Semantic Classification in Category-Specific Semantic Impairments Reflected in the Typology of Bantu Noun Class Systems

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1. Introduction

Just as the search for an explanation to category specific semantic impairments is based on the belief that the functioning and biological structure of the brain is universal it has been thought that the understanding of the grouping of nouns in noun class systems hints at a universal cognitive basis**,** which underlies such linguistic classifications. What constitutes possible typological variation of noun classification is therefore relevant to the question of the universal nature of semantic categories.

It is a crucial point for the present argument that the two sources of evidence as represented by cognitive neuroscience and linguistic typology are independent of each other and that they are practiced by separate research societies. It is also hoped that the juxtaposition of these two fields will trigger an interest in the wider question

(1) What are the cognitive bases for grammatical categories?

The term 'cognitive bases' is here used in the sense of *neural correlates*, that is, the location(s) of activity in the brain relating to a particular type of knowledge, or how different semantic grammatical content is neurally processed. On the assumption that the biological make-up is largely the same for all humans with respect to the brain, the question above may be rephrased:

(2) If types of knowledge 'belong' in particular parts of the brain, this can be assumed to be the same for all people and affect how languages in general (as well as other types of knowledge) are constructed.

As such, a viable working hypothesis is that such biological facts provide windows into a basis for linguistic universals.

Typology in the sense of analyzing a variety of language structures is a source of establishing linguistic universals. Typological research involves the establishment of typological universals in the form of common structures. This establishment of typological universals enables us to make predictions of linguistic phenomena, which again provides us with a testing ground for such predictions in the acquisition of new language data. As such, it constitutes an independent field of research.

Typological accounts often emphasize linguistic variation rather than such common structures. How is it then that typology can enlighten us on what languages have in common? Some of this variation is no doubt caused by the restrictions on change imposed on languages by previous conventionalized states of languages. Like the properties of biological species, languages are conditioned by their pasts; it is for example not an accidental that there is no variation of the number of limbs land creatures have; it is always four, never three, five or six (disregarding spiders, insects, and the tails of mammals and reptiles, which really is an extension of the spine). However, conditioning of past states slows down, but does not in principle prevent change. The types of changes that occur in

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languages are nevertheless restricted, and it is this limitation that is interesting from the point of view of investigating the possible cognitive bases of grammar.

Some variation in noun classes has been ascribed cultural variation (Aikhenvald 2000). Some linguists also prefer cultural explanations to cognitive theories that are set out to explain the semantic bases of noun class systems. Maho (1999: 66), in commenting on Moxley's (1998) analysis of the Kiswahili noun system, says that '[t]heir main usefulness, at least in my opinion, is their focus on the interrelationship between language and culture rather than language and cognition'.

Belief systems, and how people interact with their different environments, naturally vary, and also influence how languages are structured. For example, in many classifier systems, benevolent gods and angels are categorized with the 'human' class, while malevolent spirits are inanimate or not even classified (Aikhenvald 2000: 272). The general point made here is that by comparing these two types of evidence we open up for the possibility that there may be more to noun classification than just culture or the conditioning by conventionalized states: to the extent that there exists similarities among languages, it is likely that cognitive bases of the human brain will restrict (although not predict) what grammatical categories (here: noun classes) are possible in human languages.

There is no absolute one-to-one match between the categories discussed in cognitive neuroscience and grammatical classifiers of nouns in general. It is, nevertheless, possible to discern some tendencies.

2. Findings in neuropsychological research

It is an interesting fact that the semantic categories affected in some of the subjects who have suffered brain damage that are described within the field of cognitive neuroscience largely coincide with many of the semantic labels used to describe the typology of noun class systems.

Important to note here is the fact that the subjects from cognitive neuroscience are speakers of either Italian or English, languages that either do not have or have only a small noun class system[1]. Italian has grammatical gender, which may be seen as a more restricted type of noun class system partly based on animacy through the division into masculine and feminine, classes that are in part based on biological sex (or 'intrinsic gender', as Mathiot (1979:1) puts it)[2]. Present-day English has no such noun system (it was lost after Old English through the convergence of inflections), although the language is not entirely free of animacy distinctions as seen in the different uses of the relative pronouns, *who* and *which*, and in the gender distinctions in anaphoric pronouns (*he, she, it*, etc.). In these two languages then, animacy seems to be far less prominent than in many of the more elaborate noun class and classifier systems of the world. We can therefore rule out the possibility that the structure of the language that these subjects spoke influenced the types of deficiencies they suffered, that is, that specific semantic categories were already conventionalized or previously learnt grammatical categories.

