

## Debunking some myths about the role and relevance of (restricted) semantic role sets: Some thoughts on Ágel & Höllein 2021

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### *Abstract*

Addressing Ágel and Höllein's (2021) adaptation of a "significant-semantic theory" of semantic roles, this paper discusses whether a specific restricted list of semantic roles is useful to model so-called "Satzbauplanzeichen" ('clause pattern signs'). We show that Ágel and Höllein's approach faces a number of problems and argue that a much more open list of semantic roles is necessary to identify "Satzbauplanzeichen" and to capture semantic constraints at work.

### 1. Introduction<sup>1</sup>

This paper discusses Ágel and Höllein's (2021) proposals regarding the status of semantic roles as well as their relevance for the syntax-semantics interface in German. On their view, a specific restricted list of semantic roles can be used to model the meaning side of complex linguistic signs, so-called "Satzbauplanzeichen" ('clause pattern signs', lit. 'signs of sentence-building plans', a type of complex linguistic sign), which are assumed to be completely abstract signs that do not contain any concrete phonological or morphological material (Ágel and Höllein 2021: 125). Ágel and Höllein (henceforth Á&H) base their proposals on applying insights from Ágel's (2017) *Grammatische Textanalyse* to the analysis of an article from the German newspaper *Die Zeit*.<sup>2</sup> This leads the authors to propose a restricted set of semantic roles as well as a specific list of "Satzbaupläne" ('sentence-building plans'). In modeling *sentence-building plans*, Á&H follow in part the format proposed by Duden (2016: 927-951). Table 1 shows how Á&H model *sentence-building plans*, such as the German double object construction in terms of a predicate with three arguments ("Ergänzungen") and three semantic roles.

In Á&H's approach, the *sentence-building plan* representing the German double object construction is represented in terms of a basic semantic structure ("semantische Grundstruktur") consisting of a semantic predicate ("semantisches Prädikat") as well as significant semantic roles ("signifikativ-semantische Rollen"), which are represented in small caps (see Á&H 2021: 135, fn.12). In this model, grammatical information, such as *Dativobjekt* (indirect object) can be identified with semantic information ("semantische Werte") such as HANDLUNGSBETROFFENER ('PATIENT') (see Á&H 2021: 125).

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<sup>2</sup> Nicola Meier "Vorsicht Brennpunkt!", published in the weekly newspaper "Die Zeit" on August 10, 2013.

[Subjekt] (subject)	+	Prädikat (predicate)	+	[Dativobjekt] (dative object)	+	[Akkusativobjekt] (accusative object)
HANDLUNGS-TRÄGER (AGENT OF ACTION)	+			HANDLUNGSBETROFFENER (PATIENT OF ACTION)	+	HANDLUNGSGEGENSTAND (OBJECT OF ACTION)
[Der Junge]		<i>schenkte</i>		[seiner Mutter]		[Rosen]
[Der Friseur]		<i>färbt</i>		[der Kundin]		[die Haare] <i>blond</i> <sup>3</sup>

**Table 1.** Representation of the German double object construction (Á&H 2021: 239)<sup>4</sup>

According to Á&H, their text-based syntactic analysis overcomes issues of other approaches, because it relies on a “signifikative Semantiktheorie” (‘significant semantic theory’), which is based on “language-specific linguistic structures and meanings, which are models, but certainly cannot be extended and modified arbitrarily” (Á&H 2021: 243).<sup>5</sup> They claim that their model has advantages over other approaches, notably what they call the “denotative Semantiktheorie” (‘denotative semantic theory’, Á&H 2021: 242) as first proposed by Fillmore (1968), in that it employs a restricted set of semantic roles for modeling “a stricter - since clearly empirically proven - notion of signs for basic structures as complex grammatical-semantic sign schemas”<sup>6</sup> (2021: 135).

In our view, Á&H’s model is problematic for a number of reasons that we discuss below. In Section 2 we first summarize Á&H’s view of semantic roles. In Section 3 we argue that Á&H have an outdated and incorrect view of the role played by semantic roles in approaches other than their own. Of particular interest in this context is how the conception of semantic roles has changed in the research of Charles Fillmore from the 1960s to the 2000s. In Section 4 we show how a much more open set of semantic roles has been used over the past two decades to analyze and structure the English lexicon in the context of the FrameNet project. Section 5 discusses relevant issues regarding empirical methodology and the use of corpus data. Section 6 concludes by summarizing our discussion and pointing to future research issues in the domain of recent construction-building efforts.

## 2. Á&H’s (2021) view of semantic role sets

<sup>3</sup> Note that Á&H analyze *blond färben* (‘dye blond’) as a complex predicate and not as an instance of a resultative construction.

<sup>4</sup> Following usual conventions, we henceforth use small caps for marking semantic roles.

<sup>5</sup> “[...] einzelsprachliche[n] Strukturen und Bedeutungen, die zwar Modelle sind, aber gewiss nicht beliebig erweitert und modifiziert werden können”.

<sup>6</sup> “[...] strengeren, da empirisch zweifelsfrei nachweisbaren Zeichenbegriff für Grundstrukturen als komplexe grammatisch-semantische Zeichenschemata”.

