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Definite, indefinite, and kind interpretations from a cross-linguistic perspective

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ABSTRACT

This paper argues that the indefinite, definite, and kind interpretations belonging to nouns and noun phrases are independent universal semantic features realized by different linguistic means across and within languages. The investigations presented here take the viewpoint of the speaker: first the semantic content of the three features is characterized, then the linguistic expressions these interpretations belong to and arise from are examined. Cross-linguistic data support the conclusions that none of these features is derived from the other(s), their primary source is the intrasentential context, and they express "instructions" to the hearer to find more or less identifiable or more or less representative referents that pertain to the denotation of the noun (phrase).

KEYWORDS

formal semantics, (in)definiteness, kind interpretation, lexical meaning, context

1. INTRODUCTION

In a series of papers László Kálmán highlights the inadequacies of mainstream formal semantic models and methods for comprehending the real nature of linguistic meaning in natural languages (Kálmán 2018, 2019, 2022). It is not the aim of this paper to present or evaluate his thoughts and proposals, but some ideas included in his works will be used as starting assumptions in the present investigations, and an analysis of some linguistic data supporting Kálmán's view about linguistic meaning will be presented.

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1.1. Theoretical and empirical background

In the paper "The cognitive gap in modern semantics" László Kálmán argues that when Frege writes about "modes of presentation" as the differentiating property of meaning (sense), the role of communicative interaction is implicitly implied (Kálmán 2022). However, as Kálmán points out, this is not taken seriously in "Fregean-style" intensional models, where intension-functions modelling meanings are arbitrary, the similarities (or other relations) between lexical meanings remain hidden, and only the meaning postulates attached to lexical units are related to the Fregean "modes of presentation". Kálmán argues that the role of communicative interaction is essential to linguistic meaning, and senses are to be treated as speakers' instructions "for guiding the attention, recollection and associations of the audience" (Kálmán 2022, 30). Models of meaning should be mental models, he argues, because only these can fill the "cognitive gap" present in mainstream formal semantic theories.

Assume that we agree with Kálmán and accept that communicative and cognitive processes are indispensable for the proper treatment of meaning. This implies that the role of the communicating parties and their mental states cannot be left out of consideration when we try to describe semantic phenomena. The very first question to be answered is whose meaning is to be modelled when we explore the connection between linguistic signs and their meanings: the mental state of the speaker, or that of the hearer, or their shared linguistic knowledge.

In this paper I argue that taking the viewpoint of the speaker can be motivated by cross-linguistic investigations. The usual method in formal semantics proceeds from some syntactically analysed natural language fragment, and sentential meanings are computed more or less compositionally with the aid of some formal language (e.g. a typed lambda-calculus), or some other formalism (e.g. discourse representation structures). Thus, the standard method takes the viewpoint of the hearer, who is faced with linguistic signs to which (s)he tries to assign some meaning. As opposed to this, from the perspective of the speaker the starting point in the communicative process is the meaning (s)he wants to communicate, so (s)he proceeds from meanings to their linguistic realizations. Following the speaker's viewpoint, I define here the semantic content of the definite, indefinite, and kind interpretations of noun or noun phrase arguments independently of any particular language and show that these interpretations (or features) arise partly from the semantic and syntactic properties of the (broader or narrower) linguistic contexts, and partly from the situation the linguistic expressions are uttered. Thus, the inquiry will begin here with exploring certain semantic features presumably expressible in any natural languages, and their characterization will be given here as independently of syntactic considerations as it is possible. One of the main claims of the paper is that none of these features can be considered an inherent property of nouns in any languages: these interpretations arise "on the fly", similarly to the way predicates, propositions, and in general, linguistic utterances arise through a communicating process (Dessalles 2015). Linguistic tools – that is, constructions and as parts of them, articles (if they exist in the given language) – are chosen in accordance with the speaker's intended meaning.

In sum, the basic assumption of this paper is that some truth-conditionally relevant properties of nominal arguments occurring in a sentence – exemplified here by the definite, indefinite and kind interpretations – arise partly from the interaction of the meanings of lexical units and the peculiarities of the constructions they occur in (that is, from the intrasentential context), and partly from the broader (linguistic or non-linguistic) context. This entails that the calculation of

the meaning of a complex expression is not a (strictly) bottom-up process, which raises issues of compositionality, see section 4.2.

Investigations that approach the relation between linguistic signs and their meaning from the direction that goes from meanings to linguistic expressions are in good accordance with the assumption that there are some semantic features which can be expressed by any languages (see e.g. Bach & Chao 2009; von Fintel & Matthewson 2008 on semantic universals). There are works in linguistic typology along these lines, even if they do not emphasize the semantic starting point. Cross-linguistic studies which are not phonological, purely morphological, or utterly syntactic (as word-order) frequently use some semantic feature as the basis of comparing and contrasting languages. For example, when in the World Atlas of Language Structures (WALS in the following, see Dryer & Haspelmath 2013) the definite and indefinite articles are examined, languages without articles, or languages expressing definiteness or indefiniteness not by articles but by some other morphological means are also taken into account (Dryer 2013a, 2013b). Thus, although the label for the investigations about (in)definiteness is "nominal categories" in the WALS, the basis of comparison is semantic (See more about the relevant data in WALS in section 3). There are also cross-linguistic studies explicitly taking on a semantic starting point; for example, in the Introduction of the Handbook of Quantifiers in Natural Language the authors emphasize that "our basis for selecting expressions as quantificational was explicitly semantic" (Keenan & Paperno 2012a, viii).