Within cognitive neuroscience there is a vast literature on the topic of category-specific semantic impairments in patients who have suffered brain damage (see, for instance Caramazza, Berndt, and Brownell 1982, Warrington and McCarthy 1983,Warrington and Shallice 1984, Caramazza and Shelton 1998). Category-specific here means that the impairment is selective: The brain-damaged patients display problems with naming, understanding, and defining certain categories of objects and not others.

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[1] The grammatical categories GENDER and NOMINAL CLASSIFIER have up until quite recently been thought to be mutually exclusive (Dixon 1982: 220, Craig 1986), and therefore similar phenomena. However, Aikhenvald (2000: 10) states that this assumption is erroneous: in South American and Papuan languages, these categories co-occur. It is nevertheless true that both systems of noun categorization to a large extent are semantically based. They are therefore both relevant to the present argument about the cognitive bases of nominal categories.

[2] A large proportion of the nouns in present-day Italian are necessarily inanimate in a mandatory grammatical system where all nouns have to be assigned to either of the genders masculine or feminine. Interestingly however, Indo-European is believed to have originally had a distinction between animate and inanimate classes (Meillet 1964). Dixon (1982: 171) reports that according to Meillet, the gender distinction appeared through the feminine –â-/-yâ- affix. Note also that in her chapter on gender and noun class systems, Aikhenvald (2000: 25) states that '[t]here is always some semantic basis to the grouping of nouns into classes, but languages vary in how much semantic transparency there is'.

The interesting part is that while some patients have certain categories impaired (for example animate beings), other brain-damaged patients will have the opposite value impaired (for example inanimates), while the animate category is spared and fully or nearly fully functioning. The total number of cases that have been studied and tested throughout the last decades makes up an attested pattern of *associations* and *dissociation* of category-specific deficits.

The major categories that have been reported are:

1. Living things:

- Humans, Animals
- Plant life: fruits and vegetables
- Food

With some patients, *food* is selectively impaired together with *animals*, in other patients they are separate, that is, not both spared and impaired. The category of *animals* can be damaged or spared independently of the category of *fruits*, *vegetables* and *plants*. One patient was consistently impaired for the category of animals only.

2. Non-living things:

- Artifacts: furniture, tools, musical instruments

Another distinction reported in patients is abstract vs. concrete categories; of verbal concepts and written word comprehension (Goldstein 1948, Shallice and Warrington 1975, Warrington and Shallice 1984). For example, one patient's comprehension of concrete words was exceptionally poor, but he had no difficulty with any particular concrete taxonomic category (Warrington 1981).

As far back as 1936 a clinical neurologist (J. M. Nielsen) described a patient in whom he observed a selective impairment for inanimate object names, while names of animate objects (including flower names) were relatively preserved. In 1966, Goodglass et al. reported the first quantitative experiment in aphasic patients, testing for several categories, and concluded that dissociations among semantic categories may be the rule rather than the exception among aphasics.

A couple of seminal papers were written within this field in the early 1980ies. One paper (Warrington & Shallice 1984) describes four patients with *herpes simplex encephalitis* who were disproportionately impaired in producing and understanding the names of LIVING THINGS (animals and plants). For instance, one patient was unable to recognize or name 48 out of 50 animals or plants, but described or named accurately 45 out of 48 non-living things. For example, he could define the word *briefcase*, but did not understand the meaning of the word *parrot*.

A paper by Warrington & McCarthy (1983) exhibited the reverse dissociation, the comprehension of the category of living things was spared and the category of non-living things was impaired. This pointed to the possibility that brain damage could result in category-specific semantic deficits.

After this followed several reports on category-specific impairments displaying the living/non-living distinction also in other types of brain damage: cerebro-vascular accident, trauma, and neuro-surgery (Caramazza and Shelton 1998: 1, who also cite a number of other references). This led to the general inference that the semantic system might be organized categorically.

It was observed that all the patients who suffered impairments on the category of living things shared the fact that their left temporal lobe was damaged (ibid: 2). Therefore it was surmised that this area of the brain was involved in a neural network representing conceptual knowledge about living things.

There were some complications to the living/non-living distinction. The patients impaired for ANIMALS and PLANTS were also impaired for FOOD, which was considered non-living. This association of animals, fruits and vegetables on the one hand, and food on the other, is found in several reports, but there are also cases where the animal category and the food category are separate in patients (reported in Carramazza and Shelton 1998: 2).

There have been many reports where living things have been selectively impaired or spared, but there are also cases where the animal category and the FRUITS/VEGETABLE/PLANT category are spared or impaired separately. For example, Hart, Berndt, Caramazza (1985:439) reports the patient M.D. was

impaired for the category of FRUITS and VEGETABLES: while he was unable to name such common fruits as *peach* and *orange*, he easily named such infrequent items as *abacus* and *sphinx*. It was clear that the category of food as such was not impaired: he was able to correctly name 13 food items outside of the FRUIT and VEGETABLE category.

