

Designation modality and the disposition of artifacts¹

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Abstract. This article is about a modal construction of German that has hardly received any attention in the literature, and I link it to the philosophical notion of the disposition of artifacts. The name that I propose for this kind of modality is designation modality. It is instantiated by the sentence *Dieser Wein ist zur Begleitung des Käses* ‘This wine is meant to accompany the cheese.’ Being a subtype of goal-oriented modality, it features a theme or instrument oriented semantics specifying the use to which an artifact is put. A modal head underlying the preposition+determiner element *zu*+DET ‘to+DET’ combines the nominalized VoiceP in its complement with the external argument of the whole structure. To the best of my knowledge, this is the first proposal to trace the philosophical notion of the disposition of artifacts within a clearly delineated structure in natural language.

Keywords: designation modality, goal-oriented modality, disposition of artifacts, syntax-and-semantics.

1. Introduction

This article is about a curious oversight of modality research on German and, more generally, about putting a philosophical concept to use that, to the best of my knowledge, has not been considered in linguistics yet. Consider (1).

- (1) *Das Pulver ist zum Lösen schwerer Verschmutzungen in Töpfen.*^{2,3}
the powder is to.the solve of.heavy.staining in pots
‘The powder is meant to dissolve heavy staining in pots.’

(1) is about a product that was created to fulfill a certain function. (2) is a rather accurate paraphrase.

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³ There is another construction of German with the same overall make-up. An example is provided in (i).

- (i) *Dieser Film ist zum Weglaufen.*
this movie is to.the run.away
‘This movie is so bad that one wants to run away from it.’

Fortunately, it is easy to keep the two constructions apart. Structures as in (i) invariably involve an element of speaker-oriented evaluation. For this reason, (i) may be paraphrased as *Ich finde diesen Film zum Weglaufen* ‘I find this movie so bad that I want to run away from it’. This evaluative component is absent from the structure in (1) and, hence, it doesn’t allow for ‘I find...’ paraphrases. Thanks to Daniel Gutzmann and two anonymous reviewers for directing my attention to this *doppelgänger* construction.

- (2) *Mit diesem Pulver kann man schwere Verschmutzungen in Töpfen lösen.*
 with this powder can one heavy.staining in pots solve
 ‘One can dissolve heavy staining in pots with this powder.’

(2) features an existential circumstantial modal. Inasmuch as (2) involves modality, (1) does too. The difference between (1) and (2) lies in the fact that (1) explicitly entails that the powder was designed or designated to fulfill the given purpose.⁴ No such entailment holds for (2). This sentence could be uttered by someone who just found out by accident that the powder, which was designed to wash clothes, may be used to dissolve heavy stains in pots.

In terms of the morphology involved, (3) is similar to (1). And (3) is modal, too.

- (3) *Die schweren Verschmutzungen sind ab-zu-lösen.*
 the heavy.stainings are off-to-solve
 ‘The heavy staining is to be dissolved.’

The copula, *zu* and an infinitive interact, just as in (1). (3) has a deontic modal flavor (one must dissolve the staining). This kind of structure has not gone unnoticed in the grammar writing on German, and it is often called the “modal infinitive” (Gelhaus 1977, Bzdęga 1986, Pfeiffer 2002, Hansen 2009). English has similar constructions (*The book is to be read*), but the research on English has, over the past 20 years or so, concentrated on non-finite relative clause structures of this kind (Meier 2003 tackles *to*-infinitives in finite comparative structures, though). There is older work on infinitival clauses as the complement of *be*, though (Jones 1985, Jones 1991). *The wine is to complement the cheese* or *The wine is for complementing the cheese* (Jones 1991: 138, Bhatt 1999: 11) are English translational counterparts of our designation-modal structures. No attempt at a deeper analysis is made by Jones or Bhatt.

Structures as in (1) are extremely common in German, but I have not been able to find a single in-depth treatment of them in the literature. (Bayer & Brandner 2004 discuss dialectal data that sometimes belong within the array of our construction. Hole 2012, 2014 analyzes *zum*-nominalizations in the context of datives that are not subcategorized for. We will return to Hole’s analysis in section 6.) This article studies this structure, it devises a name for the kind of modality that it expresses—designation modality—and it connects this discussion to the philosophical concept of the disposition of artifacts, thereby enriching the inventory of dispositions that are taken from philosophy and inform linguistic analysis.

As is the norm with copula structures, designation modality of the ‘be-to’ kind has an adnominal counterpart; cf. (4).

- (4) *das* [_{NP} *Pulver zum Lösen schwerer Verschmutzungen in Töpfen*]
 the powder to.the solve of.heavy.staining in pots
 ‘the powder meant to dissolve heavy staining in pots’

⁴ Imagine someone finds out by accident about what the powder can do, even though it wasn’t designed for this. This person then comes to use the powder regularly for dissolving heavy stains in pots. Explaining this use to somebody else, the person may well say (1). Hence, designation instead of design is the more appropriate notion in our context.

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The analysis that I will propose for the designation-modal structure in (1) carries over to these cases if Predicate Modification (Higginbotham 1985, Heim & Kratzer 1998), or an intensional variant of it (Morzycki 2013), is allowed as a rule of composition.

