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D. T. Langendoen and P. M. Postal, *The vastness of natural languages*. Oxford: Basil Blackwell, 1984. Pp. ix + 189.

It is not clear whether this book really deserved to be written. Nearly three-fourths of its fairly short length is taken up with establishing a relatively uncontentious point, namely that 'each individual natural language is so vast that its magnitude is not given by any number, finite or transfinite'. A useful thing to have established, certainly, but not worth a book. Indeed, for those with some curiosity concerning this point, but without the money and time to purchase and read this work, the same authors have set out their arguments in about one tenth the space in Langendoen & Postal, (1985). Not much is lost in the compression.

One feels a bit like the Japanese at Singapore, arriving behind all those big guns pointing irrevocably in the wrong direction. All the effort in the book is directed at buttressing and rendering impermeable to any conceivable attack the 'NL Vastness Theorem'. Very little effort is devoted to establishing the SIGNIFICANCE of this result. In one short chapter Langendoen and Postal assert that ALL extant theories of grammar – they list them, rather like trophies on the wall – are ruled out by their result, leaving only a (trivially modified) Postal and Johnson still standing. But they devote almost no effort to buttressing THIS point, which is in fact the weak point of the whole argument. As far as I can see, of the four schools of grammatical theory enjoying considerable support these days, namely Government and Binding (GB), Generalized Phrase Structure Grammar (GPSG), Lexical Functional Grammar (LFG) and Categorical (including Montague) Grammar, all but LFG survive intact with trivial modifications, and I expect it wouldn't take much to 'salvage' LFG either.

Before expanding on this point, however, let us take a brief and necessarily somewhat simplified look at the centrepiece of the book, the 'Natural Language Vastness Theorem'.

This theorem, whose conclusion is stated in the first paragraph of this review, is most simply established by a demonstration, paralleling one of Cantor's, that the collection of sentences of a natural language, e.g. English, is not in the strict sense a set, as it has NO fixed cardinality, and is thus what is called in set theory a mega-collection, similar to the collection of all sets. Coupled with an argument from Occam that no stipulation of an upper bound on sentence length or language size is justified, this demonstration establishes the theorem.

The demonstration proceeds in two steps. First Langendoen and Postal note that there exist sets of English sentences which are infinite in size, with the cardinality of the natural numbers, i.e. \aleph_0 . One example they cite is {*Babar is happy, I know that Babar is happy, I know that I know that Babar is happy, ...*}. And they note that for any given set of sentences, there exists a single sentence, constructed by compounding, which contains all of the elements of that set. From this it follows that from the first set we can construct a new set of sentences formed by constructing a compound sentence for EVERY subset of the first set (of cardinality greater than one). By a standard result, this new set has the cardinality of the continuum, i.e. \aleph_1 . And

clearly this process can be repeated indefinitely. By a parallel argument to that by which Cantor established the impossibility of there being a set of all sets, this proves the Vastness theorem.

To the extent that I am competent to judge, the mathematical and linguistic bases of this proof are sound. Leaving aside the question of whether the 'proof' in fact goes through, that no stipulated limit on the size of an NL or its sentences is warranted, which I take it is in the end a matter of faith, does the NL Vastness Theorem justify Langendoen & Postal's principal conclusion, that of all extant grammatical theories, only Arc-Pair grammar is capable of dealing with the fact that the sentences of an NL do not form a set?

It seems clear to me that in fact it does not – that indeed almost nothing of consequence for the theoretical linguist follows from the theorem.

This assertion rests on the apparent existence of two ways of turning a generative grammar, which necessarily characterizes a recursively enumerable, therefore denumerably infinite, string-set, into what Langendoen & Postal call a 'non-constructive' grammar, which can characterize (*inter alia*) a non-denumerably infinite string collection. These two ways are

(1) to guarantee that the constructive characterization of the denumerably infinite subset of an NL automatically yields a methodology for generating infinite proofs of membership for the rest of the NL;

(2) transforming without theoretical cost the constructive/generative theories into non-constructive/well-formedness theories.

I am not qualified to expand on the first possibility, which would presumably draw on similar moves in the formal logic tradition, and recapitulate in some formal way the sort of subjective, quasi-generative reasoning we go through as we understand the demonstration of the non-denumerability of English, but the second seems so straight-forward as to raise serious questions about what can only be construed as Langendoen and Postal's wilful ignoring of it.

The claim that Arc-Pair grammar is non-constructive, and hence acceptable in the vast new world of transfinite NLs, because it is cast in terms of well-formedness conditions on sentence structures, and that by removing the (unnecessary) restriction that such structures be at most denumerably infinite in size, it applies as comfortably to transfinite as to infinite sentences. But of the theories mentioned above, GPSG is already stated in well-formedness terms, Categorical Grammar could be taken without other effects to be so stated, and GB could be so stated with a very little effort, indeed some moves in that direction were taken within the Generative Semantics camp (see e.g. McCawley, 1968; Lakoff, 1969; Thompson, 1975). I am less clear about the status of LFG, but would be surprised if some such move could not also be made for it.

The point is not just that such reinterpretations are possible, but that aside from the particular question of cardinality or the lack of it, they have NO other effects on the reinterpreted theories. No hitherto grammatical constructions are rendered ungrammatical. No loss (or gain) in the perspicuity of accounts of linguistic phenomena occur.

We note with thanks that Langendoen & Postal have established as firmly as may be, given the necessary uncertainty of their ontological assumptions, that natural languages are larger than we might have thought. And we go back to doing whatever we were doing before.

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