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No Gods and Precious Few Heroes: SFL and Evolutionary Linguistics

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There were our own, there were the others.
Their deaths were like their lives, human and animal.
There were no Gods and precious few heroes.
What they regretted when they died had nothing to do with
      race and leader, realm indivisible,
laboured Augustan speeches or vague imperial heritage.

Hamish Henderson. From *Elegies for the Dead in Cyrenaica*.

1. Introduction

As we head deeper into the 21st Century, Systemic Functional Linguistics (SFL) stands at a crossroads, as the groundbreaking theoretical work of Halliday, Hasan and others comes into contact with ongoing developments across the wide spectrum of linguistic sciences. In this paper, we propose a potential direction of travel along which the primarily social underpinnings of SFL theory can be combined with currents in biolinguistics and cultural evolution as a basis for developing a comprehensive theory of language as a dynamic psychosocial phenomenon. This paper is derived from ongoing work with my colleague NAME (see also this volume) in which we describe a small number of evolved behaviours and recurrent mechanisms and process that we believe are fundamental (though far from exhaustive) in developing a materialist and evolutionary account of the emergence and dynamics of social semiotic structures at multiple scales of human activity. As one aspect of this work, the present paper brings together research into imitation and risk from cultural evolution (Rendell et al. 2020; Pennisi 2010; Rogers 1989; Pagel 2012) with the stratal and paradigmatic architecture of Systemic Functional Linguistics (SFL) (Matthiessen 2007, 2015; Halliday and Matthiessen 2004) as a means of exploring Pennisi and Falzone's (2016:96-97) claim that language as an embodied phenomenon produces meanings from the phoneme to discourse through a series of articulations of different orders. The resultant picture is of language as a complex dynamic system expanding along two interconnected dimensions simultaneously: interstratally, as texts emerge from utterances, discourses from texts, and cultural formations from discourses; and intrastratally, as the *meaning potential* at each of these levels shifts and expands.

2. SFL and the downplaying of the biological

Within SFL, the development of the language system as a social semiotic, or *phylogenesis*, is seen as essentially interconnected with *logogenesis*, the development of texts in their social context (Matthiessen 2007:541; Martin and White 2005:26), and *ontogenesis*, the socialisation of individuals

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into and through such practices (Matthiessen 2007:541; Halliday 1975; Painter 2000). The fundamental materialism of SFL, therefore, is accounted for with reference to the social and a general avoidance of the biological as well as the cognitive.

This focus on the social in SFL can perhaps be seen as a reaction to both dualism, which separates the mind and the body, and innatism, which minimises the role of socialisation in language development. However, opposition to these two positions is common within both cognitive and biological approaches to linguistics and SFL's relative neglect of these fields detracts from its potential to account for the coevolution of *homo sapiens* as a biological species and language as our most powerful sociocultural tool. This paper, therefore, follows authors such as Thibault (2004), Lemke (e.g. 2015) and McGregor (2019) in reinflecting a fundamentally SFL orientation to language as a social semiotic with concepts from systems theory (Kretzschmar 2015), evolutionary biolinguistics (Pennisi and Falzone 2016) and cultural evolution (Rogers 1989; Rendell *et al.* 2010; Pagel 2012) as a step towards developing an account of semiotic activity as both a social and an embodied phenomenon.

Evolutionary biologists such as Pennisi and Falzone go as far as to suggest that the cognitive structures of the human brain are themselves not the cause but a by-product of communication, developing *in response to* syntactic structures which are themselves "the ontogenetic and evolutionary consequence of the possibility of realising combinatorial and recursive applications starting from structural apparatuses…which have reached a specific degree of bodily technology" (Pennisi and Falzone (2016:29). While this position is far from unique to Pennisi and Falzone, they build on these premises to state claim that:

> …language produces a system of articulations of first, second and third level allowing a virtually infinite combinatorial technology based on sound units (phones, phonemes, syllables), morphology (morphemes), semantics (lexemes, words, sentences, discourses, texts) from a finite number of dedicated physiological elements.
>
> Pennisi and Falzone (2016:96-97)

It is this system of *articulations* that is at the heart of the discussion that follows. However, the explanatory power of articulation as a concept is only hinted at in Pennisi and Falzone's work. This is not surprising, given that their focus is on the evolution of the human organism as it accommodates to language. A materialist and embodied approach to language, however, does not necessarily assume that language itself resides within the human organism in any innate form, but rather that the language system and the human species have coevolved, each accommodating to the other in order to derive the maximum reproductive advantage. In these terms, language, or languages, reside outside the individual in the form of distributed cultural systems to which speakers have differential access and which speakers all contribute to shaping in their daily use. So, while we may be genetically disposed to use language, to internalise and reproduce associations of form and function, the combinatorial technology that Pennisi and Falzone refer to is a property of the language system as an external, distributed and transmittable resource.