Before we move on, we should ask ourselves where designation modality has its place in the taxonomy of modal flavors. Frequently assumed modal flavors in the circumstantial domain (Kratzer 1991) are deontic, bouletic and goal-oriented modality, as well as ability. (1) is certainly not deontic, as no obligation or allowance is involved. It is not bouletic, either, as it is not about wishes. (To be sure, artifacts are about wishes in a way, because one designates functions for things because one wishes to put them to some use, but I would argue that this relationship with wishes does not enter into the linguistic construal of (1).) Abilities are about inherent dispositions of living beings, including plants (*Sertab can sing*, *This plant can defend itself against natural enemies*; Bhatt 1999 and much subsequent work). Dispositions of artifacts are not usually called “abilities”, simply because we associate abilities with living beings. If that wasn’t the case, then designation modality might well be categorized as a subkind of abilities (*This washing machine can hold up to 6 kg of laundry*). Goal-oriented modality, lastly, is about rational agents pursuing a goal and about what they have to do to achieve it (von Stechow & Iatridou 2007). Designation modality is a variant of this. In the end, the detergent powder of (1) exists because rational agents want clean pots. However, use of artifacts with a designated function is just one way to pursue a goal. I conclude, then, that designation modality is a subkind of goal-oriented modality. What is criterial for it is that it centers around artifacts and their intended functions, and not so much around users of these artifacts. As such, designation modality resembles a “passivization” of goal-oriented modality. I will return to this characterization in the context of the implementation of sections 7 and 8.

The plan of the article is as follows. Section 2 identifies some general properties of designation modal structures of the ‘be-to’ kind. It does so by way of frequent comparison with deontic ‘be-to’ structures so as to highlight the differences between the two constructions. Section 3 deals with the negation of designation-modal structures, leading to the conclusion that the nominalized infinitive of designation modality must be capable of having a truth-value. Section 4 has as its topic the passive orientation of designation modality, something that will inform the compositional treatment of later sections. In section 5 I adopt and modify Cohen’s (2018) taxonomy of dispositions so as to allot designation modality a place in it. As we will see, we need to expand Cohen’s classification by one dimension, namely the one distinguishing inherent dispositions from dispositions by designation. Section 6 reviews what authors have said about *zum*-uses in similar contexts like the one we are looking at here. Section 7 presents the overall analysis, while section 8 delves deeper into the NP complement of the *zum*-PP. Section 9 concludes.

2. Two variants of German *ist-zu* ‘is-to’ constructions

Compare the two modalized sentences in (5).

- (5) a. *Der Schlüssel ist mit-zu-nehmen.* (deontic)
the key is with-to-take
‘The key is to be taken along.’

- b. *Der Schlüssel ist zum Mit-nehmen (gedacht).* (design)
 the key is to.the with-taking thought
 ‘The key is meant to be taken along.’

(5a) has a deontic modal flavor. It is an obligation to take the key along. It is construed as a ‘be-to’ modal construction, a bit as in English (Bhatt 1999), but without the passive morphology (with the complication of a separable verbal particle being involved in its overall construal in the example chosen). (5b) has a designation modality flavor, and it only has this flavor. The key is meant to be taken along. The syntactic construal of (5b) differs from (5a). In (5a), the particle and the infinitive have assembled around the modal particle *zu*. In (5b), the infinitive has been nominalized, and *zu* ‘to’ appears in its prepositional (and determined) form. Even though that is not the norm, each of the designation cases as in (5b) can be augmented by *gedacht* ‘thought, meant’, converting the sentence into a stative passive and rendering the PP a complement of *gedacht* ‘thought’ (the *meant*-construal in the English translation). I will develop a syntactic and semantic analysis of designation modality as in (5b) in sections 7 and 8. Suffice it here to say that the analysis will assume a dedicated designation modality head which denotes a variant of a universal quantifier over worlds (designation-ideal worlds of a specific kind).

Der Schlüssel ‘the key’ in (5b) corresponds to a theme of events of taking something along. However, instrument involvements occur just the same. Consider (6) for some instrument involvements, and (7) for more theme involvements.

(6) instrument of infinitival event

- a. *Der Schlüssel ist zum Aufschließen der Gartentür.*
 the key is to.the unlock of.the garden.gate
 ‘The key is for unlocking the garden gate.’
- b. *Der Becher ist zum Auffangen des Safts.*
 the cup is to.the collect of.the juice
 ‘The cup is for collecting the juice.’
- c. *Der Zusatz ist zur Stabilisierung der Schlagsahne.*
 the additive is to.the stabilization of.the whipped.cream
 ‘The additive is for stabilizing the whipped cream.’
- d. *Diese Einheit ist zum Ausspähen des Gegners.*
 this unit is to.the spy.out of.the enemy
 ‘This unit is for spying out the enemy.’

(7) theme of infinitival event

- a. *Diese Ecke ist zum Abreißen.*
 this corner is to.the tear.off
 ‘This corner is meant to be torn off.’
- b. *Die Rinde ist nicht zum Essen.*
 the rind is not to.the eat
 ‘The rind is not meant to be eaten.’
- c. *Diese Sorte Samen ist zum Überall-Aussähen.*
 this variety seeds is to.the everywhere-sow
 ‘This variety of seeds is meant to be sown anywhere.’

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Note that animate (group) referents are licit in the instrument cases as in (6d) as long as they form part of a larger design and may be rendered as an instrument PP in active sentences; compare (8a) and (8b).

- (8) a. *Diese Einheit späht den Feind aus.*
this unit spies the enemy out
'This unit spies out the enemy.'
- b. *Mit dieser Einheit spähen wir den Feind aus.*
with this unit spy we the enemy out
'We spy out the enemy with this unit.'