The semantic starting point makes possible to explore the definite, indefinite, and kind interpretation of nouns or noun phrases in sentences from an unbiased cross-linguistic perspective. Although these interpretational possibilities have been extensively studied in several languages based on or resulting in various theoretical assumptions, the connections and contrasts between the three features as **basic** (non-derived) semantic features have not been analyzed. There are many works in which the kind interpretation is considered basic and indefinite interpretation is derived from it (Carlson 1977; Krifka 1995, and their followers), or conversely (Magri 2012; Rullmann & You 2006). A recurring research topic is the exploration of the conditions on which kind interpretation can be expressed by indefinite or definite noun phrases (see for instance Carlson 2010 and the references there).[1] This reflects the background assumption that the indefinite and definite properties belong to noun phrases, while kind interpretation is either the lexically given default interpretation of nouns or is an irregular or additional interpretation that may belong to the "formally" definite or indefinite expressions in appropriate circumstances. These "from syntax-to-semantics" approaches seem strongly biased from a cross-linguistic perspective, because they tacitly or overtly assume that articles (or similar means) are a primary source of the (in)definite interpretations. This assumption, however, is badly in need of some very strong supporting evidence in the light of the well-known fact that there are many languages having no articles at all (Slavic languages, Finnish, Mandarin Chinese, among others), and several languages have either definite or indefinite article (but not both), see more about this in section 3. Thus, it seems empirically more adequate to treat these three interpretation-types or semantic features equally as "first class citizens" (at least until the opposite is convincingly

[1]Notice that if (in)definiteness is considered a purely semantic feature, this question has no sense: noun phrases cannot be indefinite or definite by themselves, similarly to languages without articles, where bare noun arguments can be interpreted only with respect to their contexts (which might include grammatical means not especially devoted to express these interpretations, as e.g. cases in Finnish, see section 4.1).

proven). Accordingly, indefinite, definite, and kind interpretations will independently be defined here in two senses: independently of each other, and independently of the structure of any natural language. First the (semi-formal) definitions of the three interpretations will be given, then (the conditions of) their linguistic realizations will be exemplified by some Mandarin Chinese data, admittedly only with illustrative purposes.

The viewpoint proceeding from meaning to linguistic data eliminates biases that might arise when the structure of some language(s) is used as a starting point and has two welcome consequences. First, languages that do not have definite or indefinite articles will not be ignored or forced to have zero determiners when bare nouns appear as arguments. Second, it will not be precluded that there are languages that have an explicit kind-interpretation marker: article, suffix or some other bound morpheme, which are different from, but paradigmatically related to the markers of (in)definiteness (if these exist at all in the language under consideration).[2]

1.2. The structure of the paper

In the following section the definite, indefinite, and kind interpretations will be examined with the aid of choice-functions, which make possible to compare the semantic content of the three interpretations easily. Nothing will be said about the status of these functions with respect to a given model; but I assume that choice functions as defined here can be made compatible with various formal models, static and dynamic ones equally. In section 3 linguistic data will be presented supporting the assumption that these interpretations are best treated independently of each other; on the basis of the semantic starting point there is no convincing linguistic evidence for considering one (or two) of them more basic as the other(s). Data also show that these interpretations arise from (the interaction of) some special meaning components of certain constituents of the sentence: lexical meaning of the verbal predicate, aspectual features, locative phrases, etc. In section 4 I summarize the results of the paper from the perspective of some theoretical issues raised in László Kálmán's works.

2. DEFINITE, INDEFINITE, AND KIND INTERPRETATIONS OF NOUNS AND NOUN PHRASES

As argued above, language-independent descriptions of semantic features are useful in cross-linguistic studies because they may give us a basis that makes possible unbiased contrastive and comparative research. Thus, our starting point is not expressions or constructions of a certain

[2]A grammatical marker of kind interpretation should be productive, that is, adding it to **any** bare noun should make the noun kind-denoting. The (presumably universal) existence of the type of nominal constructions containing a word meaning 'kind' does not mean that this word can be regarded as a grammatical marker of kind interpretation: it simply **means** 'kind' (similarly to nouns meaning type, category, etc. see e.g. *the four-legged kind*, *ceramic-type material*), and its use regularly results in a taxonomic, that is, sub-kind reading. The other possibility is that the word *kind* forms idiosyncratic lexical units (see *mankind* vs.**fishkind*, **tablekind*). "As far as we know, there are no languages with articles or other determiners dedicated to the expression of generic reference" (Mari et al. 2013, viii). Chinese words *lei* or *zhong* 'kind, type, category' do not counterexemplify this claim, either: the same can be said about these words as was said of *kind* above: their use usually results in taxonomic meaning or idiosyncratic lexical units.

natural language (or languages), but interpretations that may belong to nouns or noun phrases, presumably in any human languages.

The background assumption of the semantic definitions of this section is that the definite, indefinite, and kind interpretations are referential in their nature and not quantificational. It is widely accepted since Carlson's frequently cited dissertation that kind interpretation is not quantificational (see Carlson 1977), while the non-quantificational treatment of definite and indefinite noun phrases has been worked out in Discourse Representation Theory (Kamp 1981; Heim 1982). If we consider the three semantic features discussed here resulting in an individual (e-type) referent, it is possible to define them on the (supposedly <e, t> type) denotations of nouns alone, without referring to any other constituents of the sentence.[3] This seems justified on the one hand by languages where one or more of these interpretations can belong to bare noun arguments; and on the other by the fact that linguistic means used to express these properties are manyfold, cross-linguistically and language-internally as well, see (17) in 4.1. Because of the variability of linguistic means (determiners, suffixes, etc.), including the possibility that there are no such means, it seems a well-motivated assumption that the universally available definitions of (in)definiteness and kind interpretation should be based on the lexical category of noun alone (which is although not easily definable, seems a universal category of natural languages). This is a striking difference as compared to the way the semantics of noun phrases is given in the theory of generalized quantifiers (see Barwise & Cooper 1981). However, the two approaches are not contradictory but complementary. The theory of generalized quantifiers is about the semantics of determiners (articles and quantifiers), so the category of determiners and predicates is an integral part of the theory. Here it is possible to use less sophisticated semantic definitions because the interpretations we examine are supposed to be not quantificational, but referential: the definite, indefinite, and kind interpretations are equally treated here as instructions to the hearer to choose a suitable referent from the denotation of the noun. Thus, the semantic characterization can be based on the category of nouns alone, without referring to any other constituents of the sentence.