Á&H claim that there are two different semantic approaches, namely (1) the so-called “denotativ-semantische Mainstream-Modell semantischer Rollen” (‘denotative-semantic mainstream model’) and (2) the “signifikativ-semantische Modell” (‘significative-semantic model’). Á&H, who subscribe to the second approach, criticize adherents of the first approach for having given up on a restricted set of semantic roles in favor of an open set of semantic roles. In their view, opening up the restricted set of semantic roles is theoretically problematic, because this means giving up on analyzing syntactic structures with a fixed set of semantic roles (Á&H 2021: 127, fn 4). Thus, Á&H strongly support a restricted set of semantic roles. Furthermore, Á&H criticize the first approach from the perspective of the second approach and claim the following: “To put it bluntly, denotative semantics from a significative-semantic perspective is not semantics at all, but non-linguistic general knowledge.” (Á&H 2021: 129)<sup>7</sup>

In our view, Á&H’s (2021) critique of what they call the denotative-semantic model is problematic for at least three reasons. First, arguing from a presumably structuralist point of view, Á&H assume a clear-cut delimitation of ‘linguistic’ and ‘non-linguistic’ knowledge. However, such a distinction turns out to be highly problematic for both theoretical and empirical reasons (for an extensive discussion see Boas 2013, Ziem 2014a: 99-146). Particularly, it remains opaque what semantics is all about if “general knowledge” is ignored entirely.<sup>8</sup> Unlike Á&H, following a reviewer’s suggestion, we subscribe to what could be called “epistemological realism”. In this view, semantics is inherently tied to our experiential contact with the (social, perceptible...) world. As a result, semantic categories are organized according to prototypes with overlapping structures rather than as distinct entities with necessary and sufficient properties.

Second, Á&H appear to have artificially established two different main views of semantics, but this characterization is misguided. In discussing how adherents of the so-called denotative-semantic model are thought to conduct their analyses with a to date unrestricted set of semantic roles, Á&H appear to have understood the researchers who do not share their (Á&H’s) own model to belong to a coherent group sharing a common set of theoretical insights. More specifically, Á&H discuss several authors they think to belong to a coherent group of researchers subscribing to what Á&H label the denotative-semantic model (cf. 2021, 127-131): Dowty (1991), Primus (1999/2004), Fillmore (2006), Levin & Rappaport Hovav (2005), Ziem & Lasch (2013), and Löbner (2018).

In discussing each of these authors, Á&H briefly summarize some relevant aspects of the individual proposals and then evaluate them vis-a-vis Á&H’s stated goal to have a restricted set of semantic roles, as originally proposed by Fillmore (1968). As expected, each of the analyses thought to belong to the so-called denotative-semantic model falls short of Á&H’s expectations, because they explore alternatives to a severely restricted set of semantic roles. One may agree or disagree on Á&H’s individual critiques of the different authors; however, one of the problems of Á&H’s approach is, in our opinion, to lump all the different proposals together, thereby giving the impression that the proponents of these different proposals share the same view(s).

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<sup>7</sup> “Überspitzt formuliert ist die denotative Semantik aus signifikativ-semantischer Perspektive überhaupt keine Semantik, sondern eine nicht sprachwissenschaftliche Sachkunde.”

<sup>8</sup> This important observation goes back to a reviewer’s comment for which we are grateful.

But this is not the case. While Á&H are correct in that they all conduct research on semantic roles, they miss the fact that the different researchers differ significantly in their proposals about the nature and number of semantic roles (for an overview, see Levin & Rappaport Hovav 2005). Lumping all proposals together in one group creates the misconception that their proponents all share the same view and loses sight of the important differences between them regarding methodology, analytical toolset, and overall theoretical framework.

The third and more severe problem with Á&H's critique of what they call the denotative-semantic model concerns their misinterpretation and misrepresentation of the work of Charles Fillmore, whose views about the nature of semantic roles changed quite drastically over the span of four decades. Throughout their paper, Á&H endorse a restricted set of semantic roles similar to what was first proposed by Fillmore (1968). In Section 4.2, Á&H then present what they claim is the list of denotative-semantic roles according to Fillmore (2003a), consisting of AGENT, INSTRUMENT, STIMULUS, PATIENT, THEME, and EXPERIENCER. They also point out that they chose Fillmore (2003a), because "first, his publication is newer, second, his approach is not only the prototype but still a point of reference for research" (Á&H 2021: 144).<sup>9</sup>

Identifying the list of restricted semantic roles with Fillmore (2003a) ignores two important facts. First, Fillmore (2003a) does not actually represent the then-current view of Fillmore himself regarding semantic roles (for an extensive overview cf. Ziem 2014b). In fact, there are several publications by Fillmore in the same year (and all the way up until 2014) not mentioned by Á&H. These clearly show that Fillmore's views had evolved since the 1960s and that there is a significant departure from what Á&H think is one of the more recent views of Fillmore on the question of how restricted semantic role sets should be.<sup>10</sup> In fact, Fillmore (2003a) is a review article summarizing the main ideas of Fillmore's (1968) original paper on case frames (and semantic roles). It is *not* meant to be representative of Fillmore's thinking regarding semantic role sets at the beginning of the 21st century. As we will discuss below, Fillmore's original conception of semantic roles was shown to have serious problems, which led him to abandon this original proposal and to explore in a series of publications throughout the 1970s and 1980s alternative ways of characterizing linguistic meaning(s).

Second, and perhaps more importantly, Á&H appear to ignore (for the most part) Fillmore's much more recent work on Frame Semantics (Fillmore 1982, 1985), which forms the basis of the FrameNet project, in which Fillmore and his team used semantic frames for structuring the lexicon of English.<sup>11</sup> The results of this research on applied Frame Semantics are published widely (e.g. Fillmore & Atkins 2000, Atkins et al. 2003, Fillmore et al. 2003a, Fillmore & Baker 2010, Fillmore 2012, Boas 2017; for an overview in German: Busse 2012: 23-250, Boas 2013, Ziem 2020a/2014a/2014b, Willich 2022: chapter 2), but are not mentioned

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<sup>9</sup> "[W]ir haben uns für Fillmore entschieden, da seine Publikation erstens neuer ist, zweitens sein Ansatz nicht nur der Prototyp, sondern nach wie vor Orientierungspunkt für die Forschung ist."

<sup>10</sup> See, e.g. Fillmore (2003b), Fillmore (2003c), Fillmore et al. (2003a), and Fillmore et al. (2003b).

