this is a matter of individual taste and judgement). More importantly, the structure of natural numeral systems turns out to yield a rich vein of evidence that can be brought to bear on central questions of the nature of language, the relation of language to mind and society, and the nature of number. To argue this convincingly, it is

necessary to show a linguist's appreciation of the structural details of this particular type of subsystem of languages, along with a philosopher's concern for issues of general significance.

There are two popular stereotypes of the academic. One is the scholar who likes to delve into masses of detail, and values thoroughness and the exhaustive treatment of relatively narrowly circumscribed areas. The other is of the person concerned with ideas relating to matters of great significance, such as Freedom, Human Nature, the Universe, and so on, and apparently capable of sustaining discourse on these matters with very little reference to factual details. Most real academics are aware of these pernicious stereotypes and try to distance their own practice from either model. But steering between the rock and the whirlpool is not easy. In linguistics and related philosophical work one can find many examples either of work which describes particular (groups of) constructions in great detail with no attempt to relate the facts described to wider issues, or of work which philosophizes about the possibility of innate linguistic principles with little or no reference to detailed facts of language. On purely academic, intellectual grounds, both kinds of work are often of impressively high quality, whether in disciplined meticulousness, or in the firm command of abstractions. But there is a sociological problem: the two styles seldom interact with each other. Nitty-gritty linguists are sceptical of any philosophical discussion which does not 'get its hands dirty' by dealing with linguistic facts at something like the level of detail they are used to. And many philosophers who discuss questions involving language are not sufficiently aware of the sheer depth and complexity of linguistic problems, an awareness which only comes from grappling with particularities, at least for some of the time. (Philosophers have this kind of problem with practitioners of other disciplines beside linguistics, as well, of course.)

In this book, a particular area of languages, their numeral systems, is dissected in the depth typical of a linguist's enterprise, but the motivation for the dissection is always the investigation of issues of wider significance. In this introduction, it is only necessary to give a brief foretaste of the areas in which one might expect numerals to relate to issues of more general concern.

In several publications (1980a, 1980b, 1982), Chomsky has suggested a more or less close affinity between the human language faculty and the number faculty. Indeed, in the 1982 conversations he comes close to identifying one with the other, suggesting that what underlies both is a kind of computational

complexity that is equipped to deal with discrete infinities (Chomsky, 1982, pp. 20–2). A more cautious position is expressed in the following:

To gain further understanding of the general nature of the human mind, we should ask in what domain humans seem to develop complex intellectual structures in a more or less uniform way on the basis of restricted data. Wherever this is the case, we can reasonably suppose that a highly structured genetic program is responsible for the achievement, and we can thus hope to learn something significant about human nature by studying the systems attained. Language is an obvious area ...

Are there other systems, more distinctively human in character, more enlightening as regards deeper and more fundamental characteristics of the human species? Perhaps so. Thus, one curious property of the human mind is our ability to develop certain forms of mathematical understanding – specifically concerning the number system, abstract geometrical space, continuity, and related notions. ... It is certainly possible to enquire into the nature of these abilities and to try to discover the initial state of the mind that enables these abilities to develop as they do. (Chomsky, 1980a, pp. 248–9).

I will argue later in detail that the number faculty largely emerges through the interaction of central features of the language faculty with other cognitive capacities relating to the recognition and manipulation of concrete objects and collections. The relevant features of the language faculty include the pairing of words with concepts by the linguistic sign (*à la* Saussure) and highly recursive syntax. It is therefore not necessary to postulate an autonomous ‘faculty of number’ as a separate module of mind.

Prima facie, however, numeral systems lie in the intersection of the human language faculty and the number faculty. One might therefore expect numeral systems to be a focus of considerable interest, for the kinds of reasons given by Chomsky. There are several possible reasons why this interest has not in fact materialized. A couple of arguments that could be advanced why the location of numeral systems in the intersection of the language faculty and the number faculty should not persuade one to find numeral systems particularly interesting can be summarized thus:

1.1.1 Numbers are a special area of meaning, unlike the other kinds of meanings that are conveyed in natural language, and therefore the structure of numeral systems is unrepresentative of linguistic structure generally. Numeral systems are thus of only peripheral interest to those interested in what might be called the central cases of linguistic structure.

1.1.2 The ordinary resources of natural language are only usable to provide names for a small subset of the actual numbers one might wish to name. For very high natural numbers, zero, negative numbers, irrational numbers, and real numbers, one generally needs to go beyond the resources provided by ordinary language, and invent technical notations. Thus, natural numeral systems cannot be revealing of the nature of number generally. And in any case, the names given to things are arbitrary and do not reflect the nature of the things named.

These arguments seem to me the most likely ones to be put up by a linguist and a philosopher, respectively, if asked for a good reason for paying no attention to numeral systems. Admittedly, they are straw men, but plausible ones, and the reader might need convincing that such arguments do not clinch the case.

Both arguments allege peripherality. The linguist says numerals might interest a mathematician but they are only of marginal interest to linguistics. The mathematician says they might interest a linguist but they are only of marginal interest to mathematics. If such views reflect mere sectarian prejudice, they deserve no credence. It would be rather like saying that the duck-billed platypus is not an interesting animal because it is not a central case of a mammal, or of a bird, or of a reptile, but apparently something in between. Viruses are very interesting to biologists because of, rather than in spite of, the fact that they fall only marginally, if at all, within the domain of living things. Areas where intellectual domains border on each other are of great importance. They can provide windows through which the central doctrines of any one domain may be viewed from the perspective of another. For the scholar, work in such an area is something of a high-risk enterprise, because understanding of concepts from more than one discipline is required. Consequently, studies in such areas might tend to disappoint more often than work in 'core' areas. And, of course, in an area where intellectual domains interact, the reader too is likely to have his imagination stretched more than usual. The first stretch of the imagination that is required is to see that apparent peripherality to the