This paper is not meant to be a contribution to the analyses of the fine semantic contents of the three interpretations examined here, so only the main differences (and similarities) between them will be shown here by a simple mathematical tool, called choice-function. Choice functions were introduced to linguistic analyses by Reinhart (1997). These functions are well-known in mathematics, and here I will use their pure mathematical definition as a starting point. In linguistics choice functions are mainly used to model the meaning of indefinite expressions; see Stechow (2000) about their more refined uses in linguistics.

2.1. Indefinite interpretation

My aim is to grasp the semantic content of (in)definiteness Kálmán (2022) characterizes in the following way:

[3]The semantic types and their denotations can be defined as it is well-known in formal semantics from Montague (1973). Two basic types are assumed: e, the type of entities, and t, the type of truth-values. From e and t infinitely many types can be defined by the recursive clause "if α, β ∈ Type, then <α, β> ∈ Type". On the basis of the recursive semantic **interpretation** assigned to types, the denotation of expressions belonging to the <e, t> type will be sets (or, equally but more exactly, characteristic functions).

(1) "Using a definite expression tells the addressees that … they must be able to "identify" (in some sense) a particular entity … Indefinites, on the other hand, tell the audience that they are not expected to perform such an identification …" (Kálmán 2022, 37)

Accordingly, the choice functions modelling these meanings should express what kind of mental act is expected from the hearer when the speaker utters a sentence where a nominal expression is to be interpreted as (in)definite.

A choice function f is defined on the domain of a family of sets Δ (in the following this will be the collection of the sets assigned by the model-assignment function to the nouns of a given language); and f assigns an element u to each set $A \in \Delta$ such that $u \in A$ (that is, the function "chooses" an element from each set). A simple choice function (f_{indef} in the following) can be used to describe the content of the indefinite interpretation, because in this case no identification of the referent is expected from the hearer.

(2) $f_{indef}(A) = u$,
where $u \in A$, and $A \in \Delta$ (that is, A is a set assigned to a noun as its denotation, and u is the element of A f_{indef} "chooses" from A)

The indefinite interpretation in its most general form contains no other restrictions. If restrictions occur, they come from the (linguistic or non-linguistic) context (specific indefinites, see more about them in section 2.4). In (2) there is no reference to the category of determiners, and assumptions about natural languages are very simple and intuitive: first, that they contain nouns, second, that nouns denote some set of entities, and third, that indefiniteness is a nominal property. Supposedly every natural language meets these conditions, so definition (2) applies without assuming any additional (hidden) constituents or mechanisms. Notice that from (2) follows that indefinite expressions will be e-type, in accordance with the assumption that indefinite expressions are referential, and not quantificational. Convincing arguments for e-type indefinites come not only from discourse-representation theory, but from the thorough investigations of existential sentences as well: McNally (2009) gives detailed arguments for regarding the interpretation of the indefinite noun phrase ("pivot") in existential sentences as an entity-correlate of a property. This can be formalized neatly with the aid of choice functions: their domains are sets (the extensional counterparts of properties in a model), and the e-type element chosen from a set can be considered the entity-correlate of the property the set is assigned to in the given model.[4]

2.2. Definite interpretation

The definite interpretation does not give as much freedom to the hearer as the indefinite: when an expression is to be interpreted as definite, the speaker's assumption is that the hearer is able to identify a certain entity from the denotation of the noun (see (1)); either because the set the

[4]The definitions given here do not say anything about how the domain of choice functions depend on and the chosen elements interact with the other constituents of the sentence. It is unavoidable to say something about this when we analyze linguistic expressions of a given language with respect to a well-defined semantic model. However, these language- and theory-dependent details are not relevant to the purpose of this paper.

noun denotes is a singleton (strong definites), or because the context makes possible the identification (weak definites). Thus, the choice-function is either trivial or context-dependent; in the former case the set the noun denotes has only one element, and the hearer cannot but choose the only element from that set (strong definites). In the case of weak definites the linguistic (anaphora, bridging, etc.) or non-linguistic (deixis, real world knowledge, etc.) context is (supposed to be) such that the hearer can identify the intended referent. That is, the choice function describing definiteness is such that the context determines the only element that can be chosen. This is in good accordance with our intuition on the context-dependence of the referent of a definite expression: although the referent is unique or uniquely identifiable, it may vary according to the context the definite expression occurs in. This is a shared property of the strong (unique referent) and weak (identifiable referent) definite noun phrases: in the former case the situation determining the unique referent is the whole world (e.g. *the pope*, *the sun*) as opposed to weak definites (e.g. *the dog* (*in this room*), *your dog*, etc.), which are to be interpreted with respect to a partial situation.[5]

The situation-dependent property of definite expressions is adequately described if we assume that the choice-function becomes a two-argument function, where the first argument is a situation, and the second is a nominal denotation. More formally, the domain of the f_{def} function will be $S \times \Delta$, the Cartesian product of the set S of situations and Δ (as above, Δ is the collection of the sets assigned to the nouns of a language as their denotations).

