

Among further generally oriented contributions in the volume under review, there is that by H. Günter, who points out that it is inappropriate to assume that phonological recoding necessarily occurs during reading, or even that it always precedes the access to the mental lexicon. B.L. Derwing and M.L. Dow examine spelling conventions as a possible factor in speakers' judgments on such questions as the character of English diphthongs (or single phonemes) in *pain* or *sole*, the voiceless/voiced opposition (neutralized after syllable-initial *s* in stops), and the consonant (or cluster) written *ng*; they conclude that orthography can be a very important influence on such phonological judgments, depending on the type of task. The closing paper by H. Penzl is the only one devoted to diachrony, namely to the development of writing in Old Germanic languages and in the different stages of the history of German, paying also attention to orthography as the main evidence for historical phonology.

More specific topics are discussed in the remaining four papers, where B. Jacobsen describes experiments with the new orthography of Greenlandic (which is phonemically based, although not fully consistent e.g. in the spelling of vowels); M. Durie analyzes the orthographic representation of vowels in Acehnese (and interesting results concerning the boundary between segmental and suprasegmental phonological units); G. Melchers characterizes issues of the written form of dialects (paying attention especially to that of the Shetlands); G.E. Booij investigates Dutch spelling from the viewpoint of its relationships to the structure of the language (first of all to different layers of phonological rules, as well as to syntax).

The volume as a whole reflects in a relatively exhaustive way the different present approaches to written language and orthography and shows how many questions still are open for discussion here, both within linguistic theory and in the relevant interdisciplinary domains. While the contributions by Sgall and Luelsdorff will be useful for these theoretical viewpoints, those by Derwing, Priestly and Rochet, by Lawrence, Williams and Kaye, and by Hitzenberger are important for the aims of computational approaches and applications, and others are of interest for various more specific issues.

James R. Hurford, *Language and number: The emergence of a cognitive system.*

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The number of stars in the universe! The number of drops of water in all the oceans, rivers, lakes, streams, ponds, canals, aqueducts, reservoirs, swimming pools and so forth! The number of the grains of sand on all the beaches of the world! It is difficult for western man to envisage his world without numbers and numerals. (Some languages have no numbers, though; cf. Dixon (1980).) From the square root of -1 , i.e., $\sqrt{-1}$, to the conceptions of zero and infinity (more on this later) – balancing the

checkbook, the year 1988, or indeed the time and date, what can numbers tell us about language? This is the fundamental question that this book poses, and to a certain extent, Hurford (1975) asked something similar.

We take numbers and numerals for granted, do we not? Fractions, decimal points, long division, exponents – try your foreign language skills and see if you can teach mathematics or even basic arithmetic in Chinese or French. Not in Classical Arabic, at any rate, because the rules for the numerals include such monstrosities as what is generally known as polarity (masculine numbers with feminine nouns and *vice versa*), case and indeclinable irregularities, and so on.

I have been told by countless numbers of foreigners that they always revert back to their native languages to count (and many of these speak what I consider to be perfect English) and to perform arithmetic functions. (I do this when I speak in a foreign language.) This, in itself, would, with psycholinguistic experimentation, make for a fascinating study. I would think that a database of 100 or more languages would reveal some interesting (linguistically significant) generalizations, and Hurford is the ideal scholar to undertake this work, for this volume is not Hurford's (hereafter, H.) first book on numbers. Indeed many will recall Hurford (1975) and (1979). Although the book under review is not the 1975 one, H. himself makes the valid analogical point (p. viii) that he has climbed the mountain, so to speak, twice by totally different routes looking at the different and changing scenery both times. We linguists can learn a lot about the nature of language and linguistics from this mountain climber, so I hope I have whetted your appetite to put your boots on and read on.

The significance of this book lies, without question, in its multidisciplinary and interdisciplinarity. H. is the first person to look at numeral systems in natural languages and show their relevance to some key questions in linguistics, viz., what is relevant to study within the entire field of linguistics. He has convinced this reviewer and probably most of his readers that this subsystem of language tells us something significant about language as a system, or as de Saussure put it long ago, '*un système où tout se tient*'. The author succeeds in his goal of (p. ix) 'doing linguistics' by looking at the details, and sometimes they can be quite messy. I quite agree with his perspective (p. 2) that philosophers, who try to capture generalities about the entity they study, tend to underestimate the complexity of human language because they have not delved into the many fuzzy, interwoven details of phonology and grammar.

Indeed H. has shown, and quite convincingly I might add, that there is a common, universal-tendency-*human* way of operating linguistically, i.e., the fact that the number 19 is formed in a parallel way across many languages (p. 13) is highly important, or to use H.'s own words (ibid.): '... the conformity of numeral systems the world over to 'standard' arithmetic, shows that the human psychological factors at work converge so significantly on certain patterns that these patterns can be taken as objects and studied objectively'.

