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Ways of classification: German *Art* and *Typ*

In this paper, the meaning and usage of the two taxonomic nouns *Art* and *Typ* in German is examined. It is hypothesized that they differ in their ways of classification: While *Art* refers to kinds indicating that individuals share essential properties which are based on linguistic knowledge, *Typ* refers to classes in arbitrary systems indicating that tokens match a model or prototype which is based on non-expert knowledge. The hypothesis is successfully tested against lexicographic data, corpus data and experimental data. The experimental results also provide insight into subtle differences in cases where classification by *Art* as well as *Typ* is licensed. The findings on the meaning of *Art* and *Typ* are finally considered against the background of the notions of *kind* and *type* in semantic theory.

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1 Introduction

There are nouns in many languages referring to some sort of classification, for example English *sort*, *class*, *kind* and *type*. They are called *taxonomic nouns*, see Mihatsch (2016). Even though from a broader perspective all taxonomic nouns fulfill the same task, that is, classification, there are at a closer look differences in meaning and usage which are interesting beyond matters of style, since they reveal differences in the way of classification. The focus in this paper is on the German taxonomic nouns *Art* ('kind' / 'species' / 'manner') and *Typ* ('type') which are, at first sight, near synonymous, see the example in (1).

- (1) Kapitalismus lässt sich verschieden klassifizieren. Der rheinische **Typ des Kapitalismus** / die rheinische **Art des Kapitalismus** zeichnet sich beispielsweise durch viel Mitbestimmung und durch eine funktionierende Zivilgesellschaft aus.

'Capitalism can be classified differently. The Rhenish *Typ/Art* of capitalism, for example, is characterized by a lot of codetermination and a functioning civil society.'

While the example in (1) seems to suggest that there is no difference between *Art* and *Typ*, substitution of one by the other is hardly acceptable in the examples in (2) – (6).¹

- (2) Die alten Streifenwagen haben ausgedient. Ab 2004 werden die ersten drei Streifenwagen vom **Typ (*von der Art) OPEL Vectra** in Betrieb genommen.

'The old patrol cars have had their day. From 2004, the first three patrol cars of the *Typ/Art* OPEL Vectra C will be put into operation.'

- (3) Frau Däubler-Gmelins Gegner werfen ihr gern vor, dass sie kompromissunfähig sei. Sie wolle "das deutsche Recht umkrempeln", behauptet die FAZ, die wohl eine weibliche Version **des Typs (?? der Art) Lafontaine** in ihr fürchtet.

¹ Most examples in this paper are taken from the DEWAC corpus provided by the corpus linguistics group at Humboldt-University Berlin – many thanks for access permission. Examples are often slightly simplified.

'Ms. Däubler-Gmelin's opponents like to accuse her of being incapable of compromise. She wanted "to revise German law," claims the FAZ, which probably fears a female version of the *Typ/Art* Lafontaine in her.'²

- (4) Fledermäuse stoßen Laute aus, die sehr schnell hintereinander folgen und sich hinsichtlich ihrer Lautstärke unterscheiden. **Die Art (*der Typ) "Große Hufeisennase"** stößt Ortungslaute aus, deren Schalldruck der Lautstärke eines Presslufthammers entspricht.
'Bats emit sounds that follow each other very quickly and differ in their volume. The *Art/Typ* "Big horseshoe nose" emits location sounds whose sound pressure corresponds to the volume of a jackhammer.'
- (5) Das Ausmaß und die Intensität des Antisemitismus in Europa haben sich stets verändert. Unterschiedlich waren auch der Grad und **die Art (?? der Typ) von Diskriminierung der Juden**.
'The extent and intensity of anti-Semitism in Europe has always changed. The degree and *Art/Typ* of discrimination against the Jews also differed.'
- (6) Jandl, der zu den führenden Vertretern der experimentellen Literatur in der Nachkriegszeit gehörte, verstarb im Juni 2000. **Die Art (??? der Typ) seiner Vorträge** war für seine wortmalerische Lyrik von besonderer Bedeutung.
'Jandl, one of the leading exponents of post-war experimental literature, passed away in June 2000. The *Art/Typ* of his presentations was of particular importance for his lyrics.'

As a first guess one might think that *Typ* is used in technical domains, while *Art* is used to refer to biological classification, i.e., species, as in (2) and (4). This idea is shown to be wrong by the example in (3), which is about a type of politician, and the examples in (5) and (6), in which *Art* refers to a kind of discrimination and a manner of presentation. One might think, then, that the use of *Art* and *Typ* is selected by the particular noun or name: *Vortrag* 'talk' selects *Art* and *Lafontaine* selects *Typ*. This is refuted by (1) as well as (7), where both *Typ* and *Art* are licensed. However, while the variants in (1) appear synonymous, the example in (7) exhibits a subtle difference between the *Typ* and the *Art* variant: *Typ des Handys* seems to refer to different models, say *iPhone 3* as opposed to *Nokia Lumina* and *Moto G*, while *Art des Handys* refers to, e.g., the difference between a classical feature phone, an outdoor phone and a smart phone.

- (7) Per Fernbedienung wird die Sendeleistung jedes Handys individuell geregelt. Je nach *Typ / Art* des Handys beträgt die maximale Sendeleistung zwischen 1W und 20W.
'Depending on the *Typ/Art* of mobile phone, the maximum transmission power is between 1W and 20W.'

The difference in meaning between the *Typ* variant and the *Art* variant in (7) provides evidence that the two taxonomic nouns are not, at least not in the first place, specialized in a particular domain, but rather employ different ways of classification: classes referred to by *Art* differ from those referred to by *Typ* raising the question of how to characterize the difference.

The research on *Art* and *Typ* described in this paper goes back to a talk arguing against the widely held supposition that kinds and types – more precisely: the notion of kinds and the notion of types as employed in semantics – are roughly the same. The main argument addressed the different roles of kinds and types in the semantic analyses: While kinds in many frameworks are considered as basic

² Hertha Däubler-Gmelin and Oskar Lafontaine are German politicians, FAZ (Frankfurter Allgemeine Zeitung) is a German newspaper.

ontological entities, in addition to (regular) individuals, types are part of the semantic framework ensuring the well-formedness of composition and consistency of representations. In contrast to the talk, the perspective in this paper is an empirical one. We start by comparing the meaning and in particular the classification potential of the German taxonomic nouns *Art* and *Typ* on the basis of lexicographic, distributional and experimental data. The question to what extent the findings match with the roles of kinds and types in semantic theory is only addressed at the end of the paper.

The first hypothesis in comparing *Art* and *Typ* will be that classification by *Art* does what it is expected to do, i.e., refer to kinds – natural kinds and beyond. Kinds are generally assumed to be associated with essential properties, as opposed to accidental ones, though it is meanwhile understood that such properties are not strictly necessary. For example, a dog is four-legged in virtue of being a dog, even though an accidentally three-legged one still counts as a dog. For ease of presentation these properties will be called *essential* in this paper without implicating that they are necessary. They are properties entities have simply because they are the kind of things they are, they allow for exceptions and, most importantly, they are part of what speakers acquire when learning a language. It may be argued that knowledge of these properties is encyclopedic rather than linguistic as such. Still, it is knowledge associated with a word and must be learned when learning the meaning of the word. Therefore, the assumption that the taxonomic noun *Art* refers to kinds entails that classification by *Art* relies on linguistic knowledge (in a broad sense), which will be a core hypothesis in this paper.

