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Categories and prototypes

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## 1 What is a “category”?

The term “category” can be defined loosely as the label for a set of entities that share one or more properties and that are thus to some extent similar. These properties can be said to “partition” some larger set of entities. Consider the set of linguistic entities (words) in (1):

(1) {bark, barks, believe, believes, croit, croyait}

Several partitionings of this set are possible:

- (2) a. {barks, barked, believes, believed} {croit, croyait}  
b. {barks, barked} {believes, believed, croit, croyait}  
c. {barks, believes, croit} {barked, believed, croyait}

In (2a), there are two criterial properties characterizing each of the subsets: in the first subset the words are all English and they start with a *b*; in the second subset the words are French and they start with a *c*. *Bark*, for instance, is thus “categorized” as being English and as starting with a *b*. These criteria can be called “formal”. In (2b) the criterion is semantic or “notional”: the words *barks* and *barked* relate to the concept of “barking” and the other ones to the concept of “believing”. In (2c), finally, the criterion is the distinction between present and past tense. This can be considered a semantic criterion as well, though some linguists may call the criterion “formal” or perhaps partially formal and partially semantic, because present and past tense forms can also be used to refer to non-present and non-past time spheres. Note also that the partitioning in (2c) cuts across languages, even though it is not obvious to what extent the French present or past tense is the same as the English present or past tense, independently of whether one takes “present” and “past” to be formal or semantic categories. All that matters for now is that there is at least a certain degree of similarity.

In principle, all of the subset labels used so far, i.e. , “English”, “French”, “starting with *b*”, “starting with *c*”, “present” and “past”, “relating to barking” and “relating to believing”, could be called “linguistic categories”. In practice, however, they are not. There are two reasons. Either there is a more specific label or the category is uninteresting. Thus we do not normally call “English” and “French” “categories”, because we feel happy with calling them something else, viz. “languages”. “Starting with a *b*” and “starting with a *c*” are not

normally regarded as categories either, because the partition is usually not very interesting, except perhaps in lexicography. The same goes for “relating to barking”: we are not aware of any property of language for which the identification of a word as relating to the concept of barking would be useful. This is different for “relating to believing” or, in another parlance, “propositional attitude concepts”. This is a category found useful in semantics and, in relation to verbs, it is more or less the same as the classical class of *verba sentiendi*. “Present” and “past”, finally, are also *bona fide* categories. What the above examples thus show is that the inventory of categories used in linguistics basically depends on how useful these categories are for the description and analysis of language.

So far the listings in (1) and (2) illustrate three categories. Implicitly, however, the listings illustrate several more. The entities in (1) and (2) are all verbs rather than nouns or adjectives, and they are finites rather than infinitives or participles. Let us call categories that directly partition relatively concrete linguistic objects “basic categories”. Parts-of-speech are thus basic categories, but also specific form classes like “present tense” and “past tense” or “singular” and “plural”. Accordingly, basic categories correspond to properties of concrete linguistic objects. For instance, we can say “the word *bark* is a verb”, “the verb *barked* is in the past tense” or “the pronoun *they* is in the plural”.

Basic categories always stand in opposition to at least one other category which relates to the same aspect of meaning or form (e.g. “present” vs. “past” or “singular” vs. “plural”). Taken together, such contrasting basic categories form systems of oppositions, namely, a “tense system” in the first case and a “number system” in the second case. Now, “tense” and “number” are also often called “(grammatical) categories”; but if both “number” and “singular” are “categories”, there is bound to be confusion (cf. also Dahl 1985: 21). This is the reason why we have used the attribute “basic” for categories such as “past (tense)” and “singular”, which allows us to distinguish them from “higher” categories such as “tense” and “number”.

There are, of course, other ways of establishing such a differentiation. For instance, we could simply find a different label for one of the two types of categories. This is done by Corbett (2000), among others, who regards “number” as a category (Corbett 2000: 1) and subsumes notions like “singular”, “plural”, “dual”, etc. under the term “(number) values”. However, one also finds linguists calling Corbett’s “values” a “category”, but “number” a “dimension” (cf. for instance Haspelmath 2002: 61). The latter usage seems more typical of modern linguistics, but as will be shown in Section 2, in philosophy the term “category” is usually applied to “higher” categories. What both types of categories have in common is that

they refer to sets that consist of similar elements and that have resulted from the partition of some larger set. In the case of basic categories, the elements are linguistic objects (e.g. {*barked, believed, ...*} for “past”); higher categories, by contrast, can be regarded as sets of “basic categories” (e.g. {present, past, future} for “tense”).

## 2 Some historical remarks on the notion “category”

### 2.1 Categories in philosophy

The term “category” (Gr. κατηγορία ‘accusation’, but also ‘predicate’ or ‘mode of predication’) was coined by Aristotle in his treatise on *Categories* (cf. Barnes 1984: 3-24). Aristotle distinguishes between two types of judgements: “thetic” and “categorical” ones. Thetic judgements merely state a fact, whereas in categorical statements some property is attributed to an individual or object. Simplifying somewhat, thetic statements have the form *A (is)* (e.g., *It rains*), while categorical statements always have the form *A is B* (*Socrates is short*). Among the categorical judgements Aristotle distinguishes further between ten “categories” (the examples in parentheses are Aristotle’s): (i) *substance* (e.g. “man”, “horse”), (ii) *quantity* (“four-foot”, “five-foot”), (iii) *quality* (“white”, “grammatical”), (iv) *relation* (“double”, “half”, “larger”), (v) *place* (“in the Lyceum”, “in the market place”), (vi) *time* (“yesterday”, “last year”), (vii) *position* (“is lying”, “is sitting”), (viii) *having* (“has shoes on”, “has armour on”), (ix) *doing* (“cutting”, “burning”), and (x) *being affected* (“being cut”, “being burned”).

In the course of the centuries several modifications of Aristotle’s theory of categories have been proposed. Even though this is not the place to discuss these revisions, mention should be made of one prominent philosopher, namely Immanuel Kant. In *The Critique of Pure Reason* (cf. Kant 1927), he established a system of four interrelated categories which was intended to represent the most simple and elementary concepts of human thinking. Kant’s categories – made use of also by Grice (1975) in his theory of conversational implicatures – comprise: (i) “quantity” (unity, plurality, totality), (ii) “quality” (reality, negation, limitation), (iii) “relation” (substance, causality, community), and (iii) “modality” (possibility, existence, necessity). Just like the categories of Aristotle, those of Kant are “higher categories”. Moreover, these categories are notional ones. The use of the word “category” for formal and/or basic sets is a relatively recent phenomenon that is often lamented in philosophy as being inflationary and even downright wrong.<sup>1</sup> This seems worth mentioning, for in linguistics there is the opposite tendency, namely to use “category” only for basic sets and to find new labels for higher categories (such as “dimension”; cf. above).