Indeed Ferdinand de Saussure and Edward Sapir, to mention but two illustrious predecessors of ours, looked at language as social semiotic (to borrow a phrase from

one of Australia's leading linguists, Michael A.K. Halliday) with a psychological perspective. Implicit in this view is the obvious fact of language change. H. combines these aspects into an evolutionary look at *langage*. Language acquisition and creativity occur as part of the psychological perspective of the individual whereas standardized expressions are often utilized in our day-to-day social intercourse (after all, it is a sure bet that an English speaker has uttered 'Good morning' quite a few times so far). Both of these sides of the language coin may be analyzed synchronically or diachronically. However, H. (p. 85) argues (and I agree) that 'some aspects of synchrony can only be explained diachronically'.

This book develops the thesis that the cognizance of number systems occurs as a result of the acquired language. Cf. 6.3. 'The language foundations of mathematics' in Hockett (1968: 104-118), who reminds us that Bloomfield (1933: 29) said 'language enables us to *count*'. This will be returned to later, however.

The structure of numbers reveals some secrets about the nature of language, the interrelationships of language, culture, and society, and the nature of the numeral *per se* or the conceptualization of number itself. He presents early on two basic tenets about our conception of number (p. 3): '... the number faculty largely emerges through the interaction of central features of the language faculty with other capacities relating to the recognition and manipulation of concrete objects and collections', and that (p. 6) '... numerals are primarily adjectives and secondarily nouns, and that the principle differences ... between numerals and (other) adjectives and nouns derive from their characteristic semantic denotations'. What remains unclear to me (if I interpret H. correctly) is how can they be adjectives in languages which do not have the slightest trace of the grammatical category 'adjective' since there are languages without this category, e.g., Nootka (cited on p. 195). H. is aware of this apparent paradox for he writes (*ibid.*) that he cannot comment on the fact that Wakashan languages have verb stems for the numerals or that in Fijian 'numbers behave like verbs'.

As H. goes on to explain, however, psychologism takes the point of view that linguistics has something to say about logic and mathematics (p. 9). Cf. Hockett (1968) for the same attitude. Further, he comments (*ibid.*) that Frege (1950) rejects this view on the grounds that it confuses objective facts with subjective ideas. However, people do have to share some common psychological phenomena; otherwise, communication as a process could not occur. An appreciation of one's surroundings necessarily involves the concepts of naming its constituents; this would include numerals. But as H. is quick to point out (p. 8), 'in some languages, some numbers are not named, or are named only with difficulty or uncertainty'. This is reminiscent of the time when man already had language but had not yet invented counting via words (cf. Hockett (1968: 105)). One is instantly reminded of the Sapir-Whorf hypothesis and what it says about the relativity involved in color or kinship terminology in the world's languages. And as is now becoming increasingly clear, color perception, e.g., is independent of vocabulary *per se*. H. tells us (p. 79) that

cricket umpires count the six balls by a method which has no names for the numbers themselves, and in fact, this is exactly the way counting has emerged in prehistoric times.

Just why is it, after all, that '11' often shows up as 1 + 10 or *vice versa* (e.g., Hebrew (*a*)*xat esre*, lit., '1' + '10', however, note *eser* '10'), but '2' never shows up in any language as '1' + '1'. H.'s answer to this question (pp. 8–9) is that higher numbers make use of 'linguistic devices'. This is an example of a linguistically significant generalization (cf. Hurford (1977)).

One can see from H.'s previous work that he is thoroughly trained in mathematics, logic, and probability theory and statistics. However, as H. himself notes in his well-known article about what is remarkable in language (1977: 612), he uses mathematical and statistical models to tell us something about the nature of language – not about the nature of mathematics or logic.

The present volume, as has already been alluded to and as the author tells us in his Preface (p. viii), makes the strong claim that numbers are but one piece of evidence which clearly demonstrates that language had to antedate a human's total knowledge of 'number', hence the sub-title of the book: 'the emergence of a cognitive system'. Hurford (1975) looked at the numeral systems of many languages to offer evidence in favor of an interpretive semantics (cf. Merrifield (1977)). But by 1987, H. had grown a bit disenchanted, I believe, with transformational-generative grammar as I glean from the following (p. ix): 'Linguistics has grown too large and diverse for *anyone* [italics mine] 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'.