Some association was also observed between LIVING THINGS and MUSICAL INSTRUMENTS, but that has not held up in later reports (Caramazza and Shelton 1998).

3. Suggested explanations to category-specific semantic deficits

Three theoretic models have been suggested to explain the phenomenon of category-specific semantic impairments.

1. **The sensory/functional theory** of category-specific deficits (SFT). This model argues that there are different modalities or semantic subsystems in the brain (visual/olfactory, motor/functional, etc.). Damage to the visual semantic subsystem results in disproportionate impairments of living things and food, because the identification of these categories depends crucially on their visual (sensory) features. By contrast, damage to the functional semantic subsystem results in disproportionate impairments of non-living things because identification of this category of objects depends crucially on their functional, non-sensory features.

2. **The organized Unitary Content Hypothesis** (OUCH). In this model it is assumed that 1) the properties that define an object (animate or artifact) are highly intercorrelated, and 2) members of a superordinate category have many features in common. These features are not evenly dispersed in the multidimensional space of semantic properties, but tend to lump together so that focal damage to a region of semantic space in the brain is likely to affect whole categories because of this lumpiness. For instance, a *dog* (and similar individuals) tends to have different shapes and characteristics (such as texture, color, odors) than certain other types of objects, such as a *chair*. This is what causes the lumpiness. In OUCH, category-specific deficits are not modality-specific. This model also makes the prediction that categories can be narrower than the living/non-living distinction.

3. **Domain–specific organization of conceptual knowledge in the brain as evolutionary adaptations.** In Caramazza & Shelton (1998) it is suggested that certain conceptual categories represent evolutionarily adapted domain-specific knowledge systems, and that there is evidence that these are subserved by distinct neural mechanisms. In this view, evolutionary pressures led to specific adaptations for recognizing and responding to animal and plant life, it has *fitness value*.
    a. Animals: potential predators or sources of food.
    b. Plants: food and medicine.
    c. Tools

It is pointed out that ability to recognize and react to these has survival and reproductive value. In this theory, the category-specific semantic deficits represent 'truly categorical effects' (ibid: 1).

Proponents of the evolutionist theory (e.g. Caramazza and Shelton 1998) have criticized the SFT primarily on methodological grounds, and they refer to it as 'reductionist'. The discussion now mostly goes on between theories 1 and 3. Caramazza and Shelton's major point against the SFT is that there is no reason to assume that visual attributes are more important for the identification of living things than for inanimate objects, nor that inanimate objects are characterized only or primarily in relation to their function for people. In support of their view it is worth mentioning that when looking at how inanimate objects are classified in languages (cf. Aikhenvald 2000: 272-274), it is clear that visual attributes play an essential role: EXTENDEDNESS (including SHAPE and DIMENSIONALITY), BOUNDEDNESS, CONSTITUTION, MATERIAL, SIZE, and ARRANGEMENT are all qualities that condition the classification of inanimate nouns and which depend on the visual mode for their identification.

This debate on the specific nature of category-specific semantic impairments and its causes is still not conclusive.

4. Semantic bases of noun class systems

Noun classes are formed partly on a phonological basis, partly on a semantic basis, but according to Aikhenvald (2000: 271), all classifier systems[3] have a semantic basis and there is no noun class system that is based on phonology alone. Noun class systems are known to distinguish their inflectional classes according to semantic distinctions, e.g. along the lines of animacy (incl. human/non-human) vs. artifact, various shapes and spatial configurations. The semantic organization does not happen at random. Contini-Morava puts it like this:

> '…understanding the basis for grouping nouns together as members of a class hints at a system of cognitive or cultural classification underlying the system of linguistic classification'. (Contini-Morava 1997: 599)

A major point here is that there are certain recurring patterns in the semantic organization on which noun classification is based. The most extensive work on this topic is Alexandra Aikhenvald's *Classifiers – A Typology of Noun Categorization Devices* (2000), which lists certain near universal semantic bases for noun categorization (ibid: 272-275). Categories may divide according to:

1. Animate/inanimate; human/non-humans
2. Physical properties (shape, size, position, consistency)

In classifier systems, ANIMACY can subdivide into human/non-human, person/non-person, and HUMAN can of course subdivide further into sex (masculine and feminine), but also be classified according to social status, function and age, and kinship relationship. In addition, the notion of animacy plays an important part in the syntax and morphology of many languages, cf. Frawley (1992: 93-94) who says that '[w]hen we look across the world's languages, we find remarkable regularities in the morphosyntactic reflexes of animacy'. He goes on to argue that animacy has a bearing on a number of grammatical phenomena, including split ergativity, subject-verb agreement, number, case assignment, and voice, in a wide variety of unrelated languages.