<sup>11</sup> It is not clear why Á&H do not take into account Fillmore's research on Frame Semantics. In footnote 4 on p. 127 they mention Fillmore's (2006) paper on Frame Semantics, but Á&H do not incorporate it in their discussion of Fillmore's research.

by Á&H. In addition, based on Berkeley FrameNet frames, a German FrameNet and constructicon is currently being developed at the University of Düsseldorf, which incorporates annotated data from the SALSA project as well as the E-VALBU project.<sup>12</sup>

To sum up, our main point is that Fillmore's research since the 1970s is a drastic departure from his (1968) proposals and that Á&H do not mention this important line of research. By associating a limited set of semantic roles with the designation "Fillmore (2003)", they mis-characterize Fillmore's much more recent significant achievements and also his more insightful empirical research since the 1970s. Since there appear to be a number of misconceptions about the types of concepts shared by researchers focusing on opening up restricted sets of semantic roles, we now turn to a brief summary of Fillmore's (1968) approach, then we trace the development of Fillmore's changing views regarding the nature (and number) of semantic roles.

### 3. Fillmore's evolving views on semantic roles

Over the past five decades, researchers interested in the syntax-semantic interface have made various proposals regarding the nature of semantic roles and their syntactic relevance. One of the earliest and perhaps most influential accounts is Fillmore (1968), which proposes a set of so-called case frames, which specify a verb's semantic valency (for a related proposal, see Gruber 1965). On this view, a limited amount of semantic roles (also known as deep cases) such as AGENTIVE, INSTRUMENTAL, LOCATIVE, and OBJECTIVE, organized in a specific hierarchy for realizing grammatical functions, were used to account for the syntactic distribution of verbs. Fillmore's (1968) approach differed from prior proposals in that it aimed to arrive at only a limited set of semantic roles used for the identification of a verb's arguments. On this view, semantic roles can be characterized independently of verb meaning and each semantic role can be realized by only one argument.

While Fillmore's (1968) approach was initially considered groundbreaking, further research revealed a number of issues that led to its eventual abandonment during the 1970s. Some of the problems with Fillmore's original approach were a lack of clear tests to systematically determine semantic roles, the question of how one could determine the granularity of semantic roles, and the lack of a clear one-to-one correspondence between syntactic arguments and semantic roles (see Nilsen 1972, Levin & Rappaport Hovav 2005, Boas & Dux 2017, Ziem 2014a: 267-272).

The problems underlying restricted sets of semantic roles and the insight that the many different facts of verb meanings could not be captured with a limited inventory of semantic roles led Fillmore to explore new ways of analyzing meaning in the 1970s. In a series of publications, Fillmore pointed out some of the problems of his original 1968 proposals and gave his readers a

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<sup>12</sup> Cf. [www.german-framenet.de/](http://www.german-framenet.de/); for more details about E-VALBU and SALSA see <https://grammis.ids-mannheim.de/verbvalenz> and <https://www.coli.uni-saarland.de/projects/salsa/>; last access: January 2, 2022.

glimpse of an alternative view of how meaning could be analyzed. To illustrate, consider Fillmore's (1977a) thoughts about his dissatisfaction with case grammar:

In recent years I have not had much to say about my proposals on case grammar or about the many extensions, improvements, and corrections of it that have been proposed. (...) My own silence on the subject may have been taken, I fear, as an embarrassed withdrawal. (...) Actually, the reason that I have pulled back is the same as the reason I get dissatisfied with a filing system for my notes when I suddenly become aware that the box labeled "MISCELLANEOUS" contains more than all the rest. There were just too many things I could not account for. (Fillmore 1977a: 60)

Fillmore's critical assessment demonstrates his keen insight regarding one of the key problems of case grammar: To analyze more than a few example sentences required an ever-growing inventory of exceptions to his restricted set of semantic roles (and case frames). This insight led him to explore the possibility of expanding the role of cases in a theory of grammar.

I will instead propose a new interpretation of the role of cases in a theory of grammar and a new method of investigating the question of their number and identity. I consider this new interpretation as a position in the theory of grammatical relations and as a position in semantic theory with which one could associate this slogan: *Meanings are relativized to scenes*. (Fillmore 1977b: 177)

Fillmore's willingness to consider the possibility that meanings are relativized to scenes already foreshadows one of the key ideas of his theory of Frame Semantics (Fillmore 1982/1985), namely that there are potentially as many different meanings available as there are scenes. Fillmore (2006) describes the evolution of his 1968 case frames into semantic frames as follows:

The case frames started out as clusters of participant roles using, initially, names from an assumed universally valid finite inventory of such roles and it was thought that any verbal meaning could be seen as using some collection of these. The frames of current frame semantics, in contrast, are described in terms of characteristics of the situation types themselves, including whatever could be said about the background and other associations of such situations. (Fillmore 2006: 616)

Contrary to what Á&H claim about Fillmore's (2003a) opinion about semantic role sets, this quote from Fillmore (2006) clearly shows that his newer thinking has evolved significantly since the 1960s. In tracing the evolution of Fillmore's thoughts about meaning throughout more than four decades, one can also observe the emergence of semantic frames as the central elements of a theory of meaning. In other words, instead of analyzing meaning in a top-down fashion by assuming first a universal (and restricted) set of semantic roles, Fillmore decided to focus on each semantic frame by itself, describing and analyzing meaning frame by frame (bottom-up), as the following quote illustrates.

Instead of defining frames in terms of assemblies of roles, what about making frames primary, and defining roles in terms of the frames? I then started thinking that the job of lexical semantics is to characterize frames on their own, and work out the participant structures frame by frame. (Fillmore 2012: 711)

The main idea of Fillmore's conception of Frame Semantics (Fillmore 1982/1985) is that word meanings are described in relation to semantic frames (and not in relation to restricted sets of semantic roles), that is "schematic representations of the conceptual structures and patterns of beliefs, practices, institutions, images, etc. that provide a foundation for meaningful interaction in a given speech community" (Fillmore et al. 2003c: 235). On this view, the primary unit of analysis at the word level is the lexical unit (LU) (Cruse 1986), that is, a pairing of a word and its meaning (sense). Each sense is thus described with respect to the semantic frame that it evokes (for details, see Petruck 1996, Fillmore & Baker 2010, and Boas 2017/2021; for an overview cf. Busse 2012: 132-209, Ziem 2020a). In this view, a semantic role is defined as an abstract meaning, or more broadly, function generalized across instances of the (valence) slot addressed. Importantly, in frame semantics, each semantic role is defined in recourse to the specific frame evoked.