In the case of *Typ* it is more difficult to make a clear hypothesis. There seems to be no well-established notion of type apart from the distinction between *type* and *token* (Peirce 1931) such that types are abstract entities and tokens are its particular instances. Types occurs in a wide variety of contexts and there is no indication that they are rooted in essential properties of the objects they classify. They seem to be defined instead by models or prototypes provided by some community of experts, independent of general linguistic knowledge.

Here is an example illustrating this idea: When I am asked what kind of heating (*welche Art von Heizung*) we have in our house, I may answer that it is gas operated and supplies heat as well as hot water and has been installed just two years ago (and was fairly expensive). I know that these features are relevant because I am familiar with the meaning of the word *Heizung* 'heating' and what counts as essential properties of heatings. But if you ask me for the type (*Typ*) of the heating I would be lost and refer you to our heating engineer. I might of course try the same answer as in the case of *Art* (gas operated, heat as well as water etc.) and run the risk that this is not what you want to know. It would be clearly infelicitous, however, if I would answer the *Art* question by naming a *Typ*, e.g., that we have a *B-2248 Weishaupt Eco*.³ So the hypothesis pursued in this paper is this:

***Art&Typ* hypothesis**

classification by *Art* (i) refers to (natural) kinds,
 (ii) indicates that individuals share essential properties, and
 (iii) is based on general linguistic knowledge (in a broad sense).

classification by *Typ* (i) refers to classes in arbitrary systems,
 (ii) indicates that individuals match a model or blueprint or prototype, and
 (iii) is based on expert knowledge.

³ Many thanks to one of the reviewers for pointing out the infelicity of answering the *Art* question in this way.

In the remainder of this paper, this hypothesis will be tested against three different sets of data. In section two, *Art* and *Typ* will be examined from a lexicographical point of view exploring synchronic as well as diachronic data. In section three, distributional characteristics will be considered, based on corpus data. In section four, an experimental study will be presented testing preferences in usage. In section five, we will finally come back to the roles of kinds and of types in semantics.

Finally, there is a caveat: Throughout the rest of this paper the focus will be on German *Art* and *Typ*. English *kind* and *type* are close in meaning but not fully equivalent to the German terms. For constructions involving nouns corresponding to *type* across Romance languages see Mihatsch (2016).

2 Lexical meaning

In this section, *Art* and *Typ* will be examined from a lexicographical point of view. We start with the entries in the *Duden* (lexicon of modern German), have a look at their provenience in the *Grimm* (etymological lexicon of German) and briefly consider the English counterparts *kind*, *species*, *manner* and *type* in the Oxford English Dictionary (OED). In concluding this section, the implications for the *Art&Typ* hypothesis will be considered.

2.1 *Art*

The *Duden* lists five senses of *Art*:⁴

- (8) a. *angeborene Eigenart / Wesen / Natur*
'innate nature', 'character'
- b. *(Art und) Weise*
'manner'
- c. *gutes Benehmen*
'good manners'
- d. *Einheit im System der Tiere und Pflanzen, in der Individuen zusammengefasst sind, die in allen wesentlichen Merkmalen übereinstimmen und die untereinander fruchtbare Nachkommen hervorbringen können*
'unit in the system of animals and plants including those individuals which are consistent in all essential characteristics and which can produce fruitful offspring among each other.'
(English *species*);
- e. *eine besondere, bestimmte Sorte von etwas* ('sort', 'kind').

The sense in (8e) is the general taxonomic one. Since the paraphrase by *Sorte* ('sort') is not very helpful, we refer to the more informative entry in *Adelung* (1811) which is a High German dictionary from the 19th century:

Adelung, Art

- (9) *Die Ähnlichkeit einzelner Dinge in wesentlichen Eigenschaften, und solche Dinge zusammen genommen.*
'The similarity of individual things in essential properties, and such things taken together.'

Regarding the origin of the word *Art*, the *Grimm* dictionary points to a Slavic root *roditi* meaning *give birth* or *generate*.

English translations of the taxonomic meaning of German *Art* are *kind* or *species*, and also *sort* or *type*. *Species* is a technical term in biology. *Kind*, like German *Art*, refers to "the essential quality [...] as

⁴ Dudenredaktion (o. J.): „Art“ auf Duden online; <https://www.duden.de/node/8848/revision/8875>

determining the class or type to which a thing belongs".⁵ Note that the Oxford English Dictionary includes *type* as a sense of *kind* indicating a less strict division line between *kind* and *type* than that between German *Art* and *Typ*.

2.2 *Typ*

The *Duden* lists five senses of German *Typ*:⁶

- (10) a. *durch bestimmte charakteristische Merkmale gekennzeichnete Kategorie; Art (von Dingen oder Personen);*
'category characterized by characteristic features; kind of things or persons';
- b. *Modell oder Typ einer Konstruktion*
'model or type of a construction';
- c. *Urgestalt, Grundform, Urbild, das ähnlichen oder verwandten Dingen oder Individuen zugrunde liegt;*
'basic form, archetype underlying similar or related things or individuals';
- d. *als klassischer Vertreter einer bestimmten Kategorie von Menschen gestaltete, stark stilisierte, keine individuellen Züge aufweisende Figur*
'highly stylized figure, designed as a classical representative of a certain category of men, without individual features'
- e. *männliche Person* 'male person' (as in *einen Typen kennenlernen* 'get to know a guy').

In (10a) the *Duden* lists a sense of *Typ* that is equivalent to *Art* in being defined by characteristic features which will be discussed in section 2.4 below. The senses in (c) and (d) are synonymous with *Typus*, which is a common term in philosophy and literature studies. The sense in (e) is very colloquial. Following the *Grimm* dictionary (*Grimm & Grimm* 1854), the origin of *Typ* is the Greek verb for *strike / beat* suggesting a connection to coining and printing. The latter is still visible in the printing sector where movable metal letters are called *Typen*.⁷

English *type* is also rooted in the Greek verb for *strike / beat*. It has a taxonomic use analogous to German *Typ*, denoting either a class or kind or a prototype – note that the Oxford English Dictionary also lists *kind* as a synonym of *type* in (11a).

Oxford English Dictionary, *type* ⁸

- (11) a. A kind, class, or order as distinguished by a particular character;
b. A person or thing that exhibits the characteristic qualities of a class; a representative specimen; a typical example or instance.

2.3 *Unterart* and *Untertyp*

The core idea of taxonomic nouns is two-fold. There is the dichotomy of class and instance – *set* vs. *element*, *Art* vs. *Individuum*, *type* vs. *token* etc. On the other hand, there is the idea of a taxonomy establishing a hierarchy of classes such that a subordinated class inherits the features of the super-

⁵ Oxford English Dictionary (OED) <https://www.oed.com/viewdictionaryentry/Entry/103444> (accessed Nov 15, 2020).

⁶ Dudenredaktion (o. J.): „Typ“ auf Duden online; <https://www.duden.de/node/187038/revision/187074>

⁷ Though the singular form is different, a movable letter is called *die Type*, genus feminine.