Inanimate objects on the other hand, are in Aikhenvald (2000: 272-274) classified according to (a non-exhaustive list of) nine different properties (which are again subdivided). For our purposes, we need to focus on the properties F. and G. (relevant categories are in bold types):

> F. Other INHERENT NATURE or TIME-STABLE PROPERTIES: **plants**, houses, canoes.
> G. FUNCTION: what use an object is put to or what type of action is performed on them (cutting, piercing, harvesting). Example: **can be eaten, drunk; can be planted, domesticated**; transport, clothing, housing may have separate classifiers.

Australian languages typically have four-way divided noun class systems where the category VEGETABLE is prominent. This prominence is apparent from the fact that the three other categories are masculine (I), feminine (II) and 'other' (residue) (IV). The semantic bases plant/food are both relevant and comply with both points F. and G.

An example of a language that has a special function based classifier is Hmong (ibid: 291), where the classifier *rab* is used for tools and instruments in general, especially for objects with a handle. FUNCTION often relates to the bases SHAPE and VALUE, and reflects how people interact in the world.

[3] This work goes beyond noun class systems. The term 'classifier' is more extensive and also includes other categorizing devices relating to nouns, e.g. numeral and verbal classifiers.

5. General about noun classification in Bantu

Bantu languages are a subgroup of the Bantoid languages, which again belongs to the Benue-Congo branch of the Niger-Congo language family in Africa. The Bantu languages are spoken in a contiguous area stretching from Southern Cameroon in the West to the Kenyan coastline in the East, all the way South halfway into South Africa, up North-West again through Botswana and Namibia back to Cameroon. The area has a size comparable to China or the United States, and counts 300 to 600 individual languages, depending on how they are estimated (Maho 1999: 18).

The noun class systems are concordial and formally manifest themselves as sets of prefixes attached to the noun stem, as well as on concordial adjectives and verbs, for example as in this example from Kiswahili:

(3) **Ki**tabu **ki**kubwa **ki**naanguka.
cl.7-book cl.7-big cl.7-PRESENT-fall
'The big book falls.'

The class markers that appear on the adjectives and verbs may differ from the noun prefixes, as shown in (4):

(4) **M**toto **wa**ngu **a**li**ki**nunua **ki**tabu.
cl.1-child cl.1-my cl.1-PAST-cl.7-buy cl.7-book
'My child bought a book.'

In this example, the verbal prefix *a-* and the pronominal prefix *wa-* are in concordance with the noun prefix *m-*: they all express class 1 despite of their different forms.

It is assumed that all modern Bantu noun class systems go back to an original Proto-Bantu system (cf. e.g. Maho 1999: 50-51). Most reconstructions that have been proposed count about 20 noun classes, but most modern Bantu languages exhibit fewer noun classes than that.

Some Bantu noun class systems are referred to as 'reduced', those that have been downsized both in terms of quantity (number of classes) and quality (basic functions of the system). According to Maho (1999: 53), very reduced systems are predominantly found in a few languages in the northern Bantu area, e.g. Mbati, which has only 2 classes (Richardson 1957: 39), and Kakɔ, which has 3 (Guthrie 1971: 34). By contrast, Lwena has retained as much as 15 noun classes with at least 12 singular/plural pairings and Kesukuma 18 of the total classes, ranging from 0-19 in Maho's sample (Komo has lost all classes, hence starting at 0). The majority of languages in his sample contains 7 or more, and is referred to as 'traditional noun class systems'. Maho points out that the number of classes may not be a very good criterion for typologizing noun class data with respect to semantically finer-grained distinctions, since noun class systems may have lost a few classes and still maintain their overall functions because the 'lost' classes are reallocated to the remaining classes. This is true of medium sized systems of 7 or more classes. For very reduced systems, the ones with 1-3 classes, the situation is different. Here the main functions seem to be the singular/plural distinction and to separate animate from inanimate referents (ibid: 54).

In what is known as the Bleek-Meinhof numbering system (cf. Bleek 1862, 1869; Meinhof 1899, 1932), singular and plural classes are *paired*, in the sense that nouns from a typical singular class most often form their plurals by exchanging (but in exceptional cases by adding) a prefix from a plural noun class. For example, in Kiswahili *mtoto* 'child' in class 1 takes the class 2 form *watoto* 'children' to form the plural. This is then labeled the paired 'human' class 1/2. Nouns from different singular classes may in some cases employ the same plural class, and nouns from one singular class may use disparate plural classes (cf. e.g. Maho 1999: 53). The so-called plural classes may also have other functions than to form plurals. Class 2 for instance, may also be used as an honorific, and class 14 contains abstract concepts and mass nouns as well as serving as a plural to diminutives in class 12 in reconstructed Proto-Bantu (ibid: 51, Fig. 22). The class for mass nouns and abstract concepts is the same, and a better term than singular vs. plural might therefore be 'non-individuated' in this case.