It is this symbiotic interplay between the internal and external that has made it possible for the human species to "throw off the yoke of its genes" (Pagel 2012:4) and to conquer and flourish in new niches through adaptive learning rather than genetic adaptation (*cf.* Everett 2012). The commitment to a material account of semiosis, therefore, requires us to describe not only the structural characteristics of language as a dynamic open system which provides the *affordances* for

semiotic autogenesis at "ever-greater" scales of abstraction, but also the evolved human traits that provide the *conditions of possibility* for these affordances to be operationalised in situated practice, without recourse to the concepts of free-will or intentionality. In the following sections I develop each of these concepts in turn before suggesting how they combine to provide key recursive mechanisms in the emergence of language as a dynamic system operating at multiple levels of abstraction.

3. The dynamics of adaptive change

In his "unitary biosemiotic account" of meanings and feelings, Lemke (2015:597), following Peirce (1998) via Bateson (1972), describes semiosis in terms of sets of associations between phenomena:

> As we interact in the world we encounter a lot of perceptions, actions, phenomena, doings and happenings, processes and things, places and occasions. For some of them to count for us as signs of others, there has to be some set of associations (our nervous systems seem good at producing these), such that there is not, for us, an equal likelihood that anything can go with (i.e. follow closely in time, or appear nearby in space) anything else… Mathematically, this means that there is some degree of "redundancy" or informational order: some things are more likely to go with (predict) some other things. Not absolutely, not 100% of the time, but more than by mere chance alone.

While the capacity to recognise and respond to such co-occurrences provides an evolutionary advantage, in associating a specific smell with the presence of a specific source of food, for example, it remains a relatively blunt tool, restricted to those highly constrained environments in which such associations reoccur with a high enough degree of frequency to improve the chances of survival and reproduction. In order to improve adaptability to a greater range of environments, therefore, a higher level of semiotic capacity is necessary: one that varies the strength of associations according to distinctions in the context in which they occur. At this higher level of capacity, a sensate organism recognises a distinctive context X and predicts that, within this specific context rather than any other, A and B are likely to co-occur. The converse is also true, in that an organism, on recognising the co-occurrence of A and B, can predict that it is operating within a specific context X. Thus, context X can be said to be in a redundant relation with the redundancy relationship between A and B, as each predicts the other. This is the concept of *metaredundancy* or, the ability to "recognize, classify, and respond to the same difference differently in different contexts" (Lemke 2015:599, drawing on Bateson's (1972) concept of *meta-learning*). To give a simple example of such adaptive behaviour, we can note that the same physical reaction of heightened nervous activity is related in some contexts to the presence of danger and results in flight or fight, while in other contexts it is associated with sexual attraction, with quite different behavioural consequences in terms of survival and reproduction (Wilson 2002:101). In terms of socially developed linguistic behaviour, metaredundancy is in play when a speaker can recognise the context on the basis of the observed behaviour of others and, having recognised the context, can further predict what behaviours are likely to follow. In other words, the speaker is socialised into recognising what further interactions will be judged appropriate or legitimate within the unfolding context – a point that is developed below.

In a paper entitled *Does biology constrain culture?*, Rogers (1989) considers the relative advantages of cultural versus acultural learning (i.e. dependence on social transmission rather than individual trial and error) in the evolution of the adaptive behaviour captured in the principle of

metaredundancy. He begins with the hypothesis that individual learning leads to greater variability of response and an increased habitat, while social learning is safer if more constrained:

> …the value of individual learning reflects a tradeoff between the benefit of a broad diet and the cost of occasional poisoning. A rat that learned his diet socially, by copying an elder, would be less often poisoned, but would be unable to use novel foods. Thus, cultural transmission of diet reduces the risk of being poisoned, at the cost of a narrower diet.

Rogers 1989:821

Building on this idea, Rogers conducts a thought experiment, mathematically modelling the results of different behaviours for an imaginary creature, the "snerdwump" (820). His conclusion is that both individual learning and social learning are necessary, with a happy balance to be struck between the two. The exact balance, however, in words that echo the concept of metaredundancy, are liable to vary according to the behaviour type and the environment even for a single species. In highly stable environments, consistent behaviour and social learning provide the surest means of long-term survival, while in rapidly-changing contexts – in other words, in situations where the need for context-sensitive or metaredundant associations is increased - individual learning is useful in increasing the range of responses and therefore the chances of finding a more successful behaviour. Nonetheless, even in rapidly-changing environments, *imitation based on observation* provides a safeguard for individuals and hence the species.