In Fillmore/Lee-Goldman/Rhodes (2012) the very idea that semantic roles can only be adequately defined in relation to a target structure (in the case of lexical items, for example, to their valence patterns and the frame motivating these patterns) is generalized to grammatical constructions. Thus, construction elements, the building blocks of constructions, are semantic roles determined by their functions within the target construction, respectively their semantic contribution to the overall meaning of the construction (Lee-Goldman & Petruck 2018, Ziem & Boas 2017, Boas & Ziem 2018, Ziem 2020b). To start from a limited set of semantic roles would make it impossible to account for the specific meaning of the target construction (as distinct from other constructions). This has far-reaching consequences for semantically adequate descriptions of *Satzbaupläne*. Due to space limitation, we cannot go into details here (but cf. Boas & Ziem in prep.). We now turn to a discussion of the application and implementation of the main ideas of Frame Semantics to FrameNet, a corpus-based lexicographic database of English. We restrict ourselves to valency-bearing lexical units.

#### **4. Semantic roles in Frame Semantics and in FrameNet**

Based on Fillmore's (1982, 1985) theory of Frame Semantics, Fillmore & Atkins (1992) and Atkins (1995) outline the basic architecture of a frame-based dictionary and discuss ways in which some of the main principles of Frame Semantics should be applied to the creation of such an electronic lexicographic database, namely FrameNet. More specifically, Fillmore & Atkins propose that

[a] word's meaning can be understood only with reference to a structured background of experience, beliefs, or practices, constituting a kind of conceptual prerequisite for understanding

the meaning. Speakers can be said to know the meaning of the word only by first understanding the background frames that motivate the concept that the word encodes. Within such an approach, words or word senses are not related to each other directly, word to word, but only by way of their links to common background frames and indications of the manner in which their meanings highlight particular elements of such frames. (Fillmore & Atkins 1992: 76-77)

The information contained in the Berkeley FrameNet (BFN) database (<http://framenet.icsi.berkeley>) is the result of a complex corpus-based workflow (see below for details). Most users of BFN search the database by frame or lexical unit. For example, one of the frames evoked by the verb *to give* is the *Giving* frame, which is also evoked by other verbs (such as *to bequeath*, *to contribute*, *to donate*, *to endow*) and nouns such as *contribution*, *donor*, *donation*, and *gift*. In BFN, frame definitions consist of a prose description of a situation involving various participants and other conceptual roles, each of which constitutes a Frame Element (FE). The *Giving* frame is defined as in Figure 1, followed by an annotated example sentence illustrating the distribution of FEs.

## Giving

[Lexical Unit Index](#)

### Definition:

A **Donor** transfers a **Theme** from a **Donor** to a **Recipient**. This frame includes only actions that are initiated by the **Donor** (the one that starts out owning the **Theme**). Sentences (even metaphorical ones) must meet the following entailments: the **Donor** first has possession of the **Theme**. Following the transfer the **Donor** no longer has the **Theme** and the **Recipient** does.

**Barney** **GAVE** **the beer** **to Moe**.

**\$300** was **ENDOWED** **to the university** **to build a new performing arts building**.

**Figure 1.** The FrameNet *Giving* frame<sup>13</sup>

One of the crucial aspects of a frame description is the definition of FEs. Unlike “traditional” semantic roles, which belong to a restricted set in Fillmore (1968) and in Á&H (2021), FEs are situation-specific semantic roles that are defined with respect to the types of scenarios they describe. The *Giving* frame in Figure 1 has three so-called core FEs, namely the **DONOR** (the person that begins in possession of the **THEME** and causes it to be in the possession of the **RECIPIENT**, marked in red in Fig. 1), the **RECIPIENT** (the entity that ends up in possession of the

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<sup>13</sup> <https://framenet2.icsi.berkeley.edu/fnReports/data/frameIndex.xml?frame=Giving>; for the German counterpart, the *Geben*-Frame (to which we will come back in Section 6), cf. <https://gsw.phil.hhu.de/framenet/frame?id=180>; last access: January 2, 2022.



THEME, marked in blue in Fig. 1), and the THEME (the object that changes ownership, marked in purple in Fig. 1).<sup>14</sup>

Again, it is important to point out that FEs are defined specific to each frame. Thus, the FE THEME in the Giving frame differs from the THEME of other frames such as Intercepting, Redirecting, and Storing. Similarly, the FE RECIPIENT in the Giving frame differs from the RECIPIENT in other frames such as Creating, Funding, and Renting.<sup>15</sup> The frame-specific definitions of FEs make it possible to establish clear boundaries between different frames, thereby allowing researchers to capture frames of different types, sizes, and granularity (for details, see Petruck et al. 2004).

Á&H (2021), who favor restricted sets of semantic roles, are critical of approaches using expanded sets of semantic roles such as FrameNet because, in their view, one loses certain theoretical advantages of restricted role sets. Concretely, they argue that “from a theoretical perspective, opening up the role set is problematic because it abandons the core assumption of role semantics of using a fixed set of roles to describe syntactic structures in terms of content” (2021: 127, fn 4).<sup>16</sup> In contrast to Á&H, we do not regard an expansion of semantic role sets as in FrameNet as a problem, but rather as an empirically necessary method for capturing and analyzing the full breadth and depth of the nature of different meaning structures and their different syntactic realizations. In what follows, we address some of the points raised by Á&H about restricted semantic role sets.