## 2.2 Categories in linguistics

Even though Aristotle's theory of categories was largely based on linguistic observations (insofar as it described possible modes of predication and was closely related to the use of the Greek copula: "What kind of predication can be expressed by saying *x is y*?"), the term "category" was not widely used in linguistics until the twentieth century. What is called "grammatical category" today was known as *modus significandi* in the medieval (scholastic) grammar tradition (e.g. Thomas of Erfurt). With a few exceptions, nineteenth century linguistics did not make use of the term "category" at all. Comparative or descriptive linguists simply spoke of "declensions" or "conjugations" when referring to what we call "inflectional categories" today or used it only in a notional sense (e.g. Wilhelm von Humboldt). One of the first linguists who used the notion "category" for formal categories was probably von der Gabelentz (1901).<sup>2</sup> The word "category" was established as a technical term in linguistics in the early twentieth century and was used, for instance, by Jespersen (1924: 45-57) and Bloomfield (1933: 270), who provides the following definition:

"Large form-classes which completely subdivide either the whole lexicon or some important form-class into form-classes of approximately equal size, are called *categories*. Thus, the English parts of speech (substantive, verb, adjective, and so on) are categories of our language. So are singular and plural substantives, since these two form-classes, of approximately equal size, completely subdivide the form-class of substantives. In general, inflectional forms, what with the parallel occurrence in every paradigm, represent categories – for instance, the various forms of the verb-paradigm, including the congruence-forms of finite verbs (*am : is : are* or *was : were*) and, crossing these, the tenses and modes of finite verbs (*he is : he was : he were*)."  
[emphasis original]

## 3 From necessary and sufficient conditions to prototypes

So far, we have taken the existence of categories for granted, for instance, by saying that *barks* and *croit* are both elements of the category "verb" (in different languages). But how and why do we know that these elements are verbs or present tense verbs? How does "categorization" work? This issue is, of course, a very general one, and by no means restricted to linguistics or even science (see Murphy 2002 for a state of the art discussion of the nature of categorization).

In the *bark/croit* example we have implicitly embraced the so-called "classical" model of categorization: sets of linguistic objects are neatly partitioned on the basis of similarities.

And indeed, in some languages parts of speech can be defined straightforwardly, with respect to morphology and/or syntax. Consider the category of adjectives in the Mayan language Tzotzil. Words count as adjectives if they have the following three properties: first, they can be used in an attributive function (cf. (3)); second, they do not inflect for aspect (cf. (4)); third, they may not form a noun phrase by themselves (cf. (5); see also Aissen 1987: 5).

(3) sik-il        vo'  
       cold-ATTR water  
       ‘cold water’

(4) \*ta x-sik  
       IND ICP-cold

(5) \*li sik-e  
       DET cold-CL

Since these “properties” or “conditions” serve to define a (basic) category and because they serve as criteria, they may be called “definitional” and “criterial”. Each of these conditions is furthermore necessary and they are jointly sufficient. This “classical” way of categorization is often called the “Aristotelian” model or simply the model of “necessary and sufficient conditions”. According to this model, if a given element does not meet one of the criterial conditions, it is necessarily excluded, and if it meets all of the three conditions, it is necessarily included. Category membership can thus be determined by “checking” the relevant attributes, and for each item this will lead to either inclusion in or exclusion from the category in question.

The “classical” model of categorization will have its use in some domains, but it is often at best only an idealization. With the advent of what we may broadly call the “cognitive sciences” in the second half of the twentieth century, this model of categorization was challenged radically, i.e., more than by merely pointing out that it is an idealization. Human categorization, it was claimed, should not be regarded as an abstract logical process of “feature checking” (a view sometimes referred to as “objectivism”), but as involving perceptual and physical activity on the part of the human subject. This new paradigm is sometimes called “experiential realism” or “experientialism” (cf. Lakoff 1987: xv). In experiential realism, human cognition is intimately related to bodily experience associated with a broad range of connotations. For instance, when we think of a bed we do not primarily think of a set of features that a bed necessarily exhibits; rather, we associate with that notion specific perceptual experiences like comfort and rest.

The idea of categorization being intimately related to perceptual experience had an obvious impact on the question of how categorization works. One of the most important consequences was a rethinking of the relationship between categories and their elements as well as the attributes characterizing categories. While in the classical model categories or the (abstract) criterial attributes characterizing them on the one hand, and the entities to be categorized on the other, are assumed to exist independently, proponents of “experiential realism” argued for a much tighter connection between categories and real world objects. In particular, categories were taken to be associated with and organized around particularly (cognitively and perceptually) salient representatives. Today this idea is commonly known as the essence of “prototype theory”, and the most salient instances of a category are called “prototypes” (sometimes also “stereotypes”, e.g. in the work of the philosopher H. Putnam; cf. Putnam 1975: 169ff.).

Among the most prominent early proponents of prototype theory is the psychologist Eleanor Rosch, who carried out a number of groundbreaking experiments in the seventies (e.g. Rosch 1973a,b, 1975a,b). Rosch showed that there are very clear inter-subjective (though culture-specific) intuitions as to the degree to which a given element is “representative” or “typical” of a category. For instance, the category “fruit” was shown not to be represented cognitively as an unordered set of elements meeting the biological criteria for being fruit. Rather, in Western Europe most people think of specific types of fruits – for instance, an apple – when hearing the word *fruit*. By contrast, plums, pines, and olives are less typical representatives of the category fruit, with a decrease in prototypicality from left to right (cf. Rosch 1973b: 130ff.). What the research done by Rosch shows is that (lexical) categories such as “fruit” are, cognitively seen, not just unordered sets but structures with a complex internal organization.

The same point was made in a cross-linguistic study on colour terms carried out by Berlin & Kay (1969), which showed that perceptual salience has a strong, language-independent, impact on lexical categorization. While languages (and even individual speakers of languages) tend to partition the colour spectrum in different ways – for instance, insofar as they use a different number of basic colour terms – for a given colour it is usually more or less the same shade that is identified as the most typical representative. In other words, while languages may differ as to whether they have different names for red and orange, or whether they lump together red and orange under one term, for corresponding colour terms there are striking correspondences as to the most typical shade of that colour. For instance, the typical tone of *green* identified by speakers of English is very similar to the relevant tone of

*midori(iro)* identified by speakers of Japanese, irrespective of the actual range of colours covered by each term (cf. Berlin & Kay 1969: 119, 125). These universal tendencies have been explained in terms of physical facts like brightness or saturation, or physiological ones like the make-up of the human perceptual system (cf. Croft 2003: 275-9, and also, for a more critical appraisal, Foley 1997: 150-165 and Goddard 1998: 111-135). The most important result of the study carried out by Berlin & Kay (1969) is that categorization can directly be linked to perceptual experience, and that certain (language-independent) representatives of a category are “better”, “more salient”, or simply more “prototypical” than others.

The Berlin-Kay study can be classified as lexical semantics, and this indeed proved to be the field in which elements of prototype theory have become particularly popular. A textbook example illustrating this type of application is the word (or, for that matter, “category”) *bird*, which covers a range of animals with different types of properties like: (i) it can fly, (ii) it has feathers, (iii) it has a specific (S-like) form, (iv) it has wings, (v) it lays eggs, and (vi) it has a beak (cf. Geeraerts 1989: 599). However, not all birds have all of these properties. For instance, some birds cannot fly (kiwi, ostrich), have a peculiar form (penguin), or have feathers that can hardly be identified as such (kiwi, penguin). Even though all of these animals are nonetheless birds, most people would agree that they are not particularly good representatives of that category, and that the average bird is like a sparrow or a blackbird, which have all of the properties mentioned above.