(3) $f_{def}\langle s, A\rangle = u$, where $u \in A$.
$s \in S$, $A \in \Delta$, $\langle s, A\rangle \in S \times \Delta$ (s is a situation, and A is the denotation of a noun).

As f_{def} is a function, for each <s, A> (that is, for each situation and noun-denotation pair) exactly one element can be "chosen" from the denotation of the given noun, which can be, but need not be the same in different situations. The uniqueness of plural definite expressions can easily be treated if nominal denotations are given in a structured model, because the chosen element can be a plural individual as well (see the formal details in footnote 6). Notice that although f_{def} is a function, it is not a choice function proper, either in the mathematical sense (its domain is not simply a family of sets), or in the intuitive sense (we have no choice because the situation determines the only element that can be "chosen").

2.3. Kind interpretation

In his dissertation Gregory Carlson argues that the denotation of a kind is neither a set nor an arbitrary element of it: it is an entity of a special sort (Carlson 1977). In the model he offers the domain of entities is divided into two different sorts: the one is the sort of objects, the other is that of kinds. If we accept this and regard kinds as entities, then a choice function can model

[5]A situation is usually assumed to be partial as compared to a whole world, but the difference is not essential: a world can be considered a complete or maximal situation in the sense that it can verify or falsify any proposition. Partial situations support the truth or falsity of some distinguished propositions, and the truth-value of propositions not belonging to them remains undefined on the basis of the given situation (see Barwise & Perry 1983). If we consider a possible world a complete situation, then the f_{def} function as given in (3) describes strong and weak definites equally; the difference between the two is discussed shortly in 2.4.

kind interpretation as well; but this function is not allowed to choose an arbitrary element from the sets given as the denotations of nouns (like the choice function modelling indefiniteness), and the choice does not depend purely on the context either (as in the case of the function modelling definiteness). The chosen element should be a kind-sorted entity. We could leave it at that, accepting that the type of entities is basic, so the sorts of e-type are also basic. However, things are more complicated, because there is a clear relationship between the kind-sorted and object-sorted entities. Carlson (1977) assumes a "realization" relation between the two: an object-sorted entity (object in the following) can be considered as the realization of a kind-sorted entity (kind in the following). In this way, the truth-conditions of generic sentences containing kind-denoting arguments can be given on the basis of the objects realizing a kind, so truth-conditions can be given similarly to quantified sentences. However, we can say about this more than that if we ask how this two-sortedness relates to the **lexical meaning** of nouns.

In several versions of model-theoretic semantics the denotation of a noun is assumed to be structured by a partial ordering relation, resulting in a (semi)lattice-structure.[6] Put very simply, lattice-structures contain not only singular individuals, but their sums as well. Thus, we can directly refer to plural individuals (sums), and in this way becomes possible to treat the count/mass distinction and problems of number marking in a very transparent way (see Link 1983; Landman 1989, among others). There is also an interesting endeavor to regard the elements of a (semi)lattice as kinds (Ojeda 1993), but because of its counter-intuitive nature and weak explanatory power this solution has not proven to be viable. Here I offer to take some results of (conceptual) lexical semantics seriously and will sketch a very simple way of integrating prototypes into a formal model; thus, it might become possible to fill the conceptual gap mentioned in Kálmán (2022).

In short, I accept that there are more or less prototypical individuals in the denotation of nouns, so some partial order expressing prototypicality is lexically given on the denotation of each noun. Details and problems of prototype theory put aside (see on this topic e.g. Wierzbicka 1996; Dessalles 2015), what is relevant for our present purposes is that entities belonging to the denotation of a noun can **represent** the whole set (or at least some contextually given relevant part of the set) the noun denotes, but their representative power (that is, their prototypicality) is not the same. If, for instance, Tweety is a penguin, then choosing Tweety as a representative of birds is not felicitous, because penguins cannot fly, and on the basis of our knowledge of the world, the ability of flying characterizes the kind 'bird' as a default property. However, a more prototypical bird, e.g. a robin, might well represent the kind *bird*. Thus, it seems reasonable to assume that a prototypical individual (that is, an individual ordered highly enough by a prototypicality partial order) belonging to the denotation of a noun can represent the kind the noun might refer to.

[6] A semi-lattice-structure can be defined on a partially ordered set P, that is, on a relational structure $\langle P, \leq \rangle$. If every two-element subset of P has a least upper bound, it is a semi-lattice; if every (not only two-element) subset of P has a least upper bound, then it is a complete semilattice (if there are greatest lower bounds as well, the structure is a lattice). The upper bound of a subset S of P is the $u \in P$ such that u is ordered higher than all elements of S: $u \geq x$ for all $x \in S$. The least upper bound of S is the $s \in P$ such that s is an upper bound of S and for each u upper bound of S: $s \leq u$. A semi-lattice structure with least upper bounds (join semilattice) can be viewed as a set on which a sum-operation is defined: the least upper bound can equally be considered the sum of the elements of the subset it is the least upper bound of. In this way, if the denotation of a noun is given as a semilattice, then it contains plural as well as singular individuals.

If we accept that a kind can be represented by a prototypical individual chosen from the nominal denotation, modelling kind-interpretation by choice-functions becomes possible. However, the domain of the choice function f_{kind} cannot consist of whole noun-phrase denotations. Instead, its domain should be given as a family of sets each of which is a subset of a set assigned to a noun as its (full) denotation. These subsets contain the representative or prototypical elements of the noun-denotations (for instance the ones ordered the most highly by the prototypicality partial order).