Roger's original thought experiment was taken up by Pennisi (2010) in considering the strategies individuals might adopt when they find themselves in unfamiliar environments: *Do you copy or innovate? And if you copy, who do you copy?* These questions were then tested through a computer tournament (Rendell *et al.* 2010) in which competitors were challenged to design the computer programmes with the most successful mix of individual and cultural learning strategies in response to beneficial information randomly provided by a 'multi-armed bandit'. At each turn, the individual programmes could carry out one of three possible moves: innovate ('pull a new arm' on the bandit to discover the 'payoff' of a particular behaviour); observe (watch a different programme's move to see what the payoff is); or exploit (carry out a move from with the programme's existing repertoire). Random changes were introduced into the environment as the tournament progressed. Players were also able to update their strategies and to see observe how other contestants changed theirs. When these programmes were run against each other inside a supercomputer, it was found that the winning strategy had relied exclusively on copying others, while a strategy that relied almost entirely on innovation came 95th out of a field of 100. There are two further findings of note, however, in that when the winning strategy was run in isolation, it performed very badly; and when the highest performing programmes were removed from the competition, the average payoff across the population increased. There are three provisional conclusions to be drawn here: (i) that a tendency to imitate others is more likely to prove successful than taking risks; (ii) that this is only the case in an environment in which innovation and novelty are present in sufficient numbers; and (iii) that society as a whole prospers more when the most 'parasitic' members are removed. However, as Rendell *et al.*'s results presently contain figures only for the ratio of observe to innovate for individual programmes, they do not make any predictions as to what represents the most effective balance of innovation to novelty in terms of the distribution across the population as a whole[1].

A relatively precise empirical answer to this question is suggested by research into complex dynamic systems. Kretzschmar (2015:8-9), for example, observes that within natural complex systems, such

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[1] I am at present in communication with Rendell in order to obtain data on this point.

as ant colonies, entirely deterministic responses to external stimuli such as attacks by intruders would leave the colony vulnerable. Rather than every ant rushing to defend the colony, therefore, some act to protect the queen while others continue to forage for food. Importantly, it is not the case that the same ants perform the same task each time, but that the population as a whole has evolved to display such regular variation. And the ratio of behavioural variation found repeatedly throughout such systems hovers somewhere around the 80:20 mark, whereby 20% of variation accounts for 80% of the total activity while the remaining 80% of variation accounts for only 20% of the total activity[2]. Kretzschmar refers to this skewed distribution as an *A-curve* and demonstrates its relevance for linguistic phenomena, presenting detailed evidence to show that lexical and phonetic variation consistently shows such a distribution across different groups of speakers. In other words, rather than there being an absolute correlation between groups of speakers and the linguistic variables with which they are identified, there is rather a tendency towards a norm (the predominant 20% of variants), while the 'tail' of the A-curve (the 80% of variation doing only 20% of the work) is composed of old dominant forms that have fallen out of use, of novel forms, and of minor more localised variation.

Combing Kretzschmar's findings with Rogers' and Rendell *et al.*'s work, we have the beginnings of an evolutionary explanation for the rise and functionality of the A-curve in the suggestion that a ratio in the region of 80:20 of normative to marked behaviour provides the optimal environment for the informed risk-taking necessary to protect the system from senescence and vulnerability to unexpected risks.

However, while this 80:20 ratio is a regular feature it is neither synchronically uniform nor diachronically stable. From the synchronic perspective, Kretzschmar demonstrates that while the A-curve distribution holds stable at different scales and across different population sets, the specific features that occupy the head and the tail of the curve may vary. So, for example, at the national level, a small handful of lexical variants may dominate for a specific referent; however, if we look only at men, or only at women, or at different age groups, we see different selections of lexemes dominating for each category. And from the diachronic perspective, we see that for each subgroup of the population, different features will occupy the head and tail of the A-curve at different times, while new features enter and existing features disappear. Within stable environments, such as an ant colony or an isolated social group, the rate of change within the system is slow as the existing 80/20 balance in behavioural variation is sufficient to counter or accommodate external intrusions without undermining group cohesion. Within rapidly changing environments, such as a superdiverse city, however, the system must respond more rapidly in order to survive. In such cases, the rate of movement up and down the A-curve is greatly accelerated and, if there is not the time for adaptive behaviour to even out slowly across the system, fractures will appear in the form of an increased variability of context-specific behaviours.

To summarise to this point, this section started with a definition of a sign as the regular but not absolute co-occurrence of any two sensible phenomena such that each becomes associated with the other. This mutual association, and therefore predictability, is referred to as *redundancy*. However, in more complex semiotic systems, specific redundancy relations are themselves mutually associated with specific contexts, a relationship referred to as *metaredundancy*. The capacity for metaredundancy provides an evolutionary advantage in enabling species to occupy and prosper in a variety of ecological niches. Such adaptation can come about through the process of individual trial and error, survival and reproduction or, for more advanced animals, through the capacity for social

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[2] As such, Kretzschmar's work is an elaboration and refinement of Zipf's theorem,

learning and the imitation of the successful strategies of survivors. Combining the work of Rogers, Rendell *et al.* and Kretzschmar, it was suggested that in order for species to colonise a specific niche, while maintaining the capacity to adapt to new niches and overcome unexpected disturbances, the optimum balance between normative and marked behaviour lies somewhere in the region of 80:20. Developing this observation from animal behaviour, Kretzschmar (2015) provides numerous examples of the occurrence of this ratio for linguistic patterns.