As the bird example shows, one of the most salient properties of prototype theory is that categories are not defined on the basis of the smallest common denominator of necessary and sufficient conditions – for instance, birds could be defined as “animals with two legs and feathers” in a classical approach; rather, properties are also taken into account which are not necessary for class membership. For example, the ability to fly is not a necessary but certainly a typical property of birds and should – according to prototype theory – figure in a definition of that word. As this example shows, in prototype theory lexical definitions are richer than in the classical model.

A further important difference between prototype theory and the classical model of categorization concerns the boundaries of a category. According to the “classical” model, categories have clear-cut boundaries including specific elements and excluding others. By contrast, prototype theory assumes that category boundaries are sometimes fuzzy. A standard example illustrating this point is the word *cup*, discussed in great detail by Labov (1973). Labov shows that depending on the shape and use of a “cup-like” object, this object is often on the verge of membership to the category “cup” without being clearly included or excluded.

Obviously, fuzzy boundaries are only found with specific types of categories, most notably those containing objects which may be categorized *ad hoc*. For instance, the same type of container may be categorized as either a “glass” (when it is filled with a beverage) or as a “vase” (when it contains flowers). By contrast, a penguin cannot spontaneously be categorized as, say, a seal. Also, the fact that a penguin is a bird is learnt during language acquisition. Such instances of conventionalized categorization render specific types of categories quite inflexible.

It should be mentioned that the two central postulates of prototype theory pointed out above – the internal structure and the fuzzy boundaries – should be kept apart. While having fuzzy boundaries implies having an internal structure, having an internal structure does not imply having fuzzy boundaries (cf. also Löbner 2003: 186-91 for discussion). This is illustrated in Figure 1. On the left hand side there is a cluster of objects centring around a core of (prototypical) category members, but there is no category boundary. On the right hand side the same category structure is represented, but a clear outer boundary is also given, thus excluding specific elements.



Figure 1: Internal structure and boundaries of categories

Having outlined the major corner stones of what was called “prototype theory” above, a note of caution is in order concerning the application of that term. There is no such thing as *the* “prototype theory”. Since the beginnings of research into prototypicality many of the claims made by early advocates of experiential realism have been modified or even discarded, some new ideas have been introduced as well, and prototype theory is not the only successor to the classical theory either. This is not the place to offer an overview or discussion (cf. Kleiber 1990: 147-83 and Murphy 2002), so we will restrict ourselves to some basic remarks. One important point concerns the relationship between a prototype and a category. In its strongest form, prototype theory regards prototypes as constitutive principles of a category. In other words, any element of a given category *C* is an element of that category by virtue of its similarity to the prototype. For instance, a stork would be categorized as a bird because it

exhibits a certain similarity to a sparrow or a blackbird. This “standard version” of prototype theory (Kleiber 1990) has been revised, most notably by some of the pioneers themselves (see for instance Rosch 1978). In particular, the prototype was no longer regarded as a constituting principle of a category, but merely as an effect of categorization. The direction of causality was thus reversed: given that most of the members of the category “bird” can fly, the ability to fly becomes a prototypical property of the category “bird” and the sparrow a prototypical member. The idea of prototypicality being an effect rather than a cause of categorization opens a new door that is particularly interesting for linguistic applications of that notion, for it allows us to consider the notion of frequency as a driving force in categorization (cf. Haspelmath 2006 for a discussion of the role of frequency in language): we may hypothesize that it is usually the most frequent members of the category or, at least, the properties that are most frequently found that determine prototypicality.

The reconsideration of the relationship between prototypes and categories had important consequences in another respect. While the assumption that categories are internally structured and that members exhibit different degrees of (proto)typicality is still made by most prototype theorists, the assumption of categories without external boundaries and/or necessary conditions has repeatedly been challenged (cf. Kleiber 1990: 121-24, Löbner 2003: 186-91). In other words, while categories like the one on the right-hand side of Figure 1 are still taken for granted, completely amorphous categories like the one on the left-hand side are often rejected. This does not mean that one can no longer deal with Labov’s cup problem. One could assume that certain elements may be contained in more than just one category. For instance, a container that could be used as both a drinking glass and a vase can simply be regarded as being contained in both categories. This does not prevent us from assuming that certain elements are clearly excluded from the category of glasses and others from the category of vases. Such “categorial overlap” is illustrated in Figure 2.

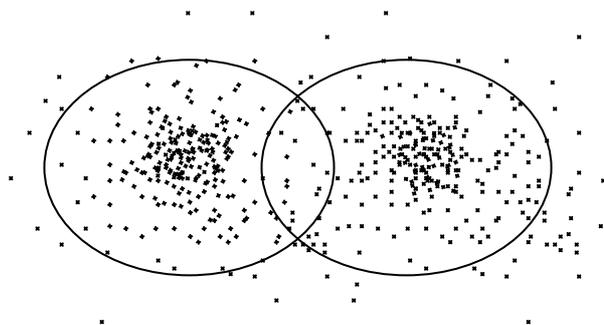


Figure 2: Overlap between similar categories

Alternatively, we could assume that utensils such as cups and vases are generally categorized along two dimensions, namely (i) in terms of physical properties such as material, shape, colour, etc., and (ii) according to what they are used for (“functional properties”). In that case, a Labov-type object would simply be categorized as a “liquid container” by virtue of its physical properties, and depending on its actual use it would be categorized more specifically as either a vase or a cup. Again, category membership would be a matter of “yes” and “no” for each instance of categorization, even though such objects have the potential to figure in more than one category.

The reconsideration of internal category structures and category boundaries has also given rise to the introduction of another important notion into prototype theory, namely “family resemblance”, which has been taken from Wittgenstein (1953: 31-2). The idea of a family resemblance is that members of a category need not meet any necessary condition, but are related to each other by a “chain” of similarity relations in a “similarity network”. To illustrate this with an example given by Wittgenstein, the German word *Spiel* (‘game’) denotes a number of rather diverse activities ranging from card games to ball games, from games that are played alone (solitaire) to team games, from entertaining games to competitive games, etc. It is hard (if not impossible) to identify a single necessary condition for the family of games. Wittgenstein points out that the different types of games constitute a network of activities in which each node has something in common with the neighbouring nodes, but not necessarily with the more remote ones. This is represented on the left-hand side of Figure 3, where each circle corresponds to a specific type of sub-category – say, a specific type of game – characterized by a (set of) criterial attribute(s) (e.g. “is played alone/in pairs/in teams”, “involves physical activity”, etc.)