#### 4.1 Restricting semantic role sets, option 1: Top-down

Over the past five decades, researchers have already pointed out extensive problems with restricted semantic role sets (see Section 2.2 above as well as the various authors cited by Á&H). Regarding restricted role sets, Á&H appear to adhere to a view that seems to persist among a group of researchers in German Linguistics such as Fleischmann (1985), Helbig (1992) and Welke (2019/2020), who subscribe to theoretical concepts from Valency Theory. In our view, the arguments against a limited set of semantic roles as in Fillmore (1968) and subsequent approaches developing restricted role sets in a top-down fashion (such as Á&H) are convincing. To date, there are still no clear tests to systematically determine abstract semantic roles of the type originally proposed by Fillmore (1968) and adopted by Á&H (2020). A related problem is the difficulty with determining the adequate granularity of semantic roles, and, more generally, there is a lack of a clear one-to-one correspondence between syntactic arguments and semantic

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<sup>14</sup> Our discussion focuses only on so-called core FEs, those FEs that are immediately relevant to the semantic frame. So-called non-core FEs (typically TIME, MANNER, PLACE) are not directly relevant to the core meaning of the frame (see Fillmore & Baker 2010, Boas 2013, Ruppenhofer et al. 2013, Ruppenhofer et al. 2016).

<sup>15</sup> More precisely, each FE in each frame would have to carry its own individual name. In the sake of practicality, however, similar roles are named the same (cf. for example THEME and RECIPIENT mentioned above). However, this should not obscure the fact that there are frame-specific differences in each case.

<sup>16</sup> “Aus theoretischer Perspektive ist die Öffnung des Rollensets problematisch, da damit die Kernannahme der Rollensemantik, mit einem festen Set von Rollen syntaktische Strukturen inhaltlich zu beschreiben, aufgegeben wird.”

roles (for details, see Nilsen 1972, Jackendoff 1983, Dowty 1991, Levin & Rappaport Hovav 2005).

#### 4.2 Restricting semantic role sets, option 2: Bottom-up

Even though the set of situation-specific semantic roles in FrameNet appears rather large at first sight, it is in fact systematically restricted in three ways (all of which differ somewhat from Á&H's ideas about what it means to restrict role sets).

First, each of the 10,478 FEs<sup>17</sup> across 1,224 semantic frames in BFN (as of Dec. 1, 2021) is the result of an empirical bottom-up discovery procedure based on corpus data, see details below. FN contains FEs that can be empirically tested using new data. If new data demonstrate that existing FE definitions are inaccurate, then they have to be modified accordingly, or, in other words, they have to be restricted in different ways (for details see Petruck et al. 2004, Ruppenhofer et al. 2017, Boas 2020).

Second, Á&H seem to misunderstand the status of semantic roles in Frame Semantics and in BFN. They claim that “significant-semantic roles, in contrast to denotative-semantic roles which are set as universal, get their value (valeur) single-language-system-internally”<sup>18</sup> (Á&H 2021: 126). However, FEs in BFN are in fact language specific, in this case they are discovered, analyzed, and defined based on English corpus data. In other words, FEs in BFN are restricted to English and they are, contrary to what Á&H claim about denotative-semantic approaches, not universal. This does not mean, however, that semantic frames cannot be applied to other languages. Research on semantic frames over the past 25 years has shown that many of the semantic frames derived on the basis of English can also be applied to other languages and to the creation of FrameNets for other languages (see Heid 1996, Fontenelle 1997, Boas 2002/2005/2009/2017/2020, Ohara 2009, Fillmore & Baker 2010, Boas et al. 2019, Baker & Lorenzi 2020, Ziem 2020a/2020b).

Third, each BFN frame is part of the FN hierarchy, a structured network of semantic frames with inheritance (and other) relations that can be accessed using the Frame Grapher visualization tool (see <https://framenet.icsi.berkeley.edu/fndrupal/FrameGrapher>) (see Fillmore & Baker 2010, Ruppenhofer et al. 2016). At the very top of this extensive network of interconnected semantic frames are some of the most abstract frames reminiscent of the case frames in Fillmore (1968), such as EVENT, STATE, and PROCESS. One of the abstract frames found at the top of the frame hierarchy is the frame `Cause_motion`, which is a more specific instantiation of the frame `Transitive_action`.

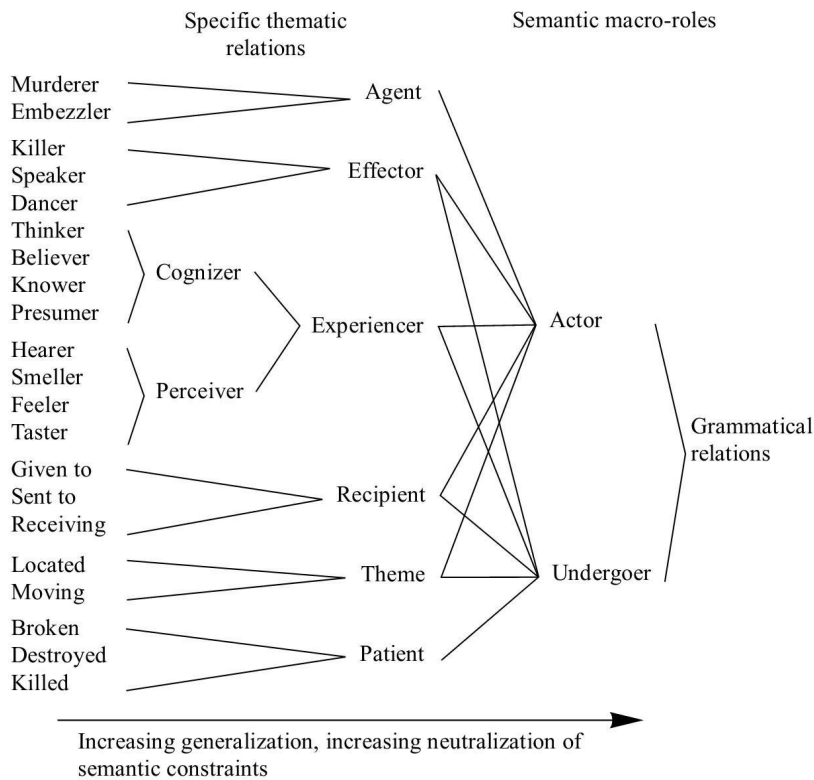
The `Cause_motion` frame, with the core FEs AGENT, THEME, SOURCE, PATH, and GOAL is inherited by a very large number of other frames, including (via a number of other

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<sup>17</sup> Note that this is the total number of FEs (token) assigned to frames. The number of FE types is significantly smaller, for details cf. the FE index in the German FrameNet: <https://gsw.phil.hhu.de/framenet/feindex>, last access: January 2, 2022.