Kretzschmar's work, however, focuses on individual lower-level and relatively arbitrary features of language such as phonemes and lexical items, while the purpose of this paper is to suggest that these same processes apply to larger stretches of language and higher orders of meaning. To this end, the following sections set out the theoretical architecture of SFL in order to provide an account of semiosis as a *fractal system*, defined as *the recursive application of self-similar mechanisms of articulation across different scales to produce meaningful units of ever higher orders of abstraction*. This is the "virtually infinite combinatorial technology" that Pennisi and Falzone (2016:96-97) only hint at and the perspective captured by Ruqaiya Hasan, one of the chief architects of SFL theory, when she says (quoted in Cloran, Butt and Williams 1996: 1): *"I have an idea that there is a continuity from the living of life on the one hand right down to the morpheme on the other"*.

4.   Redundancy and metaredundancy in language

The concepts of redundancy and metaredundancy allow us to consider linguistic ontogenesis as a process of associating language form and function and of associate such pairings with their contexts of use. Starting with a basic form such as the declarative, realised in English through the structure S^F (Subject followed by Finite element), we can say that language learners note a strong association between this form and the social function of *presenting information as needing no further input* and that children develop this association through socialisation into their speech community. This is in itself a redundancy relationship, as there is a mutual expectation between information being presented as needing no further input and the use of the declarative form: each predicts the other strongly but not absolutely. In contrast to this we have the interrogative structure (F^S in English), which is in a redundancy relationship with the social function of *presenting information as needing further input*. On this basis, we can say that declarative and interrogative clauses represent a contrastive pair within the lexicogrammatical system of MOOD.

Now, we can add to this the further idea that, within the parallel system of TONE, for English at least, a falling intonation across an utterance is associated with *speaker certainty* while a rising intonation is associated with *speaker uncertainty*. We see, therefore, that there is a *natural association* between the declarative and falling tone, as the social functions of presenting information as needing no further input and presenting information as certain fulfil similar though non-identical social functions. There is, therefore, a higher than average probability of their co-occurrence. The same point can be made for the interrogative mood and rising intonation. In other words, roughly equivalent, or overlapping, functions can be achieved by both syntactic and phonological means, while the combination of the two will intensify the force of the overlapping functions. The choice of both declarative and falling tone, for example, functions to present information as complete and accurate – what we can label a *statement* in semantic terms, while the choice of both interrogative and rising tone suggests that the information in the clause is in some way inconclusive – what we call a *question* in semantic terms (see O'Grady 2012 for a more precise discussion). There is, in other words, a relationship of redundancy between the systems of MOOD and TONE: within the semantic context of a statement, a declarative structure and falling tone carry similar information and

mutually predict each other while, in the semantic context of a question, an interrogative structure and rising intonation are similarly related. There is a degree of overlap between them, and it is this *redundancy of information* that is made relevant within the context of a statement, while the excess, or non-redundant, meaning of each form is temporarily backgrounded. We therefore have a metaredundant relationship between the lexicogrammatical and semantic systems: the context of presenting information as a statement is redundant with the redundancy relationship between the declarative and falling tone, while the context of presenting information as a question is redundant with the redundancy relationship between the interrogative and rising tone.

However, while the association between choices in mood illustrated above may be natural, they are not absolute, and this has two significant repercussions. On the one hand, it opens up the possibility that marked combinations of lexicogrammatical features can be employed to realise novel speech functions. This idea will be developed in the following section. And, conversely, it suggests that 'the same' speech function can be realised by more than one combination of lexicogrammatical features, both within and across languages. I will return to this second point in Section 5.

5.   Articulation and the accidental rise of culture

The possibility of marked combinations of features realising novel speech function is illustrated in Example 1, in which a declarative structure is uttered with a rising tone:

1.   *You're leaving?*

Simplifying things greatly, the combination of associations in Example 1 function together as neither fully a statement nor a question. On the one hand, the declarative form suggests that the information is complete and accurate; while, on the other hand, the rising tone signals speaker uncertainty. And the resultant combination functions to present the information as tentatively complete and accurate but still in need of further confirmation, a semantic complex we can label as a *check* (Hasan 1996:120). This specific combination of features is a *marked* form, in that the two component elements of declarative and rising tone have a lower degree of shared meaning potential (redundancy of information) and so, *in general*, predict each other relatively weakly. The degree of association will vary, however, according to the communicative demands of different situation types and the linguistic registers associated with these, a point to be developed below.