Hurford (1975) and the present book differ in some significant ways. For one thing, this work includes (and the older one did not) a discussion of numeral classifiers (pp. 214–218) and the very difficult-to-solve problems of word order and word-order universals (pp. 218–226), i.e., why **red five houses* is ungrammatical for *five red houses* (p. 221) 'because a collection cannot be red'. To me, one of the outstanding attributes of the current book is H.'s simple and elegant notion of 'explanation' in linguistics as part of a linguistic theory of what the ontology and epistemology of linguistics are all about. To pick a detailed example of what I am referring to, one should consider H.'s (p. 221–222) assessment of why the singular is universally morphologically unmarked as opposed to plurality: '... presumably because individual objects tend to be more salient in human perception than collections'. Then, quite ingeniously in my estimation, H. cites the opposite structure belonging to a hypothetical Martian language (pp. 222–223) and demonstrates how Egyptian Arabic is similar to it (the collective is unmarked whereas both the singular and plural are marked).¹

¹ There are a number of errors in the Arabic data. On p. 222, 'onions' should be *baṣal*, *baṣala* ~ *baṣalaaya* 'one onion'. On p. 223, '3' should be *talaat* and 'peaches' *xoxaat*. The word *xoox* 'peach' is correct, but before the plural suffix *-aat*, there is an automatic morphophonemic rule of vowel shortening. Another error (p. 236) is the Arabic name of *A Thousand and One Nights*,

I now offer a brief summary of the contents of the book. Chapter 1, 'The object of study' (pp. 1–35), presents some preliminaries about the study of language as a system of systems and subsystems, using the works of de Saussure, Chomsky, Jakobson, Katz, and many others. He sets the stage for his major thesis that the number faculty develops from the interrelatedness of language with other cognitive maturation. Cf. his concluding remark of the book (p. 306): 'Languages are artefacts resulting from the interplay of many factors'.

Chapter 2, 'Explaining linguistic universals' (pp. 36–85), deals with, among other items, the problem of defining what is linguistically significant in a language. It is a follow-up to Hurford (1977). It should be kept in mind that the concept of linguistic universal is often, in essence, nothing more than a linguistic tendency, as H. alludes to. This chapter is fundamentally important in that it explains evolutionarily these universal tendencies of regularities and irregularities, i.e., the semantic extension of a body part for a number (via a pointing gesture) (pp. 80 ff.).

Two items discussed need much further elaboration, in my view. They are the Welsh abandonment (p. 84) of the vigesimal system in favor of the decimal one, and how the Arabic (p. 85) system of using the plural with numerals from 3–10 (*not* 2–10, as stated, since Arabic has a dual to specifically cover 2) but the singular with higher numerals 'is ... a growth mark'.

Chapter 3, 'A continuous sequence of counting words' (pp. 86–131), accounts for the case of a typical language that the numbers 1–10 are single lexemes, but 11 and up use morphosyntactic means. We also learn interesting facts such as that in some languages, e.g., Ainu, many Papua New Guinean languages, etc., numerals such as 8 and 9 can be broken down morphemically as (10–2) and (10–1), respectively. Although this is an exceptional type of language, to be sure, H. is right to conclude (p. 87) that perhaps the number 10 existed before 8 and 9, although it is possible (p. 88) that the original base number was 5 and that 10 was, in essence, conceived of as 5×2 .

One extraordinary revelation of this chapter is a proof for the concept of a word – a notion which no linguistic school, in my view, has been able to define satisfactorily (p. 122): The young child possesses 'the concept of a word in general', and can use this conceptualization as he or she acquires language. H., further, argues for both 'nature' and 'nurture' (p. 125): 'However rich the innate apparatus one attributes to the child, one cannot escape the conclusion that acquisition of more elaborate knowledge involves induction from experience in some form'.

which should be *?alf leela wa leela*. These are not typographical errors, which do occur in the book as well. Some of this latter type include: (1) *langage* for *language*, p. 49; (2) the accent marks in Sara, usually known as Sara(-Ngambay), a Chadian language, p. 55; (3) *is is*, p. 102; (4) the = sign, p. 251, and a few others.

I also wish the index were larger. Do 5 pages do justice to a 300-page book? In this connection, one must point out that the index of Hurford (1975) is even briefer.

Chapter 4, 'Numbers: The meanings of numerals' (pp. 132–186), concerns itself with the philosophical foundations of the meaning of numbers using chiefly the works of Frege and Russell. I found the discussion of ordinal numbers (pp. 167–173) particularly fascinating, in which we learn some universal tendencies, such as the word for *second* is often the same word which means *other* (Egyptian Arabic *taani*), and that the first few ordinals are often suppletive (Modern Standard Arabic *lawwal* 'first', feminine *zuulaa* is not related to *waahid* 'one', feminine *waahidah*).