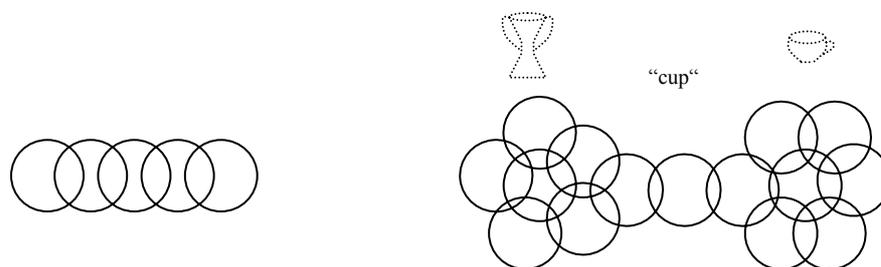


Figure 3: Family resemblances and sub-categories

In the category structure represented on the left-hand side of Figure 3 the various sub-categories simply form a chain, which suggests that each of them has more or less the same status within the overall category. However, it is quite obvious that such a homogeneous

structure will not usually be found in real world categories, since specific properties and also sub-categories are clearly more important than others (e.g., “is entertaining” is certainly more central than “can be played alone”). If sub-categories are distributed unevenly within the superordinate category, this will yield a structure such as the one on the right-hand side of Figure 3. For instance, the category “cup” can be regarded as consisting of two major sub-categories, one of which is used for drinking while the other is a sports trophy. There may be a few objects that are located somewhere in between the two sub-categories, but the majority of cups cluster around representatives of one of the two sub-categories.

As this example shows, the idea of “family resemblances” paves the way for a polysemy oriented treatment of lexical meanings within the framework of prototype theory. Instead of searching for the smallest common denominator of a category, internal semantic variation is allowed, and different sub-meanings can be identified, perhaps with specific prototypes for each sub-meaning. In linguistic typology, the idea of “family resemblances” has been exploited in the concept of “semantic maps”, which capture the relationship between networks of notional categories and formal categories of specific languages (cf. Section 6).

Let us briefly summarize some of the central hypotheses of prototype theory and their impact on matters of categorization. It is to be kept in mind that not each of these postulates applies to every “version” of prototype theory, and that some aspects may be relevant to specific types of categories but not to others:

- (i) Unlike in the classical model of categorization, in prototype theory it is not (or not only) the necessary and (jointly) sufficient conditions that are taken into consideration, but also properties that are not necessary but typical.
- (ii) On the basis of (i), categories may have an internal structure, i.e., there may be more or less central representatives of a category.
- (iii) Categories may have fuzzy boundaries, which means that sometimes the question of whether or not a given object is an element of a category cannot clearly be answered (this assumption has repeatedly been challenged).
- (v) Some categories constitute networks of elements which are organized in such a way that each element shares some property with the neighbouring nodes. This relationship holding between the elements of such a category is called “family resemblance”.

#### **4 Prototypes and word classes**

Next to lexical semantics, another domain of linguistics where concepts of prototype theory have widely been made use of is that of word classes, both in particular languages and cross-

linguistically. As pointed out in Section 3, word classes are often defined in terms of necessary and sufficient conditions. However, this is not always possible, especially in languages with a poor morphology and great “categorical flexibility” such as English and Mandarin Chinese (cf. Bisang this volume). The observation that English word classes cannot easily be defined in terms of necessary and sufficient conditions was made even before prototype theory was well established in linguistics. Crystal (1967) points out that several criteria can be used to define word classes (phonological, morphological, lexical, semantic, syntactic; cf. also Lyons 1977: 423-430 on the definition of word classes). This raises the obvious question of what to do if the different criteria do not lead to the same result. Crystal (1967: 46) proposes a “statistical approach”: “what seems to us to be intuitively the most satisfactory solution should to a large extent reflect our unconscious awareness of proportions of frequencies. This approach would also seem to be the only way whereby one can give meaning to the notion of “centrality” of membership of a word class.” In terms of prototype theory, this amounts to establishing a set of typical properties exhibited by the members of a word class, and to determine the number of properties exhibited by each element. Crystal outlines such a procedure for nouns and takes the following criteria into account: (a) may act as a subject, (b) inflects for number, (c) co-occurs with an article, and (d) has a morphological indication of being a noun. This gives us the following classes: (a) a “central class” of nouns that exhibit all four properties (*hardship, peroration*); (b) two somewhat less central classes of nouns that have three of the relevant properties (*boy* and *girl*, which lack an overt indicator of their nominal status, and *information*, which does not inflect for number); (c) one class of nouns that exhibit two of the properties (*news*, which may act as a subject and inflects for number); finally, (d) a “peripheral class” of nouns whose only nominal property is that they can occur as a subject (*phonetics*). The different intersections between these four criterial attributes are shown on the left-hand side of Figure 4. The right-hand side illustrates that the category “noun” in English can be regarded as a concentric system if nouns are classified according to the number of criteria that they meet.

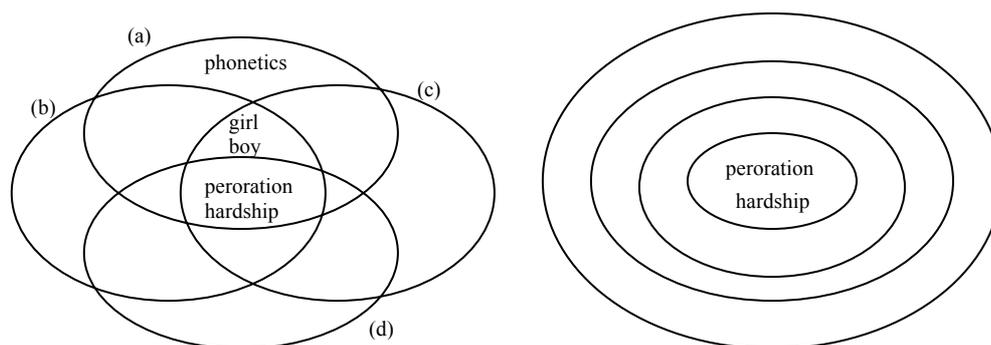


Figure 4: Prototypicality of English nouns according to Crystal (1967)

The idea of determining degrees of word class membership on the basis of a quantitative method has become a common place of research into lexical categorization (cf. Hopper & Thompson 1984, Plank 1984, Schachter 1985, Sasse 1993, 2001, 2002, Aarts 2004). It should be noted, however, that this type of approach faces a number of serious problems (cf. also Croft forthcoming). First, the choice of properties determining class membership (or non-membership) seems quite arbitrary. Thus Crystal takes it that the most typical nouns are characterized by a formal indicator of their nominal status – a derivational suffix – which is why *hardship* and *peroration* qualify as “better” nouns than *boy* or *girl*. But *hardship* and *peroration* are derived nouns, and it seems counterintuitive to claim that derived nouns are “better” than basic nouns. How could such a question be decided on *a priori* grounds? Second, even if we were able to determine a set of relevant properties for each word class, the mere number of, say, adjectival or pronominal properties exhibited by an element would not be a very telling piece of information, since presumably, some properties are more important than others.