Hence, I take (8b), and not (8a), to be the structure most directly associated with the designation modality case of (6d). Note in passing that natural causes don't make for good subjects in designation modality 'be-to' constructions. This is shown by (9).

- (9) **Der Mistral ist zum Trocknen der Wurstwaren.*
the Mistral is to.the drying of.the sausages
int.: 'The Mistral is for drying the sausages.'

Other than theme and instrument involvements of subject referents with designation-modal structures in German, I have found a slightly colloquial or maybe even sloppy use of locatives in this construction. Consider (10).

- (10) a. *Kitzbühl ist zum Gesehen-werden.*
Kitzbühl is to.the seen-become
'Kitzbühl is for being seen there (i.e., people go to Kitzbühl to be seen there.)'
- b. *Die Nordsee ist zum Ausspannen.*
the North.Sea is to.the relaxing
'The North Sea is for relaxing (there).'

I will return to these locative cases in section 4 and once the final version of my proposal has been presented in section 8, but other than that I will not discuss them in what is to follow. Note that at least (10b) doesn't feature an artifact subject.

In sum, German has two different 'be-to' modal structures, one being deontic, and one being designation-modal. The designation-modal structure features instrument, theme, or locative subjects, where the deontic structure has theme subjects only. Designation Modality involves nominalized infinitives or other event nominalizations, whereas deontic 'be-to' structures have verbal infinitives.

3. Negation and designation vs. deontic modality

In the present section, we will look at designation modality and its interaction with negation. We will keep a close eye on analogous facts from deontic modality of the 'be-to' kind to have a standard of reference.

The negation of deontic structures of this kind is straightforward, as shown in (11).

- (11) a. *Der Schlüssel ist nicht mit-zu-nehmen.*
 the key is not with-to-take
 ‘The key is not to be taken along.’
 b. ... *dass der Schlüssel [nicht mit-zu-nehmen] ist.*
 that the key not with-to-take is
 ‘...that the key is not to be taken along.’
 c. *Nicht mitzunehmen ist nur der Schlüssel, nicht aber die Karte.*
 not with-to-take is only the key not but the card
 ‘Only the key is not to be taken along, not the card, though.’

The negator *nicht* appears in a position following the inflected verb in C⁰ and preceding the non-inflected verb form of main clauses (11a). Subordinate clauses, reflecting the basic word order of German, feature the inflected verb form in a clause-final right-headed T⁰ position, and *nicht* still precedes the non-inflected verb form and forms a constituent with it to the exclusion of the copula (11b). Proof of this comes from (11c), where the negator and the infinitive have moved to SpecC. This renders negation with deontic modality a standard case of sentential negation with the negator at the edge of, or not far to the left, of VoiceP (Zeijlstra 2004, Bross 2023).⁵

(12) presents two variants of negation for the designation case.

- (12) a. ... *dass der Schlüssel nicht zum Mit-nehmen ist, sondern...*
 that the key not to.the with-take is, but
 ‘... that the key is not meant to be taken along, but...’
 b. ... *dass der Schlüssel zum Nicht-Mit-nehmen ist.*
 that the key to.the not-with-take is
 ‘... that the key is meant to not be taken along/to be left here.’

In (12a), negation takes scope over the modal operator (NOT > MOD), and a certain use of the key is negated as the intended one. In (12b), negation takes scope underneath the modal operator, saying that the intended use of the key is to not be taken along, i.e. to be left in its place. Note the *sondern*-continuation of (12a). It is supposed to hint at the fact that we are dealing with contrastive sentence negation here, most likely with a focus on *Mitnehmen* in this case (Jacobs 1982, 1991, Bross 2023). The continuation could fill in *zum In-Reserve-Halten* ‘to keep in reserve’. Contrastive sentence negation is the typical result in German if negation immediately precedes a PP and forms a constituent with it. The special thing about such designation-modal structures is that the PP is, at the same time, the main predicate of the clause. (12b), on the other hand, has properties of canonical clausal negation, albeit with its scope confined to the nominalized *zum*-complement. This can be seen from the fact that its (broad) focus encompasses the negator, as is evidenced by the possible augmentation *zum Nicht-Mitnehmen und In-Reserve-Halten* ‘to not be taken along and to be kept in reserve’, where *In-Reserve-Halten* is the alternative to *Nicht-Mitnehmen*. The focus clearly encompasses the negation. The fact that the PP-internal negation is a PP-internal variant of standard negation means that the *zum*-PP must be capable of having a truth-value. In sum, where deontic ‘be-to’ modality has one form

⁵ Note that, following Kratzer (2005), I assume VoiceP and vP to be distinct projections. vP is headed by CAUSE predicates, and VoiceP is headed by the agent conjunct of event descriptions.

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of negation, designation modality of the ‘be-to’ kind has two, one contrastive, and one canonical (though PP-internal). The canonical negation negates the designation feature, turning the use expressed by the nominalization into its complement. The contrastive negation scopes above the designation modal and negates that the item at hand has the *zum*-PP-internal use.

Note by way of a side remark that the frequently favored or obligatory phrasal compounding in the *zum*-complement leads to clumsy compounds as soon as more than the infinitive and its particle enter into the compounding structure; cf. (12b). This clumsiness is remedied in cases in which event nominalizations other than the infinitive are chosen or, more importantly, if compounds are avoided and further argumental DPs or PPs are used instead; compare the variants in (13), where (13a) features a nominalized infinitive with two constructional options, and (13b) an *-ung*-nominalization which hardly has the compounding potential.