Notice also that the semantic functions emerging from such combinations are more than the sum of their parts in two distinct ways. Firstly, they amplify the redundant information indexed by their component parts while backgrounding the excess of information of each; and, secondly, the sematic structure as a holistic unit will develop its own set of (non-absolute) associations with social functions, filling functional niches in accordance with, but not determined by, the communicative affordances of the individual parts. For example, the combination of declarative and rising intonation has stabilised (at least in some contexts) with the specific function of seeking confirmation for presupposed information – a more complex function than either simply giving or requesting information. Therefore, while lexicogrammatical structures and intonation contours are meaningful in their own terms, we can consider the semantics of utterances that arise from the synergies between these units as being of a higher order of meaning. The general term for this process is *articulation*, defined as "any practice establishing a relation among elements such that their identity is modified as a result of the articulatory practice" (Laclau and Mouffe 1985:105). Articulation is a core concept in language evolution as it not only increases the number of meanings

that can be made from a finite set of resources, given the various possible combinations of these individual elements but, in doing so, it also gives rise to the emergence of higher orders of meaning.

Articulation is, furthermore, a recursive process, in that the elemental units at any level can be articulated to create meanings at a higher level still. Thus, just as lexicogrammatical meanings articulate within a clause to realise the semantics of the utterance as a whole, so the semantics of individual utterances articulate across spoken or written texts as they realise key features of social activities. For example, in a workplace encounter between an employee and their boss, the different social status between the two participants can be marked by a variety of semantic means including the giving of orders, the requesting of information, the means of address used and the certainty with which statements are expressed. In other words, there is a natural association between such semantic features within the context of the workplace encounter. Once again, however, marked combinations are possible in which the component semantic elements have a lower degree of shared meaning potential and so predict each other relatively weakly – as, for example, when a high-ranking member of staff consults with a lower-ranking member on a topic in which the lower-ranking member has more expertise.

And, as with the relationship between the semantics and the lexicogrammar, the situation construed by the semantics is more than the sum of its individual parts. Firstly, in that the redundant information is amplified while the excess of information is temporarily backgrounded; and, secondly, in that the register of the text as a holistic unit will develop its own set of (non-absolute) associations with social functions, filling functional niches in accordance with, but not determined by, the communicative affordances of the individual parts.

This recursive process of articulation from lexicogrammar to situation is captured in Figure 1, which is the standard representation of what in SFL is referred to as the stratal organisation of language.
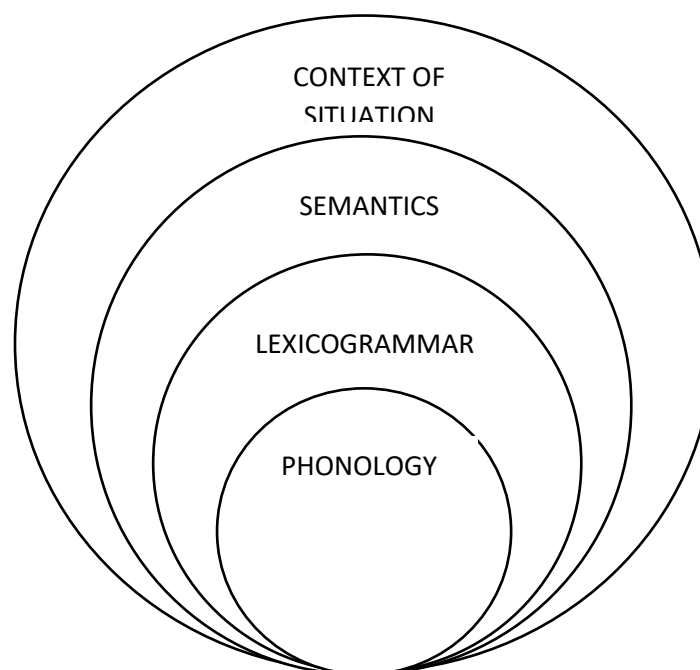

Figure 1: Strata in Systemic functional linguistics

In line with the concept of metaredundancy, the relationship between strata in this figure are said to be in a reciprocal rather than a hierarchical relationship. In other words, each stratum represents both an articulation of features from the next stratum down and the motivating context for that particular articulation of features. Also in accordance with the principle of metaredundancy, the relationship between the strata is probabilistic rather than absolute. The slippage this introduces and its relevance for language evolution will be developed further in Section 5.

Figure 1 captures the gist of the discussion to this point: any context of situation is realised through an articulation of semantic features which are themselves realised through the articulation of lexicogrammatical and intonational features. Figure 1 adds to this cycle the phonological features by which these abstract linguistic categories are realised in concrete form as sounds. It could also be extended to capture the relationships between individual contexts of situation and the type of activity they represent, and further to capture the relationship between activity types and cultural domains, and between cultural domains and whole cultures[3]. These higher-order relations are illustrated in Figure 2, where the rightmost column reproduces the stratal relation between the context of situation and the text in Figure 1, and the columns to the left of this represent ever increasing scales of articulation.