⁸ OED Online. <https://www.oed.com/view/Entry/208330?rskey=rALWIs&result=2&isAdvanced=false> (accessed November 15, 2020).

ordinated class. This idea is found in biology, but also in mathematics and computer science. Accordingly, there are in English the notions of *subspecies* and *subkind* and, in mathematics and computer science, the notion of *subtype*. In German, there is *Unterart* covering *subspecies* and *subkind*, as in (12). However, while *Unterart* is found in various contexts, the expression *Untertyp* occurs nearly exclusively in the context of diseases, as in (13a) and appears marked in other contexts, cmp. (13b). This is surprising since in mathematics and computer science *type* is translated into German by *Typ*, and the prefix *Unter-* is fully productive in German.

(12) Der in verschiedenen Unterarten vorkommende Besenginster wird meist bis zu 2 m hoch.
'The broom, which occurs in different subspecies, is usually up to 2 m high.'

(13) a. Wie die Krankheit verläuft, hängt davon ab, mit welchem Untertyp des Erregers der Patient sich angesteckt hat.

'How the disease progresses, depends on the subtype of the pathogen the patient has been infected.'

b. Die Auswahl der Panzer ist beeindruckend: Fast jeder Panzertyp und Untertyp, der damals aus den Rüstungsfabriken rollte, steht auch in *Panzer Elite*⁹ zur Verfügung.

'The choice of tanks is impressive: Almost every tank type and subtype that rolled out of the arms factories is also available in *Panzer Elite*.'

2.4 Implications for the *Art&Typ* hypothesis

The dictionary entries support the *Art&Typ* hypothesis in many ways. Its core piece concerning *Art* – individuals share essential properties – is given as a defining characteristics in the entry in Adelung, s. (9). Furthermore, the Slavic root *roditi* (*give birth* or *generate*) mentioned in the *Grimm* suggests that *Art* is diachronically connected to descent and inheritance, which is additional support for the constitutive role of essential properties.

The entry for *Typ* in the *Duden* highlights the role of a model or basic form (10b, c), which is the core piece of the hypothesis concerning *Typ*. The origin of *Typ* in Greek *beat* and its use to denote movable letters in printing confirms the idea that a *Typ* is constituted by a prototype. Actually, the word *Typ* developed into a common term from the 18th century on, that is, only after printing was established as a technique.¹⁰ It does not seem too speculative to assume that the taxonomic noun *Typ* is still connected to the idea of types in printing – produce any number of indistinguishable tokens – which is strong evidence that the idea of a prototype is at the core of its meaning.

The constitutive role of a prototype finally provides an explanation for the fact that a *Typ* can be given by its prototype. Note that in contrast to a stereotype, a prototype is not just a collection of properties but an actual individual. In *der Typ Lafontaine* in (3) the actual politician Oscar Lafontaine serves as a prototypy characterizing the tokens of this type. In contrast, the *Art Große Hufeisennase* is not constituted by a prototypical exemplar – bats of this species are related by descent. The role of the prototype is taken to the extreme when *Typ* no longer denotes a class but a man: *Sie hat einen Typ kennengelernt* ('She has met a guy.'). see (10e). This usage is colloquial and derogative, and it seems to be saying that this man is a prototypical male lacking other relevant properties.

⁹ Computer game

¹⁰ Mihatsch (2016) also observes for Romance languages that type nouns appeared later than the other taxonomic nouns.

The *Duden* entry of *Typ* includes, however, a sense in which a *Typ* is given by characteristic features, (10a), entailing that the division line between *Art* and *Typ* is not as sharp as suggested by the *Art&Typ* hypothesis. An example for this sense listed in *Duden* is *Fehler dieses Typs* which appears equivalent to *Fehler dieser Art* ('errors of this *Typ/Art*'). We saw already in the heating example in the introduction that a question addressing the *Typ* may be answered in the same way as a question addressing the *Art*, by naming characteristic features. But we also saw that this is only true for one direction: A question addressing the *Art* cannot be answered by naming a *Typ*. We will come back to overlapping interpretations in section 4.3.

In English, the division line between *kind* and *type* appears even more vague. The Oxford English Dictionary mentions *type* as (one) synonym of *kind* and vice versa. That might indicate that in English the prototype characteristics is less distinctive. The fact that, in English, *type* is rarely used in referring to a man also points to a less prominent role of the prototype.

The almost complete absence of *Untertyp* in German is a puzzle. It might be considered as supporting the *Art&Typ* hypothesis, since a "sub-prototype" is hard to conceive of, and thus *Typ* might not readily support inheritance of properties from a superordinated to a subordinated class. This would again point to a less prominent role of the prototype in English where *subtype* is highly frequent and indicates inheritance of properties.

3 Distribution

In this section, DPs headed by *Art* and *Typ* will be examined with respect to grammatical form and meaning. The analysis is based on a corpus study (*DEWAC* corpus, see footnote 1). There are two major forms: In the first, the taxonomic noun is combined with another noun by juxtaposition while in the second the taxonomic noun is complemented by a partitive genitive or a *von* ('of') PP.

Art_N, Typ_N

die Art Große Hufeisennase,
der Typ Opel Vectra, [Bundesschatzbriefe] Typ A,
[Politiker] des Typs Lafontaine;

'the species Big horseshoe nose', '[cars] of type Opel Vectra',
'type A [federal saving bonds]', '[politicians] of the type
Lafontaine';

Art_von/des_N, Typ_von/des_N

eine (besondere) Art von Wald, (der viel Wasser speichert),
eine Art [von] Gegengift,
der rheinische Typ des Kapitalismus,
der Typ der ultraviolett leuchtenden Galaxien,
der Typ des Kleinkriminellen;

'a special kind of forest (that retains a lot of water)', 'a kind of
counter poison', 'the Rhenish type of capitalism', 'the type of
ultraviolet luminous galaxies', 'the type of a petty criminal';

The two forms will be demonstrated below. The focus will be on the question of how the denotation of the taxonomic DP relates to that of the embedded noun: by identity or by subsumption? Cases with a hedging interpretation are discussed at the end of the section.

3.1 Art_N, Typ_N

Art as well as *Typ* can be combined with nouns by mere juxtaposition, as in *mein Freund Ferdinand* ('my friend Ferdinand'), which is a form of apposition (see *Duden Grammatik*, 2006). In the case of *Art* the noun has to be the name of a species, e.g., *Große Hufeisennase*.¹¹ Other nouns are blocked even if they allow for a kind reading: **Die Art Batterie / Die Batterie wurde von Volta erfunden* ('The kind battery / The battery was invented by Volta'). In this construction the denotation of the full DP is identical to that of the noun (on a kind reading) – *die Art Große Hufeisennase* and *die Große Hufeisennase* denote the same kind of bats.¹²

The *Art_N* construction requires a definite article which is explained by the fact that names of species are unique – there is exactly one kind *Große Hufeisennase*. If *Art_N* constructions occur with nouns other than species names they may have an indefinite article. These cases allow for insertion of the preposition *von* ('of') – *eine Art [von] Smartphone* – without change of meaning, which is why we subsume them under the form *Art_von/des_N*.