- (13) a. *Der Schlüssel ist zum {Im-Zimmer-}Aufbewahren {im Zimmer}.*
 the key is to.the in.the-room-keep in.the room
 ‘The key is meant to be kept in the room.’
- b. *Der Schlüssel ist zur Aufbewahrung im Zimmer.*
 the key is to.the keeping in.the room
 ‘The key is meant to be kept in the room.’

(14) presents parallel cases of PP-internal negation for the variant of designation modality involving instruments.

- (14) a. [?]**Die Ladespannungsbegrenzung ist zum Nicht-Überlasten des Akkus.*
 the charging.voltage.limit is to.the not-overload of.the battery
 ‘The charging voltage limit is there to not overload the battery.’
- b. [?]**Das Überlaufventil ist zum Nicht-Überfüllen des Beckens.*
 The overflow.valve is to.the not-overfill of.the basin
 ‘The overflow valve is there to keep the basin from getting overfilled.’

I hasten to add that these examples are very unnatural to the point of being almost ungrammatical. Periphrases of negation as in (14') are much better.

- (14') a. *Die Ladespannungsbegrenzung ist zur Vermeidung der Überlastung des Akkus.*
 the charging.voltage.limit is to.the prevention of.the overloading of.the battery
 ‘The charging voltage limit is there to prevent overloading of the battery.’
- b. *Das Überlaufventil ist zur Vermeidung eines Überfüllens des Beckens.*
 The overflow.valve is to.the prevention of.a overfilling of.the basin
 ‘The overflow valve is there to prevent the overflowing of the basin.’

I am not entirely sure why negation with instrumental designation modality is so bad. The effect may have something to do with the aversion towards phrasal compounding generally found with designation modality, but this cannot explain the whole effect, as the example in (12b) with its instance of theme-oriented designation modality is much better. Negation outside of the *zum*-PP again leads to contrastive negation; cf. (15).

- (15) *Der Zusatz ist nicht zum Haltbarmachen der Sahne, sondern zur Stabilisierung.*
 the additive is not to.the preservation of.the cream but to.the stabilization
 ‘The additive is not for the preservation of the cream, but for stabilizing it.’

In sum, the canonical negation of designation modality is PP-internal. PP-external negation at the level of the main predicate leads to contrastive negation, as the main predicate has the form of a PP. With deontic modality of the related constructional kind, only outer negation is available, and it behaves like standard negation.

4. The passive orientation of theme designation modality

Upon first sight, deontic modality and designation modality of the theme type don’t seem to differ much in terms of their theme orientation if ‘be-to’ structures are looked at. The parallels can be read off (16). (I am disregarding the designation variant with instrument subjects here, but I will return to it towards the end of the present section.)

- (16) a. *Die Ecke ist ab-zu-schneiden.* (deontic)
 the corner is off-to-cut
 ‘The corner is to be cut off.’
 b. *Die Ecke ist zum Ab-schneiden.* (design)
 the corner is to.the off-cut
 ‘The corner is meant to be cut off.’

What corresponds to the theme of the uninflected (16a) or nominalized (16b) verb becomes the subject of the ‘be-to’ construction of either flavor. However, if one tries to add the agent in a ‘by’-phrase as in (17), a difference surfaces.

- (17) a. *Die Ecke ist (durch den Benutzer) ab-zu-schneiden.* (deontic)
 the corner is by the user off-to-cut
 ‘The corner is to be cut off by the user.’
 b. *Die Ecke ist zum (*Durch-den-Benutzer-)Ab-schneiden.* (design)
 the corner is to.the by-the-user-off-cut
 int.: ‘The corner is meant to be cut off (by the user).’
 c. *Die Ecke ist zum Abschneiden (*durch den Benutzer).* (design)
 the corner is to.the off.cut by the user
 int.: ‘The corner is meant to be cut off (by the user).’

The deontic structure tolerates the agent in the ‘by’-phrase readily (17a), whereas the designation structure doesn’t tolerate it. The difference vanishes if *gedacht* ‘thought, meant’ is added (cf. (5b) above).

- (18) a. *Die Ecke ist zum ([?]Durch-den-Benutzer-)Ab-schneiden gedacht.*
 the corner is to.the by-the-user-off-cut thought
 int.: ‘The corner is meant to be cut off (by the user).’

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- b. *Die Ecke ist zum Abschneiden (durch den Benutzer) gedacht.*
 the corner is to.the off.cut by the user thought
 int.: ‘The corner is meant to be cut off (by the user).’

I take this difference between the structures with and without *gedacht* to mean that the construction without *gedacht* is not just an elliptical structure where *gedacht* can always be added. Both are constructions in their own right, where the structure without *gedacht* has slightly more rigid selectional restrictions than the structure with *gedacht*. It is certainly more averse towards integrating ‘by’-agents. As said above, I focus on the structure without *gedacht* in this article.

A different picture emerges if the creator or designer is to be integrated in a ‘by’-phrase.

- (19) *Die Ecke ist durch den Konstrukteur zum Abschneiden *(gedacht).*
 the corner is by the creator to.the off.cut thought
 ‘The corner is meant by the creator to be cut off.’

If the predicate *gedacht* is used, the creator ‘by’-phrase is licensed with designation ‘be-to’ structures. If it isn’t used the creator is not licensed. This is more evidence to the effect that the structures with and without *gedacht* differ, and it shows a complete aversion of the more coalesced designation modal structure towards creator or designator arguments.

(20) features another contrast between deontic and designation modality, and it highlights the stronger passive orientation of designation modality of the theme kind; cf. (20).