It is an interesting question how these representative elements can be given. This is the point where lexical semantics enters the picture, because defining the prototypical elements of noun denotations can be made only on the basis of the lexical meaning of nouns (which might be thought of as our concepts based on real world knowledge). Thus, it becomes necessary to build the model in such a way that the noun-denotations conform to prototype-theory as well. This is a welcome consequence if we want to integrate lexical (conceptual) semantics into model-theory, but it raises issues far too complicated to be dwelt on in this paper (see on this topic Dessalles 2015).

Let it be enough here to suppose that an ordering relation according to prototypicality is definable on each set modelling a noun denotation. Prototypicality is assumed here a simple partial order on A (a reflexive, transitive, antisymmetric relation), different from the partial order the sum operation is based on (see footnote 6). In this way becomes possible to give the domain of the choice function f_{kind} as the set of the prototypical subsets of the noun denotations.

(4) $f_{kind}(A) = f_{kind}(R_A) = r$, where A is a set (the denotation of a noun), $R_A \subseteq A$, $r \in R_A$. R_A is the subset of A containing the representative elements of A.

In sum, if we assume a lattice-theoretic model, then two different ordering relations are to be defined on the nominal domain. The one is the partial order which sum operation is based on and defines a (semi)lattice structure. This ordering is given in the model-structure, where the whole nominal domain is assumed to be structured in this way. The other ordering-relation – which I propose here to treat kind-interpretation – is a simple partial order, based on the special lexical meaning of each noun, and may depend on the context (e.g. on the meaning of the sentential predicate) as well.

As (4) shows, the kind interpretation is more restrictive than the indefinite interpretation, but here the source of the restriction is not a situation, as in the case of f_{def}, but an ordering that is supposed to be given on the basis of lexical semantic properties. In the case of f_{indef} and f_{def} the sets belonging to the domain of the functions (the elements of Δ) are simply the denotations of nouns, and any element of these sets could be chosen in principle: in the case of indefinite interpretation without any restriction, while in the case of definite interpretation the choice is actually made by a situation. But, as it was shown above, kind interpretation is a different story: here we must resort to our lexical knowledge; and building structured word-meanings into our model seems inevitable for getting the right truth-conditions of sentences containing nominal arguments with kind-interpretation.

2.4. Advantages of choice-functions

The advantage of defining indefinite, definite and kind readings with the aid of choice-functions is at least threefold. First, choice functions encode properties of nominal arguments without

referring to any linguistic tools other than the category of nouns. In this way it could remain open what other linguistic means are used in a language to express these semantic features. Second, a function can be seen as either a static or a dynamic tool, thus choice functions can be made compatible with static and dynamic models equally.[7] Third, as all the three interpretations are given with the aid of choice functions, the differences and similarities between them become transparent: all of them select an entity from a set, but while the indefinite choice-function is unrestricted, the definite is distorted by situation arguments, and the kind interpretation restricts the domain of the function to the representative subsets of the noun denotations. Moreover, these general definitions can be made more precise; I show here an interesting generalization valid for all the three interpretation-types in a similar way and can be made explicit with the aid of choice functions.

The generalization is that all the three interpretation types have a more and a less restricted version, and this can be expressed neatly by widening or restricting the possible domains of choice functions. In the case of f_{indef} only domain restriction might happen, as the definition in (2) has no restriction: any element of the noun denotations can be chosen. However, as is well-known, there are specific indefinites, where the domain of the function is restricted to contextually relevant subsets of the noun denotations (see Enç 1991). This can be given similarly to the restriction occurring in f_{kind}, but in the case of specific indefinites the source of the restriction is entirely different: it is purely the (linguistic or non-linguistic) context that could make the interpretation specific by restricting the domain of the function, and not some lexically given ordering as in the case of f_{kind}. The domain restriction occurring in the interpretation of specific indefinites can be formalized in the following way:

(5) $f_{specindef}(A) = f_{indef}(C_A) = c$, where A is a set (the denotation of a noun), $C_A \subseteq A$, $c \in C_A$.

C_A is the subset of A containing the contextually relevant elements of A, which can be given with the aid of some formalism mediating between linguistic expressions and their model-theoretic interpretation (e.g. with discourse representation structures).

The domain restriction characterizing specific indefinites is not necessarily encoded by explicit grammatical means; but see e.g. Turkish, where accusative case marking has two forms differentiating between the specific and non-specific indefinite interpretations of noun phrases (Enç 1991).

Similarly to the non-restricted and restricted domain of indefinites, f_{def} and f_{kind} also could have more or less restricted domains. In the case of f_{def} the difference between the possible domains can be expressed by the "size" of the situation arguments: if it is a maximal situation (a whole possible world), then the interpretation is strong (unique referent), while with partial situation arguments the interpretation is what is called weak definite (identifiable referent). The difference between strong and weak definiteness can also be encoded by grammatical means, see Schwarz (2012) on some versions of German.

In the case of f_{kind} a narrower domain might be available when the predicate is not i-level, because the context – including the verb form, the lexical meaning of adverbials (or the lack of

[7] A function can be seen dynamically as a process or operation that changes certain inputs in a clearly defined way; or it can be considered simply a set of ordered pairs which can be given by the usual (non-dynamic) definitions of sets based on the element-of relation.

them), and other intrasentential means – plays a definitive role in whether the sentence is generic or not, and which individuals of the nominal denotation count as prototypical (usually with respect to the sentential predicate). For instance, in the case of the sentence *Birds lay eggs* the domain of f_{kind} is restricted to prototypical **sound female adult** birds as opposed to *Birds can fly*, where the representative individual can be chosen from the prototypical subset of birds with no other restrictions on the set of birds. The more detailed examination of these phenomena is not the aim of the present paper; the point of this short summary is to show that the use of choice functions makes really transparent not only differences and similarities between the three interpretational types, but the differences occurring inside each of them in a similar way (more restricted or less restricted domain).