When *Typ* is combined with a noun by juxtaposition, the noun is a proper name. In *der Typ Opel Vectra* the term *Opel Vectra* is the name of the type. Similarly, in *Bundesschatzbriefe Typ A* ('type A federal saving bonds') and *Politiker des Typs Lafontaine* ('politicians of the type Lafontaine') the terms *A* and *Lafontaine* are names of types. Likewise, in *Autofahrer vom Typ "Hauptsache ich"* ('car drivers of the type "main thing I"') the phrase *Hauptsache ich* is the name of the type. Type names are less commonly known and exhibit a high degree of freedom compared to that combined with *Art*. This corresponds to the idea that types classify artefacts or refer to prototypes, and are not conventionalized in any way, whereas names of species adhere to biological conventions.

From the semantic point of view, phrases of the *Typ_N* are identical in reference to that of the name as such, provided that the name is interpreted as the name of the type. In the case of *Art*, kind readings of names of species have been discussed for some time pointing to a number of predicates that can be applied to kind readings only (and can be used to test for a reading), see footnote 12. In the case of *Typ*, there is an analogous ambiguity. In (14a) *Der Opel Vectra* must have a type reading because the verb *produzieren* ('produce') plus the time span blocks a token reading, and in this reading (14a) is equivalent to (14b). In (14c) the token/individual reading is the only possible one since a type cannot be owned by a person, which is confirmed by the inacceptability of (14d).

- (14) a. Der Opel Vectra wurde von 1988 bis 2008 produziert.
b. Der Typ Opel Vectra wurde von 1988 bis 2008 produziert.
c. Der Opel Vectra gehört meinem Bruder.
d. *Der Typ Opel Vectra gehört meinem Bruder.
'The [type] Opel Vectra was produced from 1988 to 2008 / is owned by my brother.'

While in the case of the *Opel Vectra* the type name is clearly primary, in *der Typ Lafontaine* the name of the individual is the primary one and is used to indicate a prototype when combined with *Typ*. Without the taxonomic noun the name allows for a type reading only if combined with an indefinite article, (15b), (see also von Heusinger 2010).

¹¹ *Große Hufeisennase* is the name of a species, not a combination of adjective and noun.

¹² Kind readings can be tested with the help of kind level predicates like *extinct* which cannot be predicated of (regular) individuals, see. e.g., Krifka et al. (1995). Compare

- a. Die Große Hufeisennase ist ausgefliegen ('The Big horseshoe nose flew away') – individual reading
b. Die Große Hufeisennase ist ausgestorben ('The Big horseshoe nose is extinct') – kind reading

- (15) a. Der neue Vorsitzende ist vom Typ Lafontaine.
 b. Der neue Vorsitzende ist ein Lafontaine.
 'The new chairman is of the type Lafontaine / is a Lafontaine.'

The ambiguity of proper names between a token and a type reading may lead to the idea that a phrase of the form *Typ_N* denotes a superclass including two individuals, the subject of the classification and also the one serving as a prototype (i.e. in 15a the new chairman and Oskar Lafontaine).¹³ This is correct if prototypes are given by proper names. We nevertheless stay with the idea that the proper name has a type reading in *Typ_N* because there is the type reading of proper names with indefinite articles.

3.2 *Art_von/des_N, Typ_von/des_N*

Art as well as *Typ* can be combined with nouns in the form of a genitive partitivus or *von* 'of' PP.¹⁴ *Art* phrases of this form are not restricted to species but instead combine with all sorts of every-day domains including abstract entities, see (16). They may occur with indefinite as well as definite articles (provided uniqueness is guaranteed), and also with quantifiers, (17). The relation between the kind denoted by the *Art* phrase and the domain denoted by the nominal complement is that of subsumption – *eine neue Art von Wald* ('a novel kind of forest') denotes a subkind of the kind forest. If combined with indefinites, *Art_von/des_N* phrases preferably include information distinguishing the subkind from the superordinated kind – a novel kind of forest – otherwise these phrases tend to be understood as a form of hedging, see next section.

- (16) eine Art von Fledermäusen, eine (besondere) Art von Baumwollstoff, eine (neue) Art von Vampiren, eine (neue) Art von Abschreckung
 'a kind of bats, a (special) kind of cotton fabric, a (novel) kind of vampires, a (novel) kind of deterrence'
- (17) a. eine / die (neue) Art von Wald (die die dem Klimawandel standhalten kann).
 'A / the (novel) kind of forest that can withstand climate change.'
 b. jede Art von Wald
 'every kind of forest'

There are cases of *Art* phrases that lack genitive marking or prepositional marking but nevertheless express a subsumption relation. The *Art* phrase in (18) clearly denotes a subkind of mobile phones. These cases allow the insertion of the preposition *von* ('of') without change of meaning, which is why we assume that they include a covert preposition *von*.

- (18) eine / die *Art* [von] Handy, die den Benutzer als Künstler ausweist
 'a / the kind of mobile phone that identifies the user as an artist'

There is finally a form of *Art* phrase that does not pattern with either *Art_N* or *Art_von/des_N*. In these cases *Art* has the meaning of manner and is specified by a relative clause headed by *wie* ('how'), see (19a). The relative clause may also occur without being headed by *Art* with the same meaning, (19b). So these cases express identity of the *Art* phrase and its complement. There is no corresponding construction with *Typ*.

¹³ Many thanks to an anonymous reviewer for pointing out this possibility.

¹⁴Lawrenz (1993) argues that *Art* is a relational noun such that the subsequent nominal or prepositional phrase has the status of a complement instead of an adjunct.

- (19) a. Die Art, wie sie sich mit ihm unterhielt, erinnerte mich an frühere Zeiten.
 b. Wie sie sich mit ihm unterhielt, erinnerte mich an frühere Zeiten.
 'The way / How she talked to him reminded me of earlier times.'

Typ phrases of the form *Typ_von/des_N* prefer artefacts and also diseases¹⁵ as their domain of classification, (20a), while every-day domains and abstract notions occur only rarely, (20b).

- (20) a. ein (neuer) Typ von aufladbarer Batterie, drei Typen von Fibromyalgie
 'a novel type of rechargeable battery, 'three types of fibromyalgia'
 b. der zweite Typ des fortgeschrittenen Trainings, der rheinische Typ des Kapitalismus
 'the second type of advanced training', 'the Rhenish type of capitalism'

Otherwise *Typ_von/des_N* phrases exhibit the same characteristics as in the case of *Art*. They can be indefinite or definite or quantified, (21). The relation between the type denoted by the *Typ* phrase and the domain denoted by the embedded nominal is that of subsumption: *Ein (neuer) Typ von Hybridfahrzeug* ('a novel type of hybrid vehicles') denotes a subtype of hybrid vehicles.

- (21) Ein / der (neue) / jeder *Typ* von Hybridfahrzeug
 'a / the novel / every type of hybrid vehicle'

There are *Typ_von_N* phrases expressing identity instead of subsumption. In (22a), for example, *der Typ der ultraviolett leuchtenden Galaxien* ('the type of ultraviolet luminous galaxies') does not denote a particular subtype of ultraviolet luminous galaxies but instead a type that is described as ultraviolet luminous galaxies, see (22a). Similarly, in (22b) the *Typ* phrase does not denote a subtype but the type as such. Cases like (22b) highlight the prototype role of the name – the petty criminal in (22b) is clearly a prototype.