Still, the prototype approach to word classes can be used to describe the overall architecture of the lexicon and take account of transition phenomena and overlap. Such a gradience-based characterization of the English lexicon was proposed by Ross (1972, 1973), who showed that word classes as well as word class systems can be represented as “quasi-continua” or “squishes”, whose endpoints are constituted by specific prototypes, e.g. verbs and nouns for the lexicon as a whole, or specific types of nominal expressions for the class of “nouns”. Other, non-prototypical categories occupy intermediate positions in such systems. The idea of “categorical squishes” has proven a useful tool to model gradience in word class membership and has been applied to various languages (e.g. Walsh 1996 for the Australian language Murrinh-Patha and Sasse 2002 for the Iroquoian language Cayuga). Table 1 shows a category squish of Murrinh-Patha (the classes “nerb” and “voun” are so called because of their intermediate status).<sup>3</sup>

Table 1: Category squish in Mirrinh-Patha (from Sasse 2001: 498)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Noun	+	+	+	±	±	±	–	–	–	–	–
Adj	+	+	+	+	+	+	–	–	–	–	–
Nerb	±	+	+	+	+	+	+	–	–	–	–
Voun	–	–	–	+	+	+	+	+	+	+ <sup>†</sup>	–
Verb	–	–	–	+	+	+	+	+	+	+	+
† 3 <sup>rd</sup> Singular Subject only											

As has become apparent, the idea of regarding word classes as exhibiting features of prototypicality and gradience can be regarded as an attempt to rescue the very notion of “word class”. If such classes cannot always be determined on the basis of necessary and sufficient conditions, it seems questionable to what extent they qualify as constituting principles of grammar at all. In fact, the conceptual primacy of categories like word classes has been challenged in the framework of “Radical Construction Grammar” (Croft 2001). Croft argues that word classes – just like syntactic relations holding between the elements of a word class – are derivative of the constructions in which they occur. In other words: linguistic knowledge is primarily represented in the form of constructional schemas. Constructional schemas, in turn, comprise slots for elements that can be associated with specific “categories”; but such “categories” are always derivative. Obviously, this approach leads to a considerable proliferation of the number of (basic) categories assumed for a given language. For instance, no category “adjective” is assumed by Croft. Instead, Croft takes a construction of the form [Det Adj N] as basic (the “attributive construction”), and it is only relative to this construction that a category label can be assigned to the Adj element (“the attributive role Adj in the attributive construction”). According to Radical Constructionalists, this proliferation of categories is not a conceptual disadvantage, since categories are derivative of the constructions in which they occur and have no central status in grammatical knowledge anyway (cf. Croft 2001, Croft forthcoming).

A prototypical approach also lends itself naturally to a cross-linguistic treatment of word classes. The main difference to the language particular methods pointed out above is that when talking about lexical categories from a cross-linguistic perspective these categories will have to rely more on notional categories. One of the first pertinent in-depth studies was carried out by Dixon (1977), who presents a cross-linguistic investigation of adjectives (cf. also Wierzbicka 1986, Bhat 1994, Wetzler 1996, Stassen 1997). Dixon identifies a core class

of adjectives that are generally morphologically basic, namely adjectives of “age, dimension, value and colour” and states that the relevant items “are likely to belong to the adjective class, however small it is” Dixon (1977: 56). As Croft(2003: 184) puts it, “[i]f a language has an adjective class, it will include words referring to the basic adjective concepts (dimension, age, color, value) in that class. If a language includes nonbasic adjective concepts in the adjective class, then it will include basic adjective concepts in that class”.<sup>4</sup>

As observed by Croft (2003: 184), “Dixon’s analysis provides an external basis for the comparison of lexical categories, the semantic class of the lexical items.” However, Croft points out that if one aims to analyse parts-of-speech systems as a whole, an additional (orthogonal) parameter of classification needs to be taken into account, viz. the difference between reference, modification and predication (what he calls “propositional acts”). Cross-classifying the “semantic class” of an expression (“objects”, “properties”, “actions”) with the “propositional act” (“reference”, “modification”, “predication”) yields a grid of nine cells (cf. Table 2).<sup>5</sup> Prototypical nouns, adjectives and verbs are located on the diagonal crossing the grid from the top-left to the bottom-right corner. This is due to the fact that specific pairs of parameter settings for “propositional act” and “semantic class” prototypically go hand in hand: (i) “objects” and “reference” (nouns), (ii) “properties” and “modification” (adjectives), and (iii) “actions” and “predication” (verbs). The less typical pairs of parameter settings can also be expressed in (most) languages, but they usually require derivation (e.g. deadjectival nouns for reference to properties, participles for modification via action descriptions, etc.).

Table 2: Word classes according to Croft (1991: 67, 2003: 185-7)

	REFERENCE	MODIFICATION	PREDICATION
OBJECTS	<i>object reference:</i> UNMARKED NOUNS	<i>object modifier:</i> genitive, adjectivalizations, PP’s on nouns	<i>object predication:</i> predicate nominals copulas
PROPERTIES	<i>property reference:</i> deadjectival nouns	<i>property modifier:</i> UNMARKED ADJECTIVES	<i>property predication:</i> predicate adjectives copulas
ACTIONS	<i>action reference:</i> action nominals, complements, infinitives, gerunds	<i>action modifier:</i> participles, relative clauses	<i>action predication:</i> UNMARKED VERBS

## 5 Prototypicality in syntactic and semantic relations

A problem parallel to the one concerning the definition of word classes emerges when we aim to provide a definition of grammatical relations such as “subject” (cf. Keenan 1976, Comrie 1989: 104-23). First, even within one language, elements commonly identified as the subject of a sentence may exhibit heterogeneous properties, for instance, morpho-syntactic properties

such as agreement and case assignment, semantic properties like semantic role, and pragmatic properties like topicality. To illustrate this with a frequently cited example, subjects in Icelandic are usually in the nominative case, but there are also so-called “oblique subjects”, i.e., noun phrases in the dative which behave like a subject in several semantic, pragmatic, and also syntactic respects. (6) is an example of a nominative subject, and (7) illustrates an “oblique subject”:

(6) Ég er íslenks.  
 I.NOM am Icelandic  
 ‘I am Icelandic.’

(7) Mér er kalt.  
 me.DAT is cold  
 ‘I am cold.’ (Eythórsson & Barðdal 2005: 824)

Oblique subjects differ from nominative subjects in not showing agreement with the verb. However, they have other properties characteristic of subjects. For instance, just like nominative subjects they may be unexpressed in control infinitives. This is shown in (8) (nominative subject) and (9) (oblique subject):

(8) Ég geri bara það sem mér er sagt að Ø gera.  
 I.NOM do only it.ACC which me.DAT is told to PRO.NOM do  
 ‘I just do what I am told to do.’

(9) ekki það sem mér er sagt að Ø líka vel við.  
 not it.ACC which me.DAT is told to PRO.DAT like .well with  
 ‘not what I am told to like.’ (Eythórsson & Barðdal 2005: 834)

Under the assumption that every sentence has a subject, subjects can consequently not be defined on the basis of structural properties like case marking alone. The problem becomes even more severe if we regard “subject” as a universal notion, i.e., if we assume that every sentence of every language has a subject. In ergative languages, for instance, both absolutive and ergative arguments have properties of what is traditionally called a “subject”. A definition on the basis of necessary and sufficient seems out of the question (cf. Comrie 1989: 110-22).