Whether the Bantu noun class system is in fact amenable to a coherent semantic analysis has been widely discussed. The debate deserves a few remarks, to avoid giving the false impression that research on the semantic bases of noun class system is a straightforward task. Naturally, a meta-system that comprises up to six hundred languages is bound to fail at the empirical level: there will always be exceptions and idiosyncrasies. Confer Richardson (1967:375), who says that 'Those who are concerned with the entire Bantu family will admit that the likelihood of establishing a viable master-system diminishes as the field of comparison widens'. Maho (1999) seems not to be in favor of such a system. He states that although many apparent idiosyncrasies can be satisfactorily explained, this is usually only true when one deals with the individual languages (ibid: 64). It is nevertheless true that a successful generalization is dependent on what perspective to adopt, and on what method to employ. There seems to be agreement that there are noticeable semantic regularities within a number of classes. For example Spitulnik (1989: 207) says that '[a] few Bantu noun classes exhibit a high degree of homogeneity, e.g. class 1/2 'human' and class 15 'nominal infinitive', and others include concentrations of certain types of nouns, e.g. class 3/4 'plant' and class 9/10 'animal' […]'. Furthermore, Maho (1999: 64) notes that '[t]he system of Bantu noun classes is not completely devoid of regular semantic tendencies. Some recur in many, most and occasionally even all Bantu languages […]'. These two scholars nevertheless adopt opposite views and methodologies; while Maho tries to illustrate the difficulty in predicting semantic coherence of the classes by referring to all the 'failed' (i.e. not exceptionless) analyses, Spitulnik argues that the classes are semantically motivated at the *notional* and *intentional* level as *sets of properties*, as opposed to explaining them in terms of the individual objects that the nouns refer to (their extensions).

6. Selected relevant semantic classes in the Bantu noun class systems

Maho (ibid: 64) makes the following generalizations about the semantic basis of the Bantu noun class system; the categories relevant to our discussion are rendered in bold types:

> 'Some [regular semantic tendencies] recur in many, most and even occasionally all Bantu languages […] One such tendency concerns the distinction between **animates and inanimates**. Typically animate classes are class 1 which in all Bantu languages contains nouns denoting **human beings**, while class 1a, where it exists, contains nouns denoting certain kinship terms, personified animals (when used in fables and tales) and various other nouns. Class 9 is most often the class where we find nouns denoting **animals**. Class 7 seems to be a typical thing-class, containing mostly **inanimate objects**, such as **tools, instruments,** utensils and other things. Other oft-occurring semantic regularities concerns **abstract nouns** mostly found in class 14, but not seldom also in class 3.' (*Bold types added*)

An overview – a basic semantic grid common to Bantu noun class systems - of the noun class system of Bantu is provided in table 1 (by Spitulnik 1989: 207, also cited in Aikhenvald 2000: 280). Again, the semantic categories relevant to the present arguments are in bold types.

Table 1 *General semantic scheme of Bantu noun class systems* (Spitulnik 1989)

Class	*Semantics*
1/ 2	**Humans** A few other animates
3/ 4	**Plants, plant parts**, **foods** Non-paired body parts Miscellaneous
5/ 6	**Fruits** Paired body parts Miscellaneous inanimates
7/ 8	Miscellaneous inanimates
9/ 10	**Animals** Miscellaneous inanimates A few humans
11/ 10	Long objects **Abstract entities** Miscellaneous inanimates
12/ 13	Small objects Birds
6	Masses
14	Abstract qualities, states Masses, collectives
15	Infinitives

This is reflected in the individual Bantu languages. For example, in the Kiswahili noun class system,

Classes 1/2 include most words for **people**: kin terms, professions, ethnicities, etc. They also include words for personified animals as they are found in fables and tales (that is, when they are pictured as people). This is therefore a semantically coherent class pair. E.g. *mtu/watu* 'person/people'.

Classes 3/4 include the names of **trees**, **plants**, **natural produce** and **nature**. E.g. *mbuyu/mibuyu* 'baobab tree(s)', *muhindi/mihindi* 'maize', *mchele/michele* 'husked rice', *msitu/misitu* 'forest(s)'.

Classes 5/6 include **fruits**. E.g. *chungwa/machungwa* 'orange(s)', *tunda/matunda* 'fruit(s)'.

Classes 7/8 typically contain **inanimate artifacts** and **tools**. E.g. *kiti/viti* 'chair(s), *kisu/visu* 'knife/knives'.

Classes 9/10 are used for most typical **animals**: *ndege* 'bird', *nswi* 'fish', and the specific names of typical beasts, birds, and bugs.

Class 14 contains most words for **abstractions**, such as *utoto* 'childhood' (from *mtoto* 'a child') and has no plural.

For the time being we shall not try to meet all the challenges of satisfying the demands of semantic coherence of certain noun classes, but rather focus on the 'concentrations of certain types of nouns' that Spitulnik refers to. As it happens, some of these concentrations semantically match the semantic categories discussed within cognitive neuroscience, quite independently of the grammatical structures of languages. Does this fact support the idea that these categories are primary semantic units?

7. Discussion: what functions do cognitive semantic bases have?

In the preceding we have seen that the semantic categories discovered within the field of cognitive neuroscience coincide with some of the semantically coherent classes or semantic sub-groupings within classes in Bantu languages. What is the exact relevance and function of the language-independent semantic categories for the structure of languages? Will the structure of languages be able to provide

the additional evidence necessary for the scientists to be able to choose between the competing theories in section 3?

For the theory of evolutionary adapted domain-specific knowledge systems it is of course interesting that animacy distinctions, distinctions between human and animal, and categories of food, plants, and tools are directly reflected in present-day human grammars. According to this theory, evolutionary pressures in ancient human history made us respond to animal and plant life, and to relate to and use tools for our survival. Such a match would then be a relic of that distant past. It is easy to imagine that such categories were not only important to discern and understand the surroundings, but also essential in singling out these things for reference in communication with congeners. However, although such semantic fields lump together in noun class systems, it is more often the case that there is no one-to-one match between the categories of the mind not determined by language and the categories of grammar. First, grammars may draw both finer and coarser distinctions. For example, 'human' may be further subdivided into masculine and feminine. The animacy value is often, as we saw for Bantu, divided into human and animal. Inanimate objects are subject to a whole array of other parameters for classification. Second, we saw that fruits and plants may be a subpart of a nominal category. In Bantu, both the class for plants (3/4) and the one for fruits (5/6) also contain human body parts. How can that be explained?

A relevant question is: what level do the semantic bases operate on in grammar? For two Bantu languages, linguistic analyses have been made where semantic bases motivate certain distinctions. There is, however, more than one parameter involved in the creation and maintenance of noun class systems. Bantuists will be familiar with Spitulnik (1989), who suggests for ChiBemba that one must distinguish between the referents of nouns as *objects*, and their inherent qualities and properties; 8 basic factors are critical in providing the semantic bases for ChiBemba noun classification: the semantic domains NUMBER, ANIMACY, SHAPE, LOCATION, SIZE, and considerations of pragmatic functions, phonological shape, and syntactic patterns. These compete with one another in the determination of class membership.

Similarly for Kiswahili, Contini-Morava (1997) has made a detailed analysis of classes 3, 7 and 11/14 where she shows that even the more complex classes can be analyzed according to features having to do with the basic, maybe universal semantic domains. What is essential in this analysis is firstly, that the categories are identified on the bases of more than one semantic domain; secondly, the entities belonging to the categories are seen in terms of *shareholders* of those domains, not in terms of the individual objects. Her method was to put 4 650 nouns into a database and label them semantically, using the labels:

HUMAN, ANIMAL, PLANT, SHAPE, SIZE, AFFECT, FORCE OF NATURE, and NUMBER.

Contini-Morava succeeds in making a coherent semantic analysis of the Kiswahili noun classification because she does not adopt the strategies of previous approaches: to strive to assign one single abstract meaning to each class; or to postulate homonymy between members of a class where some are obviously semantically related and others that are hard to classify on semantic grounds.

A basic cognitive ability that the language faculty depends on is the ability to compare entities and make judgments on their similarity, or on the similarity of *parts* of objects, that is, judgments on the sameness of features and qualities. This faculty is in fact an ability to abstract, which again underlies our ability to categorize. When we use metaphors (in language and elsewhere) we use a different mechanism, that of *changing semantic domains*. But in order to change a semantic domain one has first to discern the features and qualities of objects, otherwise the transfer will not be successful. Aikhenvald also states that metaphors and metaphorical transfers are in fact important for the semantic organization of classes and for the ways they get extended (2000: 311).

Contini-Morava accepts and incorporates metaphorical extensions among members within a noun class, which may also be culturally motivated. In this Cognitive Grammar analysis (cf. Langacker 1987, 1991) schemas operate on several levels of abstraction. Interestingly, features typical of 'living things' are essential in defining this category.

Class 3 is contains these semantic subgroups:

– Supernatural phenomena; natural phenomena; plants – especially trees; active body parts; exceptional animals, human collectives.
– Powerful things; objects made from plants; extended things; active things;
– Extended body parts; extended parts of things; extended body coverings (i.e. clothes).

A maximally abstract superschema covers all of the subgroups in terms of labeling them 'entities with vitality (but is reserved for entities that are neither human nor prototypically animal, entities that belong to other classes)'. This superschema holds together the various subcategories in the common denominator *vitality*, where 'vitality' is meant to capture various attributes of living beings**,** including 1) growing and reproducing, such as do plants, and which is also true metaphorically of human collectives. Another typical characteristic of living beings is that they are 2) able to move, such as do active body parts, and finally living beings typically 3) act on one another and affect other entities and 4) occur independently of human volition; such as is the case with supernatural and natural phenomena.

When it comes to human collectives/groups these are not in themselves human, but endowed with certain human characteristics. Typically, these are vital but not themselves human, e.g. *msoa* 'large company of people travelling together', *mji* 'town, city', and by analogy, *mzinga* 'beehive'. She observes that formally too, this class is a compromise between animate and inanimate; it has the human prefix *m-* but an inanimate agreement pattern.

With respect to the plants and trees, this is the largest subcategory, and it is productive, since almost all loanwords denoting trees and plants fall into this category (examples: *mwitu* 'forest' and *mtama* 'millet').

To the extent that members of this category are not plants, these form natural extensions from plants by metonymy (words for *wooden platter, straw mat*). This category also covers things made from plants (note that this would be true of the *food* category of the semantic impairment studies), and *elongated objects*, bridging over to SHAPE (extendedness in one dimension) as a categorizing attribute. These include words for *nail*, *ramrod (kind of stick)*, *umbrella*, and *metal-chain*. EXTENDEDNESS in one dimension also covers nouns like extended body parts of humans and animals (words for *bone*, *blood vessel*, *sinew*). From the sense 'elongated body parts' things that are wrapped around the body are extended by metonymy.

The subcategory 'active things' includes tools that have MOVEMENT as a salient attribute, such as *arrow*, *pestle* and *chopper*. These tools are similar to the subcategory *'active body parts'* in that they are not self-propelled but must be set to move by a human agent.

The last subcategory contains deverbal nouns, which are entities with vitality in the sense that they describe verbal processes as things (for example *mparuro* 'a scratching', *mfuo* 'a hammering', *mlio* 'a sound'). Verbal processes are activities, another characteristic of living things.

In Contini-Morava's analysis, class 7 is also based on a combination of two semantic domains, in this case SIZE and ARTIFACT. By the superschema 'utalitarian objects small enough to hold in the hand' (e.g. *kitana* 'comb') she covers all the artifacts in the category in addition to bridging the transfer to the objects in the class that are not instruments. Interestingly, Konorski (1967), who worked on dissociations between cognitive deficits, in identifying nine 'gnostic fields' speculates whether SMALL MANIPULABLE OBJECTS form a separate category from non-manipulable objects. The maximally abstract schema of class 7 extends to 'small entities in general', which contains these subcategories:

– Small artifacts; small animals; immature beings (incl. people with physical defects);
– Pieces, parts of things (incl. shortened things, pointed things/parts of things; part of substance, similarity/manner); small body parts (incl. ailments associated with body parts).

This class is by Denny and Creider (1976/1986) referred to as having 'instrumental artifact' as its primary meaning in Proto-Bantu class 7. Contini-Morava agrees that this is also valid for Kiswahili if 'primary' is understood as 'prototypical'. Regarding the subgroup 'parts of things' these are things 'smaller than the whole' (e.g. *kinyunya* 'piece of cake'), thus referring to SIZE and to a comparison between the part and the whole. The part-whole meaning extends to the subcategory 'shortened things'

(e.g. *kishiku* 'tree stump'), and to 'people with physical defects' (e.g. *kilema* 'lame person'), who are thought of as 'not whole'. The subcategory 'part of substance' is another type of part-whole relationship (time and space subdivisions; height, depth and units delimited in potentially unlimited spaces, e.g. *kitambo* 'short period of time'). 'Pointed things' (e.g. *kigumba* 'arrowhead') are small in the sense that the pointed part of an object is relatively speaking smaller than the object itself (even a large thing as a pointed mountain). The subclass 'similarity and manner' extends from the 'comparison' component of these part-whole relationships and comparison is therefore its most salient feature. Also manner is explained as individuals taking one of their attributes from a part of a general quality: the sweetness of a banana overlaps with the sweetness of sugar and they both partake in the 'quality of sweetness'.

Another point regards the reports in cognitive neuroscience on the selective damage to the ability of processing abstract vs. concrete concepts. Can the linguistic organization of abstract concepts in language shed any light on that?