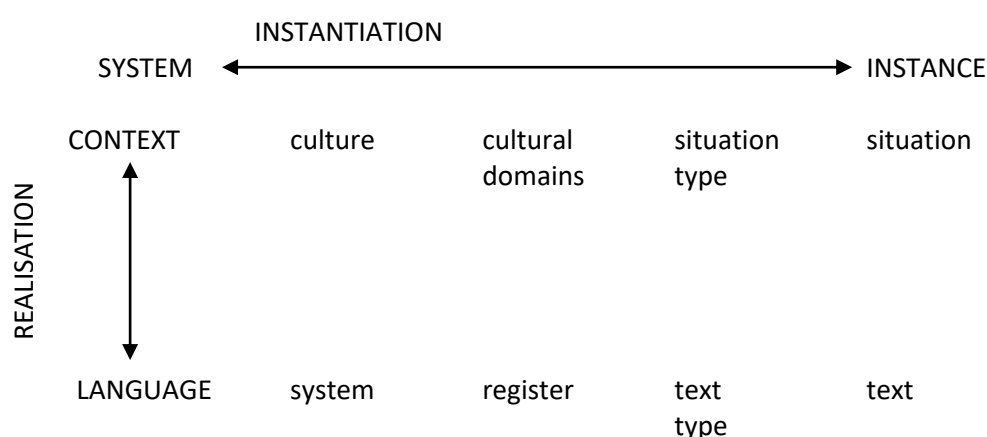| | INSTANTIATION | | | |
SYSTEM	←——————————————→			INSTANCE
CONTEXT	culture	cultural domains	situation type	situation
LANGUAGE	system	register	text type	text

Figure 2: Relations between context and language: system and instance

Between them Figures 1 and 2 represent language as a multi-layered phenomenon, but they fail to capture the dynamic relations between the different layers in terms of the synchronic and diachronic variability that is a necessary feature of metaredundant systems.

6.   Metaredundancy and metastability: The inherent dynamics of semiotic phenomena

In Section 3 I concluded that the redundancy relations, or overlap of function, between various lexicogrammatical features not only allows for the articulation of features in novel ways to create a

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[3] In SFL theory a theoretical distinction is made between the relationship of realisation between strata in Figure 1 and the relationship of instantiation in Figure 2. Both relationships, however, can be said to follow an articulatory logic.

new system of meanings at the semantic stratum but also implies that there is not a one-to-one relationship between semantic functions and the lexicogrammatical means by which they are realised. In Section 4, I elaborated on the first point and extended it to show how features at any level can be articulated to produce meanings at a still higher level. And in this section I will elaborate on the second point, demonstrating that there is more than one way to cook a semantic goose before extending this principle to account for the relationship between levels in general.

Starting, then, with the relationship between the semantics and the lexicogrammar, the following examples illustrate how a question at the semantic stratum may be realised through various articulations of lexicogrammatical and intonational features:

> 2.   Are you going to the shops?
>
> 3.   You going to the shops?
>
> 4.   Going to the shops?
>
> 5.   Going to the shops, are you?
>
> 6.   You're going to the shops, are you?
>
> 7.   You're going to the shops, aren't you?
>
> 8.   You're not going to the shops, are you?

and even, in some dialects of Scottish English:

> 9.   You're going to the shops, aren't you no?

These variations will have arisen organically in different domains of use, amongst different subgroups of speakers and within different activities, drawing on the redundancy of meaning in the lexicogrammatical and intonation systems in different ways but to similar effect. As we communicate across contexts, however, we can expect that our collective *will to semiosis* will act as a centripetal force (Bakhtin 1981), imposing systemic order and assigning mutually-agreeable distinctions to each of the structural variations. Such distinctions may be either semantic or distributional. A semantic distinction was suggested for the marked question form in Example 1, above, which was said to have appropriated a distinctive function as a *check*. Such a process of semiotic stabilisation can never be complete, however, given the vast number of contexts in which language operates and which act as centrifugal forces. It should not be assumed, therefore, that a specific structure has the same function in different contexts. Conversely, it should not be assumed that a specific function is realised in the same way across contexts. In other words, distinct articulations of lexicogrammatical features might relate not to different semantic functions but to 'the same' semantic function as it is realised across different sub-populations or situation types. As an illustration of this we can consider the characteristic lack of any mood at all for statements within the specific context of the radio shipping forecast, as in Example 10:

> 10.   Hebrides Gale force 8 backing northeasterly soon, backing northwesterly and increasing severe gale force 9 later.

In instances such as Example 10 we see, therefore, a further level of metaredundancy in that the specific context of the shipping forecast is in a redundant relationship with the already metaredundant relationship between the clause semantics and the individual lexicogrammatical features that realise the semantics, and it is this set of relations that defines the language of shipping forecast as a distinctive register. Generalising, we can say that within a specific register X, we can

predict that a specific semantic function will, in general but not in absolute terms, be realised by a particular combination of lexicogrammatical features. A register is therefore identified not simply as a specific articulation of semantic features, but also in the lexicogrammatical means by which the characteristic semantic features are characteristically realised. This is the combination that Bernstein (2000, 1971) refers to, from the perspective of the speaker, as the *Recognition Rules* and *Realisation Rules* necessary for successful interaction with in a social group. Socialisation requires a speaker not only to recognise an ongoing situation and the activities that are expected or permissible within that situation, but also the structural means by which to perform these activities appropriately.