The solution proposed by Keenan (1976) is parallel to the one chosen by Crystal (1967) to account for the heterogeneous behaviour of nouns in English: Keenan provides a “list of 30 odd properties which subjects characteristically possess” (Keenan 1976: 311). This allows one to identify the subject of a given sentence (in a given language) in a numerical

way. The list of typical subject properties provided by Keenan includes properties such as “independent existence”, “indispensability”, “autonomous reference”, “case marking properties” and “semantic role”.

Obviously, this approach raises the same questions that were discussed in the context of the quantifying approach to word classes: what properties should be used to define a subject and are they equally important? These questions are particularly central when it comes to the contrast between ergative and accusative languages. While formal properties in ergative languages often seem to indicate that it is the absolutive argument which qualifies as a subject – it typically exhibits less morphological marking and is “indispensable” – most semantic and pragmatic criteria seem to favour the ergative argument (e.g. animacy, agentivity, topicality).

In view of these difficulties the question arises to what extent “subject” can be regarded as a meaningful cross-linguistic concept at all. It is true, specific morpho-syntactic, semantic and pragmatic properties of arguments with a “privileged” status tend to co-occur, for instance, parsimonious morphological encoding and “indispensability”, or animacy, agentivity and topicality. But such prototypicality effects could be described without recurring to the notion of “subject” as well.

A problem that is closely related to the question of subjecthood and that has likewise been a challenge to the classical model of categorization in grammar has given rise to another influential study making use of prototype concepts. Dowty (1991) provides an analysis of the mapping from semantic to syntactic roles that is based on a “relativized” approach, very much like the analyses of Crystal (1967) and Keenan (1976). Instead of positing a finite number of semantic roles, Dowty (1991) proposes a characterization of semantic roles in terms of specific clusters of properties that are usually associated with either agenthood (“Proto-Agent entailments”) or patienthood (“Proto-Patient entailments”). As Proto-Agent entailments he identifies: (i) volitional involvement in the event or state, (ii) sent[i]ence (and/or perception), (iii) causing an event or change of state in another participant, (iv) movement, and, in parentheses, (v) exists independently of the event named by the verb. The Proto-Patient properties are: (i’) undergoes change of state, (ii’) incremental theme, (iii’) causally affected by another participant, (iv’) stationary relative to movement of another participant, and, again in parentheses, (v’) does not exist independently of the event, or not at all (Dowty 1991: 572).

One of the strengths of Dowty’s proposal is that it makes possible what we may call a “relativized” model of argument selection or “linking” (the mapping from semantic roles to syntactic roles; note that a similar model has been developed independently by proponents of

Role and Reference Grammar, e.g. Foley & van Valin 1984, van Valin & LaPolla 1997). Dowty postulates the following principle: “In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object” (Dowty 1991: 576). Such principles have been shown to be language-independently applicable and can be used to relate case-marking and situation semantics to each other in a highly systematic way (cf. also Primus 1999).

Prototype effects in the domain of argument structure have also been attributed to what we may broadly call the “verbal domain”. It is one of the idealizations of contemporary linguistics that each verb is assumed to come with a specific potential to link up with other elements (valency). One of the most important relevant differentiations is the one between transitive and intransitive verbs. This distinction, however, is simplifying in many respects, from a both language-particular and cross-linguistic perspective. In their study on “transitivity”, Hopper & Thompson (1980) argue that “transitivity” should be regarded as a prototypical property of clauses, and they identify a cluster of grammatical properties typically displayed by “highly” transitive clauses, and a corresponding cluster of complementary properties associated with a low degree of transitivity (see Kittilä this volume, also Rice 1987). The number of participants – on a traditional view the only property distinguishing transitive from intransitive clauses – is one of the parameters taken into account, but other parameters are also relevant: (i) kinesis (non-/action), (ii) aspect (non-/telic), (iii) punctuality (non-/punctual), (iv) volitionality (non-/volitional), (v) affirmation (affirmative/negative), (vi) mode (realis/irrealis), (vii) agency (A high/low in potency), (viii) affectedness of (the object) O (high/low), and (ix) individuation of O (highly individuated/non-individuated). “Transitivity, then, viewed in the most conventional and traditional way possible – as a matter of carrying-over or transferring an action from one participant to another – can be broken down into its component parts, each focusing on a different facet of this carrying-over in a different part of the clause. Taken together, they allow clauses to be characterized as MORE or LESS transitive” (Hopper & Thompson 1980: 253). According to this point of view, even one-participant events may qualify as relatively high in transitivity if many of the parameters mentioned above are specified as positive (e.g. *Susan left*).

Having split up the notion of transitivity into several components, Hopper & Thompson observe that “these component features of Transitivity CO-VARY extensively and

systematically” (Hopper & Thompson 1980: 254, emphasis original). This co-variation concerns both the co-occurrence of specific notional categories and formal parameters of encoding. For example, properties of events like kinesis, aspect and punctuality are often reflected in formal properties of the object such as the marking of case or individuation. Such phenomena are well-known from languages like Finnish, Estonian, Russian and Turkish but can be observed in many non-European languages as well (cf. Hopper & Thompson 1980: Section 2.3-8).

## 6 Semantic maps

In the examples considered above, concepts from prototype theory were used to define analytic notions like “noun”, “subject”, “(proto-)agent” or “transitive”, which are indispensable tools in the description and comparison of language. In this section we will illustrate how aspects of prototype theory can be used to illuminate the encoding of notional categories. In particular, the idea of structuring a larger conceptual domain in terms of a family resemblance graph has been used in the concept of “semantic” or “conceptual maps” (for an overview of the uses of semantic maps in linguistic typology, cf. also Haspelmath 2003, van der Auwera & Temürçü 2005). In the following we will briefly present two pertinent studies, namely the one by Haspelmath (1997) on indefinite pronouns and the one by van der Auwera & Plungian (1998) on modality.<sup>6</sup>

In his study on indefinite pronouns Haspelmath (1997: 2-3) distinguishes between 9 basic types which differ in terms of their contexts of use:

- (i) specific/known to speaker  
*Someone called while you were away: guess who!*
- (ii) specific/unknown to speaker  
*I heard something, but I couldn't tell what kind of sound it was.*
- (iii) non-specific/irrealis  
*Please try somewhere else.*
- (iv) polar question  
*Did anybody tell you anything about it?*
- (v) conditional protasis  
*If you see anything, tell me immediately.*
- (vi) standard of comparison  
*In Freiburg the weather is nicer than anywhere in Germany.*

- (vii) direct negation  
*Nobody knows the answer.*
- (viii) indirect negation  
*I don't think that anybody knows the answer.*
- (ix) free choice  
*Anybody can solve this simple problem.*

As the examples given show, English has three series of pronouns (*some-*, *any-* and *no-*) which cover different portions of the overall domain (*some-*: (i) – (iii); *any-*: (iv) – (vi), (viii) and (ix); *no-*: (vii)). This is, of course, not the only partitioning possible. For instance, Swedish *någon* can be used in all contexts except (ix), thus having a much wider distribution than any of the English pronouns (cf. (10) and (11)). Other languages have indefinite pronouns that are more specialized than English *some-* or *any-*. For instance, Latin pronouns in *-dam* (e.g. *quidam*, cf. (12)) can only be used in contexts of type (i) (cf. (12)), and Kannada pronouns in *-oo* are only used in contexts of type (ii) (cf. (13)):

(10) Swedish

Några tror att hon är galen.  
some believe that he is insane

‘Some people/some of us think that he is insane.’ (Holmes and Hinchliffe 1994: 185)

(11) Jag arbetar hårdare än någon gruvarbetare.