- (20) a. *Das {✓Mitnehmen/*Mitgenommenwerden} des Schlüssels ist eine Pflicht*
 the with.take/being.taken.with of.thekey is a duty
des Mieters.
 of.the tenant
 ‘Taking along the key is a duty of the tenant.’
- b. *Das {???Mitnehmen/✓Mitgenommenwerden} (des Schlüssels) ist ein Zweck*
 the with.take/being.taken.with of.thekey is a purpose
des Schlüssels.
 of.the key
 ‘The being-taken-along (of the key) is a purpose of the key.’

(20a), with its deontic content, only allows the active nominalization of the verb. The noun *Pflicht* ‘duty’ in the predicate nominal restricts the interpretation of the nominalization to the deontic case. (20b), with its designation content, strongly favors the passive nominalization of the verb form. Again the type of modality is restricted, this time to the designation kind, by *Zweck* ‘purpose’. What is more, the duty in (20a) is the duty of the agent, whereas the purpose in (20b) is the purpose that the theme referent is intended to be put to. In this sense, deontic modality expressed by way of ‘be-to’ structures is more agent-oriented, whereas designation modality of the theme type is more theme-oriented.

German doesn’t have instrument-to-subject or locative-to-subject raising (i.e., an instrumental or a locative passive; Levin 1993) in finite structures (Kamp & Roßdeutscher 1994). Consider (21) through (23).

- (21) a. *This flour bakes wonderful bread.* (Levin 1993)
 b. *This place has been dwelled in for thousands of years.*
- (22) a. * *Dieses Mehl backt wunderbares Brot.*
 int.: ‘This flour bakes wonderful bread.’
 b. *Mit diesem Mehl kann man wunderbares Brot backen.*
 ‘With this flour, one can bake wonderful bread.’
- (23) a. * *Dieser Ort wurde seit Jahrtausenden gesiedelt an.*
 int.: ‘This place has been dwelled at for thousands of years.’
 b. *An diesem Ort wird seit Jahrtausenden gesiedelt.* (impersonal passive)
 ‘At this place, people have settled for thousands of years.’

English has instrument and locational passives as in (21). German, as evinced by (22) and (23), has to resort to instrument and locative topicalizations to arrive at a similar effect. True instrument or locational passive subjects are out.

What we see now is that this restriction doesn’t hold generally—it is not present in the VoicePs of *zum*-PPs. This is a welcome result, as it renders two languages more similar that, upon first inspection and judging from what their overt alternations allow, appear to be different in this respect.⁶

Let us now turn to a classification of dispositions and the place that artifacts as occur in designation modal structures have in it.

5. Designation modality as a subkind of dispositions

Dispositions are a notion from philosophy that has received quite a bit of attention in linguistics over the past 20 years (cf., among many others, Lekakou 2004, Mari & Martin 2007, Pitteroff & Lekakou 2019, Pross 2020). Dispositions are about properties of referents that may or must become manifest if the right circumstances are given (Choi and Fara 2021). Flowers (must) blossom if temperature, humidity, light etc. are right, hence flowers have a disposition to blossom. Glass (must) break(s) if it is struck hard, hence it has the disposition of being fragile. The *if*-clauses of the aforementioned examples define the accessibility relations of the kinds of modality that dispositions instantiate (their restrictor), the blossoming and the breaking constitute their nuclear scope, where *may* and *must* correspond to the existential and universal quantifier over worlds that brings the restrictor and the nuclear scope together (Kratzer 1991). Some philosophers would call what I dub “the disposition of artifacts” a subkind of so-called “affordances”, relations between animals and their environments that instantiate certain uses of portions of their environments (Chemero 2003). I will model the disposition of artifacts with designation modality as a conditional relationship between designation-ideal worlds and the way things are put to use in them in section 7.

Cohen (2018) proposes what he dubs the “square of disposition”, thereby alluding to Aristotle’s square of opposition (the four main kinds of quantifiers such as ‘each’, ‘no’, ‘some’ and ‘not

⁶ I will leave for future studies the elucidation of the emergence of this restriction in German.

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all’, which are related to each other by inner or outer negation). Table 1 renders Cohen’s classification of dispositions (Cohen 2018: 16). It is a cross-classification of the features [\pm Causer] and [existential] vs. [universal] quantification over worlds.

	+Causer	–Causer
Existential	capability: <i>can</i>	passivity: <i>-able</i>
Universal	active disposition: <i>-er</i>	passive disposition: middles

Table 1: The square of disposition (Cohen 2018)

(24) provides one or several examples each.

- (24) a. capability
Sertab can/knows how to dance.
Hammers are good for driving nails into something.
- b. active disposition
Sertab is a dancer.
- c. passivity
washable, fragile
- d. passive disposition
The bread cuts easily.

“Capabilities” as in (24a) are the cover term for dispositions that characterize agents, instruments or causers like natural forces (summarized as [+Causer] in Table 1). Capabilities have existential force, which means that they may, but need not materialize if the right circumstances are given. If Sertab knows how to dance, then she still needn’t be dancing if the circumstances are right. Active dispositions are dispositions that define a [+Causer] participant by way of ascribing a certain defining property to the referent.⁷ Passivity (a term coined by Cohen; (24c)) is the kind of disposition that themes or patients have underneath the causal operator, a disposition that needn’t materialize. Washable clothes don’t need to be washed, and a recyclable bottle needn’t be recycled. The passive disposition of (24d) characterizes properties that materialize each time one acts upon a theme or patient. If the bread cuts easily, then it always cuts easily under normal circumstances.