However, just as the relationship between the semantics and the lexicogrammar is not absolute, neither is the relationship between a situation and the semantics by which it is realised. That is to say, each instance of a particular situation type is not realised by the exact same configuration of semantic features as any other, but will still be recognised as long as there is enough semantic consistency - or overlap - with other situations of the same type (along with a sufficient degree of the lexicogrammatical forms associated with the register). Furthermore, different registers will share some semantic features but will differ in terms of both the overall configuration and the relative proportions. Distinctive registers are, therefore, not differentiated according to a typological logic by which 'a' is distinct from 'b' and divides into 'c' and 'd' which are also distinct from each other. The logic of registers is rather that of topologies (Martin and Matthiessen 1991), in which 'a' and 'b' differ in terms of their respective distributions of non-exclusive features. In other words, registers overlap with registers and situations with situations but, *for as long as their respective profiles remain relatively stable and distinct from each other*, then we can recognise distinct types – intuitively, through the power of socialisation, as speakers; and analytically, through comparative profiling, as linguists.

Therefore, as has been noted several times already, there is not an absolute one-to-one realisational relationship between the meanings at different strata. In the case of the relationship between the semantics and the lexicogrammar, we have seen different possible realisations of a statement and their associations with different registers. Following Kretzschmar, we can predict that, across all contexts, a statement will be realised by a small number of constructions, and predominantly the declarative and a falling tone, roughly 80% of the time. However, within different registers, as with Kretzschmar's subpopulations, different construction will be at the head of the A-curve, as with the moodless form that typifies with the shipping forecast. There may be a lot of variety in the tail of the A-curve, but we associate the register with the norm, not the exceptions. And with regard to register, we can extend the idea of the A-curve beyond the formal features of language to the semantics. In these terms, as long the vast majority of the meanings made across a stretch of text are typically associated with a specific situation type, we will recognise the ongoing activity as representing just such a situation. As a consequence, however, even within the confines of a clearly-recognisable situation, there is room for a sizeable minority of utterances to attend to a highly-varied range of side issues. We can therefore distinguish between the *criterial features* of a text, those that contribute to defining its register and hence its association with a situation type, and the *background noise*, the tail of the A-curve that neither typifies the register nor undermines the overarching activity.

The balance between criterial features and noise, however, is more than an abstract statistical tendency. Within any given context there will be a centripetal pressure towards the norm in terms of those features that are most salient as indicators of what activity is being carried out any time (*cf.* Zuraw 2006). In terms of evolutionary metaredundancy, these are the features with the highest degree of redundancy, or mutual association, within a specific context and which therefore carry the

greatest chance of success, or survival, within that context. In the terms of Rendell et al.'s genetic experiments, these criterial features are once innovative responses that have been imitated and taken up wholesale by generations of speakers. These criterial features are motivated by the redundancy of meaning that associates a register with a specific situation. This is not to say, however, that the noise is unmotivated, but rather that it is motivated by the excess of information that is generally backgrounded. Generally, as they represent centrifugal forces, these innovative or marked features will have only a fleeting existence. Others, however, will fill an unforeseen (or previously non-existent) functional niche within the context of situation and will be therefore taken up by the imitators, without the risk that innovation entails, when such functionally equivalent contexts are next encountered. And, as success breeds success, these features will move up the A-curve, accelerating ever more rapidly until they become the criterial features of a reconstructed register (*cf.* Zuraw 2006). And so the cycle continues, maintaining an A-curve distribution, but with the features at the head and the tail of the curve in constant flux and the occasional intrusion of entirely innovative features.

The relationship between criterial features, noise and innovation is presented here in terms of the relationship between the two strata of semantics and context. However, as we have seen, through the principle of articulatory metaredundancy, this same dynamic relationship holds between the lexicogrammar and semantics below and between the context and the cultural system above. From the perspective of the situated speaker, this means that each interaction is embedded within a *layered simultaneity* of meanings in which "multiple timescales and multiple contexts coalesce around [the] instance of interaction" (Bartlett 2017:388: Blommaert 2005:130-131). At every instance, therefore, a speaker must not only attend to the speech function of their current utterance, but also (with varying degrees of awareness) to the role of that utterance in the context of situation and to the relationship of that situation other situations within the wider social structure. Following Rendell *et al.*, the speaker will face centripetal and centrifugal forces, the choice between imitation and innovation, between normative and marked behaviour, at all these layers simultaneously. Extending these choices to behaviours across populations of speakers, cultural learning and the evolved tendency towards imitation will provide the centripetal forces necessary for the maintenance of the system. At the boundaries however, innovative behaviours that fill functional niches will be copied and rise up the A-curve, providing the centrifugal forces that reinvigorate the system as novel articulations of lexicogrammatical elements are taken up as semantic structures, novel articulations of semantic structures are incorporated into registers, and ideologies are reshaped as novel social contexts emerge and fade away in a restless and multidimensional flux.