Chapter 5, 'Syntactic integration of counting words' (pp. 187–238), takes off where Corbett (1978) ends in trying to decide whether a numeral has more noun-like properties or adjective ones; however, H. (p. 188) insists, and quite rightly so, that morphological criteria must be differentiated from the syntactic. We have already mentioned that H. concludes that numerals are basically adjectives (cf. our earlier remarks on this point). Another dictum (p. 195) I fail to grasp concerning his general conclusion is how many African languages, which apparently only have a grand total of 3 or 4 adjectives, can have numerals which are also adjectives. Is not this tantamount to saying that there cannot be 3 or 4 adjectives in a language of this type because there are, presumably, many more than 3 or 4 numerals? This seems to me to be self-contradictory.

Chapter 6, 'Standardization of complex numerals to a fixed base' (pp. 239–301), goes over some material already presented in Hurford (1975), e.g., the Packing Strategy (p. 243): 'When forming an expression for a high number, pick the highest valued expression available as a starting point, and then build on that'. The conclusion expressed is that it is not innate (pp. 252–261).

Chapter 7, 'Denouement and prospect' (pp. 302–306), makes the solid case that 'numerals in all languages tend to be ... syntactic idioms' (p. 303) in a sense first used by Ronald Langacker. The many irregularities of the Classical Arabic numeral system (mentioned earlier) can be truly appreciated when H. maintains that (p. 304): 'The syntax of numeral constructions is partly frozen, or fossilized'. Many seemingly ad hoc rules for the numerals have been streamlined or 'simplified' (this latter, I admit, is a very misleading term) in both Classical Arabic → colloquial Arabic dialects and Biblical Tiberian Hebrew → Modern Israeli Hebrew. How can we reconcile this aspect of linguistic evolution with the apparent existence of a system such as Hindi in which the numbers 11–99 can be regarded as suppletive? Is not this situation highly suspect for linguistic change? (My own point of view is that the Classical Arabic numeral complexities have been somewhat invented by grammarians and then regularized by them and their students, and that Arabic was not really ever spoken natively with *all* these intricate rules.)

To sum up then, H.'s book can best be seen as an investigation of the hypothesis of innate psychological principles as the basis for a knowledge of language. Classical Chomskyan doctrine assumes that the structure of universal grammar is identifiable with an innate language acquisition device (sometimes, H. has abbreviated L.A.D. for his LAD, e.g., p. 22), however, H. insists it is also important to remember that

language consists of irregularities such as idioms, frozen historical remnants, etc. From this perspective, language seems to be an ill-formed system (cf. Hockett's (1968) distinction between well-defined and ill-defined). These irregularities and fossilized forms are not fully accountable for within the Chomskyan paradigm. (Incidentally, has anyone ever answered Chafe's classic (1968) paper on idiomaticity or his (1970) statements about the failure of current linguistic theories to account for the development and evolution of language?) Any degree of ill-formedness in language, it appears, presents difficulties to universal grammar. 'Some of the universals of numeral systems ... are in fact universal irregularities. The relation between deep regularities and surface irregularities is often held to be an example of the complexity of languages' (pp. 45–46). H. sums up a portion of his findings by the following perceptions (p. 305):

'With respect to number and its expression in language (that is numerals), I claim to have shown that these innate capacities are sufficient to determine the number faculty in Man ... Man has the capacity for language and for number, capacities which his ancestors at some stage lacked. Children, born with the capacity to acquire language and number, acquire them simultaneously, and this simultaneity is significant. Language is the mental tool by which we exercise control over numbers. Without language, no numeracy ...'

'The capacity to reason about particular numbers, above about 3, comes to humans only with language' (p. 306).²

These findings account for and relate to the fact that in a language such as Hottentot in which one counts 1, 2, 3, many, many, many, etc., there can be no arithmetic, or arithmetic, at least, as we know it (Martian arithmetic, perhaps?). How does one say 65 in Hottentot? The question is not a relevant one, I believe! One does not retire at 65, so 65 is an unimportant conceptualization as it is (assuming everything is equal). The relevant point is that one gets to be 'many' years old and is, therefore, just plain old in Hottentot culture and society. It seems to me that the Hottentot numeral system is *acquired* like all other aspects of Hottentot grammar. However, how can we reconcile this fact with H.'s pronouncement (p. 109) that all numeral systems are, in fact, transmitted not via the normal acquisition process but rather by formal adult teaching? How is the Hottentot case to be explained then? I cannot imagine any parent, or teacher for that matter, explaining the system to a child via any formal teaching process. Also, *why* is it that some languages lack a numeral

² Somehow, this fact must be related with the grammatical category of singular, dual, trial, and plural and the Hottentot numeral system (cf. Gamow (1947: 14–34 *passim*)), which is discussed in the text of the review itself following this note's reference.