<sup>18</sup> “Signifikativ-semantische Rollen bekommen nämlich im Gegensatz zu den als universal gesetzten denotativ-semantischen ihren Wert („valeur“) einzelsprachlich-systemintern.”

intermediate frames in the hierarchy) the *Giving* frame discussed above. Thus, part of the meaning of the *Giving* frame is inherited from the *Cause\_motion* frame, which means that through inheritance relations in the FN hierarchy the FE *DONOR* of the *Giving* frame is a more specific instantiation of the *AGENT* FE of the *Cause\_motion* frame. Similarly, the FE *THEME* of the *Giving* frame is a more specific instantiation of the *THEME* FE of the *Cause\_motion* frame, and the FE *RECIPIENT* of the *Giving* frame is a more specific instantiation of the *GOAL* FE of the *Cause\_motion* frame. Because the FN frame hierarchy is so extensive it does not lend itself easily for representation in print format. In Figure 2, we thus employ Van Valin & Wilkins (1996) to illustrate our point.



**Figure 2.** Semantic macro-roles and specific semantic roles (Van Valin & Wilkins 1996: 306)

Van Valin & Wilkins (1996) provide a simplified visual representation of the different levels of abstraction regarding semantic relations, similar to the BFN frame hierarchy. On the right side in Figure 2 we see how Van Valin & Wilkins' (1996) most abstract semantic roles, their so-called

macro-roles ACTOR and UNDERGOER, subsume other more specific semantic roles below them, including the semantic roles (FEs in BFN) AGENT, THEME, and RECIPIENT.

This short overview shows that even though the number of FEs in BFN is rather large, it is highly structured through inheritance relations in the frame hierarchy (see Fillmore & Baker 2010: 332-333 for details). As such, each semantic role in BFN is restricted in the sense that it can be identified as a situation-specific instance of a much more abstract semantic role such as AGENT or PATIENT at the top of the frame hierarchy. Capturing semantic roles this way makes it possible to capture situation-specific knowledge in terms of situation-specific frames such as GIVING. In addition, it allows us to capture the type of more abstract knowledge about the type of event such as Cause\_motion and Transitive\_action, making it possible to understand the situation-specific frame as an instance of the more abstract frame, which can be characterized with the type of restricted set of semantic roles (see Figure 2) that Á&H espouse.

To summarize, even though the number of semantic roles documented by BFN so far is rather large, it is restricted in the sense that new FEs are only postulated when corpus evidence provides support for them. At the same time, frames (and their FEs) are structured in a multi-layered hierarchy that makes it possible to identify for each FE higher-level FEs such as AGENT, PATIENT, and INSTRUMENT. The ultimate number of frames and FEs can only be determined once BFN has arrived at a much broader coverage of English.<sup>19</sup>

## 5. Advances in FrameNet: empirical data, methodology, theoretical insights

One of Á&H's main points concerns the methodology of approaches that do not follow Á&H's ideas about restricting semantic role sets. More specifically, they claim the following:

Surprisingly, denotative semantics has not managed to present a theoretically robust set of semantic roles, and this, although the stipulated roles have not even been introduced on authentic linguistic data. Had an attempt been made to test the roles at least on short coherent textual sequences, the problems of these roles would have quickly become apparent. (Á&H 2021: 126)<sup>20</sup>

In our view, this critique is not justified, because by claiming that there is an approach that they label “denotative semantics” they make it appear as if the members of a group of researchers including Dowty, Fillmore, Lasch, Levin, Primus, Rappaport Hovav, and Ziem all share a common view that would justify labeling them all as adherents of “denotative semantics.”

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<sup>19</sup> Hanks (2012) criticizes FrameNet for covering the lexicon of English frame by frame, claiming that such a process will result in too many gaps and that it will take too long to finish. We do not see this problem much different than the problems faced by a traditional lexicographic approach that covers the lexicon alphabetically word by word. We think that if FrameNet were to continue its work (with adequate funding and personnel) for as long as it took the Oxford English Dictionary to be completed (more than 60 years), then it would very well be possible to arrive at a much more complete FN coverage of the English lexicon.

<sup>20</sup> “Erstaunlicherweise hat es die denotative Semantik nicht geschafft, ein theoretisch abgesichertes Set von Rollen zu präsentieren, und das, obwohl die stipulierten Rollen nicht einmal an natürlich-sprachlichem Material eingeführt wurden. Hätte man versucht, die Rollen wenigstens an kurzen kohärenten Textsequenzen zu erproben, wären die Probleme dieser Rollen schnell offen zu Tage getreten.”

However, this is not the case and grouping them all into one class creates, in our opinion, a strawman that Á&H use to highlight their own approach to semantic role sets.<sup>21</sup>

In what follows, we take this as a starting point to address Á&H's critique by first discussing the empirical methodology proposed by Fillmore (who Á&H appear to label as an adherent of "denotative semantics") as it is implemented in different FrameNet projects. We then turn to some issues regarding the restricted set of semantic roles proposed by Á&H.