Cohen’s terminology for the square of dispositions is not entirely fortunate, I think. [–CAUSER] is not the best cover term for what essentially boils down to themes. Agents, natural forces and instruments may be subsumed under the cover term [+CAUSER], but since we gave up [–CAUSER] a moment ago, we can just as well choose something else. I propose “(theta-roles) above CAUSE/v” instead of “[+CAUSER]” and “Themes” instead of

⁷ Cohen’s (2018) argumentation concerning the existential or universal force of dispositions is a bit blurry at times. For instance, Cohen (2018: 14) states explicitly that the disposition of *-er*-nominals sometimes has to be manifested (*saver of lives*), and sometimes needn’t (*lifesaver*). On the following page, he goes on state that “...*-er*-nominals [...] express active universal dispositions.” He arrives at that conclusion mainly by discussing the phrase *beautiful dancer*, to which he ascribes the interpretation ‘someone x such that if x dances... x does so beautifully (borrowed from von Stechow & Heim 1999). Note that the universal force ties together cases of dancing and doing so beautifully here, but doesn’t say anything about the universal manifestation of dancing in a referent.

“[–CAUSER]”. I’m a little wary of Cohen’s argumentation concerning existential and universal quantification (cf. fn. 7). This may be a matter to come back to later; at the present point, I will give up the existential/universal dimension in the classification. Instead I will introduce a new dimension that we need for the central topic of this article. The distinction between inherent dispositions and dispositions by designation. That flowers blossom given the right circumstances is an inherent disposition. That one best opens a beer can by lifting the ring on its top is due to a disposition of the beer can by designation or design. This gives us the updated square of disposition in Table 2.

	above CAUSE/v	Themes
inherent disposition	<i>Sertab can dance.</i> <i>Sertab is a dancer.</i>	<i>Flowers blossom.</i> <i>Glass is fragile.</i>
disposition by designation or design	<i>This unit is for spying out the enemy.</i> <i>Hammers are good for driving nails into things.</i>	<i>The corner of this packaging is meant to be cut off.</i> <i>This fabric is washable.</i>

German ‘be-to’+nominalization

Table 2: A new square of disposition

What unites the ‘inherent disposition’ row as a category is that no designator’s intention came up with these dispositions. Moving on to the designation row, the left cell assembles dispositions of entities involved in causing events. Designers of special organizational structures may devise a certain unit to spy out the enemy. Hammers are designed to be instrumental in driving nails into things. The right cell of the ‘disposition by designation or design’ row assembles dispositions that themes have as a result of a designator’s or designer’s intention. This is completely clear in the packaging case. It holds for the washability case if the washability is the result of a designer’s intention, but not if the fabric is washable just so. Now, the neat thing about the ‘disposition by designation’ row is that all the dispositions here may be expressed by German ‘be-to’+nominalization constructions as discussed in this contribution. This establishes this row of Table 2 as a natural class. This should come as no surprise, as the functional dispositions of artifacts constitute a standard type of dispositions in philosophy (cf. the overview in Preston 2020). I introduce them to linguistics here.

Here’s a last amendment to my proposal for a new version of the square of dispositions. For it to be of use for my description of designation modality, I need the distinction between artifact dispositions that are primary and others that are secondary. If a clothes designer designs a winter sweater keeping an eye on washability, it is possible to say (25a), but not (25b).⁸

- (25) a. *Dieser Pullover ist zum Warmhalten in Winter.*
 this sweater is to.the warm.keep in.the winter
 ‘This sweater is meant to keep you warm in winter.’

⁸ This characterization can be maintained even in view of the acceptability of (25b) in a context in which there are two piles of clothes, one meant to go to dry-cleaning, and the other one to the washing machine. In this case, the *ad-hoc* designation of the second pile is for the clothes to go into the washing machine.

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- b. # *Dieser Pullover ist zum Waschen.*
this sweater is to.the wash
‘This sweater is made for washing.’

The primary function of the particular sweater in question is to keep you warm in winter. It is not a primary function of any pullover to be washable, even though its washability may well be among the design intentions of its designer. Only the sweater’s primary function(s) can be encoded by the German ‘be-to’ construction, but not its secondary function(s), this is what the contrast in (25) leads me to conclude. (Preston’s 2020 proper functions in her take on artifacts correspond to my primary functions, whereas her system functions align with my secondary functions.)

6. The market on *zum*

Zum is the contracted form of the dative-governing preposition *zu* ‘to’ and the masculine or neuter dative singular form of the definite article *dem*. Hence its literal meaning is ‘to the’. Depending on the gender of the nominalization found in its NP complement in designation modality structures, one also finds the corresponding feminine form *zur*.

I am aware of two analyses of intensional *zum*-PPs in contexts other than designation modality. One is about structures as in (26) (Meier 2003), and the other one about structures as in (27) (Hole 2012, 2014).

(26) ‘too/enough’-comparatives

- Sertab ist alt genug zum Autofahren.*
Sertab is old enough to.the car.drive
‘Sertab is old enough to drive a car.’

(27) Datives that are not subcategorized-for

- a. *Paul strickt Sertab einen Pullover zum Anziehen im Winter.*
Paul knits Sertab.DAT a sweater to.the wear in winter
‘Paul is knitting Sertab a sweater to wear in winter.’
b. *Der Pullover ist Paul zu kratzig zum Anziehen.*
the sweater is Paul.DAT too scratchy to.the wear
‘Paul finds the sweater too scratchy to wear.’

