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Fission in component-based phonology

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ABSTRACT

This paper advances a novel view of the interrelatedness of the ultimate phonological components. Accepting that these are unary, the paper hypothesises that the phonological components in the three segmental gestures, articulation, categorisation and initiation, can be seen as modulations of basic pulmonic pressure. The modulation is viewed as a result of fission processes splitting nuclei into fragment nuclei which again can undergo further fission at the same time as the nuclei undergoing fission are preserved. The fragment components arising from fission exhibit greater phonetic sophistication than their mother nuclei, because they appear as a result of a demand for more detailed phonological differentiation. Fissional fragment components are developed for all three gestures and the paper deals with a variety of phonological contrasts and attempts to calculate the markedness value of representations.

1. Preamble

Dependency/government phonology in its standard form builds on two well-substantiated assumptions about the internal structure of phonological segments (see Anderson and Ewen, 1987; Lass and Anderson, 1975; Lass, 1976; Ewen and van der Hulst, 2001). The first assumption involves the claim that phonological segments are organised in three phonetically and phonologically motivated gestures (sub-segments), each of which typically describes the initiation, the categorisation and the place of articulation of speech sounds. The second assumption involves the contention that the phonological primes used to specify the internal structure of each of these gestures constitute a restricted set of unary components which typically interact in dependency/government relations, the type and number of which depend on the multitude and character of the phonological contrasts that require differentiation and on the definition and nature of the unary components used to represent such contrasts (see Anderson and Jones, 1974, 1977; Anderson, 1980; Anderson and Ewen, 1987; van der Hulst, 1989, 1994, 1995). The description of phonological constituents to be presented in this paper is founded on both these views about the architecture of phonological segments and the constituents used to describe them. But where dependency/government models normally fail to express in any very explicit way that the phonological components of individual gestures are inter-related or that the number of components is not random, the present proposal contends that the basic components make up a restricted but non-arbitrary and phonetically inter-connected system. The phonetic inter-connectedness and non-arbitrariness of these components, not only gesture-internally but also cross-gesturally, follows from a fundamental hypothesis of this system. This hypothesis is that principally all components are viewed as products of basically the same kind of process. The process is instrumental in the creation of all the ultimate phonological components used to describe the internal structure of the three gestures. This process splits or propagates a nucleus component into one or more fragment components, at the same time as the mother nucleus of this expansion continues to exist independently. Fission, as this

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process will be referred to, is induced by gestural domain, in particular by the number of phonological contrasts requiring differentiation in each gestural domain, but all fission of nuclei involves copying and refinement of the phonetic properties of the mother nuclei so any new fragments resulting from fission of a nucleus share some phonetic material with their mother nuclei, at the same time as they differ from them and in case of binary splitting from one another in terms of phonetic sophistication. The duplication and refinement involved in fission mean that the components of such a system as will be presented below not only remain unary, since all fissionable nuclei are unary, but also that its components make up a set which is phonetically inter-connected such that gestures, albeit discrete, also share properties thanks to the components' common phonetic core.

Fission is commonly associated with the natural sciences. The term is adopted here because fission in both nuclear physics and biology resembles fission as this term is defined here (see Cottingham and Greenwood, 2001; Carter et al., 2005). As in nuclear physics, phonological fission splits a nucleus into fragment components, but unlike in nuclear physics phonological fission is without by-products such as damaging gamma ray-like entities, and without the loss of the nucleus undergoing fission. On the other hand, induced fission, despite its negative implications as the driving force of nuclear weapons, has a parallel in phonology. Phonological fission is also non-spontaneous, generated in particular by the need for phonological differentiation. In biology, phonological fission is paralleled by the binary replication found in cell duplicating mitosis and the division that prokaryote cells without a nucleus undergo. Both biological processes involve the generation of two equal or nearly equal daughter cells as a result of binary fission. But again, as in nuclear physics, the parent nucleus ceases to exist after biological fission, whereas in phonology the nuclei undergoing fission continue to exist because contrast differentiation drives the fission process, and both parent and daughter components are needed for the characterisation of phonological distinctions. Probably biological gemmation more closely resembles phonological fission without being completely the same. As a result of gemmation, a bud-like cell separates from a parent and begins an independent existence, but although the parent is preserved, sophistication in the new fragment is negligible, if at all observable. Finer details aside, phonological fission thus bears some resemblance to elemental transmutations in the natural sciences, but phonological fission also differs in important ways from them, notably in the preservation of the fissioning nuclei and in the sophistication of the copy fragment components, just as it remains to be seen whether it is only in phonology and not in nuclear physics and biology that fragments enter into government/dependency relationships. In fact, phonological fission differs in one more and important way from natural elemental transmutations found in nuclear physics and biology. In phonology some fission processes presuppose other fission processes. Therefore in phonology fission, as it is understood here, is seen as a series of interconnected binary divisions or sophisticating unary transformations and the term is intended to cover either in the following. The components resulting from fission also make up a phonetically coherent system of entities which allow for contrasting speech sounds. A similar coherence exists in the system proposed by Chomsky and Halle (1968), the features of which are held together by being articulatorily defined, and in the system of Jakobson et al. (1951) which exclusively consists of acoustically defined features. But in neither system does coherence entail systematic organisation of matrices in gestures just as features, be they articulatory or acoustic, are not interpreted as instances of refinement or sophistication of a core common to all primes. In the model to be proposed here such a common core assumption is basic and coherence is obtained because fission has to start where such coherence can be ensured. One plausible starting point is fundamental pulmonic egressive compression, an initiation type used in all languages.

The hypothesis is therefore that the basic fission process, basic because its fission products feed other fissions, involves the bifurcation of pulmonic egressive initiation. This initiation type is thus seen as the 'epicentre' of phonological component formation, being the phonetic pulse always used in a language. Initially, fission involves the splitting of this fundamental nucleus into the fragments consonantality and vocalicness. Its universally stable and balanced status opts for an interpretation of this basic nucleus as unary in line with much work in dependency/government phonology. Thus the fission of this nucleus as well as the fission or transformation of its fragments and its fragments' fragments will result in components which are also unary. At the same time, because it is induced by the need for phonological differentiation, fission as a process involving successive binary replication results in increasing sophistication of components and thus more generally creates a phonetically coherent system of phonological components. The most basic fission process splitting pulmonic egressive initiation into vocalicness and consonantality provides the components |a| and |C| respectively. As unary and as always present entities, these components may fission into three or more fragment components. Fission of the basic two categorial components, |a| and |C| is characteristic of specifically the articulatory gesture, whereas the categorial gesture, hosting the two basic components, exhibits fission internally if phonological differentiation in the form of phonologically relevant laryngeal settings requires it. As supplier of componential energy, the initiatory gesture typically is unspecified, but phonologically relevant suction and glottalic pressure mechanisms, when these relatively rare mechanisms are used, require individual components and thus presuppose initiatory fission other than splitting into basic |C| and |a|. Fission of these basic two into three components is always found in the articulatory gesture of vowels, since most if not all languages minimally have three (peripheral) vowels. Similarly, fission is also found in the articulatory gesture of consonants which typically requires fission into four components, given that the number of consonant place contrasts rarely is less than four. The following diagram shows the system of components and the fission paths that exist between the categorial and the articulatory gestures: