Word classes in Radical Construction Grammar

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1. Introduction

Radical Construction Grammar (Croft 2001, 2005a, 2013) is a construction-based theory of grammar that allows for the representation of both cross-linguistic and language-internal grammatical diversity. Radical Construction Grammar analyses conform to the following three basic principles:

(1)   Word classes and other syntactic structures are language-specific and construction-specific. What is universal is patterns of variation in the verbalization of experience, represented for example in conceptual space.

(2)   The internal structure of the morphosyntactic form of constructions consists solely of the part-whole relation between construction roles ("slots") and the whole construction. The complexity of constructions rests in the symbolic relations between the roles and their meanings/functions, and the rich semantic/functional structure expressed by the construction and its parts.

(3)   The morphosyntactic forms of constructions are language-specific, that is, there is potentially gradient variation of constructional form across and within languages.

Radical Construction Grammar (Croft 2001) and *Morphosyntax: Constructions of the World's Languages* (Croft, in prep.) propose many specific analyses of constructions and universals of constructional variation. While those analyses may and likely will need revision as knowledge of the constructions of the world's languages increases, any analysis that conforms to the principles in (1)-(3) can be considered a Radical Construction Grammar analysis. Many if not most analyses of grammatical phenomena in the functional-typological approach conform to the principles of Radical Construction Grammar (although they are not always presented that way).

These three principles result from the observation of the great diversity of morphosyntactic form used to verbalize experiences within and across languages, They also result from a critique of methods of syntactic argumentation used in contemporary grammatical analyses that have their roots in the structuralist and generative traditions (for general overviews, see Croft 2009, 2010a; for critiques of specific analyses, see those references and Croft 2005b, 2007, 2010b; Croft and Van Lier 2012).

These assumptions involve deeply-held theoretical principles that clash with the empirical fact of diversity of grammatical form. Word classes are a classic illustration of this problem, and constitute the focus of this chapter as well as many of the publications cited above. Word classes play a quite different role in Radical Construction Grammar than they do in other grammatical theories. For this reason, after an initial definition of word classes in Radical Construction Grammar in §§2-3, I will discuss the role of word

classes in other grammatical theories in §§4-7, and the theoretical assumptions they serve: methodological opportunism, the skeleton model of language universals, the building block model of grammars and the essentialist theory of categories. In §§7-9, I describe the role of word classes has in a theory like Radical Construction Grammar that does not make these theoretical assumptions.

2. Word classes and distributional analysis

Word classes are identified by distributional analysis. For example, English Adjectives[1] such as *tall* are defined by:

>   (i) their occurrence as modifiers of nouns: *a **tall** tree*
>   (ii) their occurrence as the complement of a copula *be* in predication: *That tree **is** tall*
>   (iii) the fact that they inflect in a certain way (a morphological construction): *tall-**er**, tall-**est***
>   (iv) the fact that they can in turn be modified by certain degree expressions: ***very** tall, **a little** tall*).

In contrast, English Verbs such as *jump* are defined by:

>   (i) their inflection for Tense and (in the Present) person in predication: *The deer **jumped***
>   (ii) their occurrence in a relative clause as modifiers of nouns: *the deer **that** jumped*
>   (iii) the fact that they can occur in the Progressive or the Pluperfect: *the deer **is** jump**ing**; the deer **had** jump**ed***
>   (iv) the fact that they can in turn be modified by certain other degree expressions: *the deer was jumping **a lot***

At least as important is distributional absence. English Adjectives do not inflect for Tense and Person (**That tree talls*), nor can they directly occur in the Progressive or Pluperfect (**That tree had talled*). English Verbs do not inflect for degree with *-er/-est* (**jump-er, *jump-est*), nor can they be modified by *very* (**The deer very jumped*). English Verbs cannot occur in their inflected or root form as modifiers of nouns (**The jumped deer was a doe*). These distributional facts distinguish English Adjectives from English Verbs.

This type of argumentation, DISTRIBUTIONAL ANALYSIS, is universally used in syntactic argumentation for word classes, and for other morphosyntactic units, in structuralist, generative, functional and 'theory-neutral' analysis of a language. In the American structuralist tradition, distributional analysis was based purely on linguistic form. In other traditions, including generative grammar, meaning or function may also play a role in defining constructions used in distributional analysis. The distribution of English Adjectives above makes reference to degree expressions, a category partly defined by meaning, and the *be* of predication, as opposed to other functions of *be*.

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[1] In this chapter, names of word classes in specific languages are capitalized; see §8 for discussion.

Distributional analysis is essentially OCCURRENCE IN A PARTICULAR ROLE IN A PARTICULAR CONSTRUCTION. For example, the distribution of English Adjectives described above can be defined as the occurrence of a word in the English Adjective word class in the underlined role in the following constructions:

(i) Noun Modification (Attributive): [Art __ Noun]
(ii) Copula Predication: [Sbj *be* __]
(iii) Comparative Degree, Superlative Degree: [__-*er*], [__-*est*]
(iv) Degree Modification: [*very/a little* __]

'Construction' is defined as in contemporary construction grammar (Fillmore, Kay and O'Connor 1988; Goldberg 1995; Croft and Cruse 2004): any morphosyntactic structure, complex or atomic (like a single word), syntactic or morphological (occurrence with an affix or other morphological operation), with elements of the construction being either substantive morphemes (like *be, -er,* or *a little*) or schematic elements (like Art, Noun, Sbj).

This is not the usual description of distribution analysis. There is no standard terminology for distributional analysis, for reasons that will be discussed in §4. The constructions used to define word classes are called many different things: 'criteria' (Givón 2001a:49; Dixon 2010:38), 'tests' (McCawley 1998; Carnie 2013:47, 98-100), 'evidence', 'phenomena', 'operation', and 'process' (Mulder 1994:114). The words in a word class are said to have a particular grammatical or syntactic 'distribution' (Harris 1951:5; Carnie 2013:47), 'behavior' (McCawley 1998:186), 'properties' (McCawley 1998:18; Evans and Osada 2009:452; Schachter and Shopen 2007:2), 'features' (Amha 2001:89), 'use' (Jagersma 2010:268), or 'function' (Palmer 2009:94), instead of simply saying that they occur in certain roles in certain constructions and not in others. As a result, an important point is often overlooked: DISTRIBUTIONAL ANALYSIS PRESUPPOSES THE PRIOR IDENTIFICATION OF THE CONSTRUCTIONS USED IN DISTRIBUTIONAL ANALYSIS.

One consequence of the use of distributional analysis to identify word classes (and other grammatical categories and structures) is that DISTRIBUTIONALLY-DEFINED WORD CLASSES ARE LANGUAGE-SPECIFIC. The simple reason for this is that such word classes are defined by their occurrence in a particular role in a particular construction (or set of constructions), and those constructions are language-specific. English Adjectives do not occur in German constructions, and German Adjectives do not occur in English constructions. Although this property of word classes appears to be self-evident, it is in fact a highly contentious issue, because it is incompatible with certain deeply-held assumptions about language universals and individual language grammars. This issue will be discussed in detail in §§3-5.

Distributional analysis usually involves occurrence in roles in multiple different constructions. In fact, it is usually considered a stronger argument for a particular theoretical analysis if one can argue for the same distribution in multiple constructions. However, a fundamental empirical fact of languages is that DIFFERENT CONSTRUCTIONS DEFINE DIFFERENT DISTRIBUTIONS. That is, the class of words defined by occurrence in a

certain role in one construction is almost always different from the class of words defined by occurrence in a certain role in another construction (Croft 2001:34-36). For example, the four constructions used to define English Adjectives above define slightly different classes, as can be seen in the problematic cases below:

(4) *Modification of a referent:*
     a. This insect is alive.
     b. *an alive insect

(5) *Predication with a copula:*
     a. An entire chapter is devoted to this problem.
     b. *This chapter is entire.

(6) *Degree inflections:*
     a. tall-er, tall-est
     b. *intelligent-er, *intelligent-est

(7) *Degree modifiers:*
     a. a very tall tree
     b. *a very even number

In other words, the different constructions in (4)-(7) do not define a single word class of English Adjectives. Instead, they define a set of distinct but overlapping word classes.

These empirical observations were made by the American structuralists, who provide the most explicit and careful methodological discussion of distributional analysis. For example, Bloomfield writes, 'Form-classes are not mutually exclusive, but cross each other and overlap and are included one within the other, and so on' (Bloomfied 1933:269). And Harris writes, 'If we seek to form classes of morphemes such that all the morphemes in a particular class will have identical distributions, we will frequently achieve little success' (Harris 1951:244). In a very large grammar of French containing 600 rules covering 12,000 lexical items, no two lexical items had exactly the same distribution, and no two rules (that is, constructions) had exactly the same domain of application (Gross 1979:859-60).

Hence, a consequence of the careful application of distributional analysis to word classes within a single language is that WORD CLASSES ARE ALSO CONSTRUCTION-SPECIFIC. This conclusion is at least as contentious as the conclusion that word classes are language-specific, because it is incompatible with other very deeply-held assumptions about the nature of individual language grammars. This issue will be discussed in greater detail in §§6-7.

3. Word classes and comparative concepts

If word classes are language-specific, then they cannot play the role in Radical Construction Grammar that word classes play in other grammatical theories. In other

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grammatical theories, word classes form the basis for a significant set of language universals. For those theories, word classes must be comparable across languages: that is, one should be able to treat English Adjectives and Lango Adjectives as instances of a cross-linguistic category of 'adjective', which has certain universal properties associated with it.

In this approach, it makes sense to ask the question: "does a particular language have adjectives or not?" But this approach—word classes as cross-linguistic categories—is incompatible with distributionally defined word classes. In a strictly distributional definition of word classes, this question makes no sense. Word classes are defined by their occurrence in a particular role in a particular construction in a particular language. Hence a word class must be language-specific, as noted in §2. English Numerals are defined by their occurrence in the relevant slot in the English Numeral Modification Construction [__ N-NUM]. Lahu Numerals do not occur in the English Numeral Modification Construction. Conversely, English Numerals do not occur in the Lahu Numeral Modification Construction.

For this reason, Radical Construction Grammar, in concert with a number of typologists (most recently, Dryer 1997 and Haspelmath 2010, but also many earlier typologists including Greenberg, as will be seen below), posits a different type of theoretical entity, which Haspelmath (2010) has christened a COMPARATIVE CONCEPT. A comparative concept, unlike a distributionally-defined word class, is defined on a cross-linguistically valid basis.

The simplest type of comparative concept is a semantic or pragmatic concept; here we will call it a FUNCTIONAL COMPARATIVE CONCEPT. For example, a property, in the sense of a unary valency, stable, inherent gradable category, such as age, dimension and value (Dixon 1977) is a functional comparative concept. Words denoting property concepts can be identified in any language, and compared across languages. Functional comparative concepts were introduced into typology by Greenberg in his seminal paper on word order typology (Greenberg 1966:74).

Comparative concepts that are more interesting for typologists are those that combine both function and grammatical form (Haspelmath 2010). These can be called HYBRID COMPARATIVE CONCEPTS (Croft 2016a). Hybrid comparative concepts are possible because there are certain formal traits that can be cross-linguistically defined, i.e. not with respect to distributional occurrence in a role in a language-specific construction. For example, the order of elements, such as Adjective-Noun order in English vs. Noun-Adjective order in Zuni, is a cross-linguistically defined formal property. Another cross-linguistically defined formal property is zero vs. overt coding of a semantic category, such as zero coding of singular number in English vs. overt coding of singular number in Lithuanian. It is worth noting that cross-linguistically valid formal traits in morphosyntax always involve a functional category (Croft 2009). For example, the order of elements requires a definition of the elements that occur in that order, in our example the Adjective and Noun categories; and zero vs. overt coding is always coding of some semantic category.

Two types of hybrid comparative concepts are widely used in typology. The first is a CONSTRUCTION (Croft 2014, 2016a). A construction is a pairing of form and meaning, as in Construction Grammar (see §2). A construction as a comparative concept in typology is generally a construction that expresses a particular function. For example, a study of the typology of the "passive construction" (Siewierska 1985) or the typology of "intransitive predication constructions" (Stassen 1997) covers any morphosyntactic form that encodes the relevant function.

The second widely used type of comparative concept in typology is a STRATEGY (Croft 2014, 2016a; the term is used early in modern typology; cf. Keenan and Comrie 1977 and Givón 1979). A strategy is a construction that expresses a particular function with a particular cross-linguistically valid formal trait. For example, property modification can be expressed with a prenominal strategy (Adjective-Noun) or a postnominal strategy (Noun-Adjective).

Of course, constructions and strategies are broad categories of hybrid comparative concepts, just as there are many different functional comparative concepts. More specific comparative concepts, such as 'numeral modification construction' or 'prenominal modifier strategy', have been developed by typologists. Haspelmath suggests that comparative concepts are created by typologists for their 'usefulness' (Haspelmath 2010). But their 'usefulness' is ultimately founded on an empirical basis, namely the existence of language universals that require the relevant comparative concepts to be formulated, such as Greenberg's Universal 18: 'When the descriptive adjective precedes the noun, the demonstrative and the numeral, with overwhelmingly more than chance frequency, do likewise' (Greenberg 1966:86; see also Croft 2019).

4. Cross-linguistic word classes and methodological opportunism

Comparative concepts are not word classes—that is, they are not distributionally defined in terms of roles in language-specific constructions. However, comparative concepts play an important role in typological theory, including Radical Construction Grammar, that is played by word classes in other grammatical theories.

Specifically, word classes such as 'noun', 'verb' and 'adjective' are considered to be cross-linguistic categories as well as language-specific categories in other grammatical theories. How do word classes serve as cross-linguistic categories as well as language-specific categories (see also Baker and Croft 2017)?

One approach is to define cross-linguistic categories in essentially semantic terms. The most consistent approach in this respect is that of Cognitive Grammar (Langacker 1987a,b, 2008). Langacker offers conceptual definitions of 'noun', 'verb' and all other categories that play a role in his general theory of language. In the two closely related functional theories Role and Reference Grammar (Van Valin and LaPolla 1997) and Functional Grammar (Dik 1997), the basic theoretical categories are predicates and arguments/terms, which are functional categories; they are subdivided into semantically

defined subclasses. Functionally-defined categories are analogous to functional comparative concepts. But their relationship to distributionally-defined language-specific word classes is unclear.

A second approach is to posit abstract formal categories that represent word classes, and to argue that the abstract formal categories are (or, sometimes, are not) manifested in word classes in specific languages. These abstract formal categories are defined in terms of their role in the abstract formal structures posited in the grammatical theory. The most consistent approach in this respect is generative grammar, particularly Baker (2003). One could also include here the less theoretically-oriented, more informal practice of many typologists and field linguists who assume that 'noun', 'verb' and 'adjective' are cross-linguistic categories, and then ask whether a particular language has 'adjectives' or not. Abstract formal categories are not comparative concepts in the sense defined in §3. But their relationship to distributionally-defined language-specific word classes is unclear as well.

Radical Construction Grammar argues that the only way that traditional word classes could be identified as cross-linguistic categories is through an inconsistent and selective use of distributional analysis which is called METHODOLOGICAL OPPORTUNISM (Croft 2001, chapter 1) A simple example of two closely related languages, English and German, illustrates the point (Croft 2007). German Adjectives are defined distributionally by the fact that they index (agree with) the Number and Case values of the German Noun that they modify. English Adjectives do not index the English Nouns that they modify by either category; the main distributional definition is their occurrence in the relevant role in the English Noun Phrase.

Now, 'English Adjective' and 'German Adjective' are language-specific categories. They are defined in terms of certain English and German constructions respectively. Hence, at one level, it is completely arbitrary that they are both called 'Adjective'. But they are considered to be instantiations of the cross-linguistic word class 'Adjective'. From the point of view of distributional analysis, the equating of German Adjectives and English Adjectives is opportunistic. Not only do English Adjectives not occur in German and German Adjectives not occur in English, but the constructions used in distributional analysis are totally different.

One could use the "same" constructions for distributional analysis across the two languages. The only way to do that is by comparative concepts, in particular of indexation of particular semantic categories such as cardinality (number) and participant role (case). But the only words in English that index any feature of the head are the English Demonstratives *this/these* and *that/those*. So this approach would equate German Adjectives with English Demonstratives—approximately only, since English Demonstratives do not index Case, only Number. It is obvious that the reason English Adjectives and German Adjectives are called 'Adjective' is functional: the two word classes both include words that correspond to property concepts, and the words are also used as modifiers in referring expressions. The use of distributional analysis is inconsistent and selective, designed to identify two word classes as the 'same' across

languages for other reasons—based on function in this case, but based on abstract theoretical reasons in other theories. Or they are based on a preconception of whether the language has Adjectives at all.

5. Cross-linguistic word classes and the skeleton model of language universals/ Universal Grammar

Dryer (1997) poses the problem of cross-linguistic categories with respect to grammatical relations, but notes parallels with phonemes and parts of speech, that is, the word classes used here. He suggests four things that grammatical theories might propose to exist (Dryer 1997:116-17, as adapted in Croft 2001:32):

a.   categories and relations in particular languages
b.   similarities among these language-particular categories and relations across languages
c.   functional, cognitive and semantic explanations for these similarities
d.   categories and relations in a cross-linguistic sense

Dryer argues that for a theory of cross-linguistic universals, one only needs (c); one does not need (d) (Dryer 1997:139), and in fact trying to establish (d) impedes the explanation of cross-linguistic patterns (ibid., 140).

In Radical Construction Grammar, for example, universal patterns of variation (that is, similarities and differences among language-particular categories) in the realm of parts of speech are explained in terms of certain combinations of semantic concept categories and information-packaging functions, such as modification by property concepts. These are comparative concepts, not word classes. These universal patterns of variation do not require positing a cross-linguistic category of 'adjective'. Universal patterns of variation in the occurrence of indexation in modification constructions can be characterized in terms of implicational universals defined over semantic categories, e.g. 'If a property concept modifier indexes the referent, then the deictic concept modifier does as well'.

The reason for positing cross-linguistic categories and relations is that there is a hidden assumption about the nature of language universals, which can be called the SKELETON MODEL of language universals, or of Universal Grammar. The skeleton model is the assumption that the theoretical entities in Universal Grammar are of the same type as the entities in particular language grammars—e.g., word classes. In the skeleton model, the entities in Universal Grammar are a subset of what is found in particular language grammars, because particular language grammars have many arbitrary patterns that "flesh out" the skeleton of entities in Universal Grammar. But particular language grammars include instantiations of the entities in Universal Grammar (the "bones"). For example, for many linguists, the skeleton includes 'noun' and 'verb'.

The skeleton model presupposes that language universals are of the form "All languages have X", where "X" is a particular grammatical category or structure; "X" constitutes the "bones" of the skeletal model. Most adherents to the skeleton model allow that not

everything available in Universal Grammar may be found in a language. For example, for many linguists, including typologists who adhere to the skeleton model, 'adjectives' do not need always to be present. But enough of the skeleton has to be instantiated in a particular language grammar.

Radical Construction Grammar, and much of modern typology, does not adopt the skeleton model. In Greenbergian typology, the vast majority of language universals, and certainly most of the interesting language universals, are universals of patterns of cross-linguistic variation. A universal like Universal 18 is not the description of a particular grammatical structure that may or may not be found in a language. Hence there is no need in Radical Construction Grammar, or in typology, for cross-linguistic categories such as 'noun' or 'adjective'. Language universals represent 'functional, cognitive and semantic explanations' for word class variation. But they are based on patterns of word class variation that are systematically, not opportunistically, defined. The role of word classes in uncovering these types of universals will be discussed in §§7-9.

6. Language-specific word classes and the building block model of grammar

The preceding sections show that a major difference between Radical Construction Grammar and other theories is the nature of language universals, or Universal Grammar. In particular, word classes are not doing the work of providing a skeleton for language universals. But the role of word classes in the analysis of the grammars in specific languages in Radical Construction Grammar also differs from other theories. In the debates over the relationship between language universals and language-specific word classes, there are hidden assumptions about specific language grammars as well.

It is generally assumed that there is a small number of word classes in a language. The major word classes are Noun, Verb and (in some cases) Adjectives; in addition a larger but not enormous set of minor word classes is posited. It is also generally assumed that the word classes are mutually exclusive and form an exhaustive partition of the words in a language, although most grammatical descriptions allow for some polycategoriality or polysemy, that is, membership in more than one word class. In particular, word classes are GLOBAL in the sense of being shared across grammatical constructions of the language.

Many reference grammars include chapters on word classes near the beginning of the grammar. Some reference grammars are entirely organized around word classes. With this assumption, it seems more plausible to consider the small number of word classes to be universal in the sense of being shared across languages, and hence part of the skeleton model of language universals.

Radical Construction Grammar argues that this is not what is found in the grammars of specific languages. As noted in §2, the word class defined by occurrence in a role in one construction will not in general be the same as the word class defined by occurrence in a role in another construction in the same language. A consistent, strictly distributional analysis will lead to a very large number of word classes. Moreover, the word classes will

overlap everywhere and will therefore not form a partition of the words in the language. In other words, word classes are not global; they are specific to the construction that defines them.

How is the result of consistent, strict distributional analysis reconciled with the assumption of a small number of (largely) mutually exclusive word classes that partition the words of a language? Again, Radical Construction Grammar argues that the only way that word classes can be rendered global is through an inconsistent and selective use of distributional analysis, namely methodological opportunism. One selects just one construction and ignores the other constructions, or a handful of constructions with strongly overlapping distribution and ignores the differences in distributions of the individual constructions (and any other constructions that are not used). For example, the differences in distribution of English Adjectives in (4)-(7) in §2 are ignored in positing a construction-independent, global word class of Adjective in English.

There is a hidden assumption here as well. The motivation for seeking a small set of word classes that is shared across grammatical constructions of a language is the BUILDING BLOCK MODEL of grammar. In the building block model, word categories are atomic, primitive units of grammatical analysis and structure. Constructions are built out of word categories. For example, a simplified characterization of the English Noun Phrase construction is [Dem Num Adj N], or [Dem [Num [Adj N]]]. There are of course other modifiers in the English Noun Phrase, but including them would simply show that there are more building blocks necessary to define the English Noun Phrase construction.

Radical Construction Grammar rejects the building block model along with its prerequisite, global word classes. There is a circularity of argumentation in the building block model of word classes. Word classes are defined by their occurrence in constructions (see §2). But once they are defined by constructions, word classes are assumed to be atomic primitive units, and constructions are defined as being built out of combinations of word classes (Croft 2001:34-37). In other words, identification of constructions is presupposed in order to define word classes, but then constructions are defined in terms of word classes.

The way out of this circular reasoning that is taken by other grammatical theories is an a priori assumption that word classes as building blocks are "already there", and distributional analysis is merely a way of "discovering" their existence. But, as with the assumption of cross-linguistic word classes, linguists do not agree on what the building blocks are. So they opportunistically select just the distributional facts that support their a priori assumptions. When two linguists disagree, there is no way one can resolve the disagreement because both linguists are being methodologically opportunistic: both are right for the distributions they present in their arguments, and both are wrong due to the distributions they ignore or dismiss. These a priori language-specific word classes are also the a priori cross-linguistic word classes we observed in the preceding sections.

Instead, Radical Construction Grammar follows the consequence of consistent, strict distributional analysis and recognizes that constructions, not word classes, are the

primitive units of grammatical analysis. Word classes are defined in terms of roles in constructions. They are not the building blocks out of which constructions are made. There is a many-to-many mapping of the words of a language to roles in the constructions of the language. Overlapping word classes are the starting point of grammatical analysis of particular languages. This approach will be illustrated in §§8-9, but first we turn to another hidden assumption about word classes and their role in grammatical theory.

7. Language-specific word classes as populations rather than essentialist categories

In Radical Construction Grammar, distributionally-defined language-specific word classes are completely different from the comparative concepts with which language universals are described. Comparative concepts are essentialist categories, while word classes are populations in the sense of the neo-Darwinian synthesis of evolutionary biology.

Of these two, the nature of comparative concepts is the more familiar. Comparative concepts like humanness (the semantics of animacy), cardinality (the semantics of number and numerals) or linear order (a cross-linguistically definable property of morphosyntactic form) are defined by essential properties. These essential properties allow us to identify a linguistic construction (form-meaning pairing) as instantiating, or not instantiating, the comparative concept, in any language. This is, of course, the "classical" definition of a category as a kind: a grouping of individuals by virtue of a set of properties that all and only the individuals possess. This type of grouping of individuals goes under many names; for example, Dahl (2016:428) calls it 'Universal'. Here we use the term 'essentialist', which describes the defining feature of this type of category and is also the term used in evolutionary biology (Mayr 1982:256; Hull 1976, 1988:215-16).

Individuals, by contrast, are spatiotemporally bounded: they exist only in a particular space and time. The individuality of a quartz crystal is its unique spatiotemporal existence: it was formed at a point in time, it exists in some location for some period of time, and it will pass out of existence when it is destroyed. In other words, individuals are historical entities.

What sort of "category" is a distributionally-defined word class? Dahl suggests that single values of a language-specific category such as the Future Tense 'tend to be Individual-like', but questions this conclusion for language-specific, distributionally-defined word classes such as the Adjective (Dahl 2016:429). A word class is a grouping of individuals; but it is not defined by essential properties of the individual words (or morphemes, or phrases) in the class.

Distributionally-defined word classes are best defined as populations in the biological sense (Ghiselin 1974; Hull 1976; Mayr 1982:272-75). Population thinking emerged with the neo-Darwinian synthesis in evolutionary biology (see Mayr 1982, chapter 6 for a brief history). Population thinking resolved serious problems in the essentialist theory of a

biological species by abandoning the essentialist theory. Biological species cannot be defined in terms of a set of essential properties. There are species that share seemingly essential structural traits, yet do not interbreed (Hull 1988:104). Above all, the "essential" traits of species evolve over time and may disappear.

Instead, species are defined as a reproductively isolated population of organisms. As such, a species is a historical, spatiotemporally bounded individual: 'Just as the name "Gargantua" denotes a particular organism from conception to death, *Gorilla gorilla* denotes a particular segment of the phylogenetic tree' (Hull 1988:215). Populations may be a grouping of individual entities, but they are very different type of grouping from an essentialist category. Since a species is itself an individual, a species name is a proper name, not the name of a type (Ghiselin 1974), and the relation between the constituent organisms and the population is not a type-instance (token) relation, but more like a part-whole relation (Hull 1976).[2]

Radical Construction Grammar is a component of the evolutionary framework for understanding language presented in Croft (2000). In the evolutionary framework, speech communities are populations, and so are the linguistic entities dependent on them: languages, utterances, and the structural parts of utterances. A speech community is a population of (relatively) communicatively isolated speakers (Croft 2000:17-19). A language is the population of the actual utterances produced by the speech community (Croft 2000:26)—hence Radical Construction Grammar is a completely usage-based theory of language. All of the familiar "problems" of defining languages are found in defining species, and can be addressed in the population theory of a language (Croft 2000:13-20; the "problems" are mostly due to the gradual process of speciation/language birth, and the incompleteness of reproductive/communicative isolation).

The population of utterances that constitutes a language forms a population not only by virtue of being produced by members of a speech community. Single-word utterances are replications of the words that make them up. That is, words are replicated from prior uses of that word. Multiword utterances are the result of the recombination of linguistic units replicated from prior uses of those units. The linguistic units that are replicated and recombined are the constructions and the words that fill the roles in the constructions. The replication process is of course mediated by speakers, who replicate and recombine words and constructions and other linguistic units based on their knowledge about their language—the utterances they have been exposed to, and used themselves, and their component parts—which is usage-driven. A speaker's grammar is also a spatiotemporally bounded individual, and so is the collection of the grammatical knowledge about their language of all the members of the speech community.

In contrast, structuralist and generative theories of language and language structure are essentialist. Words and constructions exist as abstract entities, not bound to time or space;

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[2] The population theory of species is still contested in evolutionary biology (Mayr 1982:276,279; Hull 1988:213, fn. 2). Dahl proposes using a modified essentialist theory for language-specific categories from biologists who do not accept the population theory of species (Dahl 435-36; Dahl does not discuss the population theory).

the same applies to the rules that govern their combination (not RECombination, which implies replication and thus historical existence). Grammars in either the sense of an idealized speaker-hearer's knowledge or in the sense of an abstract description of grammatical structures and rules are also essentialist. It is likely that the widespread essentialist representation of a grammar, the sentences generated or sanctioned by the grammar, and the parts of those sentences including word classes, underlies arguments that language-specific word classes are the same kind of thing as comparative concepts, which are defined in essentialist terms (see above).

The Radical Construction Grammar definition of a word class is an exdample of the population definition of linguistic units, including words, phrases and constructions. In order to explain the population definition of word classes, we will start with the definition of a single word, such as English *heart*. In an essentialist theory, English *heart* is a single individual abstract unit with a particular form and meaning, possibly multiple meanings, as in a dictionary entry. In the essentialist view, the word has as an essential property its word class, as asserted in introductory linguistics and syntax textbooks in various approaches, generative and otherwise (e.g., Carnie 2013:44; Fabb 2005:11; O'Grady et al. 1997:164; Finegan 2007:35).

In the population view, English *heart* is a population of uses of the word, replicated through the lifetimes of speakers of English and, thanks to the overlap of generations of speakers, through the history of the language. Thus, a word as a population has a historical (temporal) as well as a spatial dimension. Of course, for a single speaker, the most relevant uses are those in that speaker's direct experience. But the uses that speaker is exposed to are replications of prior uses outside the speaker's immediate spatiotemporal experience, and those prior uses influenced the uses that the speaker experienced. The uses of *heart* in the English speech community form a LINEAGE, or rather a set of intertwining lineages of replications of prior uses. These lineage structures may not seem very relevant to the analysis of a common word such as *heart*. However, the lineage of uses is more obviously central to the understanding of a linguistic term such as *subject* or *aspect* and reflected in citations in the linguistic literature referring to prior uses of the term, tracing the lineage of its use and the evolution of its meaning.

The same is true of constructions. A construction such as the English Progressive construction, described in essentialist terms as [SBJ *be* VERB-*ing* ...] is a population of its uses. The population is defined by the replication of the construction by speakers of the English speech community. Unlike a simple word, a construction also involves recombination: recombination of the construction, forms of *be*, the morpheme *-ing* and the fillers of the roles: the English Passive Verbs that have occurred in the construction and the English Passive Subject phrases that have occurred in the construction—which in turn are recombinations of the elements of the Subject phrase. Since the English Progressive construction involves recombination, an utterance replicating the Progressive construction constitutes multiple intertwining lineages.

Now we may provide a Radical Construction Grammar definition of word classes. Word classes are distributionally defined. They are therefore language-specific and

construction-specific. As such, a word class is a population: the population of elements that have filled, and will fill, a particular role in the replications of a particular construction (i.e., in specific utterances), which is also a population. The names for word classes, like other language-specific linguistic entities, are proper names. Hence the convention adopted in typology and in Radical Construction Grammar to capitalize the names of language-specific word classes (and constructions) accurately captures their nature as populations.

As a population, a word class is completely different from a comparative concept, which is a kind, defined by the essential traits of the kind. Word classes are "made up of" particular linguistic entities—individuals in a language. Comparative concepts are also "made up of" particular linguistic entities—individuals within and across languages. But the relation between a population and its constituent entities, and the relation between a kind and its instantiations, are totally different. The first is a relation between a spatiotemporally bounded individual and its component parts (the replications); the second is a relation between a universal kind and instances that share the essential traits of the kind (Hull 1976).[3]

8. The role of word classes in Radical Construction Grammar: language-internal and cross-linguistic variation

Sections 3-6 focused largely on what word classes in Radical Construction Grammar are not, because what they are not are linked to deeply held assumptions about the nature of words, grammar, and language universals by advocates of other linguistic theories. Word classes are not essentialist categories; they are populations defined by occurrence—and recurrence—in a particular role in a particular construction. Word classes are not building blocks for grammatical structure; they are the product of recombination in the replication of the constructions that define them. Finally, word classes as spatiotemporally bounded populations cannot be used to provide a skeleton of grammatical categories for Universal Grammar; language universals must be built on comparative concepts, which are kinds, that is, essentialist categories.

Radical Construction Grammar, and typology, proceeds by the inductive analysis of empirical linguistic data. Empirical linguistic research forms generalizations over samples of the populations of words, constructions and utterances produced by speakers of the language, and seeks to explain those generalizations. Freed from requiring word classes to be essentialist kinds, building blocks of grammars, and the skeleton for language universals, Radical Construction Grammar uses patterns of distribution of words to uncover language universals.

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[3] Dahl (2016) and Gil (2016) suggest that different dialects, varieties and even languages may have the "same" category, e.g. the Perfect in different English dialects or the Relative Case in Eskimo-Aleut languages (Dahl 2016:430). Gil extends this idea to code-mixing and borrowing. What these categories have in common is a shared lineage (language contact can lead to category lineages "jumping" languages). Lineages are historical entities, so they are not comparative concepts of the type discussed in §3. Language-specific categories are single branches of shared lineages, though there are complex issues in deciding whether there is sufficient communicative isolation to define a separate language lineage, as noted above.

Radical Construction Grammar is based on distributional analysis. In section 2, it was observed that, empirically, word classes defined by distributional analysis are construction-specific and language-specific. In the grammatical description of a single language, distributional analysis produces a many-to-many mapping between words and constructions, or more precisely, between words and a particular role in a construction. This many-to-many mapping does not "clump" words into a small number of global (construction-independent) word classes.

Taking this view means taking a less restrictive perspective on the representation of word classes. Word classes are not mutually exclusive. However, in most grammatical theories, overlap is generally restricted to a taxonomic hierarchy (a tree), or a set of shared features, which leads to a lattice. A lattice quickly becomes unreadable when every construction determines a different distribution. More significantly, it does not easily capture generalizations linking overlapping distributions. In order to capture these generalizations, we must also find a basis for cross-linguistic comparison of word classes.

Constructions are defined in terms of both form and function. Typically this is done informally, not least because distribution is commonly not described as occurrence in constructions (§2). In construction grammar, distributional analysis is defined explicitly in terms of words occurring in roles in complex constructions. Words and complex constructions are both pairings of form and function. The function of words and (complex) constructions provides a basis for cross-linguistic comparison, because functions are comparative concepts. Thus, words can be compared in terms of translation equivalents for the relevant word sense, and constructions can be compared in terms of equivalent functions, such as predication and modification. Methodological opportunism is avoided by comparing distributions across languages of semantically equivalent words in functionally equivalent constructions.

For example, English uses different constructions with different strategies for predication of action concepts, property concepts and object concepts:

(8)   a. Donna sings.
        b. Donna **is** tall.
        c. Donna **is an** Alabaman.

These constructions share the same function and so they can be compared. One can also compare predication constructions across languages—'predication construction' is a comparative concept. We can then examine distribution patterns for words expressing action concepts, property concepts and object concepts across languages as well as within languages.

In this case, there is an implicational hierarchy across languages with respect to the strategies used for predication, specifically the use of zero vs. an overt morpheme for predication of action, property and object concepts: a predication construction for any semantic type on the hierarchy Action < Property < Object uses at least as many

morphemes as predication of any semantic type to the left on the hierarchy (Croft 1991:130; Stassen 1997:127; Pustet 2003). In English, overt coding is found in property and object predication; see (8b-c). In Mandarin, overt coding is found in object predication only (Li and Thompson 1981; but see below). In Makah, no overt coding is used for action, property or object predication (Jacobsen 1979). The language-specific word classes defined by the zero and overt predication constructions are different: based on the predication construction, one might say that English "distinguishes Adjective and Verb", Mandarin "does not distinguish Adjective and Verb", and Makah "does not distinguish Noun, Adjective and Verb". But Mandarin, Makah and English all instantiate the language universal given at the beginning of this paragraph. Specifically, this universal and other universals of predication, modification and reference constructions indicate that action concepts are prototypically predications, and that property concepts are prototypically modifiers and object concepts are prototypically referring expressions (Croft 1991, 2001).

Yet this hierarchy is already manifested in English alone. English has both overt coding and zero coding strategies for its predication construction. Most object predication constructions involve two morphemes, *be* and *a*, whereas property predication involves just one morpheme, *be*. In fact, most typological universals involve comparison of patterns of distribution—variation in use—of multiple constructions in a language, and equivalents of those same constructions across languages. In other words, GRAMMATICAL VARIATION WITHIN A LANGUAGE AND GRAMMATICAL VARIATION ACROSS LANGUAGES ARE GOVERNED BY THE SAME UNIVERSAL PATTERNS AND PRINCIPLES (Croft 2001:107).

If we drill deeper into language use in a single language, this principle continues to hold. In some languages, for example Lango, constructions exhibiting different strategies for modification—zero, the Attributive Particle, or the combination of Attributive Particle and Relative Pronoun—are used in both property and action modification. Hence there is no difference in the distribution of the different modification constructions in categorical terms. However, the more overtly coded Attributive+Relative combination, using two morphemes instead of one, is less normal for property concepts but preferred to action concepts (Croft 2001:78-80, from Noonan 1992 and personal communication), as expected from the universal that property concepts are prototypically modifiers. In Mandarin (and Cantonese; Li and Thompson 1981:143; Matthews and Yip 2004:158; Croft 2020, Lecture 3 and references cited therein), the degree modifier for property concepts is frequently used in predication without denoting intensification; that is, it is grammaticalizing into overt coding for property predication.

9. Word classes, the semantic map model, and exemplar semantics

In Radical Construction Grammar, construction-specific word classes can be compared within and across languages using the meanings of words and the functions of constructions. This comparison reveals universal patterns of variation in distribution. The preceding section gives simple cases where implicational hierarchies familiar from typology capture the universals.

Other universal patterns of distribution are more complex, and different methods are used to capture the patterns. The basic method is the SEMANTIC MAP MODEL, also with a long lineage in typology (for overviews, see Croft 2003; Haspelmath 2003). In the semantic map model, word meanings occurring in distributionally defined word classes are mapped in a conceptual space structured according to variation in distribution within and across languages. For example, one can organize word meanings in a conceptual space according to their distribution in different predication constructions, as is done by Stassen (1997). The classic semantic map model uses a graph (network) structure for the conceptual space: word meanings that occur in the same construction(s) are nodes joined by edges (links) in the graph (for an algorithm for constructing the graph, see Regier et al. 2013; for fitness statistics for the algorithm, see Croft to appear).

For even more complex patterns of distribution, multidimensional scaling (MDS) can be used (Croft and Poole 2008; Croft 2010c, to appear; for an implementation for use in linguistics, see Timm 2020). MDS uses a Euclidean spatial model: word meanings that occur in the same construction(s) are spatially near each other. Otherwise it is constructed in the same way as the traditional graph structure model: organize meanings in a conceptual space such that meanings of words that occur in the same overlapping construction-specific distributions are "closer" to each other, either in terms of paths through the graph or in terms of Euclidean distance. For example, Rogers (2016) uses the distribution of 49 object, property and action concept words in reference, modification and predication constructions in 11 languages to reveal universal patterns of variation in so-called "parts of speech".

Semantic map model research using the graph-based or multidimensional scaling methods has used progressively more fine-grained meanings. For example, Rogers' MDS analysis of property concepts confirms that different subclasses of property concepts form a scale from "more nouny" to "more verby" "adjectives" (terms are in scare quotes because these are not word classes as building blocks, but a way to convey the scalar quality of the language universal; see also Dixon 1977; Wetzer 1992:242; Stassen 1997:168-69; Croft 2001:96-97).

The logical conclusion to this process is to use nonlinguistic stimuli, such as the Bowerman-Pedersen spatial relations pictures (found in Levinson and Wilkins 2006:570-75). Empirical research in eliciting words using nonlinguistic stimuli, such as adpositions used to express spatial relations, reveals even finer-grained variation in distribution than was previously realized (Levinson et al. 2003). Distributional variation should not be thought of as being organized into a network of discrete concepts but rather as multiple continuous dimensions of meaning or function (Croft 2010c). The dimensions of meaning/function in conceptual space are the language universals; language-specific word classes "cut" these dimensions into constructionally-defined categories constrained by the conceptual dimensions.

Even this research does not fully capture the nature of variation in distributional patterns. This research assumes that any particular meaning/function, even a very finely-defined specific function, is expressed by one word or construction in a language. The reality of

course is that speakers vary in their choice of word or construction for a particular experience, such as the spatial situations represented in the Bowerman-Pedersen stimuli. This is a truism: different speakers, and even the same speaker at different times, verbalize an experience in different ways. Variation in verbalization of scenes in the Pear Film (Chafe 1980), for example, is ubiquitous (Croft 2010d).

In order to integrate variation in verbalization to the theory of word classes, one must shift from an essentialist view of word classes, in which a word is a possible filler of a constructional role, to the population view of word classes described in §7, in which actual frequencies of occurrence are what matters. And one must look at the distribution of word plus construction across the situations mapped in conceptual space.

This is a far more complex task than simply recording occurrences of words in constructions. But preliminary studies suggest it is a fruitful approach. A study of the 20 verbalizations of scenes in the Pear Film found in Chafe (1980) shows that variation in verbalization is the origin of grammatical, lexical and constructional change found in language histories and across languages (Croft 2010d). A follow-on study of the same data showed that the frequency distribution of words and constructions varied according to well-known semantic dimensions (Croft 2020, Lecture 9). For example, animacy and alienability governs preference for definite article vs. 3rd singular possessive for recurrent reference, degree of control over an event governs preference for subject vs. oblique realization of the experiencer in unintended human events, and direct manipulation and individuated theme vs. indirect causation and less individuated theme governs preferences in the choice of verb in the application ('putting') argument structure construction.

The conclusion that can be drawn from these studies is that VARIATION IN LANGUAGE USE (VERBALIZATION) AS WELL AS GRAMMATICAL VARIATION WITHIN A LANGUAGE AND GRAMMATICAL VARIATION ACROSS LANGUAGES ARE ALL GOVERNED BY THE SAME UNIVERSAL PATTERNS AND PRINCIPLES (Croft 2010d, 2020). Distributional patterns of words and constructions are best thought of as probability distributions of use over conceptual space (Croft 2020:271). These probability distributions are directly manifested in language use, that is, the verbalization of experience. These patterns of variation get conventionalized in grammatical patterns of the speech community. Conventions change over time and as speech communities split, the patterns of variation in language use come to be reflected in typological universals of cross-linguistic variation (Croft 2016b).

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