- (22) a. Entdeckungen, die zum *Typ* der ultraviolett leuchtenden Galaxien gehören.
 ' Discoveries that belong to the / a type of ultraviolet luminous galaxies.'
 b. Eigentlich ist er nicht der *Typ* des Kleinkriminellen.
 ' He is not the type of a petty criminal.'

3.3 Hedging by *Art*

It was observed above that indefinite *Art_von/des_N* phrases preferably include information distinguishing the subkind from the superordinated kind as in *eine neue Art von Wald* or *eine Art von Wald, die dem Klimawandel standhalten kann* ('a novel kind of forest / a kind of forest that can withstand climate change'). Another way of distinguishing subkinds would be by accenting the indefinite article, thereby indicating cataphoricity of a distinguishing property (see Umbach 2004). Without distinctive information indefinite *Art_von/des_N* phrases tend to be understood as a form of hedging. Similarly, indefinite *Art_N* with a covert *von* preposition are frequently understood as hedging: When the speaker uses *eine Art [von] Smartphone* ('a kind of smartphone') instead of *ein Smartphone* she seems to be reluctant to call the referent a smartphone, but this term is the closest she can think of. The same effect is shown in (23): *eine Art Gegengift* is something close to counter

¹⁵ The use of *Typ* when classifying disease is not surprising taking into account that diseases are frequently classified by way of "clinical pictures", that is, by way of prototypical appearance.

poison but not what is usually meant by this term and *eine Art von Dialog* differs from a real dialogue – you cannot have a proper dialogue with your tools and medium.

(23) a. [In seiner Übertreibung ist diese Erzählung] eine *Art* Gegengift zu Gaaders Innerlichkeit.

'[In its exaggeration, this narrative is] a kind of counter poison to Gaader's inwardness.'

b. Sicher steht ein Künstler in einer *Art* von Dialog mit seinem Werkzeug und seinem Medium.

'Certainly an artist stands in a (particular) kind of dialogue with his tools and his medium.'

The puzzle with this form of hedging is: why call something *eine Art von Smartphone* if it is not a smartphone in the first place? In fact, these phrases appear ambiguous in an elusive way. Setting aside stress on the determiner (*EINE Art von Smartphone*) there seems to be no clear difference between the regular (subkind) interpretation and the hedging interpretation. One might test whether speakers agree that *eine Art von Smartphone is a smartphone*. The prediction will be that they agree and at the same time argue that it is not a regular one.

There is no room in this paper to do justice to the broad literature on hedging (starting with Lakoff 1973). However, for the *Art* variety there is a straightforward semantic explanation how the hedging effect comes about. Assume that inheritance in taxonomies is a default: By default, every subkind of smartphone inherits the features of the kind smartphone. But there may also be exceptional subkinds.

The Gricean maxime of manner then allows to reason as follows: If the speaker uses the expression *Art von Smartphone* instead of the simpler expression *Smartphone* without indicating the distinctive feature of the kind she has in mind, the hearer will infer that the item in question does not have the usual smartphone properties but instead is an exceptional kind of smartphone. From this point of view, hedging by *Art* is not a matter of fuzzy boundaries of a concept but instead a matter of non-strict taxonomic inheritance (technically, it is not a matter of indeterminate truth values but of non-monotonic inference). This explanation for the hedging use of *Art* is supported by the observation that the hedging flavor is lost as soon as *Art* is modified – *eine neue Art von Smartphone* ('a novel kind of smartphone') denotes a subkind of smartphones without any trace of hedging (see also Kolde 2004 on the grammar of the German hedging expression *Art*).

Finally, unlike *Art* phrases, *Typ* phrases never license a hedging interpretation. Similarly, English *kind* is used for hedging, but not English *type*. In many languages, however, the word corresponding to *type* is a prominent hedging device, for example Swedish *typ* and Italian *tipo* (for Romance languages see Mihatsch 2010).

4 Empirical study

Taking stock, the dictionary entries in section two provided evidence that the taxonomic nouns *Art* and *Typ* are notably different in origin. *Art* is diachronically connected to descent and inheritance, whereas *Typ* appears connected to coining and printing. This supports the general hypothesis in this paper that classification by *Art* makes use of essential properties whereas classification by *Typ* makes use of a model or prototype.

Considering the grammatical form of *Art* and *Typ* phrases, the taxonomic nouns are either combined with a name (or an expression that functions as a name) by juxtaposition (*Art_N*, *Typ_N*) or they are combined with a genitive or *von*-PP (*Art_von/des_N*, *Typ_von/des_N*). The former express identity of the denotation of the taxonomic phrase and the referent of the name, while the latter express subsumption – the denotation of the taxonomic phrase is subsumed by the denotation of the

complement nominal phrase. As for lexical content it was found that *Typ* is preferred with artefacts and diseases and also with humans, see (20), while *Art* is used in biological domains but more importantly (and more frequently) in classifying everyday items and abstract issues, see (16).

These results raise the question to what extent the taxonomic nouns *Art* and *Typ* are specialized. The idea that *Art* makes use of essential properties while *Typ* makes use of models predicts that *Art* is close to biology and *Typ* is close to technology. It does not predict, however, that classification by *Art* and classification by *Typ* exclude each other. Why should it not be possible to classify a domain on the basis of essential properties and, alternatively, classify it on the basis of models or prototypes? In fact, we saw such a case in the example in (7) in the introduction. But this example also suggests that the two ways of classification yield different results. The experiment described below aims at detailing these differences.¹⁶

4.1 Design

We used (slightly simplified) corpus examples with *Art* or *Typ* phrases and substituted one term by the other. The variants were presented simultaneously in a forced choice acceptability design, with one or two sentences of preceding contexts. Subjects were informed that they see texts from newspapers and blogs with two different continuations. They were instructed to decide which of the continuations was the original one, assuming that subjects consider the more acceptable version to be the original. In (24) and (25) two items are shown, the first occurred originally with *Art* and the second with *Typ*. Judgments for these two items were in agreement with the original term: in the first, around 90% of the subjects decided for *Art* while in the second, around 90% decided for *Typ*.

(24) (originally *Art*)

Schäuble vertrat [...] die Auffassung, dass das Instrumentarium der internationalen Gemeinschaft nicht mehr ausreicht, um den Herausforderungen der Gegenwart zu begegnen.

- a. Er forderte eine neue *Art* von Abschreckung.
- b. Er forderte einen *Typ* von Abschreckung.

'S. proposed [...] that the means of the international community were insufficient to meet present challenges. He called for a novel *Art* / *Typ* of deterrence.

(25) (originally *Typ*)

Das Ziel der Militäroperation „Grand Slam“ war ein sowjetisches Raketentestgelände, das die Piloten jedoch nie erreichten.

- a. Abfangjäger fingen das US-amerikanische Aufklärungsflugzeug des *Typs* U-2 kurz vor Erreichen des Ziels ab.
- b. Abfangjäger fingen das US-amerikanische Aufklärungsflugzeug der *Art* U-2 kurz vor Erreichen des Ziels ab.