I work harder than any miner

‘I work harder than any miner.’ (Holmes and Hinchliffe 1994: 195)

(12) Latin

philosophus qui-dam  
philosopher.NOM PRO.3MASC.SG-*dam*

‘a certain philosopher’ (Rubenbauer & Hofmann 1995: 234)

(13) Kannada

Yaar-oo bandaru.  
who-INDEF came

‘Someone came.’ (Haspelmath 1997: 40)

The different sub-categories of indefinite pronouns do not just represent an unordered set of use types but are to varying degrees similar to each other. Different degrees of similarity can be represented in the form of “semantic maps”, i.e., “similarity networks”, in

which conceptual similarity is reflected in spatial proximity. The semantic map for indefinite pronouns given by Haspelmath is displayed in Figure 5:

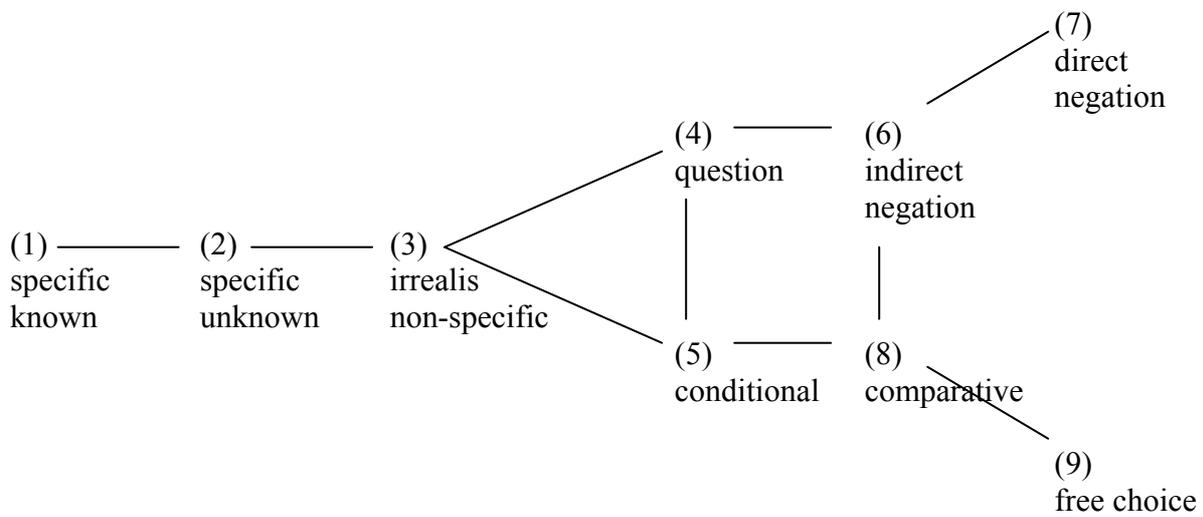


Figure 5: A semantic map for indefinite pronouns (Haspelmath 1997: 64)

The range of use types associated with a given marker can now be indicated by identifying the relevant region on the map. This is shown for Swedish and Latin in Figure 6.

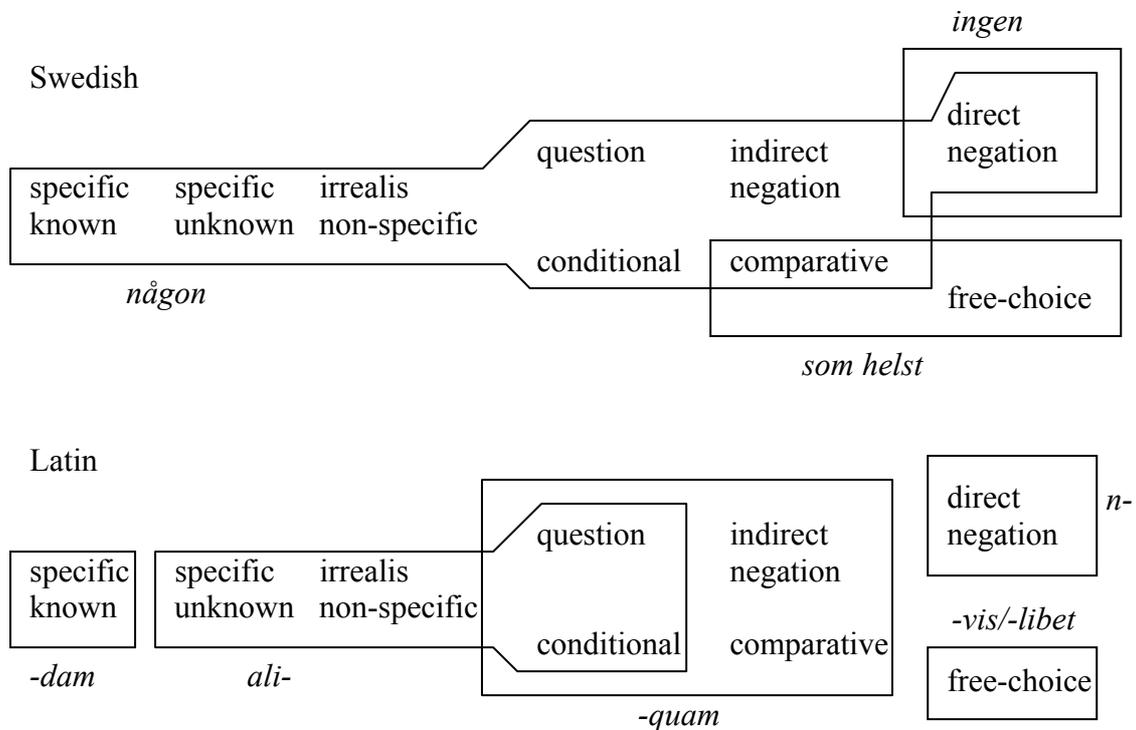


Figure 6: Indefinite pronouns in Swedish and Latin (Haspelmath 1997: 68-9)

Given that indefinite pronouns always cover contiguous regions on the semantic map, we can derive a number of implicational statements from them: if some marker *x* can be used in two contexts *A* and *B*, it can also be used in all contexts in between *A* and *B*. For instance, pronouns that can be used in both a “specific/known” and an “non-specific/irrealis” context but not in the intermediate “specific/unknown” function are thus excluded. This is, of course, not accidental but results from the fact that neighbouring nodes on semantic maps are characterized by shared features. Various subregions on the map can be identified using the following semantic parameters (cf. Haspelmath 1997: 119-22): 1. known vs. unknown to the speaker ((i) vs. the rest), 2. specific vs. non-specific ((i) and (ii) vs. the rest), 3. scalar endpoint vs. no scalar endpoint ((iv) – (viii) vs. the rest), 4. in scope of negation vs. not in scope of negation ((vii) and (viii) vs. the rest) and, for those uses with a scalar endpoint ((iv) – (viii)), 5. endpoint on non-reversed scale vs. endpoint on reversed scale ((ix) vs. the rest).