Regarding Á&H's first point in the quote above, namely that adherents of "denotative semantics" have not arrived at a theoretically based set of roles, let us look at the structure and goals of FrameNet. Started as a lexicographic database of English in 1997, BFN has discovered, analyzed, and described more than 13,000 Lexical Units (henceforth LU) evoking more than 1,220 frames. This work is very time intensive and not yet complete. As such, it is not different from other large-scale lexicographic projects, some of which have taken decades to complete. Every time a new frame is completed and the lexical entries of the LUs evoking that frame are finalized, they have to be cross-checked for coherence vis-a-vis the other frames, especially when it comes to the question of where they fit into the frame hierarchy. One of the side effects of this procedure is that sometimes frames have to be reformulated or FE definitions have to be amended (see Petruck et al. 2004 and Fillmore & Baker 2010). By doing this, BFN follows a well-established procedure of scientific inquiry, by which research results are updated and, if necessary, changed as new discoveries are made. As such, BFN is an on-going work in progress and not yet finished. This means that the current set of frames, FE definitions, and lexical entries in BFN are only a snapshot, not yet complete, of the English lexicon. This also applies to other FrameNet projects in other languages including German.

To date, this usage-based bottom-up methodology resulting in an extensive set of semantic roles appears to have yielded semantic roles that have been successfully applied in foreign language teaching and learning (see Herbst 2016 and the contributions in De Knop & Gilquin 2016 and in Boas 2022) as well as a variety of natural language processing applications, including automatic role labeling, applications of core inference, and applications of extended inferences (see Ruppenhofer et al. 2017: 391-92). The jury is still out regarding the "complete" set of semantic roles of English, because this determination can only be made once BFN has completed its work on one large corpus of English such as the British National Corpus or the American National Corpus. However, the interim results provided by FrameNet seem to suggest that the extensive set of semantic roles defined with respect to the semantic frames and vis-a-vis the frame hierarchy is extremely promising.

Criticizing approaches that operate with (for now) open semantic role sets is like criticizing astronomers for not having a complete inventory of types of cosmic entities (e.g., planets, moons, stars, and black holes) in space or a theory of how they interact and why. Only after astronomers have a complete inventory of planets, moons, stars, and black holes in space will they arrive at a more sophisticated and complete theory of the universe. Similarly, we will

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<sup>21</sup> Another problem is that there is a proof-of-concept showing how full-text analyses using semantic frames (and constructions) work, see Ziem et al. (2014).

have to wait until the English (or German) lexicon (or at least those items used most frequently) has been analyzed in greater depth and detail to see what number and what types of semantic roles we end up with. Then it should be possible to arrive at an empirically founded restricted set of semantic roles. However, as of now, it is an open question just how big such a set will be and proposing a restricted role as done by Á&H is in our view premature.

Regarding Á&H's second point in the quote above, namely that the semantic roles proposed by adherents of "denotative semantics" are stipulated and not grounded in naturally occurring linguistic material, let us look at the methodology and workflow that BFN has followed since its inception in 1997. The same workflow leading to semantic frames and lexical entries in BFN is adapted in the German FrameNet Project ([www.german-framenet.de](http://www.german-framenet.de)). It consists of three main stages.

(a) *Detecting frames.* First, a group of lexicographers proposes new semantic frames and LUs that evoke them. This step typically involves the identification of a specific sense of a particular word that represents the prototypical meaning of that word and the frame more generally. An example is the LU *to give*, whose meaning expresses the prototypical meaning of the *GIVING* frame. BFN lexicographers arrive at preliminary frame descriptions by first comparing definitions of prototypical LUs in various dictionaries (Fillmore & Baker 2010). Then, they discuss these definitions, compare them with their own intuitions, and carefully study the contexts in which the LUs appear in large electronic corpora such as the American National Corpus and the British National Corpus. This stage is crucial for drafting frame definitions, because BFN lexicographers need to verify existing dictionary definitions and their own linguistic intuitions (which can sometimes vary) using empirical evidence. Sometimes, corpus data will also reveal new aspects of a word's usage that had not been previously recorded by any dictionary.

(b) *Compiling preliminary frame entries.* BFN lexicographers identify other LUs that evoke the same frame including verbs, nouns, adjectives, and prepositions (Boas 2017). When defining the boundaries of a frame, BFN lexicographers pay special attention, because all LUs should evoke the same type of event and share the same inventory and configurations of frame elements (FEs) (see Atkins, Rundell, and Sato 2003, Petruck et al. 2004, Ruppenhofer et al. 2010, Ruppenhofer et al. 2013). After several rounds of revisions, the first group of lexicographers finalizes a preliminary version of a frame description, frame element definitions, and a list of LUs evoking the frame. Then, a script automatically extracts several hundred example sentences for each relevant LU evoking the same frame from the British National Corpus.

(c) *Annotating corpus examples and refining frame entries.* Finally, a group of annotators uses an annotation tool<sup>22</sup> to (1) display the extracted corpus sentences, (2) identify sentences in which the relevant LUs are used in-frame, and (3) annotate relevant example sentences with FE

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<sup>22</sup> While lexicographers in BFN use the so-called "FrameNet desktop", in the German FrameNet construction project we developed our own software ("AnnotationTool") to annotate both frames and grammatical constructions incrementally with the help of one and the same software tightly implemented in the construction infrastructure (Ziem & Flick 2019: 29-33).

information (Fillmore & Baker 2010, Ruppenhofer et al. 2016). When annotators study the list of extracted corpus sentences to determine whether the LUs are in-frame and to then identify the FEs in sentences, they are using the frame descriptions and FE definitions created before by the group of lexicographers. In most cases, this process is unproblematic, but there are cases where annotators discover problems with frame descriptions or FE definitions, because they do not match up with the extracted corpus sentences. When this happens, annotators have to discuss these issues with the group of lexicographers in order to find a resolution. In some cases, frame descriptions or FE definitions have to be refined. In other cases, the discussion leads to the insight that a specific use of an LU is not in-frame, which leads to that LU being taken off the list of frame-evoking LUs.

In such a three-step lexicographic process, which has been successfully applied in the Berkeley FrameNet project since 1997 and in many other FrameNet projects in other languages, such as German, Brazilian Portuguese, Swedish, Japanese, French, Spanish and Chinese, frame descriptions and FE definitions function as a metalanguage for semantic analysis (see Boas 2020). When annotating, annotators use the insights from the first group of lexicographers in order to replicate their insights based on new corpus data. If there are problems with replicating the insights, descriptions, and definitions from the group of lexicographers based on new data, then they need to be refined. This workflow thus follows the scientific method, in which one first makes an observation that describes the problem and then one creates a hypothesis (BFN lexicographers creating frame descriptions and FE definitions).