'The aim of the military operation "Grand Slam" was a Soviet missile test site, which the pilots never reached. Interceptors caught the US reconnaissance aircraft *Typ* / *Art* U-2 shortly before reaching the finish.'

The predictions resulting from the previous section are

for phrases of the form *Art_N* and *Typ_N*

- (i) if N is a biological name *Art* is preferred (*die Art Große Huftisennase*);

¹⁶Many thanks to Julia Otterpohl who developed the stimuli and implemented the study.

- (ii) if N is the name of a technical device *Typ* is preferred (*der Typ Opel Corsa C*);
- (iii) if N is the name of a person *Typ* is preferred (*der Typ Lafontaine*);

for phrases of the form *Art_des/von_N* and *Typ_des/von_N*

- (iv) if N denotes items created in mass production, *Typ* is preferred (*ein neuer Typ von Batterie*);
- (v) if N denotes schemata imposed by definitions, *Typ* is preferred (*der rheinische Typ des Kapitalismus, klassische Typ der Depression*);
- (vi) if N is an abstract nouns, *Art* is preferred (*die Art von Abschreckung / Kommunikation*);
- (vii) if N matches neither (iv) nor (v), *Art* is preferred (*die Art der Nahrungsmittel / des Materials*);

These predictions relate to preferences in certain domains for *Art* over *Typ* or vice versa. The actual hypothesis of our experiment is, however, that there are *equal preference items*, that is, cases where neither kind nor type is preferred, but classification yields different results.

The experiment included ten *Art* and ten *Typ* items of the form *Art/Typ_des/von_N*, as well as ten *Art* and ten *Typ* items of the form *Art/Typ_N*. We also added five items of the form *Art_N* for which we assumed an implicit *von*-phrase, as in (18). The items were presented online in a forced choice acceptability design (see above). We had 25 participants. For equal preference items we conducted informal post-hoc interviews.

4.2 Results

The results confirmed some but not all of the predictions listed above. Since the main hypothesis relates to the equal preference items, we did not perform a proper statistical analysis and the percentages mentioned below describe tendencies. Starting with the *Art* items, (i) was fully confirmed: in the case of biological names (e.g. *Großer Brachvogel*, *Crassula brevicaula*), more than 80% of the subjects preferred *Art* although, surprisingly, the preference for *Art* was never absolute. Prediction (vi) was confirmed to a large extent: nouns denoting abstract entities like *Erfolg* 'success', *Variation* 'variation', *Diskriminierung* 'discrimination', *Reaktion* 'reaction' etc. yielded more than 75% *Art* preference. This included combinations of the form *Art_des/von_N* with implicit *von*-phrases.

For *Typ* items results were more diverse. On the one hand, prediction (ii) and (iii) were fully confirmed: technical names yielded more than 90% and personal names more than 80% *Typ* preference. However, predictions (iv) and (v) failed: Most of the *Typ_des/von_N* items yielded no *Typ* preference or even a slight *Art* preference. This included nouns like *Hörgerät* 'hearing aid', *Persönlichkeitsstörung* 'personality disorder', *Schlaganfall* 'stroke' and *Dokument* 'document'. Cases like these will be discussed in the next section.

Summing up the results, the predictions for constructions of the form *Art/Typ_N* are confirmed. Moreover, for those of the form *Art/Typ_des/von_N* there are a number of equal preference items. Equal preference results might be explained by assuming that the domains in these items are insensitive to the choice between *Art* and *Typ*. But if classification by *Art* and by *Typ* are two distinct ways of classification, the subjects may opt for either way depending on what they consider more relevant in the context.

4.3 Equal preference items

In this section, selected equal preference items will be discussed. We asked some of the participants post-hoc why they chose a particular alternative and what they think is the difference between, e.g., a kind of smartphone as opposed to a type of smartphone. These interviews were conducted orally and informally with a limited number of subjects. The items presented below include four *Typ* and two *Art* cases.

Handy

The equal preference item shown in (7) in the introduction is repeated in (26). It occurred in the corpus with *Typ*. The text is about the regulation of transmission power, which is highly technical topic. Post-hoc assessments provide evidence that *Art* and *Typ* convey slightly different meanings which are, however, both reasonable in this context. *Art von Handy* classifies mobile phones according to form and function, e.g., smartphones, children phones, slider phones, flip phones, outdoor phones etc. In contrast, *Typ von Handy* refers to a classification imposed by the manufacturer, e.g., *Samsung Galaxy iPhone 3*, *Nokia Lumina* and *Moto G*. The results of classification are distinct: When classifying by *Art* there is, for example, a class of outdoor phones including a wide range of phones sharing outdoor fitness as an essential property. When classifying by *Typ* there is, for example, a class *Samsung Galaxy*' including instances of this model. Two exemplars may differ in their date of manufacture and in color and traces of use, but otherwise, they are clones – tokens of the same type.

(26) (originally *Typ*)

Per Fernbedienung wird die Sendeleistung jedes Handys individuell geregelt.

- a. Je nach *Typ* des Handys beträgt die maximale Sendeleistung zwischen 1W bis 20W.
- b. Je nach *Art* des Handys beträgt die maximale Sendeleistung zwischen 1W bis 20W.

'The transmission power of each mobile phone is individually controlled by remote control. Depending on the type of mobile phone, the maximum transmission power is between 1W and 20W.'

The semantic difference between *Art* and *Typ* found in the above example is supported by examples like (27) – (30) (which were not part of the empirical study). In (27) smart phones are said to be the preferred *Art* of mobile phones implying that smart phones are in fact considered as an *Art* of mobile phones. Using *Typ* in (27) would not be infelicitous but clearly less appropriate. In (28) the fact that mobile phones are in general banned on the factory site is expressed by quantifying over *Art*. Quantifying over *Typ* would not meet the intention of the ban, which is (presumably) to prohibit simple feature phones as well as smartphones with cameras, irrespective of producer and model.¹⁷ Finally, the coordination of *Art* and *Typ* in (29) would not be acceptable if there were no semantic difference, and in (30), which is taken from a technical data sheet, the notions of *Geräteart* and *Gerätetyp* ('kind vs. type of device') are used side by side. *Geräteart* refers to the function of the device, in this case a TV, while *Gerätetyp* refers to the model.

¹⁷ An anonymous reviewer objected that a ban of *Typ von Handy* (including, e.g., *Galaxy S8*, *Iphone 10*, *Huawei P3*, ...) would essentially mean the same thing as with *Art*, namely that mobile phones in general are banned on the factory site. However, when possible exceptions are considered, it might make sense to allow a particular kind, e.g., those without cameras, but it would not make sense to allow a *Galaxy S8* while banning an *Iphone 10* etc.

(32) (originally *Typ*)

Bei der Entscheidung, neue Windkraftanlagen zu bauen, steht der Referenzertrag der Anlage im Fokus.

- a. Das ist die für den jeweiligen *Typ* der Windkraftanlage spezifische Strommenge, die in fünf Betriebsjahren erbracht wird.
- b. Das ist die für die jeweilige *Art* der Windkraftanlage spezifische Strommenge, die in fünf Betriebsjahren erbracht wird.