An interesting point is that some regions turn to be more frequently covered by markers than others. Thus indefinite pronouns for uses (2), (3), (4), (6) and (7) seem to be frequent, and indefinite pronouns for uses (2), (3), (5), (8) and (9) are not: though the constellation as such is perfectly acceptable, Haspelmath (1997: 76-77) has not found any attestation for it. As to the frequent pronouns, they would seem to be deserving of the epitheton “prototypical”. Bybee, Perkins & Pagliuca (1984) would call them “universal gram types”, “mediating between the universal concepts and the language-specific grams” (Bybee, Perkins & Pagliuca 1984: 48).

Apart from indicating restrictions on the formal encoding of specific meanings on a synchronic basis, semantic maps can also be used to illustrate the direction of diachronic developments within a given domain. Whenever the domain covered by some marker on a semantic map changes, the relevant developments can only affect neighbouring nodes. While this follows naturally from the (synchronic) observation that markers may only cover contiguous regions on a semantic map, we can add more specific information by illustrating the possible direction of change between neighbouring nodes. This is illustrated for the domain of modality in Figure 7 (from van der Auwera & Plungian 1998: 111).

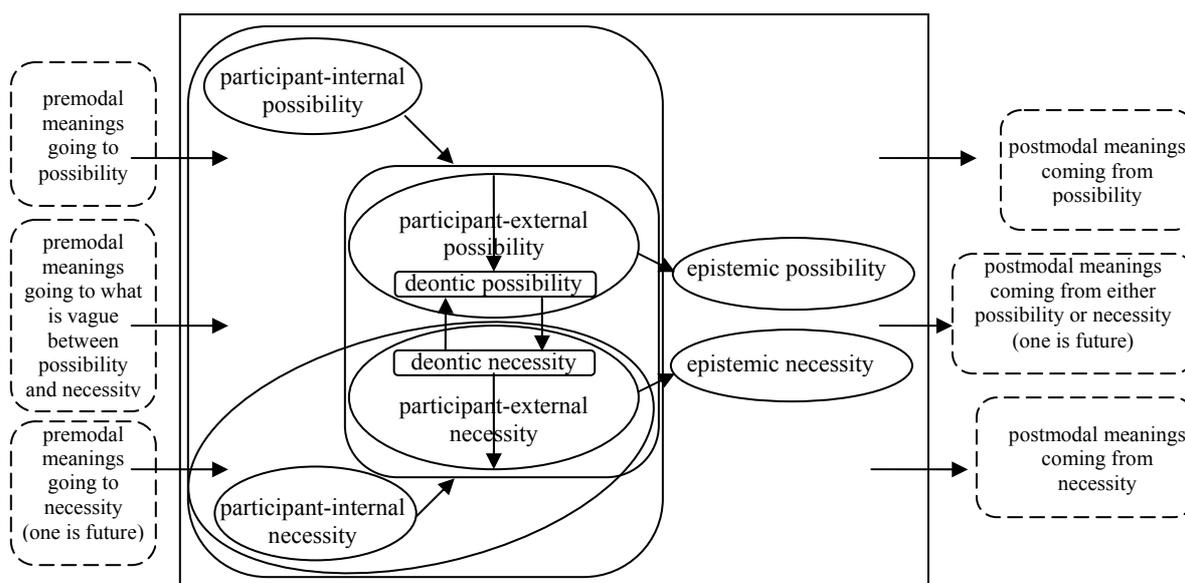


Figure 7: Modality's semantic map (van der Auwera & Plungian 1998: 111)

The domain of modality is represented in Figure 7 as a two-dimensional space that is structured by: (i) the modal partition into the two values “possibility” (upper half) and “necessity” (lower half), and (ii) the “source” of modality, from left to right: (a) “participant-internal” (ability, need), (b) “participant-external” (possibility and necessity resulting from some external circumstances), and (c) “epistemic” (possibility and necessity based on inferences made by the speaker). “Deontic” modality represents a special case of participant-external modality in which the external source of modality corresponds to some other participant’s volition.

Figure 7 indicates the possible directions of diachronic change: while a given modal marker may extend its territory from participant-internal to participant external modality, some other changes such as, for instance, epistemic possibility to participant-external possibility, are unattested. In cases like the above, in which the semantic categories may be expressed by elements with different degrees of grammaticalization, the diachrony enriched semantic map can be seen as encompassing grammaticalization paths.

## 7 Conclusions

Defining linguistic categories is an indispensable component of linguistic analysis, be it language-particular or cross-linguistic. Given the various types of gradience phenomena that can be observed in human conceptualization and natural language, such definitions cannot easily or always be provided on the basis of necessary and sufficient conditions. As we hope to have shown, aspects of prototype theory like the assumption of internal category structures

and family resemblances can be very useful in many domains of grammar and lexicon, and in linguistic conceptualization more generally. Even though it has, at the same time, become apparent that prototype theory cannot account for all the problems of categorization, it certainly has its place in contemporary linguistics.

### List of abbreviations

ACC	accusative
ATTR	attributive marker
DAT	dative
DET	determiner
ICP	incompletive aspect
IND	indicative mood
NOM	nominative
PRO	empty pronominal

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<sup>1</sup> This is also witnessed by early mentions of the term "category" in the OED, where its use as standing for "class" is called a "specimen of bad English": "The following specimens of bad English ... have been taken from despatches recently received at the Foreign Office... 'category' for class." OED, s.v. *category*. 1883.

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- <sup>2</sup> Since ‘category’ is still reserved for the notional use of the term at the beginning of the twentieth century, von der Gabelentz uses the compound *Formkategorien* (‘formal categories’): “Von unerquicklichen Wortstreitereien ist auch unsere Wissenschaft nicht verschont geblieben. Jede Sprache hat ihre eigenen Formkategorien. Wie soll man die benennen?” (von der Gabelentz 1901: 63).
- <sup>3</sup> The criteria are: (a) compatibility with the “propriety suffix” *-ma* ,associated with’; (b) case inflection; (c) compatibility with nominal classifiers; (d) cross-referencing object pronoun; (e) body-part incorporation, (f) number indicator; (g) adverb incorporation; (h) cross-referencing benefactive pronoun; (i) tense-aspect-mood suffix; (j) compatibility with the ,primary auxiliary’; (k) other cross-referencing pronouns.
- <sup>4</sup> One may wonder, of course, to what extent this generalization is falsifiable at all: whenever there is a word class containing the relevant adjective concepts we can simply call this class “adjective”, which makes the generalization a truism. However, the mere fact that there is a group of notional categories that tend to be encoded uniformly across languages is interesting in itself.
- <sup>5</sup> A similar classification of semantic functions is proposed by Hengeveld (1992), whose analysis is based on the notions “predication”, “modification” and “reference” and the presence/absence of morphological marking. However, Hengeveld’s overall conclusions are quite different from those arrived at by Croft (see Bisang this volume).
- <sup>6</sup> Table 2 is also a semantic map, too, and Croft’s Construction Grammar (2001) is a maximally semantic map based theory of syntax.