In addition to the advantages mentioned above, there are also cross-linguistic considerations that strongly support defining these semantic features in the way I offered above. In the next section I mention and present linguistic data which call for this kind of general, language-independent definitions of the three semantic features dealt with here.

3. LINGUISTIC DATA

The *World Atlas of Language Structure* explores the linguistic means of expressing definiteness and indefiniteness in two chapters (among the nominal categories) with the title "Definite articles" (chapter 37) and "Indefinite articles" (chapter 38). There are 620 languages placed on the map that shows the linguistic tools these languages use for encoding definiteness, and indefiniteness is explored similarly in 534 languages. What is the most interesting thing for us beyond the documentation of the many ways human languages can mark (in)definiteness is that 198 languages were found where neither definite, nor indefinite article exists (Dryer 2013a, 2013b). As for the kind interpretation, there are no data in WALS. The reason might be that the aim of WALS is to compare languages on the basis of the linguistic tools they use (morphemes, determiners, word order, etc.), and presumably no languages have been found where kind interpretation is marked by some morphemes, articles, or any other detectable linguistic means devoted to express kind interpretation. It does not follow, however, that there are no such languages, as WALS contains (any types of) information on 2,662 languages, which is although an enormous amount, it is less than the half of the supposedly existing roughly 6,000–7,000 languages. Thus, it might happen that a language will be found where some explicit linguistic tool (morpheme, determiner, clitic, etc.) is used to mark reference to kinds. Until the emergence of such languages, it seems a reasonable generalization that at least it is a universal tendency in natural languages that they do not have generic article or suffix, or other explicit linguistic tool devoted to give the noun (phrase) a kind-referring interpretation (see footnote 2). Kind interpretation is attached to either bare nouns, or to noun phrases with indefinite or definite article, depending on the special properties of the given language and the given context.

The lack of explicit linguistic means for kind interpretation is not very surprising in the light of the fact that there are 198 languages (from 620) where, similarly to the kind interpretation, explicit markers neither for definiteness nor indefiniteness exist, and there are 98 additional languages where only definite articles can be found, and 45 languages have indefinite, but no definite article. These facts justify the purely semantic treatment of these interpretations relying on the denotation of the noun and the context alone: if we want to give language-independent

characterizations for the definite, indefinite, and kind-denoting features, these must not contain any reference to the category of determiners (or any other morpheme expressing (in)definiteness). But then the question arises where these interpretations exactly come from. The answer can be found only if we examine whole sentences of a language with no articles, where in spite of the lack of any determiner or other morpheme expressing (in)definiteness or kind-interpretation these meanings can unambiguously arise.

A well-studied language with these desirable properties is Mandarin Chinese; in this language all the three examined interpretations could belong to bare noun arguments. Although Chinese bare nouns can be interpreted in more than one way in many contexts, there are sentences where unambiguously definite, indefinite, or generic interpretation belong to the bare noun (even if we cannot rely on any disambiguating context). These sentences might give us reliable cues for discovering the origin of these interpretations. Of course, the results must be checked in as many languages as it is possible if we want to draw universally valid conclusions; but starting assumptions may be based on these data.[8]

(6) You gui.
have ghost
'There are ghosts (here).'
Huang (1987, 227, (2))

(7) Yuanchu gou zai jiao.
far-away dog DUR bark
'Far away, dogs are barking.'
*'Far away, the dog is barking.'
Yang (1998, 258, (21b))

(8) Ta zai zhao jingcha.
she DUR look-for cop
'She is looking for a cop.'
Yang (1998, 249, (4c))

The bare noun arguments in (6)–(8) are interpreted as indefinite: (6) is an existential sentence, and the construction (the verb *you* 'have, exist, be') evokes the indefinite interpretation of the bare argument; (7) has a locative phrase (*yuanchu* 'far away') in it, the presence of which (with the durative or progressive marker *zai*, usually glossed as 'at') forces indefinite interpretation on the noun, while in (8) the intensional verb allows only the opaque reading of the bare noun object. This seems not very special to Mandarin if we have a look at counterpart sentences in other languages. Existential constructions are widespread cross-linguistically, and frequently exhibit the well-known definiteness effect: this construction blocks the definite (or specific) interpretation of the "pivot" argument in it. The role of the locative phrases in evoking indefinite readings is also attested in other languages; for instance, locative phrases in Hungarian can

[8]The abbreviations in the glosses are used as in Zhang (2013): CL (classifier), DUR (durative aspect) PRF (perfect aspect), DE (associative particle).

license bare noun subjects (with activity-verbs), and bare noun arguments always have (non-specific) indefinite interpretation in Hungarian neutral sentences (see Maleczki 2008). Finally, in (8) the verb creates an intensional context, where indefinite arguments can have in principle opaque and transparent readings. It seems a universal tendency that bare arguments can only have the opaque (that is, non-specific or narrow-scope indefinite) reading. Also in Mandarin, the transparent indefinite reading can only be expressed with noun phrases containing numerals and classifiers, see (9a); and "in the object-level interpretation, Chinese bare nouns are ambiguous between an opaque reading and a definite reading" (Li 2013, 93).