'When deciding to build new wind power plants, the focus is on the plant's reference yield. This is the amount of electricity specific to each *Art/Typ* of wind power plant, which will be provided over five years of operation.'

Hörgerät

Surprisingly, there are a number of items showing a slight preference for *Art* even though the original was a *Typ* sentence. Examples are *Typ des Hörgeräts* 'hearing aid', *Typen von Persönlichkeitsstörungen* 'personality disorders', *Typ von Schlaganfall* 'stroke' and *Typ des Dokuments*. All of these terms are familiar in every-day language and, moreover, the items were presented in non-expert contexts, as in (33). These results support the tendency we saw above: in the case of every-day terms – speakers being familiar with their meaning and essential properties – *Art* is a good choice, and in a non-expert context may even be the preferred one.

(33) (originally *Typ*)

Menschen mit Hörgeräten können unter Umständen Störgeräusche wahrnehmen, wenn in deren Nähe schnurlose Geräte verwendet werden.

- a. Der Grad der Störung ist abhängig vom *Typ* des Hörgeräts und dem Abstand zur Störungsquelle.
- b. Der Grad der Störung ist abhängig von der *Art* des Hörgeräts und dem Abstand zur Störungsquelle.

'People with hearing aids may experience noise when cordless devices are used nearby. The degree of interference depends on the *Typ/Art* of hearing aid and the distance to the source of the interference.'

Vampir

The item in (34) is originally *Art*. The term *Vampir* 'vampire' belongs to every-day language, speakers of German are familiar with vampires and their essential properties, which would support classification by *Art*. The equal preference result may be explained by taking into account that the context is about the presentation of vampires in animated film which is an expert context, and the vampire at issue is an animation instead of a real one.

(34) (originally *Art*)

Michael hat mit seiner Freundin einen Animationsfilm über Vampire gesehen und freut sich über die Darstellung: "Sie sind robuster und haben einen netten Unterkiefer. Sowas habe ich echt noch nicht gesehen und es ist auch einfach zu genial, wie sich das Gesicht öffnet, eine Zunge hervorkommt und den Anderen aussaugt." ...

- a. "Ich finde diese neue *Art* von Vampiren wirklich äußerst gelungen."
- b. "Ich finde diesen neuen *Typ* von Vampiren wirklich äußerst gelungen."

'Michael saw an animated film about vampires and is pleased with the presentation: "They are more robust and have a nice jaw, something I've really never seen and it's just too awesome when the face opens, a tongue comes out and sucks the other. I really like this new *Art/Typ* of vampire.'"

Herrscher

Finally, the item in (35) is originally *Art*. Since the term *Herrscher* 'ruler' belongs to every-day language and the context is non-expert, the question arises why we don't find a clear preference for *Art*. A possible explanation is this: recall that *Typ* is not only preferred with technical items but also with persons (*Typ Lafontaine*). When choosing *Art*, the sentence is about classifying behavior – manner of ruling. When choosing *Typ* it is about classifying persons by prototypical rulers. But even though the ways of classification differ, the outcome will be the same – in the case of *Art* the president belongs to a class comprising rulers that came to power in a particular manner, namely in a coup d'état, whereas in the case of *Typ* the president belongs to a class of rulers matching a prototype who came to power in a coup d'état.

(35) originally *Art*)

Der damalige Präsident von Togo machte sich das Konzept der ethnischen Zugehörigkeit zunutze.

- a. Er war die *Art* Herrscher, die durch Staatsstreich an die Macht gekommen das Land mit Terror überzieht.
- b. Er war der *Typ* Herrscher, der durch Staatsstreich an die Macht gekommen das Land mit Terror überzieht.

'The then president of Togo took advantage of the concept of ethnicity. He was the *Art/Typ* of ruler who came to power in a coup d'état covering the country with terror.'

5 Kinds and types in semantics

As mentioned in the introduction, the research on *Art* and *Typ* described in this paper goes back to a talk arguing against the widely held supposition that kinds and types – more precisely: the notions of kinds and types employed in semantic theory – are roughly the same. But instead of investigating the theoretical status of these notions, this paper took an empirical perspective comparing the meaning, and in particular the classification potential, of the German taxonomic nouns *Art* and *Typ*. The question to what extent the findings in the paper match with the notions of *kind* and *type* in semantic theory will be addressed in this section.

Kinds

The notion of kinds as a theoretical notion in semantics is rooted in the philosophical notion of natural kinds (Putnam 1975) and plays a major role in the analysis of generic expressions, see Carlson (1980), Krifka et al. (1995). In English and German (and many other languages), kinds can be denoted by bare plurals. So the bare plural in (36a) refers to a plural individual of whales, while the same expression in (36b) refers to the kind *Cetacea*. The fact that kind-denoting terms must be distinguished from individual denoting terms is obvious in (36c): the predicate *be an endangered species* cannot be applied to a (plural) individual. This observation led to the idea that kinds are basic ontological entities, in addition to (regular) individuals. This step provides a straightforward interpretation of taxonomic phrases using *kind/Art*, as in (36d) or (36e).

- (36) a. There are whales to be seen.
 b. Whales are mammals.
 c. Whales are an endangered species.
 d. Die Art des Wals / The kind of whale is an endangered species.
 e. Zwei Unterarten des Wals, nämlich der Blauwal und der Finwal, wurden unter Artenschutz gestellt. / Two subkinds of whale, namely the blue whale and the fin whale were put under protection.

In philosophy as well as psychology there is a longstanding debate about the question whether kinds (or concepts)¹⁹ are associated with so-called essential properties. Recent research in the area of genericity shows that there are in fact particular properties associated with kinds. But these properties are not necessary but instead allow for exceptions. In Greenberg (2002) they are called "in virtue of" properties. For example, a dog is four-legged in virtue of being a dog, even though an accidentally three-legged dog still counts as a dog. Likewise, Prasada and Dillingham (2006) present a series of experiments showing that there are principled connections between kinds and properties – so-called *k-properties* – which differ from merely statistically correlated properties and nevertheless allow for exceptions. Carlson (2010) argues that Greenberg's "in virtue of" properties and Prasada & Dillingham's *k-properties* are in fact the same.

These properties play a core role in classification by *Art/kind* because entities have these properties simply because they are the kind of things they are. They are learned when learning the meaning of a word, that is, the kind or concept denoted by a word. Even if this is encyclopedic rather than core linguistic knowledge, it is something speakers of a language are in command of. This is why classification by *Art/kind* feels more colloquial.

The notion of kinds in semantics has meanwhile been subject to further specification. There are *well-established kinds*, which in English allow for singular definite generic expressions, compare *the Coke bottle* as opposed to **the green bottle*, see (Krifka 1995).²⁰ Rothstein (2013), furthermore, distinguishes *taxonomic kinds*, which are expressed by bare singulars in Hebrew, from general (intensional) kinds. She argues that, while intensional kinds are given by regularities across worlds, taxonomic kinds are particular individuals (and rigid designators in the sense of Kripke 1972).²¹

Another variety of kinds are those that are ad-hoc generated by the use of similarity demonstratives like German *so* and English *such / like this* (see Umbach & Gust 2014). Suppose, the speaker points to a table uttering the sentence in (37a). The nominal phrase *so ein Tisch* will then denote a set of tables similar to the one the speaker points to. This set of tables constitutes a kind ad-hoc created by similarity, which is evidenced by the fact that (37b) is equivalent to (37a).²²

- (37) a. So einen Tisch hat Berta auch.
 'Berta has a table like this, too.'
 b. Diese Art von Tisch hat Berta auch.
 'Berta has a table of this kind, too.'