Other facts which need to be tied in here are that young children definitely operate with the words 1 and 2, yet one cannot be sure about 3 (p. 126), and that in child language acquisition, there is a one-word stage (*mama: papa*) and a two-word stage (*mama allgone*), but there is no three-word stage (**mama allgone now*).

system altogether (*ibid.*)? Is the answer similar to why some languages do not have words such as German *Schadenfreude* 'malicious joy' or are other factors involved? Presumably the *urge* to count one's fingers, toes, or hands, ears, eyes, etc. is *not* universal, although doubtless this gesture or deixis must have occurred before counting developed in word format. This is more proof, I think, for the gestural origin of language itself. Hockett (1968: 106) as a leading authority does say that the limited counting of some may be older, such as showing fingers.

One of the most intriguing aspects, I think, of H.'s book deals with the 'Ritual Hypothesis' (pp. 102 ff.) or the 'Eeny, Meeny, Miny, Mo Hypothesis', which states that out of counting comes a numeral system. This seems quite logical to me, but where is the evidence for H.'s statement that the first counters (p. 120) 'probably had some extremely vague, totally inexplicit, idea at the back of their minds of what they were doing and why'? How does this jive with the fact that speakers of languages without numeral systems have no problem learning a numeral system when and if they become bilingual? What we find particularly fascinating is the extension of the 'Ritual Hypothesis' to explain the origin and development of human language itself which H. does not do. Once one has the noise produced (i.e., phonology), then one can assign a semantic structure to it. Could not part of language have evolved with people just chanting ritualistically without referential, and then much later, a referential (for whatever reasons) developed? Usually, pictures of linguistic structure show just the opposite: *semantics* → *phonetics*, which is, I think, basically correct but not for the totality (100 per cent) of language and not for the entirety of linguistic evolution. An argument in favor of this latter picture comes from an experiment discussed (p. 94) about the counting skills of two-year-olds. If their verbal skills were better developed they could subitize (sometimes H. has 'subitisc', e.g., p. 118) better. The implication is that the children have the thought capacity for discriminating aggregates of objects, but they have not yet developed the verbal means to express their thoughts (or pre-thoughts (?)), i.e., in a nutshell, thought is there before the noise to express it, paralleling the emergence of numerals themselves.

Looking at numbers provides important evidence that one can indeed think or reason without having specific words for particular concepts in and of themselves. We do not have specific words in English for 10^4 , 10^5 , 10^7 , 10^8 , 10^{10} , 10^{11} , and so on whereas we do for 10^2 , 10^3 , 10^6 , 10^9 , 10^{12} , and 10^{18} . In American English a billion is 10^9 , but older forms of British English have no lexeme for this because a billion in British English is 10^{12} . Just because the British have no separate word for 10^9 , that does not mean that 10^9 is in any sense a difficult number for them to conceptualize. (British English today is influenced by American English and a billion is indeed 10^9 .) Surely the converse to this is also relevant to reflect upon. The English word 'infinity' explains the set of all integers, yet the number of points on a straight line is a bigger infinity than the set of all integers. But how can this be? The famous mathematician Georg Cantor was the first to work all of this out in elaborate detail. Further, there are some 'semantic adjustments' one must get used to because the infinity of a straight

line 1 inch long is the same as the infinity of a straight line 1 mile long. Now, would not this be difficult to explain to a Hottentot, who, seemingly, cannot count past three?³ And would not a Hottentot or an Arabic speaker, for that matter, be fascinated with the English word *googol* (coined by a child, incidentally) for 10^{100} and a *googolplex*, which is $10^{10^{100}}$?

I enjoyed reading H.'s book, as I think the reader has already discovered from my remarks. Numbers are real or as H. says (p. 179), 'numbers seem to be real ...'. Numbers are and can be real fun too. He has convinced me that numerals⁴ are important for linguists to consider for they are (p. 6) 'unlike almost anything else in language'. H. has already written two books on numerals and linguistics, and if a third is yet to come, I believe linguists will still profit. Even the 'hocus-pocus' linguist will find something of interest in this work.

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³ 'Infinity' is not in H.'s index, incidentally. Strangely enough, there is no reference in the book to any of the writings on language, logic, and mathematics by Charles F. Hockett, especially Hockett (1966).

⁴ We can conclude that numerals, like other lexical terms, channel the way we perceive everything being equal. The major difficulty is that the traditional 'language and culture' tests of abstract comparisons do not work out because how often can everything be equal?