Meier’s work on structures as in (26) is really on English. But as the set of infinitival clauses (like *to drive a car*) in the comparative structures under scrutiny naturally translate as *zum*-PPs in German, I take her analysis to carry over to German. Details left aside, Meier (2003: 87) assigns the denotation in (28) to *to drive a car* of and, by my transfer to German, to *zum Autofahren*.

- (28) $\llbracket \textit{zum Autofahren} \rrbracket^{w^*} = \lambda w. \text{ given what the law provides in the evaluation world } w^*, \text{ Sertab can drive a car in } w$

This is a predicate of worlds, and embedded in it we furthermore find ‘can’, a clearly intensional operator (Meier 2003: 83 assumes a standard existential analysis for *can*). *Sertab* appears in the denotation of (28), because *Sertab* binds a PRO at the left edge of the *zum*-PP of (26).

Hole’s (2012, 2014) analysis of *zum*-PPs as in (27) is partly derivative of his observation that German datives which are not subcategorized-for must bind a variable in their local domain. In the *zum*-cases as in (27) he makes out this variable at the left edge of the *zum*-PPs, and its value is the “owner” of a purpose predicate (the one who pursues a goal). His proposal is not fully worked out and also problematic in its details, but the λ -term in (29) appears to do justice to his analytical intention.⁹

(29) $\llbracket \textit{zum Anziehen im Winter (27a)} \rrbracket^{w*} = \lambda x. \lambda e. e \text{ can fulfill Sertab's purpose}_{w*} \text{ of wearing } x \text{ in winter}$

The important thing about this denotation is that it contains the predicate ‘purpose’, again a clearly intensional notion. On top of that it has an existential modal, thereby displaying a parallel to Meier’s *zum*-phrases. Generalizing over Meier’s and Hole’s analyses, *zum*-PPs serve to tie certain intensional additions to the truth-conditions of sentences, and these intensional additions are anchored in one or several of the local clauses’ arguments (i.e., these arguments bind an argument of the intensional predicate at hand).

In sum, Meier (2003) resorts to rather unspecific possibilities in *zum*-PPs with *zu* ‘too’ and *genug* ‘enough’. Hole (2014) assumes the more specific possible pursuit of goals in the denotations of *zum*-PPs co-occurring with datives that are not subcategorized for. We characterized designation modality as a subkind of goal-oriented modality earlier, so I’ll side with Hole’s (2014) general intuition involving purposiveness in *zum*.

7. The syntax-and-semantics of designation modality in German (first take: variable-free style)

In this section, I will develop a first (variable-free; Jacobson 1999) take on the syntax-and-semantics of designation modality of the ‘be-to’ type.¹⁰ It probably gets most of the semantics right, but, as we will see in section 8, it needs to be worked out in its details within the NP complement.

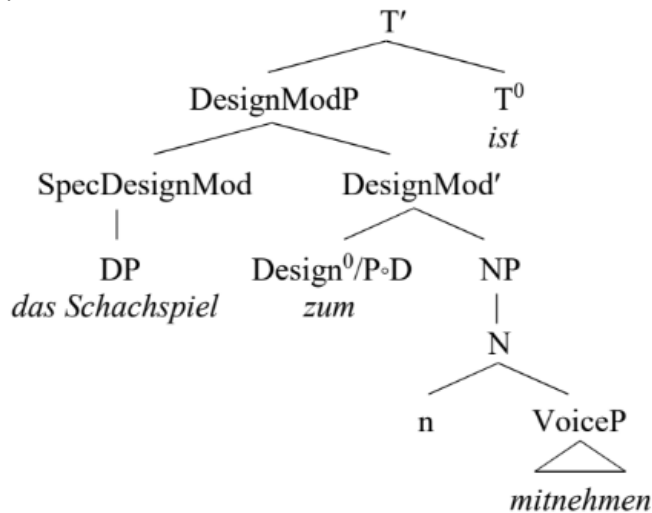
Consider (30).

(30) a. ... *dass das Schachspiel zum Mitnehmen ist.*
 that the chess.set to.the take.along is
 ‘...that the chess set is meant to be taken along.’

⁹ Hole (2015: 180) assumes *zum*-PPs as in (27) to be predicates of events and fails to model the reference to the pullover in the *zum*-PPs. I present a reconstruction of his analytical intentions here.

¹⁰ Note that “variable-free” in the sense of Jacobson (1999) means ‘interpretation without indices or assignments’ in the input, not ‘interpretation without λ -bound variables’.

b.



Zum is the designation modality head. It amalgamates the preposition *zu* ‘to’ with the determiner, and it selects an NP complement and a DP in its specifier. The DP eventually moves up to SpecT. *Mitnehmen* in the complement of *zum* must at least be a VoiceP, because it can be negated (cf. section 3). Little *n* nominalizes the VoiceP. Probably this overall syntax is uncontroversial, with different treatments conceivable for the P–D head or the nominalization trigger. A very interesting alternative to the P–D analysis comes from Postma (2014). Investigating Brazilian Pomeranian (West-Germanic), he proposes that *taum* ‘for.to’ in that language, with identical function with German *zum*, is really an amalgam of the non-finite complementizer *um* and the T-level infinitival marker. However, German clearly has a dative-marked nominalization here (where the dative is required by *zu* ‘to’), rendering the *zu + um* analysis rather unlikely.