¹⁹ I follow Carlson (2010) in assuming that kinds correspond to labeled concepts.

²⁰ From the point of view of this paper, *the Coke bottle* might be more of a type than a kind.

²¹ Hebrew bare singulars are primarily used to denote species and sub-species as well as "types of machines such as cellular phones, food processors and so on" (Rothstein 2013, p. 36). The latter characteristic is strongly reminiscent of types in the sense of this paper.

²² Kinds ad-hoc created by similarity are also observed with verbal expressions, but not with adjectives: *Diese Art zu laufen* 'this way of running' vs. ?? *Diese Art groß (zu) sein*. 'This kind of being tall'.

The core issue raised by similarity-based kinds is the question of which properties of the target of demonstration, i.e. the table the speaker points to in (37), are licit in determining similarity. Consider (38). In (38a), being a diesel as well as being a Japanese car leads to the interpretation that Berta has a Japanese car and a diesel, respectively. In (38b), however, being a new car does not qualify as a feature of comparison in determining similarity – the second sentence cannot be understood such that Berta has a new car.

(38) a. Anna fährt ein japanisches Auto / einen Diesel. Berta fährt auch so ein Auto
(nämlich ein japanisches Auto / einen Diesel).

'Anna drives a Japanese car / a diesel. Berta drives such a car, too (namely a Japanese car / a diesel).'

b. Anna fährt ein neues Auto. Berta fährt auch so ein Auto (*nämlich ein neues Auto).

'Anna drives a new car. Berta drives such a car, too (namely a new car).'

Umbach & Stolterfoht (in preparation) present a sequence of experimental studies testing these restrictions and argue that properties licit in kind-formation by similarity have to be "in-virtue-of" properties in the sense of Greenberg (2003) and Prasada & Dillingham (2006). Their findings confirm the idea that classes generated by similarity demonstratives²³ are in fact kinds, even if ad-hoc. Moreover, it is predicted that the expressions including *Art* phrases are subject to the same restrictions as found for similarity demonstratives, which appears plausible, see (39).

(39) Anna fährt ein japanisches / ein neues Auto. Berta fährt auch diese Art von Auto.
(nämlich japanische Autos / *nämlich neue Autos).

'Anna drives a Japanese car / a new car. Berta also drives this kind of car (namely Japanese cars / new cars).'

In contrast, it is predicted that expressions including *Typ* phrases should not be picked up by similarity demonstratives, which seems to be refuted by the fact that the *so*-phrase in (40) is fully acceptable. On a closer look, however, the *so*-phrase does not pick up the type Opel Corsa – Berta need not have the same type of car. Instead, it picks up Opel Corsa features in creating a kind (middle size, small motor, etc.). This is evidenced by the fact that the *Art* continuation but not the *Typ* continuation matches with the *so*-phrase.

(40) Anna fährt einen Opel (vom Typ) Corsa. Berta fährt auch so ein Auto.

(nämlich ein Auto in der Art des Opel Corsa / *ein Auto desselben Typs).

'Anna drives an Opel Corsa. Berta drives such a car, too (namely a car like the Opel Corsa / namely a car of the type of Opel Corsa).'

Types

Types play a major role in semantics as an instrument in the analysis. They provide a *regime* (Chatzikiyiakidi & Cooper 2018) to structure the universe and safeguard semantic representations. Their role as semantic objects depends on the respective semantic theory. Standard Montague-style semantics makes use of *simply typed λ -calculus* where types are built from two basic types e(ntities) and t(ruth values) and functions thereof, and guide the denotations of natural language expressions in

²³ when combined with nominal and verbal expressions, see previous footnote.

order to avoid inconsistencies. The other strand of semantic theory is oriented towards *constructive type theory* (Martin-Löf 1984). One of these systems is *Type Theory with Records* (Cooper & Ginzburg 2015, Cooper in preparation) where basic types can be freely chosen. In this system types may themselves serve as denotations of, e.g., nouns and verbs (for an overview see Chatzikyriakidi & Cooper 2018).

Setting formal issues of type theory aside, the notion of types in semantics goes back to Peirce's distinction between *type* and *token* (Peirce 1931). Following Peirce, types are abstract entities and tokens are particulars instantiating or exemplifying types. Even though the relation between a type and a token is similar to that between a set and an element, the perspective is reversed. While sets are meant to collect distinct objects into a single unit, types are meant to generate arbitrarily many clone-like tokens. This is why the classification capacity of a type is not determined by common origin or common characteristics but is instead rooted in the type itself – the prototype or model – independent of whatever tokens there are.

6 Conclusion and future prospects

We started out from the idea that the German taxonomic nouns *Art* and *Typ* denote two distinct ways of classification: Classification by *Art* makes use of essential properties shared by the instances of a kind while classification by *Typ* makes use of models or prototypes shaping the tokens of a type. Essential properties of a kind are associated with the meaning of the corresponding word and are thus part of what speakers learn when they learn a language. Models or prototypes, on the other hand, are specified by expert communities. They need not be familiar to non-expert speakers of a language. This idea has been stated in the *Art&Typ* hypothesis in the introduction.

Support for this idea was found in dictionaries (section two), by corpus data (section three) and by the results of an experimental study (section four). While the dictionary entries of *Art* highlight the sharing of essential properties, the entries of *Typ* point to the role of a model or prototype. From a diachronic point of view, *Art* and *Typ* notably differ in origin: While *Art* is connected to descent and inheritance, *Typ* is connected to coining and printing.

The corpus search showed that there are basically two forms of *Art/Typ* phrases such that the noun is either juxtaposed or embedded by a genitive or *von*-phrase. In the former, *Art* phrases preferably denote biological species whereas *Typ* phrases refer to technical devices, diseases or persons. In the latter, *Art* occurs with every-day domains as well as abstract entities while *Typ* still prefers technical issues and diseases.

The experimental study confirmed the division of domains between *Art* and *Typ* to some degree. But the core result were the equal preference items for which classification by *Art* is as acceptable as classification by *Typ* while showing subtle differences in meaning.

Languages other than German have not been taken into consideration in this paper. English *kind* vs. *type* appear close in meaning to *Art* and *Typ*, but they are not equivalent (to be observed in the translations of the examples). A hypothesis to be explored in future work would be that languages in general include taxonomic expressions denoting classification based on linguistic knowledge as opposed to classification by language independent expert knowledge.

The original concern of this paper was not the semantic difference between the expressions *Art* and *Typ* but rather the difference in the role of kinds and types in semantic theory. We came back to this questions only in the final section. The empirical results on the meaning of *Art* and *Typ*, even

though not decisive in theory formation, may at least provide some evidence against the idea that kinds and types are roughly the same.

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