(9) a. ta zai zhao yi ge baomu.
he DUR seek one CL maid
'He is looking for a maid.' (opaque or transparent)

b. ta zai zhao baomu.
he DUR seek maid
'He is looking for a maid/maids.' (opaque reading)
OR 'He is looking for the maid(s).' (definite reading)
Li (2013, 95, (12a), (12b))

Although definiteness can be expressed by the demonstratives *zhe* 'this', *na* 'that' in Mandarin, definite interpretation can also belong to bare nouns, as (9b) exemplifies; moreover, it systematically arises when the bare noun is in topic position (and the predicate is not i-level), because topic position requires specificity, see (10). But topichood is not required for the definite interpretation: as (11) demonstrates, bare noun objects in postverbal (that is, not topic) position can also have definite interpretation if they "refer to entities that are (perceptually) visible in an immediate situation or particularly salient or familiar in the discourse context" (Li 2013: 120).

(10) Ren lai- le.
man come- PRF
'The man came.'
Yang (1998, 251, (6a))

(11) Zhangsan reng- le yanhe.
Zhangsan throw- PRF inkpot
'Zhangsan threw the inkpot.'
Paris (2022, 124, (33))

Moreover, bare nouns can also be used anaphorically if the antecedent and the noun referring to it is in the same situation (Dayal & Jiang 2023). Assume that (13) is uttered in the context of (12). The bare nouns *nüsheng* 'girl' and *nansheng* 'boy' in (13) are used anaphorically in that context.

(12) Jiaoshi li zuo zhe yi ge nansheng
classroom in sit PROG one CL boy
he yi ge nüsheng.
and one CL girl
'A boy and a girl is sitting in the classroom.'

(13) Nüsheng zuo zai nansheng pangbian.
girl sit DUR boy side
'The girl is sitting next to the boy.'
Dayal & Jiang (2023, 160, (20b))

Turning now to generic sentences, these also demonstrate that the semantic properties of the predicate can determine (at least partly) the interpretations available for its arguments. This is illustrated here by Mandarin sentences where the bare noun is interpreted as a kind-denoting expression, see (14)–(16).

(14) Konglong juezhong-le.
dinosaur extinct-PRF
'Dinosaurs are extinct.'

(15) Tuzi fanzhi-de hen kuai.
rabbit reproduce-DE very fast
'Rabbits reproduce rapidly.'
Kuo & Yu (2012, 675, (72c), (72b))

Here the verbs force kind-interpretation onto their arguments by their lexical meaning, and no other interpretation is available for their arguments. Similar behavior of a group of predicates (called i-level predicates by Carlson 1977) is widely attested in various languages, see the *extinct* and *reproduce* predicates in the English translations above. Generic statements, however, can be expressed by sentences with stage-level predicates as well; for instance, in (16) the interpretation of *gou* 'dog' is kind-denoting.

(16) Gou yao-ren.
dog bite-man
'Dogs bite.'
Kuo & Yu (2012, 675, (72a)

The moral of the story these Chinese data tell us is that neither of the definite, indefinite, and kind interpretations belong to the lexical meaning of nouns. It is a widely held view that nouns are lexically kind-denoting in Chinese (or perhaps universally, see Krifka 1995). Others argue that nouns are lexically indefinite (existential), see e.g. Rullmann & You (2006) on Chinese, or Magri (2012) on English; or which of these depends on the language (Chierchia 1998, 2021). However, the cross-linguistic variability of linguistic means expressing these features on the one hand, and Mandarin data with bare noun arguments on the other seem to be best explained if we accept what Kálmán expresses in the quotation in (1), extending it to kind-interpretation as well: these interpretations can be regarded as instructions to the hearer how to choose referents from the denotation of the noun. The data above show that these instructions arise from several sources: from the lexical meaning of the predicate (kind interpretation, indefinite interpretation), from some (locative) adverbial phrase (indefinite interpretation), from some construction or syntactic position (indefinite interpretation, definite interpretation), from some aspectual feature of the predicate or the whole sentence (indefinite interpretation, definite interpretation).

Only in the case of proper nouns and pronouns originates the definite (unique or identifiable referent) interpretation from their lexical meaning. In languages with articles the definite or indefinite article can mark the definite or indefinite interpretation, respectively; however, **their** use is dependent on similar contextual factors we saw in Chinese. The context may override the definite or indefinite interpretation marked by the articles and may evoke or even force the kind interpretation onto expressions with either definite or indefinite article (in language specific ways, see among others Carlson 2010 for English data, and Mari, Beyssade & Del Prete 2013 for data in other languages).

4. SUMMARY AND OUTLOOK

The main claim of this paper is that definite, indefinite, and kind interpretations arise from the intrasentential or broader linguistic or non-linguistic contexts, and do not belong to lexical units. Here intrasentential contexts were exemplified by Mandarin data because in this language all the three interpretation-types can be expressed by bare nouns. Treating these three properties equally (that is, considering neither of them more basic than the others) results in interesting theoretical consequences. These are only sketched below; the elaboration of these topics requires separate papers.

4.1. Universal features realized by variable linguistic tools

Cross-linguistic data show that there are plenty of languages where one or more of the semantic features examined here can belong to bare nouns, that is, these meanings can be expressed without specific determiners, morphemes or other overt linguistic means. The other relevant observation is that if there are grammatical tools that can express these meanings, they are variable not only cross-linguistically, but also within languages. These facts strongly support the view, also argued for in László Kálmán's works, that interpretation arises in the process of communication, and the definite, indefinite, and kind interpretations can be grasped as the speaker's instructions about the referents of nouns or noun phrases. I argued here that these different instructions can neatly be characterized with the aid of choice functions. The difference between the three interpretation-types can be modelled by the systematically different domains of the choice-functions. The crucial role of domain-restriction is a clear indication of the strong context-dependence of these interpretations.

