Considering Optimality Theory from an Evolutionary Biological persepctive

Abstract

The strictly orthodox version of OT, as proposed by Prince and Smolensky (1993), has as one of its tenets that there is a set of violable constraints that are innate and universal in human languages, and it is their ranking which causes the structural differences between human languages.

This paper explores the objections raised by McMahon (2000) who suggests that such a set of violable constraints forming a part of the human language faculty is incompatible with the idea that language is a product of evolutionary biology. These objections can be summarised as follows: a closed set of universal constraints could only have arisen by means of a single macro-mutation; a closed set is anyway inherently objectionable, since it allows no scope for further evolution (which of course never stops); alternatively a non-closed set implies that the constraints are learned rather than being an innate part of an evolved language faculty.

The first point seems to be directly analogous to the classic objection to the possibility of complex organs arising as a result of evolution: what use is half an eye (or indeed half of any complex organ)? The eye has been used as an example both by people who wish to argue against the possibility of evolution (Paley, 1828), and by those who argue that nothing but evolution can possibly account for complex living organisms (eg Pinker, 1994 and Dawkins, 1986). Dawkins (1986: 81) goes further than asking whether half an eye is beneficial, he considers the benefit of 5 per cent of an eye: "Vision that is 5 per cent as good as yours or mine is very much worth having in comparison with no vision at all. So is 1 per cent vision better than total blindness."

The key point here is that part of a system is often very much better than no system at all, and even if it is not obvious how a set of violable constraints could have been built up by a series of small steps, this is not to say it did not happen. If you accept evolutionary theory, then you 'accept that complex systems arise through small steps, even if the small steps are not immediately obvious.' (Brown pc).

The second objection, is more subtle. Is it possible for a system to have arisen through the process of evolution and then appear not to change for an extended or even indefinite period of time (even though change is always possible)? Again, the answer is yes. There are many examples of organisms which appear to remain in a constant state for hundreds of millions of years, probably due to a lack of selection pressure in favour of change. Indeed, in some cases, a departure from average, in either direction, can confer a disadvantage (in either survival or reproductive terms), resulting in evolution positively favouring stability. In the case of the human language faculty it seems reasonable that effective acquisition and use of language relies in part on a shared (and innate) set of parameters, and any mutational change to these parameters is more likely than not to result in an impairment to the language faculty, rather than an improvement to it.

The alternative suggestion – that if novel constraints are possible, they must be learnt rather than acquired – implies a mistaken assumption. If it is accepted that the existing constraint set evolved, then novel constraints must also be capable of emerging via evolution,

such a possibility being entirely compatible with an evolutionary approach to the language faculty, although the emergence of such novel constraints would possibly entail a radical re-writing of grammatical possibilities (whether phonological, syntactic or relating to some other aspect of the language faculty), and would not be likely to spread through a population, unless such a re-writing would confer an evolutionary advantage of some kind. The hard-wiring of various novel, language-specific constraints would also have serious implications for anyone who believes that all languages are equally amenable to acquisition by human infants.

It is not suggested here that the set of violable constraints comprise the whole of the human language faculty. Clearly, some aspects of human languages, such as vocabulary, are learnt, rather than arising from universal constraints - it would be extremely unlikely that anyone would propose an OT tableau with an input such as 'domestic canine', with a set of possible outputs to include *dog* and *chien*, and where the optimal output (for any given language) is determined by a set of rankable constraints. Equally, the fact that data sets from different languages can be compared meaningfully at all suggests that there are at least some absolute universals in human language which define the parameters of the speech signal. For example, it would seem to be the case that all natural human languages are parsable into syllables.

The model of the human language faculty proposed as a result of these considerations would be firstly a 'base layer' of *inviolable* constraints underpinning the language faculty that allows human beings, including infants, to identify the types of sound which form part of the human speech signal, to analyse it and to acquire language; secondly there is a closed set of non-language-specific *violable* constraints, which should be well-motivated and attested cross-linguistically to be accepted as such; and finally there is a set of language-specific learnable *rules*, which arise as a result of historical accident. Only the set of violable and inviolable constraints fall within the scope of UG, and are proposed as being a part of the innate, hard-wired human language faculty. The layer of 'rules' is suggested as being relatively flexible and adaptable.

An possible synthesis of this view, suggested by Johnson (pc), would be to suggest that *markedness* constraints in OT are part of the set of universal violable constraints, whereas *faithfulness* constraints derive from language-specific phenomena. If one takes this latter view, then any observed constraint or rule falls within the scope of OT, but care should be taken when proposing an OT constraint to specify whether that constraint should be taken to be part of the universal, violable set of markedness constraints, or an instantiation of a language-specific rule.