With our purpose-oriented modeling goal from the previous section in mind, one could propose something as in (31) as the denotation of *zum Mitnehmen*.

$$(31) \llbracket \textit{zum Mitnehmen} \rrbracket^{w*} = \lambda x. \forall e [e \text{ instantiates } x\text{'s designated purpose}_{w*} \rightarrow \exists y [y \text{ takes } x \text{ along}(e)]]$$

With the chess set filled in, we would arrive at the preliminary denotation in (32) for the complete DesignModP.

$$(32) \llbracket \text{DesignModP of (30b)} \rrbracket^{w*} = \forall e [e \text{ instantiates the chess set's designated purpose}_{w*} \rightarrow \exists y [y \text{ takes } x \text{ along}(e)]]$$

This makes for an intuitively good denotation, I would say. However, in what sense is it modal? I would like to propose that we can break the instantiation of purposes down as in (33).¹¹

$$(33) \llbracket \text{DesignModP of (30b)} \rrbracket^{w*} = \forall e \forall w [w \text{ is designation-ideal}_{w*} \text{ with respect to the chess set} \\ \& e \text{ has the chess set as a part in } w \rightarrow \exists y [y \text{ takes the chess} \\ \text{set along}(e)(w)]]$$

In (33), the instantiation of a purpose has been restated as something that must hold in all designation-ideal worlds as defined in the evaluation world w^* . The antecedent of the implication in the truth-conditions thus has the standard format of making reference to an ordering source (Kratzer 1991). This may now be teased apart in the standard way so as to have *zum* denote the quantifiers with their restrictions, and the NP – the consequent, with the subject DP being filled in last; cf. (34).

$$(34) \text{ a. } \llbracket \text{zum} \rrbracket^{w*} = \\ \lambda f_{\langle s, \langle e, \langle s, t \rangle \rangle} . \lambda x . \forall e \forall w [w \text{ is designation-ideal}_{w*} \text{ with respect to } x \& e \text{ has } x \text{ as a part in} \\ w \rightarrow f(w)(x)(e)] \\ \text{ b. } \llbracket \text{Mitnehmen} \rrbracket^v = \\ \lambda w . \lambda z . \lambda e . \exists u [u \text{ takes } z \text{ along}(e)(w)]$$

This will do the trick. However, the type of $\llbracket \text{Mitnehmen} \rrbracket$ in (34b) is unusual. It has the look of an intensional passivized verbal entry with its agent variable existentially bound and the theme argument still unsaturated. In the next section, I will shed some light on this situation and render it compatible with standard syntax assumptions.

8. Decomposing the NP complement

Recall the denotation that we assumed for *Mitnehmen* ‘taking along’. I repeat it in (35).

$$(35) \llbracket \text{Mitnehmen} \rrbracket^v = \lambda w . \lambda z . \lambda e . \exists u [u \text{ takes } z \text{ along}(e)(w)]$$

Undoing intensionalization, we arrive at (36).

$$(36) \llbracket \text{Mitnehmen} \rrbracket = \lambda z . \lambda e . \exists u [u \text{ takes } z \text{ along}(e)]$$

That is the denotation of a passivized VoiceP, with the theme argument still unsaturated. A syntax that gives us this is provided in (37).

$$(37) [\text{PRO}_i [\text{VoicePPASS} \dots t_i \dots]]$$

The PRO object has moved to the periphery of the passivized VoiceP. There it functions as a λ -abstractor (Landau 2015), yielding a function of type $\langle e, \langle s, t \rangle \rangle$, as needed. Instrument-oriented nominalizations may be treated analogously such that PRO originates as an instrumental DP

¹¹ To maintain perspicuity, I refrain from introducing counterparts in the main text. If necessary, one may replace *the chess set* in (33) by *the counterpart of the chess set in w*, or “C(chess set)(w).”

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and moves up just like the PRO in (37). I take this architecture to properly reflect the passive-like properties of the nominalizations found in designation-modal structures.

There remains the question of negation within the nominalization, as in (38) (=12b)).

- (38) ... *dass der Schlüssel zum Nicht-Mit-nehmen ist.*
that the key to.the not-with-take is
'... that the key is meant to not be taken along/to be left here.'

This negation cannot be modeled in the most standard way, namely as a negated existential quantifier binding the event variable (Acquaviva 1997, Giannakidou 1999, Zeijlstra 2004). The reason for this is that the event variable needs to stay available for composition higher up, namely to get bound by the universal quantifier in the denotation of *zum* (cf. (34a)). For this reason I assume a rather old-fashioned operator that maps the denotation of the VoiceP to its complement.

Higher negation, typically resulting in contrastive sentence negation, is easily introduced by way of negating the existential quantifier in the consequent of (33), repeated here as (39).

- (39) $\llbracket \text{DesignModP of (30b)} \rrbracket^* = \forall e \forall w [w \text{ is designation-ideal}_{w^*} \text{ with respect to the chess set} \\ \& e \text{ has the chess set as a part in } w \rightarrow \exists y [y \text{ takes the chess} \\ \text{set along}(e)(w)]]$

This concludes my proposal for designation-modal 'be-to' structures in German.

9. Conclusion

In the present article, I focused on a modal construction of German which had virtually gone unnoticed before. I came to characterize this construction as a theme or instrument-centered "passivized" version of goal-oriented modality. Specifically, this type of modality is not so much about agents pursuing goals, but about instruments and themes being used according to their designated purposes. I proposed an implementation with a universal quantifier over worlds which ties together designation-ideal worlds with the way things are put to use in them. Lastly, I identified the disposition of artifacts, maybe a subkind of affordances, as the philosophical counterpart of this kind of modality, thereby bringing together discussions from philosophy and linguistics.

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