In the light of this semantic characterization, it is not surprising that linguistic means expressing these instructions (or semantic features) are variable not only across but within languages as well. Even in Chinese there are alternative ways for expressing all the three types of semantic interpretations examined here.[9] As a very sketchy illustration, (17) summarizes the possible realizations of (in)definiteness and kind-denoting property in three languages.

[9]See Zhang (2013, 93–101) on the existential and generic uses of the numeral *yi* 'one', which must be followed by a selectionally suitable classifier when used in these senses as well; this is indicated by (*ge*) in (17).

(17)

semantic features/ languages	indefiniteness	definiteness	kind-reading
Mandarin Chinese	bare nouns yi (ge) 'one+CL'	bare nouns demonstrative determiners	bare nouns yi (ge) 'one+CL'
English	bare nouns (count in Plur) indefinite determiners	definite determiners	bare nouns (count in Plur) indefinite article definite article + Sg
Hungarian	bare nouns indefinite determiners	definite determiners	definite article indefinite article

More data and more languages can easily be added on the basis of the abundant literature on several languages. Here I only mention one additional interesting piece of data on kind interpretation. Kind-referring property can be marked by the systematically contrasting use of nominal cases in Finnish. This language has no articles, but, as opposed to Mandarin, has morphologically marked nominal cases: "first (i.e. "proto-agentive") arguments are regularly marked as nominative (rather than as partitive) under generic interpretation, and second (i.e. "proto-patientive") arguments as partitive (rather than as accusative)" (Behrens 2005, 277).

Although only three languages are contrasted in (17), the variability of linguistic means expressing these interpretations is clearly demonstrated: differences show up in expressing all the three examined semantic features. This variability supports the conclusion that from a cross-linguistic perspective none of these interpretations belong to the lexical meaning of nouns, and they are not necessarily expressed by some special functional morpheme, either. These interpretations arise from the interaction of the underspecified nominal meanings with their narrower or wider, linguistic and non-linguistic context, modulo the special properties of the given language.

4.2. Issues of compositionality[10]

The (in)definite and kind interpretations are evoked by intrasentential contexts in a fairly systematic way: a) by the lexical semantic properties of the verb the noun (phrase) is an argument of; b) by certain adverbial phrases; c) by some aspectual markers (see section 3). This shows that the calculation of these interpretations is not a bottom-up process. However, this does not mean that the principle of compositionality is necessarily hurt: Kálmán (2018) argues that "compositionality does not force us to *interpret* the embedded expressions of a larger expression prior to the *interpretation* of the larger one (Kálmán 2018, 224, emphasis in original). If we accept this, then it is not excluded that (in)definite and kind interpretations could be calculated compositionally; however, a thorough examination of compositionality issues requires much more research work, because

> …the principle can be made precise only in conjunction with an explicit theory of meaning and of syntax, together with a fuller specification of what is required by the relation "is a function of". (Partee 1984, 281)

[10]"The compositionality principle, in its most general form, can be expressed as follows: The meaning of an expression is a function of the meanings of its parts and of the way they are syntactically combined." (Partee 1984, 281)

That is, a detailed examination of this question requires syntactic analyses, a well-defined semantic theory, and an elaborated compositionality principle. This work, however, would avert us from our present topic, so only some sketchy remarks will be made here, leading us to the third section of this summary.

Kálmán (1995) proposes that the principle of compositionality could be strengthened by the property of additivity. This means that while forming complex expressions no information belonging to the subexpressions is lost. Without a more detailed examination I risk the assumption that compositionality strengthened in this way can be saved only if we assume that lexical meanings are strongly underspecified, and these underspecified meanings are "sharpened" when they enter a linguistic construction. In this way, the intrasentential (and also the broader) context adds something to the vague lexical meanings, and nothing will be destroyed (which would be inevitable if lexical meanings were too specific).

4.3. Underspecified lexical meanings

The underspecified or vague character of lexical meanings could be a natural consequence of considering them mental units, that is, concepts. Concepts are subjective and vague, and their vagueness varies according to the speaker, the circumstances, etc. (see Millikan 2005). Carlson (2010) assumes that lexical meanings are concepts, but expressions made of them are not (or not necessarily). Kálmán (2018) is more radical; he argues that even subordinate clauses (in intensional contexts) are concepts "arising from a combination of associations". I do not want to take a stand on this issue; but I think that the Carlsonian view could be elaborated for instance in the way Dessalles (2015) proposes. Dessalles argues that the interrelations between concepts, logical abilities and language can be described along the lines offered by Gärdenfors' conceptual structures by adding a contrast operation for predicates. The gist of this proposal is that concepts are mental units which are given in our head with their special (vague) properties and interrelations, while predicates and logical relations (which give the ground for reasoning) are transient properties, based on contrast. The contrast operation involves heavy context-dependence, as it presupposes something that a predicate could be compared and contrasted with.

Unfortunately, even a sketchy presentation of these issues would highly exceed the limits of the present paper. In this short summary I only wanted to point out the possible ramifications of the investigations presented here. The route offered here begins with well-defined semantic properties and proceeds from these to their different linguistic realizations in order to avoid biases originating from the special structural properties of one or more languages. This method seems entirely compatible with, or even support theories that try to unite the conceptual and logical aspects of meaning. I think that a lucky combination of these theories could result in filling the cognitive gap in formal semantics László Kálmán called our attention to.

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