The class 11/14 has 'delineated spaces/entities' as its semantic superschema. This characterization covers the subcategories 'extendedness salient' (e.g. two-dimensional surfaces) and 'extendedness not salient'. That is, the category has SPACE as its semantic domain. The subcategory 'extendedness not salient' covers 'non-solid but cohesive substances, delineated but not individually countable', e.g. *uki* 'honey'. That category again extends further to the three subcategories 1) 'things ground into particles', *ufukwe* 'fine sand', 2) 'plants processed into non-solid substance, *wanga* 'arrowroot flour', and 3) 'thick liquids', *udende* 'saliva'. From the cohesive substance subcategory 'abstractions' are extended, since they are 'not individually countable', e.g. *uongo* 'falsehood'. EXTENDEDNESS operates in space. This implies that abstractions are viewed metaphorically against the domain of SPACE.

Contini-Morava's analysis is logical in the sense that making an abstraction involves to go from the concrete and the individual (object or incident), that is, the countable, to thinking and talking about something that is not necessarily present, and to make predictions that are valid for new concrete and individual units of the same kind. In this sense, to view abstractions against SPACE makes sense, if it is understood as 'becoming detached from space'. The feedback to neuroscientists would be that it might be interesting to look at how patients with such deficits relate to spatial concepts.

In summary, we have seen that the categories of 'living things' and 'non-living things' are relevant to the organization of grammar. However, languages do not exploit one such semantic distinction only, but tend to combine several semantic domains in the formation of grammatical categories. Consequently, a more viable approach is to see such non-linguistic cognitive values as a *conditioning background* for grammar, a semantic 'pool' to choose from, rather than as a deterministic factor that predicts class membership of whole, unanalyzed entities (objects).

8. An evaluation of the cognitive neuroscience theories in light of the language data

With respect to the competing theories of cognitive neuroscience, a few observations can be made when holding it against what we know about noun classes. Regarding the evolutionary approach, it can be said in its favor that the co-occurrence of the categories 'living things', 'plants' and 'artifacts' as semantically based grammatical categories in many languages is striking. It might also well be that the human race in the process of survival learned to distinguish living things from tools, and animals from plants. However, in order to do that, humans very likely relied on more basic perceptual phenomena like SHAPE and MATERIAL, SPACE or the ability to move and procreate as qualities of those entities. How *conscious* they were at an early stage in evolution about separating them from objects in the world can only be a matter of speculation. It might be that cognitive evolution brought with it the ability to think in abstract terms, and that the exploitation of those facets for abstract systems like language happened at a later stage. Therefore, a theory that heeds semantic domains independently of the individual objects they are part of and as a perceptible and meaningful part of cognition would be more viable in also explaining grammatical organization.

From the point of view of language organization, entities in the world are understood against more generic semantic domains. This fact favors the SFT. The main disadvantage of the SFT is its

assumptions on modality specificity with respect to animacy. For example, this model is challenged by the fact that living things are categorized in relation to semantic domains thought primarily to be characteristic of inanimate things, like SIZE.

The OUCH is advantageous in relation to linguistic organization because we see that various languages make finer or coarser semantic distinctions within the same semantic field, which the theory predicts. But are semantic attributes lumpy? To a certain extent the answer is yes, in the sense that certain qualities co-occur. We saw that class 7 in Kiswahili the value 'small' in the domain SIZE is combined with the domain LIVING THING in some subgroups, e.g. 'small animal'. A characteristic of living things is the ability to grow, hence the attributes 'small' and 'living' yields the prediction 'not fully grown'. It is this co-occurrence that enables the further semantic extension to 'immature beings'. But does the fact that certain qualities co-occur *in the world* mean that they are also so organized in the brain in a fixed manner – and not as resources of free association when language needs them? That has yet to be answered.

9. Conclusion

In this paper we have looked at two independent fields of research, cognitive neuroscience and the typology of noun class systems in Bantu and found that certain semantic categories overlap in the two types of research results, one based on experiments and clinical investigations, the other on traditional semantic analysis and classification. Since noun class systems display consistent and recurring patterns as to what may and may not be the semantic basis for these grammatical categories, it appears that the overlap could be due to something other than chance. Part of language structure will always be language specific, and culture specific, and there are Bantuists who seem to stress the fact that semantic regularities are typically overblown. Nevertheless, it has been the purpose of this article to draw to attention the possibility that some of the similarities could be the result of what is common to all humans; a certain biological make-up and certain typical ways of interacting with the external world. This paper has also looked at what language analyses may contribute to the debate on the causes of category-specific semantic impairment studies within the field of cognitive neuroscience. It has been argued that although some categories exhibit a striking similarity to the 'evolutionary' categories, noun class categories more commonly exploit and depend on semantic characterization and domains across these, and requires one to evoke several semantic domains for their explication.

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