The hypothesis is then tested, in this case by the annotators who are looking at new corpus data to identify FEs in content. If annotators can successfully annotate corpus sentences using the lexicographer’s frame descriptions and FE definitions, then the hypothesis is supported and the sentences can be successfully annotated, leading to the final stage in the FrameNet workflow process, during which an automated script generates lexical entries based on the annotations, which are then stored in the FrameNet database. If annotators encounter issues, they have to go back to the lexicographers to refine the frame descriptions and FE definitions, see above (see Ruppenhofer et al. 2016, 2017).

<u>2</u> TOTAL	Donor	Manner	Recipient	Theme
(1)	NP Ext	AVP Dep	PP[to] Dep	PP[of] Dep
(1)	PP[by] Dep	AVP Dep	DNI --	NP Ext
<u>1</u> TOTAL	Donor	Manner	Recipient	Time
(1)	CNI --	AVP Dep	PP[to] Dep	NP Dep
<u>4</u> TOTAL	Donor	Purpose	Recipient	Theme
(1)	CNI --	VPto Dep	PP[to] Dep	NP Ext
(2)	NP Ext	VPto Dep	DNI --	NP Obj

**Figure 3.** Partial excerpt of the LU *to give* in the Giving frame.<sup>23</sup>

The FrameNet workflow results in lexical entries consisting, among other things, of frame descriptions (Figure 1 above), annotated example sentences, and valence tables. Figure 3 is an excerpt of the valence table of the LU *to give* in the Giving frame, showing how different frame element configurations are realized syntactically. For example, the first two lines in Figure 3 show how the frame element configuration DONOR, MANNER, RECIPIENT, and THEME are realized syntactically as an external NP, a dependent AVP, a dependent PP headed by *to*, and a dependent PP headed by *of* as in the corpus sentence that serves as its basis *But [<sub>Donor</sub>he] would give<sup>Target</sup> [<sub>Manner</sub>generously] [<sub>Theme</sub>of his time] [<sub>Recipient</sub>to such organizations as the British Council].*

Our short discussion of the FrameNet workflow, which is based on key insights from Fillmore's (1982, 1985) Frame Semantics, shows that the procedures that underlie the discovery, analysis, and description of FEs, i.e. situation-specific semantic roles, follow a systematic corpus-based process aiming at defining semantic roles on empirical grounds. This process of refining, sustaining, and finally determining semantic roles does not only happen during the workflow involving a single frame, but also during the determination of how new frames (and LUs evoking them) fit into the hierarchy of existing frames, a process also known as re-framing. In the 25 years of BFN, there have been numerous instances in which existing frames and FEs had to be modified, because of the creation of new frames (see Petruck et al. 2004 for a discussion).

Reframing is also necessary when Berkeley frames are re-used to start building FrameNet resources for other languages. For example, the German FrameNet project started with Berkeley frames being continuously refined if sufficient corpus evidence were provided (Ziem 2020a). Given the numerous FEs documented over the years by FrameNet on the basis of corpus evidence, we very much disagree with Á&H's (2021: 140-141) claim that what they label as the denotative-semantic analysis of semantic roles has been unsuccessful over the past 50 years. Rather, in stark contrast, the very concept of 'denotative' semantic roles are effectively re-used to analyze grammatical constructions as configurations of semantic roles, encouraging multifarious endeavors to develop constructicons in different languages (Lyngfelt et al. 2018).

## 6. Conclusions

In this paper, we argued in favor of a linguistic framework that refrains from limiting semantic roles to a more or less fixed set of rather abstract roles. Specifically, we discussed a number of problems faced by Ágel and Höllein's (2021) so-called significantive-semantic approach. To address Á&H's misconceptions of Fillmore's more recent theory of semantic roles, we demonstrated how Fillmore's view of semantic roles have evolved during the 1970s and 1980s, leading to a new framework known as Frame Semantics (Fillmore 1982, Fillmore & Atkins

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<sup>23</sup> <https://framenet2.icsi.berkeley.edu/fnReports/data/lu/lu4344.xml?mode=lexentry>



1992), which formed the basis for the development of the Berkeley FrameNet in the late 1990s and its extension to a FrameNet construction fifteen years later. This framework has been successfully applied to several languages, including German (cf. [www.german-constructicon.de](http://www.german-constructicon.de)). This framework has also been shown to be useful in the teaching and learning of foreign languages, see, e.g. De Knop (2020), De Knop & Mollica (2016/2018/2022), as well as the contributions in De Knop & Gilquin (2016).

Generally, it is important to keep in mind that semantic roles are always defined relative to a specific embedding structure, which may vary substantially, ranging from item-specific valency patterns to rather abstract argument structure constructions, including SBPs as addressed by Á&H. Hence, as Van Valin & Wilkins (1996: 306f.) point out, the degree of abstraction of semantic roles increases in the same way as the referenced embedding structure becomes more abstract.

Against the backdrop of Fillmore's refusal of limiting semantic roles to a fixed set, it is not difficult to see the major advances in his conception that led to the large-scale FrameNet project and eventually paved the way for integrating the very idea of semantic roles in an empirically sound approach to grammatical constructions (Fillmore et al. 2012), in which semantic roles are conceptualized as building blocks of constructions. We consider this approach to semantic roles the very basis of current bottom-up construction-building efforts (cf. Ziem & Boas 2017/2021, Lyngelt et al. 2018, Boas et al. 2019, Ziem & Flick 2019, Ziem 2020b), aiming at empirically documenting constructions of *all* kinds analyzed in a uniform way and implementing them in a construction that acknowledges the continuum between lexicon and grammar. For this challenging endeavor, an open and empirically grounded list of semantic roles is undoubtedly a key concept.

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