7. <u>Conclusion:</u> There's a crack, a crack in everything; that's how the light gets in (Leonard Cohen, *Anthem*)

As stated at the beginning of the paper, the aim has been to establish a connection between the architecture of SFL as a socially-oriented theory of language with recent work in systems theory, evolutionary biolinguistics and cultural evolution as a basis for developing a comprehensive theory of language as a dynamic psychosocial phenomenon. More specifically, the paper set out to integrate ideas from these diverse fields in order to propose a materialist account of the emergence of higher-order semiotic structures through the recursive application of self-similar rules across different scales. The concept of metaredundancy was seen as a vital link in bringing these different theoretical approaches together.

The concept of metaredundancy, in its linguistic manifestation, can be summarised as follows. The meanings made at one stratum of language are realised by the articulation of meanings at the next stratum down, for which the higher stratum provides the motivating context. This relationship is recursive such that, for example, the context of situation is realised by the semantics as this is realised by the lexicogrammar. The relationship between the strata is not direct, but between *zones of meaning* (see Taverniers 2019 for a full discussion); nonetheless, within a specific domain of use, this will tend towards one-to one relationship.

This is a more complex metaredundancy relationship than the association of a smell with a source of food in specific environments, as described above. In that more basic case, we have the association between, for example, one physical form (a smell) and one function (eating) being associated within a particular context. In the linguistic situation described, in contrast, we have a convergence of two physical forms which, owing to the overlap of associations between them, regularly co-occur to fulfil a single semantic function which is, in turn, associated within a specific context. We can refer to this more complex phenomenon, which is as a key feature of human semiosis, as *articulatory metaredundancy*.

Articulatory metaredundancy is itself a recursive phenomenon, such that any meaning that is itself the product of a process of articulation may be articulated with other meanings of the same order to create meanings at a higher order still, as illustrated above in the progression from lexicogrammar through semantics to register.

Novel articulations represent marked behaviour and are and only likely to be imitated if they are seen to full functional niches. Many novel articulations, therefore, remain in the tail of the A-curve as background noise. When a novel articulation at a particular stratum is imitated and taken up, however, it creates a complex sequence of *feedback loops* at different strata. These occur through four interconnected processes:

(i) A novel articulation realises a new meaningful element at a higher stratum of meaning;

(ii) Following Saussurean systems logic, the introduction of each new element into the higher-order system will necessarily lead to a recalibration of the meanings within that system;

(iii) The meanings of the lower-order elements are themselves recalibrated within the lower-order stratum as a washback effect of their novel associations with higher-order meanings (*cf.* Halliday (1984) on "the ineffability of grammatical categories");

(iv) These new meanings at the different strata are now available for further combinations and so the process repeats itself cyclically *ad infinitum* – which is to say that the system is always emergent but never arriving or finalised.

These are the "recursive applications" alluded to but not illustrated in Pennisi and Falzone. As a set, they lead not just to a reconfiguration of probabilities in an existing system, but to *an expansion of the meaning potential within the overall language system* both interstratally, through the creation of higher-order strata of meanings, and intrastratally, through the generation of new systems of meanings within each stratum.

Following this logic, the SFL models in Figures 1 and 2 do not represent a stable hierarchical structure "from the morpheme up", but an ever-shifting lingua-cultural system being acted out through an unstable alliance of cultural domains and situation types, each of which is realised by an articulation of features across several strata held together in dynamic tension through the expectancy relationships of redundancy and metaredundancy and our evolved predilection for

imitation over innovation, or normal over marked behaviour. Given its origins in Marxist theory and the goal of correlating language varieties in relation to situational and social variables, SFL has tended to focus on the normative or criterial features of registers and codes as these have stabilised in different sociopolitical contexts. Supplementing this approach with concepts from systems theory and cultural evolution, as presented above, we can also focus on those non-criterial or marked features that comprise the most accessible stockpile of resources for the gradual but motivated modification of the system across scales. In the terms of evolutionary biology, such non-criterial features are the equivalent of *genetic debris*, or what Pagel (2012:128) calls "the raw materials of our differences"; and just as evolutionary biology sets out to establish the conditions and mechanisms by which such debris becomes criterial to different species, so the conceptual framework and experimental methods form the field of cultural evolution set out to explain the contextual conditions and embodied mechanisms by which non-normative behaviour is replicated and becomes dominant. Combining insights from biolinguistics and cultural evolution with SFL theory thus opens up avenues for each of the disciplines, with the architecture of SFL providing a model of how higher orders of meaning can be accounted for within an evolutionary perspective, while concepts form bilolinguistics and cultural evolution provide the basis for an SFL account of language development as inseparably social *and* embodied.

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